Critical Review of Rate Constants for Reactions of Transients from Metal Ions and Metal Complexes in Aqueous Solution

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Kinetic data for transient metal species in aqueous solution have been critically reviewed. The compilation covers over 2000 measurements of rate constants involving 660 metal ions and metal complexes from Groups 4-15; lanthanides and actinides are not included. Most of the data have been obtained by the methods of pulse radiolysis or flash photolysis. Data have been collected from 500 publications through 1993. ©*1995 American Institute of Physics and American Chemical Society.*

Key words: aqueous solution; chemical kinetics; critical review; data compilation; flash photolysis; metal ions; pulse radiolysis; rate constants; transients.

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1. Introduction

A wealth of information on the rates of fast reactions of metal ions has been obtained in the last 30 years, but there has been no systematic review of the data since the first tables of rate constants were published in 1978.[1] Such information is valuable in the fields of homogeneous catalysis, radio-sensitisation and solar energy conversion.

The present compilation, which supersedes the previous one,[1] comprises critically reviewed rate constants for the reactions of metal ions and their complexes in aqueous solution, together with pertinent data on their spectral properties and acid dissociation constants.

Rate constants are recorded for reactions where the metal species has a transient existence. Thus the compilation contains not only those species that are inherently unstable (e.g., Cd^+, Tl^{2+}), but also stable ions which react so rapidly under the given conditions that they have to be generated *in situ* usually by the fast time-resolved methods of pulse radiolysis or flash photolysis. To keep the compilation within reasonable bounds we have generally omitted the vast amount of data that has been obtained by the slower time-resolved method of stopped-flow. Nevertheless, a few stopped-flow data have been included when we judge them to be particularly relevant to the pulse radiolysis or flash photolysis data. Finally, a small number of rate constants obtained from competition kinetics studies using γ-radiolysis and other steady-state methods are listed when they are the only available data.

A number of review articles have been published which deal with the mechanistic roles of metal ions[2–4] and the kinetic data compiled here are complementary to this mechanistic information.

2. Methods of Generation and Detection of Transients

2.1. Pulse Radiolysis

When moderately dilute ($\leq$1 mol L^{-1}) aqueous solutions are exposed to ionizing radiation, such as ^{60}Co γ-rays or fast electrons from an accelerator, energy is predominantly absorbed by the solvent to create radical and molecular products. The overall chemical change is summarized by Eq.(1):

$$4.1\ H_2O \rightsquigarrow 2.6\ e_q^- + 0.6\ H^{\cdot} + 2.7\ {}^{\cdot}OH + 0.45\ H_2 + 0.7\ H_2O_2 + 2.6\ H^+, \quad (1)$$

where the numbers represent the radiation chemical yields, G-values, in units of molecules per 100 eV of absorbed energy. These units are converted to SI units of mol J^{-1} by multiplying by 1.036×10^{-7}.

The hydrated electron, e_{aq}^-, and the hydrogen atom are powerful reducing agents and the hydroxyl radical is a strong oxidant.[5] Because of these properties they are very effective in bringing about one-electron changes in the oxidation states of metal ions, so radiolysis, and particularly pulse radiolysis, has been widely exploited for this purpose. Reactions (2)–(4) below are some illustrative examples of how

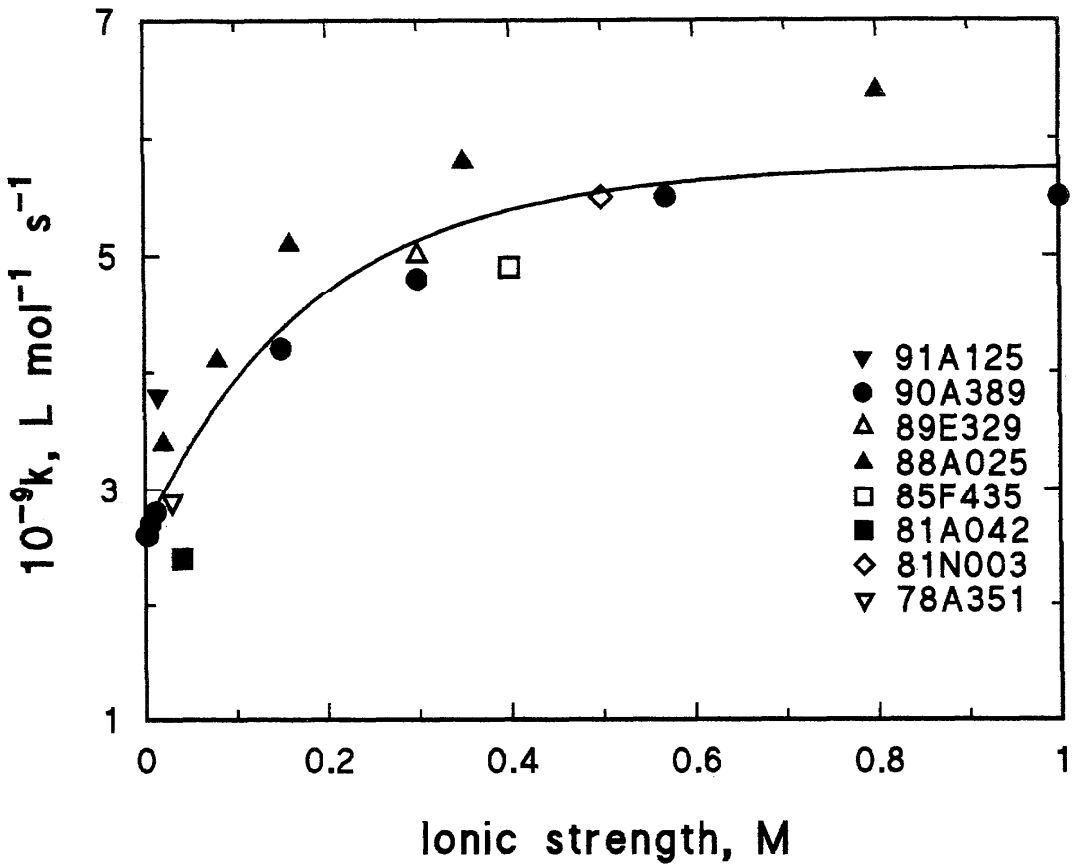

FIG. 1. Effect of Ionic Strength on the Bimolecular Rate Constant for $Ru(bpy)_3^{3+}+MV^{\cdot+}\rightarrow Ru(bpy)_3^{2+}+MV^{2+}$ in Aqueous Solution.

oxidation states, which are not generally accessible by ordinary chemical means, can be generated in aqueous solution:

$$e_{aq}^- + Ni^{2+} \rightarrow Ni^+ \quad k = 1.9\times10^{10}\ \text{L mol}^{-1}\,\text{s}^{-1}, \quad (2)$$

$$H^{\cdot} + Cu^{2+} \rightarrow Cu^+ + H^+ \quad k = 9.1\times10^{7}\ \text{L mol}^{-1}\,\text{s}^{-1}, \quad (3)$$

$$^{\cdot}OH + Tl^+ \rightarrow TlOH^+ \quad k = 9.9\times10^{9}\ \text{L mol}^{-1}\,\text{s}^{-1}. \quad (4)$$

Data for the reactions of these free radicals with other metal species can be found in Ref. 6, and details of the conditions used to separate the radicals are described in Ref. 5.

It is sometimes desirable to convert the primary radicals of water radiolysis [reaction (1)] to secondary radicals so that redox changes can be controlled. For example, the reactions of $^{\cdot}OH$ with metal ions are generally believed to result in the formation of hydroxo-adduct [e.g., reaction (4)] because simple outer-sphere electron transfer is unlikely on energetic grounds. On the other hand, outer-sphere electron transfer is more common with inorganic radicals such as $SO_4^{\cdot-}$ and $N_3^{\cdot}$. Judicious choice of the redox agent becomes important when metal ions have ligands which can also be oxidized or reduced. Data for the reactions of these secondary radicals with metal ions and their complexes can be found in Ref. 7.

2.2. Photolysis

2.2.1. Photoionization and Photoexcitation

In this case energy is imparted directly to the metal ion or complex when it absorbs a photon. The result may be loss of an electron (photoionization) or excitation of an electron to a higher orbital (photoexcitation). In the first case one-electron oxidation of the metal species occurs, but in the second case the excited state may be quenched oxidatively or reductively by electron transfer to an acceptor or from a donor, respectively. Extensive kinetic data and details of these redox quenching processes can be found in Ref. 8.

2.2.2. Oxidative Quenching of Tris(2,2'-bipyridine)ruthenium(II) ion

The oxidative quenching of $[Ru(II)(bpy)_3^{2+}]^*$ by 1,1'-dimethyl-4,4'-bipyridinium ion (MV^{2+}) [reaction (5)] provides an illustrative example of the type of process that is relevant to this compilation, namely the back electron transfer reaction (6) between the oxidation product $Ru(III)(bpy)_3^{3+}$ and the one-electron reduced quencher $MV^{\cdot+}$:

$$[Ru(II)(bpy)_3^{2+}]^* + MV^{2+} \rightarrow Ru(II)(bpy)_3^{3+} + MV^{\cdot +}, \quad (5)$$

$$Ru(III)(bpy)_3^{3+} + MV^{\cdot +} \rightarrow Ru(II)(bpy)_3^{2+} + MV^{2+}. \quad (6)$$

We highlight reaction (6) here because its rate constant has been measured many times under a wide range of conditions of pH and ionic strength. Figure 1 shows data for $I<1$ mol L^{-1} which form a self-consistent set. The solid line is given by the empirical expression:

$$k = \{3.1\times10^9[1 - \exp(-5.3I)] + 2.7\times10^9\} \text{ L mol}^{-1}\text{ s}^{-1}. \quad (7)$$

The data and their sources are listed in Appendix I, Table 22B; also included are data for $I>1$ mol L^{-1}.

3. Explanation of the Tables

3.1. Scope of the Compilation

The compilation contains data published by the end of 1993; data from a few papers received early in 1994 have also been included. The data were located through literature searches of the bibliographic database maintained by the Radiation Chemistry Data Center, and by examination of reviews.

Rate constants have not been recorded when the metal species is in the form of a macromolecule, a polymer or a colloid, or is contained in a micellar system, or in non-aqueous (≤50% v/v H_2O) solvent. Intramolecular electron transfer reactions have also been omitted.

3.2. Data Selection

In order to be included in this compilation, values of the rate constants had to be reported in published papers, including proceedings of conferences, or communicated to us in the detail appropriate for a paper in a refereed journal. Preference has been given to data obtained under well defined experimental conditions for well characterized chemical species. However, data for which the conditions are poorly defined, or even unstated, have been included when no others are available on the grounds that they are better than no data at all. The reader is given sufficient information in each entry to judge the quality of the result.

3.3. Uncertainties and Sources of Error

In many cases authors have quoted the uncertainty of their data but the method of evaluation is not always specified. In others single values are reported to three significant figures. We have decided, therefore, not to report any errors and, since values of rate constants obtained in independent measurements are unlikely to have uncertainties of less than 5–10%, we have reported data to a maximum of two significant figures. In cases where the uncertainty is in the first figure or the data represent upper or lower limit values, only the first figure is recorded. Where the data have an uncertainty of more than 40–50%, they have been prefixed with "~". When discrepant values of a rate constant have been reported we have endeavoured to judge which is correct from the information available and report only that one. In a few cases where it has not been possible to make this choice, the data have been marked to indicate that there is an unexplained discrepancy.

For some reactions there is uncertainty about the mechanism and even the structure of the reactant. Where different authors have presented different interpretations we have noted them in a comment along side the entries (e.g., Table 19, entries 19.29 and 19.30). In those cases where subsequent work has shown an earlier identification of the transient reactant to be in error, the correct identification has been used in the entry from the earlier work (e.g., Table 15, entries 15.29.1–15.29.6).

One of the main sources of error in measuring rate constants is the failure to take proper account of temperature. Many measurements are reported without reference to the temperature at which they were made, although the ambient temperature can vary by several °C. Where the measuring temperature is reported we have recorded it in the entry in the column headed "t(°C)", otherwise this column is left blank.

Another source of error in data for reactions between charged species is due to measurement having been made at different, but unspecified, ionic strengths. Accordingly ionic strength is included in an entry only when it is specified by the authors. Lack of pH control can also be a source of error and again the pH has been recorded only if it is reported by the authors, or when it can be calculated from the *stated concentration* of H^+ or OH^-.

3.4. Spectral Properties and pK_a's of the Metal Transients

We have collected data on the optical absorption spectra and values of ϵ (molar absorptivity) of transient metal species in separate tables for each metal. The species are arranged in order of ascending oxidation number. When the oxidation number is not known it is listed as, for example, Pt(II/?) to indicate that the oxidation number of the starting material is (II) but that of the product is uncertain. The entry numbers in Tables 1–28 to which the data refer are included in these tables; also reported there are values of acid dissociation constants (pK_a).

For reactions between like species where the measured parameter is k/ϵ (or $2k/\epsilon$) discrepancies arise through the use of differing values of ϵ. If divergent values of k have been reported using different values of the molar absorptivity, the latter have been reassessed and values of k recalculated if appropriate.

3.5. Nomenclature

Each chemical species has been named according to IUPAC rules whenever posible. The names of the reacting species appear as headings for the entries. An index of chemical names and synonyms is provided (Sec. 9), as well as a molecular formula index (Sec. 8), as aids in locating reactants which are present in Tables 1–28.

When it is not clear where the redox change occurs in the generation of a transient metal complex, the name used

combines those of the starting material and the redox agent, e.g., Table 7, entry 7.13, "Tris(5-chloro-1,10-phenanthroline)chromium(III), carboxyl radical adduct." Table 19, entry 19.11, "Bis(ethylenediamine)platinum(II), H reaction product" and Table 15, entry 15.59, "Nitriloacetatonickelate(II), H-abstraction product."

Abbreviations are used in writing the reactions, and these are listed separately in Sec. 4. Generally the metal appears as the first symbol, but where it is clear that a free radical bonds to a metal centre that is bonded to other ligands, the radical symbol precedes that of the metal, e.g., Table 6, entry 6.83.1, $HOCH(CH_3)Co(4,11\text{-dieneN}_4)^{2+}$.

In some cases symbols of different ligands are contained in parentheses for the sake of clarity, e.g., Table 6, entry 6.108.1, $HOCH_2CoHEDTA(H_2O)^-$.

A roman numeral is used to indicate the oxidation state of the metal when it is not obvious from the formula of the complex. Water of hydration has generally been omitted from the formulae. In some cases, free radical species are enclosed in square brackets with a superscripted dot for the sake of clarity, e.g., Table 6, entry 6.98.1, $[Co(bpy)_2(bpyOH)]^{\cdot 3+}$ and Table 6, entry 6.1.29 $[2\text{-}CH_3NQ]^{\cdot -}$.

3.6. Arrangement of the Tables

There is a table for each metal and these are arranged in alphabetical order of the metal symbol. Where a reaction involves two different transient metal species, it is recorded in both tables; but for a reaction between two stable metal species where one of them is produced transiently, the rate contant appears in the table appropriate to the transient. Tables containing spectral properties and pK_a's have the same number, with the suffix A, as the rate constant tables for the individual metals. These tables are collected in Appendix I, Sec. 10.

3.6.1. Order of Entries

In each table the reactions are listed in order starting with the lowest oxidation state of a particular metal species. Subject to the principle of keeping similar organometallic transients together, they are generally listed within the ligand subgroupings: simple aliphatic, simple alicyclic and simple aromatic derivatives, followed by chelating and macrocyclic ligands. The order of entry of the metal transients in the tables is shown in the listing in Sec. 11 (Appendix II).

The reactions of each species are divided into groups according to whether the second reactant is a radical, an inorganic or an organic. First-order reactions are listed first, then radical–radical reactions, which precede the reactions with inorganics. Reactions with inorganics are grouped in alphabetical order of the main element. Reactions with organics follow, alphabetically by name. Multiple entries for the same reaction are listed in descending chronological order of publication date. The location of all reactants (including the metal transients) can be found from the Molecular Formula Index (Sec. 8) and the Chemical Name Index (Sec. 9).

3.6.2. Rate Constants

Values of k are in units of L mol^{-1} s^{-1} and these units are given at the head of the column. The unit of s^{-1} is included with the value of k when it refers to a first-order reaction or a bimolecular reaction with water.

3.6.3. pH

This is included in the entry when it is reported by the authors or if it can be calculated from the concentration of H^+ or OH^- in the solution.

3.6.4. Ionic Strength

The ionic strength is entered only when it is reported by the authors. The number of significant figures quoted by the authors has been retained.

3.6.5. Temperature

Most data have been obtained at ambient temperature which is not always reported. Unless the temperature was specified it has been omitted from the tables, but in those cases it can be taken to be the room temperature.

3.6.6. Method

This is entered in abbreviated form, e.g., p.r., f.p., etc., and the abbreviations are listed in Sec. 4.

3.6.7. Comments

The comments column contains detailed information in abbreviated form in the following order: The method used to obtain the value of k and the wavelength of measurement if appropriate; the composition of the solution; values of k obtained under other specified conditions. Where a reaction is reversible and the rate constant for the reverse reaction is also known it is reported as k_r. When a value of k has been obtained by computer fitting this is stated. Activation parameters, E_a, $\Delta H\ddagger$ and $\Delta S\ddagger$, are quoted if they are known. Also included in this column are rate constants for further changes in the primary product.

3.6.8. References to Tables

The references are listed by the serial number in the RCDC bibliographic database. These corresponding full references are presented in ascending chronological order in the bibliography (Sec. 7).

4. List of Abbreviations and Symbols

Methods and Other Symbols

c.k.	competition kinetics
condy.	conductivity
d.k.	decay kinetics
$\Delta G‡$	free energy of activation
$\Delta H‡$	enthalpy of activation
$\Delta S‡$	entropy of activation
ϵ	extinction coefficient (molar absorptivity)
E_a	activation energy
e.d.	discharge
esr	electron spin resonance
f.p.	flash photolysis
f.p./rq	flash photolysis/reductive quenching
f.p./oq	flash photolysis/oxidative quenching
f.p./pi	flash photolysis/photoionization
G	radiation yield (molecules per 100 eV)
γ-r.	gamma radiolysis
I	ionic strength
K	equilibrium constant
k	specific rate of the forward reaction
k_r	specific rate of the reverse reaction
OQ	oxidative quencher
pK_a	negative logarithm of the acid dissociation constant, e.g., where $AH+H_2O \rightleftarrows A^-+H_3O^+$
phot.	photolysis
p.b.k.	product buildup kinetics
p.r.	pulse radiolysis
RQ	reductive quencher
satd.	saturated
soln.	solution
s.f.	stopped flow

Chemical Species and Ligands

ABTS	2,2′-azinobis(3-ethylbenzothiazoline-6-sulfonate)
Ac	acetyl
acac	acetylacetonato (2,4-pentanedionato)
Ala	alanine
aneN$_4$	5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradecane
[13]aneN$_4$	1,4,7,10-tetraazacyclotridecane
[15]aneN$_4$	1,4,8,12-tetraazacyclopentadecane
[16]aneN$_5$	1,4,7,10,13-pentaazacyclohexadecane
AQ	9,10-anthraquinone
AZAcapten	8-methyl-1,3,13,16-tetraaza-6,10,19-trithiabicyclo[6.6.6]eicosane
bpm	2,2′-bipyrimidine
bpy	2,2′-bipyridine
4,4′-bpy	4,4′-bipyridine
bpz	2,2′-bipyrazine
bth	2,2′-bithiazole
BuOH	butanol
tert-BuOH	*tert*-butyl alcohol (2-methyl-2-propanol)
chxn	*trans*-1,2-cyclohexanediamine
Cp	cyclopentadienyl
cyclam	1,4,8,11-tetraazacyclotetradecane
CysSH	cysteine
diamsar	1,8-diamino-3,6,10,13,16,19-hexaazabicyclo[6.6.6]eicosane
dien	diethylenetriamine
4,11-dieneN$_4$	5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene
4,13-dieneN$_4$	2,2,4,11,11,13-hexamethyl-1,5,10,14-tetraazacyclooctadeca-4,13-diene

4,14-dieneN$_4$	5,7,7,12,12,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,14-diene
10,13-dieneN$_4$	11,13-dimethyl-1,4,7,10-tetraazacyclotetradeca-10,13-diene
diHOamsar	1,8-bis(hydroxyamino)-3,6,10,13,16,19-hexaazabicyclo[6.6.]eicosane
dinosar	1,8-dinitro-3,6,10,13,16,19-hexaazabicyclo[6.6.6]eicosane
DMCH	6,7-dihydro-5,8-dimethyldibenzo[*b*,*j*][1,10]phenanthroline
dmg	dimethylglyoxime
DMSO	dimethyl sulfoxide
DP	deuteroporphyrin
dppz	dipyrido[3,2-*a*:2′,3′-*c*]phenazine
DQ	duroquinone
DTPA	diethylenetriaminepentaacetate ion
EDDA	ethylenediaminediacetate ion
EDTA	ethylenediaminetetraacetate ion
en	ethylenediamine
Et$_4$dien	tetraethyldiethylenetriamine
EtOH	ethanol
Fc	ferrocene
HEDTA	*N*-(2-hydroxyethyl)-*N*,*N*′,*N*′-ethylenediaminetriacetate ion
HypO$^-$	hydroxyprolinato
Gly$^-$	glycinato
IDA	iminodacetate ion
Im	imidazole
In	indole
isn	isonicotinamide
mbpy	1-methyl-4,4′-bipyridinium
Me	methyl
Me$_6$[14]aneN$_4$	5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradecane
Me$_4$cyclam	1,4,8,11-tetramethyl-1,4,8,11-tetraazacyclotetradecane
Me$_{10}$cyclam	1,4,5,7,7,8,11,12,14,14-decamethyl-1,4,8,11-tetraazacyclotetradecane
MeNH$_2$[18]aneN$_6$	8-Amino-8-methyl-1,3,6,10,13,15-hexaazatricyclo[13.1.1.1^{13,15}]octadecane
MeNO$_2$[18]aneN$_6$	8-Methyl-8-nitro-1,3,6,10,13,15-hexaazatricyclo[13.1.1.1^{13,15}]octadecane
MeOH	methanol
Me$_2$pyo[14]aneN$_6$	α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),13,15-triene
Me$_2$pyo[14]hexaeneN$_4$	α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,6,11,13,15-hexaene
Me$_2$pyo[14]trieneN$_4$	α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,11,13,15-pentaene
Me$_4$tetraeneN$_4$	1,3,8,10-tetraamethyl-1,4,8,11-tetraazacyclodeca-1,3,8,10-tetraane
MV^{2+}	1,1′-dimethyl-4,4′-bipyridinium (methyl viologen)
na	nicotinamide
NAD	nicotinamide adenine dinucleotide
NTA	nitrilotriacetate ion
NQ	naphthoquinone
PFP	tetra(*N*-methylisonicotinamidophenyl)phosphine
Ph	phenyl
phen	1,10-phenanthroline
pm	pyrimidine
PP	protoporphyrin
PrOH	propanol
pts	trisulfophthalocyanine
py	pyridine
pytda	2-(1,2,4-thiadiazol-5-yl)pyridine
pyth	2-(2-thiazolyl)pyridine
pz	pyrazine
Q	1,4-benzoquinone
QH$_2$	hydroquinone
sar	3,6,10,13,16,19-hexaazabicyclo[6.6.6]eicosane
SDS	sodium dodecylsulfate
sep	1,3,6,8,10,13,16,19-octaazabicyclo[6.6.6]eicosane
tacn	1,4,7-triazacyclononane
TAP	1,4,5,7-tetraazaphenanthrene

TAPP	tetra(4-trimethylammoniophenyl)porphine
TCPP	tetra(4-carboxyphenyl)porphine
TCPPS	tetra(2,6-dichloro-3-sulfonatophenyl)porphine
TEOA	triethanolamine
terpy	2,2′:2′,2″-terpyridine
tetraen	tetraethyldiethylenetriamine
tetraeneN_4	5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraene
tetren	tetraethylenepentamine
TFPPS	tetra(2-fluoro-3-sulfonatophenyl)porphine
tim	2,3,9,10-tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraene
TMpyP	tetra(1-methyl-4-pyridyl)porphine
2-TMpyP	tetra(1-methyl-2-pyridyl)porphine
3-TMpyP	tetra(1-methyl-3-pyridyl)porphine
TPP	tetraphenylporphine
TPPS	tetra(4-sulfonatophenyl)porphine
TpyP	tetra(4-pyridyl)porphine
2-TpyP	tetra(2-pyridyl)porphine
3-TpyP	tetra(3-pyridyl)porphine
trien	triethylenetetramine
TrpH	tryptophan
tspc	3,10,17,24-tetrasulfophthalocyanine
TTP	tetra(4-methylphenyl)porphine
$TxOH^-$	6-hydroxy-2,5,7,8-tetramethylchroman-2-carboxylate ion (Trolox C anion)
TyrOH	tyrosine
TZP	tetra[4-*N*-(3-sulfonatopropyl)pyridyl]porphine
U	uracil

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TABLE 1. Rate constants for silver transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
1.1	**Silver atom**							
1.1.1	**Silver atom**							
	$Ag^0 + Ag^0 \rightarrow Ag_2{}^0$	$\sim 1.6 \times 10^{10}$				p.r.	Estimated from comparison of spectral changes and calculated concentration-time profiles of the early products of reduction of Ag^+.	93A166
1.1.2	**Silver(I) ion**							
	$Ag^0 + Ag^+ \rightarrow Ag_2{}^+$	8×10^9				p.r.	D.k. at 360 nm and p.b.k. at 310 nm in soln. contg. 0.1 mol L^{-1} 2-PrOH and 1×10^{-4} mol L^{-1} $AgClO_4$.	93A166
		6.5×10^9	1.0		29	p.r.	D.k. at 410 nm in soln. contg. 0.0042-0.34 mol L^{-1} *tert*-BuOH, 0.1 mol L^{-1} $HClO_4$ and 1×10^{-4} mol L^{-1} $AgClO_4$.	731053
		5.2×10^9	1.0		29	p.r.	D.k. at 410 nm in soln. contg. 0.0042-0.34 mol L^{-1} *tert*-BuOH, 0.1 mol L^{-1} $HClO_4$ and 1×10^{-4} mol L^{-1} $AgClO_4$; measured at pressure of 6.72 kbar.	731053
		5.9×10^9				p.r.	P.b.k. at 260 nm and d.k. at 360 nm in soln. contg. 0.1 mol L^{-1} MeOH and 10^{-5} mol L^{-1} Ag_2SO_4.	680431
1.1.3	**Diamminesilver(I) ion**							
	$Ag^0 + Ag(NH_3)_2{}^+ \rightarrow Ag_2(NH_3)_n{}^+$	5.2×10^9				p.r.	D.k. at 360 nm and p.b.k. at 260 nm in soln. contg. 0.1 mol L^{-1} MeOH, 0.1 mol L^{-1} NH_3 and 10^{-5} mol L^{-1} Ag_2SO_4. Product contains unknown number of ammine ligands.	680435
1.1.4	**Copper(II) ion**							
	$Ag^0 + Cu^{2+} \rightarrow Ag^+ + Cu^+$	6.5×10^8				p.r.	D.k. at 360 nm in soln. contg. 1×10^{-5} mol L^{-1} Ag^+.	78A410
1.1.5	**Iron(III) ion**							
	$Ag^0 + Fe^{3+} \rightarrow Ag^+ + Fe^{2+}$	1.2×10^9	2			p.r.	D.k. at 360 nm in soln. contg. 1×10^{-5} mol L^{-1} Ag^+.	78A410
1.1.6	**Oxygen**							
	$Ag^0 + O_2 \rightarrow Ag^+ + O_2{}^{\cdot -}$	5.0×10^9				p.r.	D.k. at 360 nm in soln. contg. 1×10^{-5} mol L^{-1} Ag^+.	78A410
1.1.7	**Hydrogen peroxide**							
	$Ag^0 + H_2O_2 \rightarrow$	3.5×10^9				p.r.	D.k. at 360 nm in soln. contg. 1×10^{-5} mol L^{-1} Ag^+.	78A410
1.1.8	**Bromoform**							
	$Ag^0 + CHBr_3 \rightarrow$	3.0×10^9				p.r.	D.k. at 360 nm in soln. contg. 1×10^{-5} mol L^{-1} Ag^+.	78A410
1.1.9	**Carbon tetrachloride**							
	$Ag^0 + CCl_4 \rightarrow$	1.1×10^9				p.r.	D.k. at 360 nm in soln. contg. 1×10^{-5} mol L^{-1} Ag^+.	78A410
1.1.10	**Chloroacetate ion**							
	$Ag^0 + ClCH_2CO_2{}^- \rightarrow$	1.5×10^8				p.r.	D.k. at 360 nm in soln. contg. 1×10^{-5} mol L^{-1} Ag^+.	78A410
1.1.11	**Chloroform**							
	$Ag^0 + CHCl_3 \rightarrow$	1.1×10^9				p.r.	D.k. at 360 nm in soln. contg. 1×10^{-5} mol L^{-1} Ag^+.	78A410
1.1.12	**Nitrobenzene**							
	$Ag^0 + C_6H_5NO_2 \rightarrow$	2.8×10^9				p.r.	D.k. at 360 nm in soln. contg. 1×10^{-5} mol L^{-1} Ag^+.	78A410

TABLE 1. Rate constants for silver transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
1.1	**Silver atom** — Continued							
1.1.13	**Nitromethane**							
	$Ag^0 + CH_3NO_2 \rightarrow$	2.3×10^9				p.r.	D.k. at 360 nm in soln. contg. 1×10^{-5} mol L^{-1} Ag^+.	78A410
1.2	**Silver(I) ion, complex with Ag(0)**							
1.2.1	**Silver(I) ion, complex with Ag(0)**							
	$Ag_2^+ + Ag_2^+ \rightarrow Ag_4^{2+}$	1.3×10^9				p.r.	D.k. at 310 nm in N_2O-satd. soln. contg. formate.	93A166
1.2.2	**Iron(III) ion**							
	$Ag_2^+ + Fe^{3+} \rightarrow$	3.0×10^8	2			p.r.	D.k. at 310 nm in soln. contg. 0.001 mol L^{-1} Ag^+.	78A410
1.2.3	**Permanganate ion**							
	$Ag_2^+ + MnO_4^- \rightarrow$	$\sim 1.2 \times 10^{10}$			20	p.r.	D.k. at 545 nm in soln. contg. 10^{-5} mol L^{-1} MnO_4^- and varied [Ag^+].	650385
1.2.4	**Hydrogen peroxide**							
	$Ag_2^+ + H_2O_2 \rightarrow$	8.0×10^6				p.r.	D.k. at 310 nm in soln. contg. 0.001 mol L^{-1} Ag^+.	78A410
1.2.5	**Oxygen**							
	$Ag_2^+ + O_2 \rightarrow$	4.6×10^8				p.r.	D.k. at 310 nm in soln. contg. 0.001 mol L^{-1} Ag^+.	78A410
1.2.6	**Tris(2,2'-bipyridine)ruthenium(III) ion**							
	$Ag_2^+ + Ru(bpy)_3^{3+} \rightarrow 2\ Ag^+ + Ru(bpy)_3^{2+}$	1.2×10^{10}				f.p./oq	P.b.k. in soln. contg. $Ru(bpy)_3^{2+}$ and Ag^+ (OQ).	80C004
1.2.7	**1,4-Benzoquinone**							
	$Ag_2^+ + Q \rightarrow 2\ Ag^+ + Q^{\cdot -}$	1.5×10^8	5.8		25	p.r.	P.b.k. at 430 nm in soln. contg. 0.005 mol L^{-1} Ag^+, $(2\text{-}4) \times 10^{-5}$ mol L^{-1} benzoquinone and 1 mol L^{-1} *tert*-BuOH.	761134
1.2.8	**Bromoform**							
	$Ag_2^+ + CHBr_3 \rightarrow$	5.0×10^8				p.r.	D.k. at 310 nm in soln. contg. 0.001 mol L^{-1} Ag^+.	78A410
1.2.9	**Carbon tetrachloride**							
	$Ag_2^+ + CCl_4 \rightarrow$	1.5×10^7				p.r.	D.k. at 310 nm in soln. contg. 0.001 mol L^{-1} Ag^+.	78A410
1.2.10	**Nitrobenzene**							
	$Ag_2^+ + C_6H_5NO_2 \rightarrow$	3.0×10^8				p.r.	D.k. at 310 nm in soln. contg. 0.001 mol L^{-1} Ag^+.	78A410
1.2.11	**Nitromethane**							
	$Ag_2^+ + CH_3NO_2 \rightarrow$	1.1×10^8				p.r.	D.k. at 310 nm in soln. contg. 0.001 mol L^{-1} Ag^+.	78A410
1.3	**Amminesilver(0)-silver(I) complex**							
1.3.1	**Diamminesilver(I) ion**							
	$Ag_2(NH_3)_n^+ + Ag(NH_3)_2^+ \rightarrow Ag_3(NH_3)_n^{2+}$	$\sim 10^8$				p.r.	Estimated from rate of formation of product in soln. contg. 0.01 mol L^{-1} $Ag(NH_3)_2^+$.	680435
1.3.2	**Amminesilver(0)-silver(I) complex**							
	$Ag_2(NH_3)_n^+ + Ag_2(NH_3)_n^+ \rightarrow Ag_4(NH_3)_n^{2+}$	2.5×10^9				p.r.	D.k. at 310 nm in soln. contg. 0.001 mol L^{-1} Ag^+ and 0.01 mol L^{-1} NH_3.	78A410
1.3.3	**Hydrogen peroxide**							
	$Ag_2(NH_3)_n^+ + H_2O_2 \rightarrow$	1.0×10^9				p.r.	D.k. at 310 nm in soln. contg. 0.001 mol L^{-1} Ag^+ and 0.01 mol L^{-1} NH_3.	78A410

TABLE 1. Rate constants for silver transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
1.3	**Amminesilver(0)-silver(I) complex** — Continued							
1.3.4	**Oxygen**							
	$Ag_2(NH_3)_n^+ + O_2 \rightarrow$	7.0×10^9				p.r.	D.k. at 310 nm in soln. contg. 0.001 mol L^{-1} Ag^+ and 0.01 mol L^{-1} NH_3.	78A410
1.3.5	**Bromoform**							
	$Ag_2(NH_3)_n^+ + CHBr_3 \rightarrow$	2.0×10^9				p.r.	D.k. at 310 nm in soln. contg. 0.001 mol L^{-1} Ag^+ and 0.01 mol L^{-1} NH_3.	78A410
1.3.6	**Carbon tetrachloride**							
	$Ag_2(NH_3)_n^+ + CCl_4 \rightarrow$	1.0×10^8				p.r.	D.k. at 310 nm in soln. contg. 0.001 mol L^{-1} Ag^+ and 0.01 mol L^{-1} NH_3.	78A410
1.3.7	**Chloroacetate ion**							
	$Ag_2(NH_3)_n^+ + ClCH_2CO_2^- \rightarrow$	3.0×10^6				p.r.	D.k. at 310 nm in soln. contg. 0.001 mol L^{-1} Ag^+ and 0.01 mol L^{-1} NH_3.	78A410
1.3.8	**Chloroform**							
	$Ag_2(NH_3)_n^+ + CHCl_3 \rightarrow$	2.0×10^8				p.r.	D.k. at 310 nm in soln. contg. 0.001 mol L^{-1} Ag^+ and 0.01 mol L^{-1} NH_3.	78A410
1.3.9	**Nitrobenzene**							
	$Ag_2(NH_3)_n^+ + C_6H_5NO_2 \rightarrow$	9.0×10^8				p.r.	D.k. at 310 nm in soln. contg. 0.001 mol L^{-1} Ag^+ and 0.01 mol L^{-1} NH_3.	78A410
1.3.10	**Nitromethane**							
	$Ag_2(NH_3)_n^+ + CH_3NO_2 \rightarrow$	1.5×10^8				p.r.	D.k. at 310 nm in soln. contg. 0.001 mol L^{-1} Ag^+ and 0.01 mol L^{-1} NH_3.	78A410
1.4	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatoargentate(I) ion**							
1.4.1	**Water**							
	$AgTPPS^{5-} + H_2O \rightarrow AgTPPSH^{4-} + OH^-$	5×10^4 s^{-1}	8.0			p.r.	D.k. in N_2-satd. soln. contg. $AgTPPS^{4-}$ and 0.1 mol L^{-1} 2-PrOH.	81A247
1.5	**Silver(II) ion**							
1.5.1	**Chromate(V)**							
	$Ag^{2+} + Cr(V) \rightarrow Cr(VI) + Ag^+$	5.8×10^7	1		21	p.r.	D.k. at 270 nm in Ar-satd. soln. contg. 10^{-4} mol L^{-1} $Cr_2O_7^{2-}$ (mostly $HCrO_4^-$), 2×10^{-5} mol L^{-1} Ag^+ and 0.1 mol L^{-1} $HClO_4$.	89A422
1.5.2	**Perhydroxyl**							
	$Ag^{2+} + HO_2^{\cdot} \rightarrow Ag^+ + H^+ + O_2$	1.7×10^8	1		21	p.r.	D.k. at 280 nm in O_2-satd. soln. contg. 10^{-4} mol L^{-1} $Cr_2O_7^{2-}$ (mostly $HCrO_4^-$), 2×10^{-5} mol L^{-1} Ag^+ and 0.1 mol L^{-1} $HClO_4$.	89A422
1.5.3	**Hydrogen peroxide**							
	$Ag^{2+} + H_2O_2 \rightarrow Ag^+ + HO_2^{\cdot} + H^+$	4.5×10^7	3		21	p.r.	D.k. at 280 nm in N_2O-satd. soln. contg. 1×10^{-4} mol L^{-1} Ag_2SO_4 and 1, 5 and 10×10^{-4} mol L^{-1} H_2O_2.	89A422
1.5.4	**5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)porphinatozinc(II) ion**							
	$Ag^{2+} + ZnTMpyP^{4+} \rightarrow Ag^+ + [ZnTMpyP]^{\cdot 5+}$	6.0×10^7	4.0, 5.0	0.004		p.r.	P.b.k. at 690-700 nm in N_2O-satd. buffered soln. contg. Ag_2SO_4 and $(1\text{-}4) \times 10^{-4}$ mol L^{-1} porphyrin; the π-radical cation complexes with Ag(II).	85A038
1.5.5	**α-Aminoisobutyric acid**							
	$Ag^{2+} + (CH_3)_2C(NH_3^+)CO_2^- \rightarrow$	1.7×10^6	4.4			p.r.	D.k. in N_2O-satd. soln. contg. 5×10^{-1} mol L^{-1} $AgClO_4$ and $(5\text{-}100) \times 10^{-5}$ mol L^{-1} aminoisobutyric acid; reaction product assigned as a complex which decays by intramolecular oxidation, $k = 5 \times 10^3$ s^{-1}.	80A307

TABLE 1. Rate constants for silver transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
1.5	**Silver(II) ion** — Continued							
1.5.6	**6-Aminophenalenone**							
	$Ag^{2+} + 6\text{-}NH_2PHO \rightarrow Ag^+ + [6\text{-}NH_2PHO]^{\cdot+}$	1.1×10^9				p.r.	P.b.k. at 420 nm in N_2O-satd. soln. contg. 0.005 mol L^{-1} Ag_2SO_4.	93A404
1.5.7	**Anisole**							
	$Ag^{2+} + C_6H_5OCH_3 \rightarrow Ag^+ + [C_6H_5OCH_3]^{\cdot+}$	3.8×10^7	4		20	p.r.	P.b.k. in N_2O-satd. soln. contg. $AgNO_3$.	751171
1.5.8	**Diethyl disulfide**							
	$Ag^{2+} + C_2H_5SSC_2H_5 \rightarrow Ag^+ + [C_2H_5SSC_2H_5]^{\cdot+}$	3.5×10^8	4			p.r.	D.k. at 300 nm and p.b.k. at 430 nm in N_2O-satd. soln. contg. 0.002 mol L^{-1} Ag^+ and various lower concn. of disulfide.	761143
1.5.9	**1,2-Dimethoxybenzene**							
	$Ag^{2+} + 2\text{-}CH_3OC_6H_4OCH_3 \rightarrow Ag^+ + [2\text{-}CH_3OC_6H_4OCH_3]^{\cdot+}$	6.0×10^7	4		20	p.r.	P.b.k. in N_2O-satd. soln. contg. $AgNO_3$.	751171
1.5.10	**1,3-Dimethoxybenzene**							
	$Ag^{2+} + 3\text{-}CH_3OC_6H_4OCH_3 \rightarrow Ag^+ + [3\text{-}CH_3OC_6H_4OCH_3]^{\cdot+}$	6.3×10^7	4		20	p.r.	P.b.k. in N_2O-satd. soln. contg. $AgNO_3$.	751171
1.5.11	**1,4-Dimethoxybenzene**							
	$Ag^{2+} + 4\text{-}CH_3OC_6H_4OCH_3 \rightarrow Ag^+ + [4\text{-}CH_3OC_6H_4OCH_3]^{\cdot+}$	4.6×10^7	4		20	p.r.	P.b.k. in N_2O-satd. soln. contg. $AgNO_3$.	751171
1.5.12	**2,3-Dimethoxybenzoic acid**							
	$Ag^{2+} + 2,3\text{-}(CH_3O)_2C_6H_3CO_2H \rightarrow Ag^+ + H^+ + [2,3\text{-}(CH_3O)_2C_6H_3CO_2]^{\cdot}$	6.7×10^8	~3			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgSO_4$.	771006
1.5.13	**3,4-Dimethoxybenzoic acid**							
	$Ag^{2+} + 3,4\text{-}(CH_3O)_2C_6H_3CO_2H \rightarrow Ag^+ + H^+ + [3,4\text{-}(CH_3O)_2C_6H_3CO_2]^{\cdot}$	4.2×10^8	~3			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgSO_4$.	771006
1.5.14	**2,4-Dimethoxybenzoic acid**							
	$Ag^{2+} + 2,4\text{-}(CH_3O)_2C_6H_3CO_2H \rightarrow Ag^+ + H^+ + [2,4\text{-}(CH_3O)_2C_6H_3CO_2]^{\cdot}$	4.5×10^8	~3			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgSO_4$.	771006
1.5.15	**2,6-Dimethoxybenzoic acid**							
	$Ag^{2+} + 2,6\text{-}(CH_3O)_2C_6H_3CO_2H \rightarrow Ag^+ + H^+ + [2,6\text{-}(CH_3O)_2C_6H_3CO_2]^{\cdot}$	2.2×10^9	~3			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgSO_4$.	771006
1.5.16	**3,5-Dimethoxybenzoic acid**							
	$Ag^{2+} + 3,5\text{-}(CH_3O)_2C_6H_3CO_2H \rightarrow Ag^+ + H^+ + [3,5\text{-}(CH_3O)_2C_6H_3CO_2]^{\cdot}$	6.0×10^8	~3			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgSO_4$.	771006
1.5.17	**Dimethyl disulfide**							
	$Ag^{2+} + CH_3SSCH_3 \rightarrow Ag^+ + [CH_3SSCH_3]^{\cdot+}$	5.2×10^8	3.5			p.r.	D.k. at 300 nm and p.b.k. in N_2O-satd. soln. contg. 0.002 mol L^{-1} Ag^+ and various lower concn. of disulfide.	761143
1.5.18	**Ethylene glycol**							
	$Ag^{2+} + HOCH_2CH_2OH \rightarrow$	1.3×10^6	4.7			p.r.	D.k. at 265 and 300 nm in N_2O-satd. soln. contg. 1.1×10^{-3} mol L^{-1} $AgClO_4$ and $(1.1\text{-}4) \times 10^{-3}$ mol L^{-1} ethylene glycol; reaction product assigned as a complex which decays by intramolecular oxidation, $k = 2.8 \times 10^3$ s^{-1}.	81A209
1.5.19	**Glycine**							
	$Ag^{2+} + GlyH \rightarrow AgGly^+ + H^+$	1.5×10^6	4.4			p.r.	D.k. at 310 nm in N_2O-satd. soln. contg. 1×10^{-4} mol L^{-1} $AgClO_4$ and ~$1\text{-}2 \times 10^{-3}$ mol L^{-1} glycine; at [GlyH] > 0.01 mol L^{-1} $k = 5.2 \times 10^3$ s^{-1} for decay of the complex by intramolecular oxidation.	80A307

TABLE 1. Rate constants for silver transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
1.5	**Silver(II) ion** — Continued							
1.5.20	**Methionine**							
	$Ag^{2+} + Met \rightarrow Ag^{+} + [Met]^{\cdot+}$	3.3×10^{8}	<5			p.r.	D.k. in N_2O-satd. soln.; evidence is given that amino group of methionine (10^{-2} mol L^{-1}) is complexed with Ag^{+} (5×10^{-2} mol L^{-1} $AgNO_3$).	81A340
1.5.21	**2-Methoxybenzoic acid**							
	$Ag^{2+} + 2\text{-}CH_3OC_6H_4CO_2H \rightarrow Ag^{+} + H^{+} + [2\text{-}CH_3OC_6H_4CO_2]^{\cdot}$	6.8×10^{8}	~3			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgSO_4$.	771006
1.5.22	**3-Methoxybenzoic acid**							
	$Ag^{2+} + 3\text{-}CH_3OC_6H_4CO_2H \rightarrow Ag^{+} + H^{+} + [3\text{-}CH_3OC_6H_4CO_2]^{\cdot}$	3.0×10^{8}	~3			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgSO_4$.	771006
1.5.23	**4-Methoxybenzoic acid**							
	$Ag^{2+} + 4\text{-}CH_3OC_6H_4CO_2H \rightarrow Ag^{+} + H^{+} + [4\text{-}CH_3OC_6H_4CO_2]^{\cdot}$	3.8×10^{8}	~3			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgSO_4$.	771006
1.5.24	**1,2,3-Trimethoxybenzene**							
	$Ag^{2+} + 1,2,3\text{-}C_6H_3(OCH_3)_3 \rightarrow Ag^{+} + [1,2,3\text{-}C_6H_3(OCH_3)_3]^{\cdot+}$	2.5×10^{7}	4		20	p.r.	P.b.k. in N_2O-satd. soln. contg. $AgNO_3$.	751171
1.5.25	**1,2,4-Trimethoxybenzene**							
	$Ag^{2+} + 1,2,4\text{-}C_6H_3(OCH_3)_3 \rightarrow Ag^{+} + [1,2,4\text{-}C_6H_3(OCH_3)_3]^{\cdot+}$	7.0×10^{7}	4		20	p.r.	P.b.k. in N_2O-satd. soln. contg. $AgNO_3$.	751171
1.5.26	**1,3,5-Trimethoxybenzene**							
	$Ag^{2+} + 1,3,5\text{-}C_6H_3(OCH_3)_3 \rightarrow Ag^{+} + [1,3,5\text{-}C_6H_3(CH_3O)_3]^{\cdot+}$	5.6×10^{7}	4		20	p.r.	P.b.k. in N_2O-satd. soln. contg. $AgNO_3$.	751171
1.5.27	**2,3,4-Trimethoxybenzoic acid**							
	$Ag^{2+} + 2,3,4\text{-}(CH_3O)_3C_6H_2CO_2H \rightarrow Ag^{+} + H^{+} + [2,3,4\text{-}(CH_3O)_3C_6H_2CO_2]^{\cdot}$	4.7×10^{8}	~3			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgSO_4$.	771006
1.5.28	**3,4,5-Trimethoxybenzoic acid**							
	$Ag^{2+} + 3,4,5\text{-}(CH_3O)_3C_6H_2CO_2H \rightarrow Ag^{+} + H^{+} + [3,4,5\text{-}(CH_3O)_3C_6H_2CO_2]^{\cdot}$	4.0×10^{8}	~3			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgSO_4$.	771006
1.5.29	**2,4,5-Trimethoxybenzoic acid**							
	$Ag^{2+} + 2,4,5\text{-}(CH_3O)_3C_6H_2CO_2H \rightarrow Ag^{+} + H^{+} + [2,4,5\text{-}(CH_3O)_3C_6H_2CO_2]^{\cdot}$	2.6×10^{8}	~3			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgSO_4$.	771006
1.5.30	**2,4,6-Trimethoxybenzoic acid**							
	$Ag^{2+} + 2,4,6\text{-}(CH_3O)_3C_6H_2CO_2H \rightarrow Ag^{+} + H^{+} + [2,4,6\text{-}(CH_3O)_3C_6H_2CO_2]^{\cdot}$	1.1×10^{9}	~3			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgSO_4$.	771006
1.5.31	**Trimethylacetate ion**							
	$Ag^{2+} + (CH_3)_3CCO_2^{-} \rightarrow$	~1×10^{8}	4.3			p.r.	D.k. at 310 nm in N_2O-satd. in soln. contg. $AgClO_4$ and ~1×10^{-4} mol L^{-1} trimethylacetic acid (S); reaction product assigned as a complex which decays by intramolecular oxidation, at [S] = 2×10^{-4} to 1×10^{-2} mol L^{-1} $k = 1 \times 10^{4}$ s^{-1}.	80A307
1.6	**Hydroxysilver(II) ion**							
1.6.1	**Hydrogen ion**							
	$AgOH^{+} + H^{+} \rightarrow Ag^{2+} + H_2O$	8×10^{9}	4.3			p.r.	P.b.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} Ag^{+}.	79A304
		1.2×10^{10}				p.r.	D.k. at 310 nm in N_2O-satd. soln. contg. 0.001 mol L^{-1} Ag^{+} and varied [H^{+}].	78C006
1.6.2	**2,3-Dimethoxybenzoate ion**							
	$AgOH^{+} + 2,3\text{-}(CH_3O)_2C_6H_3CO_2^{-} \rightarrow Ag^{+} + OH^{-} + [2,3\text{-}(CH_3O)_2C_6H_3CO_2]^{\cdot}$	8.4×10^{8}	5-6			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgSO_4$.	771006

TABLE 1. Rate constants for silver transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
1.6	**Hydroxysilver(II) ion** — Continued							
1.6.3	**3,4-Dimethoxybenzoate ion**							
	$AgOH^+ + 3,4\text{-}(CH_3O)_2C_6H_3CO_2^- \rightarrow Ag^+ + OH^- + [3,4\text{-}(CH_3O)_2C_6H_3CO_2]^\bullet$	2.2×10^9	5-6			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgSO_4$.	771006
1.6.4	**2,4-Dimethoxybenzoate ion**							
	$AgOH^+ + 2,4\text{-}(CH_3O)_2C_6H_3CO_2^- \rightarrow Ag^+ + OH^- + [2,4\text{-}(CH_3O)_2C_6H_3CO_2]^\bullet$	1.9×10^9	5-6			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgSO_4$.	771006
1.6.5	**2,6-Dimethoxybenzoate ion**							
	$AgOH^+ + 2,6\text{-}(CH_3O)_2C_6H_3CO_2^- \rightarrow Ag^+ + OH^- + [2,6\text{-}(CH_3O)_2C_6H_3CO_2]^\bullet$	2.4×10^9	5-6			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgSO_4$.	771006
1.6.6	**3,5-Dimethoxybenzoate ion**							
	$AgOH^+ + 3,5\text{-}(CH_3O)_2C_6H_3CO_2^- \rightarrow Ag^+ + OH^- + [3,5\text{-}(CH_3O)_2C_6H_3CO_2]^\bullet$	2.3×10^9	5-6			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgSO_4$.	771006
1.6.7	**2-Methoxybenzoate ion**							
	$AgOH^+ + 2\text{-}CH_3OC_6H_4CO_2^- \rightarrow Ag^+ + OH^- + [2\text{-}CH_3OC_6H_4CO_2]^\bullet$	4.0×10^9	5-6			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgSO_4$.	771006
1.6.8	**3-Methoxybenzoate ion**							
	$AgOH^+ + 3\text{-}CH_3OC_6H_4CO_2^- \rightarrow Ag^+ + OH^- + [3\text{-}CH_3OC_6H_4CO_2]^\bullet$	1.4×10^9	5-6			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgSO_4$.	771006
1.6.9	**4-Methoxybenzoate ion**							
	$AgOH^+ + 4\text{-}CH_3OC_6H_4CO_2^- \rightarrow Ag^+ + OH^- + [4\text{-}CH_3OC_6H_4CO_2]^\bullet$	1.6×10^9	5-6			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgSO_4$.	771006
1.6.10	**2,3,4-Trimethoxybenzoate ion**							
	$AgOH^+ + 2,3,4\text{-}(CH_3O)_3C_6H_2CO_2^- \rightarrow Ag^+ + OH^- + [2,3,4\text{-}(CH_3O)_3C_6H_2CO_2]^\bullet$	2.1×10^9	5-6			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgSO_4$.	771006
1.6.11	**3,4,5-Trimethoxybenzoate ion**							
	$AgOH^+ + 3,4,5\text{-}(CH_3O)_3C_6H_2CO_2^- \rightarrow Ag^+ + OH^- + [3,4,5\text{-}(CH_3O)_3C_6H_2CO_2]^\bullet$	1.2×10^9	5-6			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgSO_4$.	771006
1.6.12	**2,4,5-Trimethoxybenzoate ion**							
	$AgOH^+ + 2,4,5\text{-}(CH_3O)_3C_6H_2CO_2^- \rightarrow Ag^+ + OH^- + [2,4,5\text{-}(CH_3O)_3C_6H_2CO_2]^\bullet$	1.2×10^9	5-6			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgSO_4$.	771006
1.6.13	**2,4,6-Trimethoxybenzoate ion**							
	$AgOH^+ + 2,4,6\text{-}(CH_3O)_3C_6H_2CO_2^- \rightarrow Ag^+ + OH^- + [2,4,6\text{-}(CH_3O)_3C_6H_2CO_2]^\bullet$	2.4×10^9	5-6			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgSO_4$.	771006
1.7	**Mono- and dihydroxysilver(II)**							
1.7.1	**2-Aminoethanol**							
	$AgOH^+/Ag(OH)_2 + H_2NCH_2CH_2OH \rightarrow$	5.5×10^8	8.9			p.r.	P.b.k. at 400 nm in N_2O-satd. soln. contg. 1.2×10^{-3} mol L^{-1} $AgClO_4$ and ~1-7 × 10^{-4} mol L^{-1} ethanolamine; reaction product assigned as a complex which decays by intramolecular oxidation, $k = 2 \times 10^3$ s^{-1}; $k = 8 \times 10^7$ L mol^{-1} s^{-1} for uptake of another glycol.	82A098
1.7.2	**α-Aminoisobutyric acid**							
	$AgOH^+/Ag(OH)_2 + (CH_3)_2C(NH_3^+)CO_2^- \rightarrow$	4×10^7	8.8			p.r.	D.k. in N_2O-satd. soln. contg. 5×10^{-1} mol L^{-1} $AgClO_4$ and (5-100) × 10^{-5} mol L^{-1} aminoisobutyric acid; reaction product assigned as a complex which decays by intramolecular oxidation, $k = 4 \times 10^3$ s^{-1}.	80A307

TABLE 1. Rate constants for silver transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
1.7	**Mono- and dihydroxysilver(II)** — Continued							
1.7.3	***cis*-1,2-Cyclohexanediol**							
	$AgOH^+/Ag(OH)_2 + c\text{-}C_6H_{10}(OH)_2 \rightarrow$	1.5×10^8	8.7			p.r.	P.b.k. at 400 nm in N_2O-satd. soln. contg. 1.2×10^{-3} mol L^{-1} $AgClO_4$ in borate buffer; reaction product assigned as a complex which decays by intramolecular oxidation, $k = 3 \times 10^3$ s^{-1}; $k = 8 \times 10^7$ L mol^{-1} s^{-1} for uptake of another glycol.	82A098
1.7.4	***trans*-1,2-Cyclohexanediol**							
	$AgOH^+/Ag(OH)_2 + c\text{-}C_6H_{10}(OH)_2 \rightarrow$	3.7×10^8	8.7			p.r.	P.b.k. at 400 nm in N_2O-satd. soln. contg. 1.2×10^{-3} mol L^{-1} $AgClO_4$; reaction product assigned as a complex which decays by intramolecular oxidation, $k = 3 \times 10^3$ s^{-1}; $k = 7.5 \times 10^7$ L mol^{-1} s^{-1} for uptake of another glycol.	82A098
1.7.5	**Diethyl disulfide**							
	$AgOH^+/Ag(OH)_2 + C_2H_5SSC_2H_5 \rightarrow Ag^+ + OH^-/2OH^- + [C_2H_5SSC_2H_5]^{\cdot+}$	7.0×10^8	8			p.r.	D.k. at 300 nm and p.b.k. in N_2O-satd. soln. contg. 0.002 mol L^{-1} Ag^+ and various lower concn. of disulfide.	761143
1.7.6	**Dimethyl disulfide**							
	$AgOH^+/Ag(OH)_2 + CH_3SSCH_3 \rightarrow Ag^+ + OH^-/2OH^- + [CH_3SSCH_3]^{\cdot+}$	5.6×10^8	8			p.r.	D.k. at 300 nm and p.b.k. in N_2O-satd. soln. contg. 0.002 mol L^{-1} Ag^+ and various lower concn. of disulfide.	761143
1.7.7	**Ethylene glycol**							
	$AgOH^+/Ag(OH)_2 + HOCH_2CH_2OH \rightarrow$	1.5×10^8	8.6			p.r.	P.b.k. at 400 nm in N_2O-satd. soln. contg. 1.2×10^{-3} mol L^{-1} $AgClO_4$; reaction product assigned as a complex which decays by intramolecular oxidation, $k = \sim 2.5 \times 10^3$ s^{-1}; $k = 3 \times 10^7$ L mol^{-1} s^{-1} for uptake of another glycol.	82A098
1.7.8	**Glycine, negative ion**							
	$AgOH^+/Ag(OH)_2 + Gly^- \rightarrow AgGly(OH)/AgGly(OH)_2^-$	6×10^7	9.0			p.r.	D.k. at 330 and 400 nm in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgClO_4$ and (0.5-4) $\times$ 10^{-3} mol L^{-1} glycine; experimentally indistinguishable from $AgGly(OH)/AgGly(OH)_2^- + Gly \rightarrow Ag(Gly)_2$; extrapolation gives 3×10^8 L mol^{-1} s^{-1} for reaction of the fully basic form, Gly^-. At $[Gly^-] > 0.001$ mol L^{-1}, $k = 50$ s^{-1} for decay of the complex, $Ag(Gly)_2$, by intramolecular oxidation; at low $[Gly^-]$, $k = 500$ s^{-1}.	80A307
1.7.9	**Trimethylacetate ion**							
	$AgOH^+/Ag(OH)_2 + (CH_3)_3CCO_2^- \rightarrow$	$<10^7$	8.8			p.r.	D.k. at 310 nm in N_2O-satd. in soln. contg. *$AgClO_4$ and* $\sim 1 \times 10^{-4}$ *mol* L^{-1} trimethylacetic acid.	80A307
1.8	**Dihydroxysilver(II)**							
1.8.1	**Dihydroxysilver(II)**							
	$Ag(OH)_2 + Ag(OH)_2 \rightarrow$	7.5×10^9	9.2-9.8			p.r.	D.k. at 270 nm and p.b.k. at 390 nm in N_2O-satd. soln. contg. 0.001 mol L^{-1} Ag^+; reaction suggested to be dimerization $\rightarrow [Ag(OH)_2]_2$ and ultimate formation of Ag(III), which decays with $k = \sim 0.1$ s^{-1}.	79A304

TABLE 1. Rate constants for silver transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
1.9	**Tetraamminesilver(II) ion**							
1.9.1	**Tetraamminesilver(II) ion**							
	$Ag(NH_3)_4^{2+} + Ag(NH_3)_4^{2+} \rightarrow$	6×10^5	11.5			p.r.	D.k. at 270 nm in N_2O-soln. contg. 0.001 mol L^{-1} Ag^+ and 1 mol L^{-1} NH_3.	79A304
1.9.2	**Alanine, negative ion**							
	$Ag(NH_3)_4^{2+} + Ala^- \rightarrow Ag(NH_3)_3(Ala)^+ + NH_3$	8×10^5	11.5			p.r.	D.k. at 270-280 nm in N_2O-soln. contg. 0.001 mol L^{-1} Ag^+ and 1 mol L^{-1} NH_3; $k = 5 \times 10^3$ s^{-1} for decay of the complex by intramolecular oxidation.	80A307
1.9.3	**α-Aminoisobutyrate negative ion**							
	$Ag(NH_3)_4^{2+} + (CH_3)_2C(NH_2)CO_2^- \rightarrow Ag(NH_3)_3[(CH_3)_2C(NH_2)CO_2]^+ + NH_3$	2×10^6	11.5			p.r.	D.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $AgClO_4$ and 1 mol L^{-1} NH_3; reaction product assigned as a complex which decays by intramolecular oxidation, $k = 5 \times 10^3$ s^{-1}.	80A307
1.9.4	**Aspartate monoanion**							
	$Ag(NH_3)_4^{2+} + Asp^- \rightarrow Ag(NH_3)_3(Asp)^+ + NH_3$	1.2×10^6	11.5			p.r.	D.k. at 270-280 nm; $k = 4 \times 10^3$ s^{-1} for decay of the complex by intramolecular oxidation.	80A307
1.9.5	**Glycine, negative ion**							
	$Ag(NH_3)_4^{2+} + Gly^- \rightarrow Ag(NH_3)_3(Gly)^+ + NH_3$	5×10^5	11.5			p.r.	D.k. at 270-280 nm in soln. contg. 0.001 mol L^{-1} Ag^+ and 1 mol L^{-1} NH_3; $k = 3 \times 10^3$ s^{-1} for decay of the complex by intramolecular oxidation.	80A307
1.10	**Diammine(hydroxy)silver(II)**							
1.10.1	**Ammonia**							
	$Ag(NH_3)_2OH^+ + NH_3 \rightarrow Ag(NH_3)_3OH^+$	3×10^7	10.5			p.r.	P.b.k. at 270 nm in N_2O-satd. soln. contg. 0.001 mol L^{-1} Ag^+ and (3-12) $\times 10^{-3}$ mol L^{-1} NH_3.	79A304
1.11	**Triammine(hydroxy)silver(II) ion**							
1.11.1	**Ammonia**							
	$Ag(NH_3)_3OH^+ + NH_3 \rightarrow Ag(NH_3)_4^{2+} + OH^-$	8×10^6	10.5			p.r.	P.b.k. at 270 nm in N_2O-satd. soln. contg. 0.001 mol L^{-1} Ag^+ and (1-9) $\times 10^{-2}$ mol L^{-1} NH_3; $k_t = 8 \times 10^7$ L mol^{-1} s^{-1}.	79A304
1.12	**Nitrilotriacetatoargentate(II)**							
1.12.1	**First-order reaction**							
	Ag(II)NTA $\rightarrow$	2×10^3 s^{-1}	10.7			p.r.	D.k. in N_2O-satd. soln. contg. $AgClO_4$ and NTA; decay suggested to occur by intramolecular oxidation.	80A307
1.13	**Ethylenediaminetetraacetatoargentate(II)**							
1.13.1	**First-order reaction**							
	Ag(II)EDTA $\rightarrow$	8 s^{-1}	11.0			p.r.	D.k. in N_2O-satd. soln. contg. $AgClO_4$ and EDTA; decay suggested to occur by intramolecular oxidation.	80A307
1.14	**Silver(II)-succinate complex**							
1.14.1	**First-order reaction**							
	Ag(II)($^-O_2CCH_2CH_2CO_2^-$) $\rightarrow$	2×10^2 s^{-1}	5.6			p.r.	D.k. in N_2O-satd. soln. contg. $AgClO_4$ and succinic acid; decay suggested to occur by intramolecular oxidation.	80A307

TABLE 2. Rate constants for aluminum transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
2.1	**Aluminum(III) sulfophthalocyanine, radical anion**							
2.1.1	**Oxygen**							
	$[Al(pts)]^{\cdot\cdot} + O_2 \rightarrow Al(pts) + O_2^{\cdot\cdot}$	1.5×10^8	7			f.p./rq	D.k. in soln. contg. Al(pts) and 5×10^{-3} mol L^{-1} 4-aminophenol (RQ) and varied $[O_2]$.	89R092
2.1.2	**4-Aminophenoxyl**							
	$[Al(pts)]^{\cdot\cdot} + 4\text{-}H_2NC_6H_4O^{\cdot} + H^+ \rightarrow Al(pts) + 4\text{-}H_2NC_6H_4OH$	3.3×10^9	7			f.p./rq	D.k. in N_2-satd. soln. contg. Al(pts) and 10^{-4} mol L^{-1} 4-aminophenol (RQ).	89R092

TABLE 3. Rate constants for gold transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
3.1	**Dicyanoaurate(0) ion**							
3.1.1	**First-order reaction**							
	$Au(CN)_2^{2-} \rightarrow Au^0 + 2\ CN^-$	† 6.7×10^3 s^{-1}	9.5			p.r.	D.k. at 420 nm in soln. contg. 1×10^{-5} mol L^{-1} $KAu(CN)_2$ and 0.1 mol L^{-1} 2-PrOH. † Different d.k. have been reported for the same species, see following entry.	89A310
3.1.2	**Dicyanoaurate(0) ion**							
	$Au(CN)_2^{2-} + Au(CN)_2^{2-} \rightarrow$	† 3.2×10^9	11			p.r.	D.k. at 410 nm in soln. contg. 0.5 and 1×10^{-4} mol L^{-1} $KAu(CN)_2$, 0.002 mol L^{-1} MeOH and 0.001 mol L^{-1} NaOH. Unclear whether k or $2k$.	680302
		† 2.9×10^9	13			p.r.	D.k. at 410 nm in soln. contg. $KAu(CN)_2$ and 0.098 mol L^{-1} H_2. Unclear whether k or $2k$. † Different d.k. have been reported for the same species, see previous entry.	680302
3.1.3	**Ferricyanide ion**							
	$Au(CN)_2^{2-} + Fe(CN)_6^{3-} \rightarrow$	5.5×10^8				p.r.	D.k. at 410 nm.	680302
3.1.4	**Nitrous oxide**							
	$Au(CN)_2^{2-} + N_2O \rightarrow$	5.5×10^8				p.r.	D.k. at 410 nm.	680302
3.1.5	**Oxygen**							
	$Au(CN)_2^{2-} + O_2 \rightarrow$	3.6×10^9				p.r.	D.k. at 410 nm.	680302
3.2	**Hydrogen dicyanoaurate(0) ion**							
3.2.1	**Hydrogen ion**							
	$Au(CN)_2H^- + H^+ \rightarrow Au(CN)_2H_2$	5.9×10^{10}	~4.5-5			p.r.	D.k. at 420 nm in soln. contg. 8×10^{-4} mol L^{-1} $KAu(CN)_2$, 0.1 mol L^{-1} 2-PrOH and ~(1-3) $\times 10^{-5}$ mol L^{-1} H^+.	89A310
3.3	**Dihydrogen dicyanoaurate(0)**							
3.3.1	**First-order reaction**							
	$Au(CN)_2H_2 \rightarrow$	† 5.3×10^4 s^{-1}	3			p.r.	D.k. at 260 nm in soln. contg. 3.6×10^{-5} mol L^{-1} $KAu(CN)_2$ and 5×10^{-3} mol L^{-1} *tert*-BuOH. † Different d.k. have been reported for the same species, see following entry.	89A310
3.3.2	**Dihydrogen dicyanoaurate(0)**							
	$Au(CN)_2H_2 + Au(CN)_2H_2 \rightarrow$	† 5.0×10^9	2			p.r.	D.k. at 270 nm in soln. contg. $KAu(CN)_2$ and MeOH or under 110 atm. H_2. Unclear whether k or $2k$. † Different d.k. have been reported for the same species, see previous entry.	680302
3.4	**Dicyanohydroxyaurate(II) ion**							
3.4.1	**Dicyanohydroxyaurate(II) ion**							
	$(OH)Au(CN)_2^- + (OH)Au(CN)_2^- \rightarrow Au(CN)_2^- + (OH)_2Au(CN)_2^-$	2.5×10^8	7-10			p.r.	D.k. at 270 nm in N_2O-satd. soln. contg. 5×10^{-4} mol L^{-1} $Au(CN)_2^-$. Unclear whether k or $2k$. Au(III) product reported to undergo H_2O elimination, $k = 9.5$ s^{-1}, to give $O{=}Au^{III}(CN)_2^-$.	91A018

TABLE 3. Rate constants for gold transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
3.4	**Dicyanohydroxyaurate(II) ion** — Continued							
3.4.2	**Hydrogen ion**							
	$(OH)Au(CN)_2^- + H^+ \rightarrow [(OH)Au(CN)_2]^-H^+$	2.1×10^{10}	~4.5-5			p.r.	D.k. at 270 nm and condy. change in N_2O-satd. soln. contg. 5×10^{-4} mol L^{-1} $Au(CN)_2^-$ and ~(1-3) $\times 10^{-5}$ mol L^{-1} H^+. Product reported to undergo HCN elimination, $k = 4.8$ s^{-1} at pH 4.4.	91A018
3.5	**Dicyano(hydroxy)aurate(II) ion, protonated**							
3.5.1	**Dicyano(hydroxy)aurate(II) ion, protonated**							
	$[(OH)Au(CN)_2]^-H^+ + [(OH)Au(CN)_2]^-H^+ \rightarrow Au(CN)_2^- + [(OH)_2Au(CN)_2]^-H^+ + H^+$	1.0×10^9	4.6			p.r.	D.k. at 270 nm and condy. change in N_2O-satd. soln. contg. 5×10^{-4} mol L^{-1} $Au(CN)_2^-$. Unclear whether k or $2k$.	91A018
3.6	**Gold(II)**							
3.6.1	**Gold(II)**							
	Au(II) + Au(II) →	1.4×10^9	2		20	p.r.	D.k. at 270 nm in soln. contg. 5.0×10^{-5} mol L^{-1} $NaAuCl_4$ and 0.01 mol L^{-1} $HClO_4$. In the presence of 0.12 mol L^{-1} $NaClO_4$ $k = 1.5 \times 10^9$ L mol^{-1} s^{-1}.	700580
		8.6×10^8	2		20	p.r.	D.k. at 270 nm in soln. contg. 5.0×10^{-5} mol L^{-1} $NaAuCl_4$, 0.01 mol L^{-1} $HClO_4$ and 0.001 mol L^{-1} Cl^-. In the presence of 0.12 mol L^{-1} $NaClO_4$ $k = 1.2 \times 10^9$ L mol^{-1} s^{-1}.	700580
		2.7×10^8	2		20	p.r.	D.k. at 270 nm in soln. contg. 5.0×10^{-5} mol L^{-1} $NaAuCl_4$, 0.01 mol L^{-1} $HClO_4$ and 0.01 mol L^{-1} Cl^-.	700580
		2.5×10^7	2		20	p.r.	D.k. at 270 nm in soln. contg. 5.0×10^{-5} mol L^{-1} $NaAuCl_4$, 0.01 mol L^{-1} $HClO_4$ and 0.1 mol L^{-1} Cl^-.	700580
		2.4×10^8	2			p.r.	D.k. at 330 nm in soln. contg. $Au(CN)_2^-$, N_2O and 0.01 mol L^{-1} HCl. Unclear whether k or $2k$.	680302
		4.8×10^8	4,7			p.r.	D.k. at 330 nm in soln. contg. $HAuCl_4$, MeOH and 0.01 mol L^{-1} KCl. Unclear whether k or $2k$.	680302

TABLE 4. Rate constants for bismuth transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
4.1	**Bismuth(II) ion**							
4.1.1	**Bismuth(II) ion**							
	$Bi^{2+} + Bi^{2+} \rightarrow$	2.5×10^8	~1.5			p.r.	D.k. in Ar-satd. soln. contg. 0.001 mol L^{-1} $Bi(OAc)_3$.	761233
		6×10^8	~1			p.r.	D.k. in aerated soln. contg. 0.01 mol L^{-1} $BiCl_3$.	761233
4.1.2	**Hydroxyl**							
	$Bi^{2+} + {}^{\bullet}OH \rightarrow Bi^{3+} + OH^-$	2×10^9	≤0			p.r.	D.k. in Ar-satd. soln. contg. 1-5 mol L^{-1} $HClO_4$.	88A493
4.1.3	**Perhydroxyl**							
	$Bi^{2+} + HO_2^{\bullet} + H^+ \rightarrow Bi^{3+} + H_2O_2$	2.5×10^9	~1.5			p.r.	D.k. in aerated soln. contg. 0.001 mol L^{-1} $Bi(OAc)_3$.	761233
4.2	**Hydroxymethylbismuth(IV) ion**							
4.2.1	**First-order reaction**							
	$BiCH_2OH^{3+} \rightarrow$	4.8×10^3 s^{-1}	≤0			p.r.	D.k. in Ar-satd. soln. contg. 1-5 mol L^{-1} $HClO_4$ and MeOH.	88A493
4.3	**1-Hydroxyethylbismuth(IV) ion**							
4.3.1	**First-order reaction**							
	$BiCH(CH_3)OH^{3+} \rightarrow$	3.6×10^4 s^{-1}	≤0			p.r.	D.k. in Ar-satd. soln. contg. 1-5 mol L^{-1} $HClO_4$ and EtOH.	88A493
4.4	**1-Hydroxy-1-methylethylbismuth(IV) ion**							
4.4.1	**First-order reaction**							
	$BiC(CH_3)_2OH^{3+} \rightarrow$	1×10^3 s^{-1}	≤0			p.r.	D.k. in Ar-satd. soln. contg. 1-5 mol L^{-1} $HClO_4$ and 2-PrOH.	88A493
4.5	**2-Hydroxy-2-dimethylethylbismuth(IV) ion**							
4.5.1	**First-order reaction**							
	$BiCH_2C(CH_3)_2OH^{3+} \rightarrow$	1.0×10^5 s^{-1}	≤0			p.r.	D.k. in Ar-satd. soln. contg. 1-5 mol L^{-1} $HClO_4$ and *tert*-BuOH.	88A493
4.6	**Carboxybismuth(IV) ion**							
4.6.1	**First-order reaction**							
	$BiCOOH^{3+} \rightarrow$	$<10^3$ s^{-1}	≤0			p.r.	D.k. in Ar-satd. soln. contg. 1-5 mol L^{-1} $HClO_4$ and HCO_2H.	88A493

TABLE 5. Rate constants for cadmium transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
5.1	**Cadmium(I) ions**							
5.1.1	**Cadmium(I) ions**							
	$Cd^+ + Cd^+ \rightarrow Cd_2^{2+}$	2.1×10^9				p.r.	D.k. in soln. contg. $Cd(ClO_4)_2$ and *tert*-BuOH; value cor. for $\varepsilon = 1.4 \times 10^4$ L mol^{-1} cm^{-1} [92A182].	88A124
		1.5×10^9				p.r.	D.k. at 300 nm and condy. change in soln. contg. 5×10^{-4} mol L^{-1} $CdSO_4$ and MeOH, EtOH or 2-PrOH; value obtained by computer fit.	751064
		2.5×10^9				p.r.	D.k. in Ar-satd. soln. contg. 1×10^{-3} mol L^{-1} Cd^{2+} and 0.025 mol L^{-1} EtOH, ethylene glycol or *tert*-BuOH.	751153
5.1.2	**Hydroxyl**							
	$Cd^+ + {}^{\bullet}OH \rightarrow Cd^{2+} + OH^-$	$\sim 1.3 \times 10^{10}$			25	p.r.	D.k.; value cor. for $\varepsilon = 1.4 \times 10^4$ L mol^{-1} cm^{-1} [92A182].	751027
		2×10^{10}				p.r.	D.k. at 300 nm, p.b.k. at 240 nm and condy. change in soln. contg. 5×10^{-4} mol L^{-1} $CdSO_4$; value obtained by computer fit.	751064
5.1.3	**Hydroxymethyl**							
	$Cd^+ + {}^{\bullet}CH_2OH \rightarrow CdCH_2OH^+$	2×10^8				p.r.	D.k. at 300 nm, p.b.k. at 240 nm and condy. change in soln. contg. 5×10^{-4} mol L^{-1} $CdSO_4$ and MeOH; value obtained by computer fit.	751064
5.1.4	**1-Hydroxyethyl**							
	$Cd^+ + CH_3\dot{C}HOH \rightarrow CdCHOHCH_3^+$	1.3×10^9				p.r.	D.k. at 300 nm, p.b.k. at 240 nm and condy. change in soln. contg. 5×10^{-4} mol L^{-1} $CdSO_4$ and EtOH; value obtained by computer fit.	751064
5.1.5	**1-Hydroxy-1-methylethyl**							
	$Cd^+ + (CH_3)_2\dot{C}OH \rightarrow CdC(CH_3)_2OH^+$	2.4×10^9				p.r.	D.k. at 300 nm, p.b.k. at 240 nm and condy. change in soln. contg. 5×10^{-4} mol L^{-1} $CdSO_4$ and 2-PrOH; value obtained by computer fit.	751064
5.1.6	**2-Hydroxy-2,2-dimethylethyl**							
	$Cd^+ + {}^{\bullet}CH_2C(CH_3)_2OH \rightarrow Cd^{2+} + CH_2{=}C(CH_3)_2 + OH^-$	$\sim 1 \times 10^9$				p.r.	D.k. at 300 nm, p.b.k. at 240 nm and condy. change in soln. contg. 5×10^{-4} mol L^{-1} $CdSO_4$ and 0.5 mol L^{-1} *tert*-BuOH; $k(Cd_2^{2+} + {}^{\bullet}CH_2C(CH_3)_2OH \rightarrow Cd^+ + Cd^{2+} + (CH_3)_2C{=}CH_2 + OH^-) = \sim 1 \times 10^9$ L mol^{-1} s^{-1}; both values obtained by computer fit.	751064
5.1.7	**Carbon dioxide radical anion**							
	$Cd^+ + CO_2^{\bullet -} \rightarrow Cd^0 + CO_2$	2×10^9				p.r.	D.k. in deaerated soln. contg. 5×10^{-4} mol L^{-1} $Cd(ClO_4)_2$ and 10^{-3} mol L^{-1} formate.	92N098
5.1.8	**Bromate ion**							
	$Cd^+ + BrO_3^- \rightarrow$	1.3×10^8		0.08		p.r.	D.k. at 313 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and varied $[BrO_3^-]$; studied at 3-90 °C. E_a = 13.4 kJ mol^{-1} [701228].	68G855
5.1.9	**Tris(ethylenediamine)cobalt(III) ion**							
	$Cd^+ + Co(en)_3^{3+} \rightarrow Cd^{2+} + Co(en)_3^{2+}$	1.6×10^7	5-6	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and $(0.5\text{-}3.0) \times 10^{-4}$ mol L^{-1} complex.	690428

TABLE 5. Rate constants for cadmium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
5.1	**Cadmium(I) ions** — Continued							
5.1.10	***cis*-Dichlorobis(ethylenediamine)cobalt(III) ion**							
	$Cd^+ + cis\text{-}Co(en)_2Cl_2^+ \rightarrow Cd^{2+} + cis\text{-}Co(en)_2Cl_2$	2.3×10^9	5-6	0.08		p.r.	D.k. at 350 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times$ 10^{-4} mol L^{-1} complex.	690428
5.1.11	***trans*-Dichlorobis(ethylenediamine)cobalt(III) ion**							
	$Cd^+ + trans\text{-}Co(en)_2Cl_2^+ \rightarrow Cd^{2+} + trans\text{-}Co(en)_2Cl_2$	2.6×10^9	5-6	0.08		p.r.	D.k. at 350 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times$ 10^{-4} mol L^{-1} complex.	690428
5.1.12	**Carbonatobis(ethylenediamine)cobalt(III) ion**							
	$Cd^+ + Co(en)_2CO_3^+ \rightarrow Cd^{2+} + Co(en)_2CO_3$	6.7×10^8	5-6	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times$ 10^{-4} mol L^{-1} complex.	690428
5.1.13	***cis*-Bis(ethylenediamine)difluorocobalt(III) ion**							
	$Cd^+ + cis\text{-}Co(en)_2F_2^+ \rightarrow Cd^{2+} + cis\text{-}Co(en)_2F_2$	6.0×10^8	5-6	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times$ 10^{-4} mol L^{-1} complex.	690428
5.1.14	**Aquabis(ethylenediamine)fluorocobalt(III) ion**							
	$Cd^+ + Co(en)_2(H_2O)F^{2+} \rightarrow Cd^{2+} + Co(en)_2(H_2O)F^+$	4.1×10^8	5-6	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times$ 10^{-4} mol L^{-1} complex.	690428
5.1.15	***cis*-Amminechlorobis(ethylenediamine)cobalt(III) ion**							
	$Cd^+ + cis\text{-}Co(en)_2(NH_3)Cl^{2+} \rightarrow Cd^{2+} + cis\text{-}Co(en)_2(NH_3)Cl^+$	1.8×10^9	5-6	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times$ 10^{-4} mol L^{-1} complex.	690428
5.1.16	***cis*-Nitroamminebis(ethylenediamine)cobalt(III) ion**							
	$Cd^+ + cis\text{-}Co(en)_2(NH_3)NO_2^{2+} \rightarrow Cd^{2+} + cis\text{-}Co(en)_2(NH_3)NO_2^+$	2.8×10^9	5-6	0.08		p.r.	D.k. at 350 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times$ 10^{-4} mol L^{-1} complex.	690428
5.1.17	**Hexaamminecobalt(III) ion**							
	$Cd^+ + Co(NH_3)_6^{3+} \rightarrow Cd^{2+} + Co(NH_3)_6^{2+}$	1.7×10^8	5-6	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times$ 10^{-4} mol L^{-1} complex.	690428
5.1.18	**Pentaammine(bromo)cobalt(III) ion**							
	$Cd^+ + Co(NH_3)_5Br^{2+} \rightarrow Cd^{2+} + Co(NH_3)_5Br^+$	2.5×10^9	4.0	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times$ 10^{-4} mol L^{-1} complex.	690428
5.1.19	**Pentaammine(chloro)cobalt(III) ion**							
	$Cd^+ + Co(NH_3)_5Cl^{2+} \rightarrow Cd^{2+} + Co(NH_3)_5Cl^+$	2.2×10^9	5-6	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times$ 10^{-4} mol L^{-1} complex.	690428
5.1.20	**Pentaammine(cyano)cobalt(III) ion**							
	$Cd^+ + Co(NH_3)_5(CN)^{2+} \rightarrow Cd^{2+} + Co(NH_3)_5(CN)^+$	9.1×10^8	5-6	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times$ 10^{-4} mol L^{-1} complex.	690428
5.1.21	**Pentaammine(fluoro)cobalt(III) ion**							
	$Cd^+ + Co(NH_3)_5F^{2+} \rightarrow Cd^{2+} + Co(NH_3)_5F^+$	5.4×10^8	5-6	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times$ 10^{-4} mol L^{-1} complex.	690428
5.1.22	**Pentaammine(fumarato)cobalt(III) ion**							
	$Cd^+ + Co(NH_3)_5fumarate^+ \rightarrow Cd^{2+} + Co(NH_3)_5fumarate$	8.3×10^8	5-6	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times$ 10^{-4} mol L^{-1} complex.	690428

TABLE 5. Rate constants for cadmium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
5.1	**Cadmium(I) ions** — Continued							
5.1.23	**Pentaammine(aqua)cobalt(III) ion**							
	$Cd^+ + Co(NH_3)_5(H_2O)^{3+} \rightarrow Cd^{2+} + Co(NH_3)_5(H_2O)^{2+}$	6.2×10^8	4.0	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and $(0.5\text{-}3.0) \times 10^{-4}$ mol L^{-1} complex.	690428
5.1.24	**Pentaammine(hydroxy)cobalt(III) ion**							
	$Cd^+ + Co(NH_3)_5OH^{2+} \rightarrow Cd^{2+} + Co(NH_3)_5OH^+$	9.0×10^8	7.1	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and $(0.5\text{-}3.0) \times 10^{-4}$ mol L^{-1} complex.	690428
5.1.25	**Pentaammine(azido)cobalt(III) ion**							
	$Cd^+ + Co(NH_3)_5(N_3)^{2+} \rightarrow Cd^{2+} + Co(NH_3)_5(N_3)^+$	1.4×10^9	5-6	0.08		p.r.	D.k. at 350 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and $(0.5\text{-}3.0) \times 10^{-4}$ mol L^{-1} complex.	690428
5.1.26	**Pentaammine(thiocyanato-*N*)cobalt(III) ion**							
	$Cd^+ + Co(NH_3)_5(NCS)^{2+} \rightarrow Cd^{2+} + Co(NH_3)_5(NCS)^+$	1.3×10^9	5-6	0.08		p.r.	D.k. at 350 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and $(0.5\text{-}3.0) \times 10^{-4}$ mol L^{-1} complex.	690428
5.1.27	**(Acetato)pentaamminecobalt(III) ion**							
	$Cd^+ + Co(NH_3)_5(OAc)^{2+} \rightarrow Cd^{2+} + Co(NH_3)_5(OAc)^+$	9.0×10^7	5-6	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and $(0.5\text{-}3.0) \times 10^{-4}$ mol L^{-1} complex.	690428
5.1.28	**μ-Amido-μ-superoxidotetrakis(ethylenediamine)dicobalt(III) ion**							
	$Cd^+ + NH_2[Co(en)_2]_2(O_2)^{4+} \rightarrow Cd^{2+} + NH_2[Co(en)_2]_2(O_2)^{3+}$	4×10^9				p.r.	D.k. at 310 nm and p.b.k. at 380 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$ and 0.01 mol L^{-1} MeOH; an intermediate Cd(II) adduct forms the peroxo complex with $k = 2.4 \times 10^3$ s^{-1}.	80A069
5.1.29	**Hexaamminebis(μ-hydroxy)-μ-(trifluoroacetato)dicobalt(III) ion**							
	$Cd^+ + CF_3CO_2[Co(NH_3)_3]_2(OH)_2^{3+} \rightarrow$	4.1×10^8			22	p.r.	D.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} $CdSO_4$ and 0.1 mol L^{-1} *tert*-BuOH.	83A140
5.1.30	**Hexaammine-μ-(difluoroacetato)bis(μ-hydroxy)dicobalt(III) ion**							
	$Cd^+ + CHF_2CO_2[Co(NH_3)_3]_2(OH)_2^{3+} \rightarrow$	3.6×10^8			22	p.r.	D.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} $CdSO_4$ and 0.1 mol L^{-1} *tert*-BuOH.	83A140
5.1.31	**Hexaammine-μ-(fluoroacetato)bis(μ-hydroxy)dicobalt(III) ion**							
	$Cd^+ + CH_2FCO_2[Co(NH_3)_3]_2(OH)_2^{3+} \rightarrow$	3.0×10^8			22	p.r.	D.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} $CdSO_4$ and 0.1 mol L^{-1} *tert*-BuOH.	83A140
5.1.32	**μ-Acetatohexaamminebis(μ-hydroxy)dicobalt(III) ion**							
	$Cd^+ + CH_3CO_2[Co(NH_3)_3]_2(OH)_2^{3+} \rightarrow$	2.2×10^8			22	p.r.	D.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} $CdSO_4$ and 0.1 mol L^{-1} *tert*-BuOH.	83A140
5.1.33	**Tris(2,2'-bipyridine)chromium(III) ion**							
	$Cd^+ + Cr(bpy)_3^{3+} \rightarrow Cd^{2+} + Cr(bpy)_3^{2+}$	1.8×10^9	~7		23	p.r.	D.k. at 310 nm in soln. contg. 0.1 mol L^{-1} *tert*-BuOH, 0.01 mol L^{-1} $CdSO_4$ and varied concentrations Cr complex.	87A309
5.1.34	**Tris(1,10-phenanthroline)chromium(III) ion**							
	$Cd^+ + Cr(phen)_3^{3+} \rightarrow Cd^{2+} + Cr(phen)_3^{2+}$	1.7×10^9	~7		23	p.r.	D.k. at 310 nm in soln. contg. 0.1 mol L^{-1} *tert*-BuOH, 0.01 mol L^{-1} $CdSO_4$ and varied concentrations Cr complex.	87A309
5.1.35	**Bis(2,2'-bipyridine)oxalatochromium(III)ion**							
	$Cd^+ + Cr(bpy)_2(C_2O_4)^+ \rightarrow Cd^{2+} + Cr(bpy)_2(C_2O_4)$	2.3×10^9	~7		23	p.r.	D.k. at 310 nm in soln. contg. 0.1 mol L^{-1} *tert*-BuOH, 0.01 mol L^{-1} $CdSO_4$ and varied concentrations Cr complex.	87A309

TABLE 5. Rate constants for cadmium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
5.1	**Cadmium(I) ions** — Continued							
5.1.36	**Bis(1,10-phenanthroline)(oxalato)chromium(III) ion**							
	$Cd^+ + Cr(phen)_2(C_2O_4)^+ \rightarrow Cd^{2+} + Cr(phen)_2(C_2O_4)$	2.5×10^9	~7		23	p.r.	D.k. at 310 nm in soln. contg. 0.1 mol L^{-1} *tert*-BuOH, 0.01 mol L^{-1} $CdSO_4$ and varied concentrations Cr complex.	87A309
5.1.37	**2,2'-Bipyridinebis(oxalato)chromate(III) ion**							
	$Cd^+ + Cr(bpy)(C_2O_4)_2^- \rightarrow Cd^{2+} + Cr(bpy)(C_2O_4)_2^{2-}$	2.2×10^9	~7		23	p.r.	D.k. at 310 nm in soln. contg. 0.1 mol L^{-1} *tert*-BuOH, 0.01 mol L^{-1} $CdSO_4$ and varied concentrations Cr complex.	87A309
5.1.38	**Bis(oxalato)phenanthrolinechromate(III) ion**							
	$Cd^+ + Cr(phen)(C_2O_4)_2^- \rightarrow Cd^{2+} + Cr(phen)(C_2O_4)_2^{2-}$	2.4×10^9	~7		23	p.r.	D.k. at 310 nm in soln. contg. 0.1 mol L^{-1} *tert*-BuOH, 0.01 mol L^{-1} $CdSO_4$ and varied concentrations Cr complex.	87A309
5.1.39	**Chromate(VI) ion**							
	$Cd^+ + CrO_4^{2-} \rightarrow$	9.8×10^9		0.02	25	p.r.	D.k. in soln. contg. Cd^{2+}.	761072
5.1.40	**Dichromate(VI) ion**							
	$Cd^+ + Cr_2O_7^{2-} \rightarrow$	1.6×10^{10}		0.02	25	p.r.	D.k. in soln. contg. Cd^{2+}.	761072
5.1.41	**Copper(II) ion**							
	$Cd^+ + Cu^{2+} \rightarrow$	1.2×10^8		0.08		p.r.	D.k. at 313 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and varied [Cu^{2+}].	68G855
5.1.42	**Hydrogen peroxide**							
	$Cd^+ + H_2O_2 \rightarrow Cd^{2+} + {}^{\bullet}OH + OH^-$	2.2×10^9			25	p.r.	D.k.; $E_a = 9.2$ kJ mol^{-1}.	761072
		1.6×10^9				p.r.	D.k. at 313 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$ and 0.001 mol L^{-1} MeOH.	68G855
5.1.43	**Iodate ion**							
	$Cd^+ + IO_3^- \rightarrow$	2.3×10^9		0.08		p.r.	D.k. at 313 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and varied [IO_3^-].	68G855
5.1.44	**Permanganate ion**							
	$Cd^+ + MnO_4^- \rightarrow Cd^{2+} + MnO_4^{2-}$	7.8×10^9	7.0		~22	p.r.	D.k. in Ar-satd. soln. contg. ~1 mol L^{-1} *tert*-BuOH.	731104
		1.3×10^{10}			~20	p.r.	D.k. in deaerated soln. contg. 0.64, 1.35, or 2.25×10^{-3} mol L^{-1} Cd^{2+} and 1×10^{-5} mol L^{-1} MnO_4^-.	650385
5.1.45	**Nitrite ion**							
	$Cd^+ + NO_2^- \rightarrow$	2.0×10^9		0.08		p.r.	D.k. at 313 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and varied [NO_2^-]; studied at 3-90 °C, E_a = 12.5 kJ mol^{-1} [701228].	68G855
5.1.46	**Nitrate ion**							
	$Cd^+ + NO_3^- \rightarrow$	3.5×10^8		0.08		p.r.	D.k. at 313 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and varied [NO_3^-].	68G855
5.1.47	**Nitrous oxide**							
	$Cd^+ + N_2O \rightarrow CdO^+ + N_2$	3.5×10^6			25	p.r.	D.k. in N_2O-satd. soln.; $E_a = 45.6$ kJ mol^{-1}.	761072
		$\leq 2 \times 10^6$				p.r.	D.k. at 313 nm in soln. contg. 1 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and varied [N_2O].	68G855
5.1.48	**Oxygen**							
	$Cd^+ + O_2 \rightarrow$	3.6×10^9			25	p.r.	D.k. in O_2-satd. soln. contg. 0.1 mol L^{-1} Cd^{2+} and 0.1 mol L^{-1} formate ion.	761072

TABLE 5. Rate constants for cadmium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
5.1	**Cadmium(I) ions** — Continued							
5.1.48	**Oxygen** — Continued							
		2.4×10^9		0.08		p.r.	D.k. at 313 nm in soln. contg. 0.02 mol L^{-1} $CdSO_4$, 0.001 mol L^{-1} MeOH and varied [O_2].	68G855
		3.3×10^9			18	p.r.	D.k.	66A001
5.1.49	**Lead(II) ions**							
	$Cd^+ + Pb^{2+} \rightarrow$	7.5×10^8				p.r.	D.k.	66A001
5.1.50	**Hexaammineruthenium(III) ion**							
	$Cd^+ + Ru(NH_3)_6^{3+} \rightarrow Cd^{2+} + Ru(NH_3)_6^{2+}$	2.2×10^9		0.08		p.r.	D.k. in soln. contg. 0.02 mol L^{-1} $CdSO_4$ and (0.5-10) $\times 10^{-4}$ mol L^{-1} $Ru(NH_3)_6^{3+}$.	701229
5.1.51	**Tris(2,2'-bipyridine)ruthenium(II) ion**							
	$Cd^+ + Ru(bpy)_3^{2+} \rightarrow Cd^{2+} + Ru(bpy)_3^{+}$	6.1×10^8	5.9		24	p.r.	P.b.k. at 510 nm in soln. contg. 4.0 $\times$ 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$ and 0.03 mol L^{-1} $CdSO_4$.	78A002 771093
5.1.52	**Tris(2,2'-bipyridine)ruthenium(III) ion**							
	$Cd^+ + Ru(bpy)_3^{3+} \rightarrow Cd^{2+} + Ru(bpy)_3^{2+}$	2.8×10^9	4.6		24	p.r.	P.b.k. at 455 nm in Ar-satd. soln. contg. (2-8) $\times 10^{-4}$ mol L^{-1} $Ru(bpy)_3^{3+}$, 0.5 mol L^{-1} *tert*-BuOH and 0.5 mol L^{-1} $CdSO_4$.	78A070
5.1.53	**Peroxodisulfate ion**							
	$Cd^+ + S_2O_8^{2-} \rightarrow Cd^{2+} + SO_4^{\bullet -} + SO_4^{2-}$	2.4×10^9		0.02	25	p.r.	D.k. in deaerated soln. contg. 0.01 mol L^{-1} $CdSO_4$ and (0.5-10) $\times 10^{-4}$ mol L^{-1} $S_2O_8^{2-}$.	761072
5.1.54	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatozincate(II) ion**							
	$Cd^+ + ZnTPPS^{4-} \rightarrow [ZnTPPS]^{\bullet 5-} + Cd^{2+}$	1×10^{10}				p.r.	P.b.k. in deaerated soln.	82A279
5.1.55	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatozincate(II) ion, triplet state**							
	$Cd^+ + {}^3(ZnTPPS^{4-})^* \rightarrow [ZnTPPS]^{\bullet 5-} + Cd^{2+}$	1×10^{10}				p.r.	P.b.k. in deaerated soln. Combined pulse radiolysis and photolysis.	82A279
5.1.56	**Acetophenone**							
	$Cd^+ + C_6H_5COCH_3 \rightarrow Cd^{2+} + C_6H_5\dot{C}O^{-}CH_3$	2.5×10^8				p.r.	D.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, $Cd(ClO_4)_2$ and acetophenone.	93A362
5.1.57	**9,10-Anthraquinone**							
	$Cd^+ + AQ \rightarrow Cd^{2+} + [AQ]^{\bullet -}$	1.0×10^9	7.0		~22	p.r.	P.b.k. in Ar-satd. soln. contg. $CdSO_4$ and ~1 mol L^{-1} *tert*-BuOH.	731104
5.1.58	**Benzil**							
	$Cd^+ + C_6H_5COCOC_6H_5 \rightarrow Cd^{2+} + C_6H_5COC\dot{O}^{-}C_6H_5$	2.1×10^9				p.r.	D.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, $Cd(ClO_4)_2$ and benzil.	93A362
5.1.59	**Benzophenone**							
	$Cd^+ + (C_6H_5)_2CO \rightarrow Cd^{2+} + (C_6H_5)_2\dot{C}O^{-}$	1.2×10^9				p.r.	P.b.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, $Cd(ClO_4)_2$ and benzophenone.	93A362
		1.0×10^9	7.0			p.r.	P.b.k. in soln. contg. 5×10^{-3} mol L^{-1} $CdSO_4$, 5×10^{-5} mol L^{-1} benzophenone, ~1 mol L^{-1} *tert*-BuOH and 0.001 mol L^{-1} phosphate.	751032
5.1.60	**1,4-Benzoquinone**							
	$Cd^+ + Q \rightarrow Cd^{2+} + Q^{\bullet -}$	3.9×10^9				p.r.	P.b.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, $Cd(ClO_4)_2$ and benzoquinone.	93A362

TABLE 5. Rate constants for cadmium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
5.1	**Cadmium(I) ions** — Continued							
5.1.60	**1,4-Benzoquinone** — Continued							
		4.1×10^9	5.4		25	p.r.	P.b.k. at 430 nm in soln. contg. 0.01 mol L^{-1} $CdSO_4$, 1 mol L^{-1} *tert*-BuOH and (2-4) $\times$ 10^{-5} mol L^{-1} benzoquinone.	761134
		4.4×10^9	7.0			p.r.	P.b.k. in soln. contg. 5×10^{-3} mol L^{-1} $CdSO_4$, 5×10^{-5} mol L^{-1} benzoquinone, ~1 mol L^{-1} *tert*-BuOH and 0.001 mol L^{-1} phosphate.	751032
5.1.61	**4,4'-Dimethoxybenzophenone**							
	$Cd^+ + (4\text{-}CH_3OC_6H_4)_2CO \rightarrow Cd^{2+} + (4\text{-}CH_3OC_6H_4)_2\dot{C}O^-$	8×10^8				p.r.	D.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, $Cd(ClO_4)_2$ and 4,4'-dimethoxybenzophenone.	93A362
5.1.62	**Duroquinone**							
	$Cd^+ + DQ \rightarrow Cd^{2+} + [DQ]^{\cdot -}$	2.0×10^9				p.r.	P.b.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, $Cd(ClO_4)_2$ and duroquinone.	93A362
5.1.63	**9-Fluorenone**							
	$Cd^+ + C_{13}H_8O \rightarrow Cd^{2+} + [C_{13}H_8O]^{\cdot -}$	1.8×10^9				p.r.	P.b.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, $Cd(ClO_4)_2$ and fluorenone.	93A362
5.1.64	**2-Hydroxy-1,4-naphthoquinone**							
	$Cd^+ + 2\text{-(OH)NQ} \rightarrow Cd^{2+} + [2\text{-(OH)NQ}]^{\cdot -}$	3.6×10^9	7.0		~22	p.r.	P.b.k. in Ar-satd. soln. contg. $CdSO_4$ and ~1 mol L^{-1} *tert*-BuOH.	731104
5.1.65	**2-Methyl-1,4-naphthoquinone**							
	$Cd^+ + 2\text{-}CH_3NQ \rightarrow Cd^{2+} + [2\text{-}CH_3NQ]^{\cdot -}$	4.7×10^9	7.0		~22	p.r.	P.b.k. in soln. contg. 5×10^{-3} mol L^{-1} $CdSO_4$, 5×10^{-5} mol L^{-1} 2-methylnaphthoquinone, ~1 mol L^{-1} *tert*-BuOH and 0.001 mol L^{-1} phosphate.	731104 731047 751032
5.1.66	**Nicotinamide adenine dinucleotide**							
	$Cd^+ + NAD^+ \rightarrow Cd^{2+} + NAD^{\cdot}$	2.9×10^9	7.0		~22	p.r.	P.b.k. in Ar-satd. soln. contg. $CdSO_4$ and ~1 mol L^{-1} *tert*-BuOH.	731104
5.1.67	**1,4-Naphthoquinone-2-sulfonate ion**							
	$Cd^+ + 2\text{-}SO_3NQ^- \rightarrow Cd^{2+} + [2\text{-}SO_3NQ]^{\cdot 2-}$	7.4×10^9	7.0		~22	p.r.	P.b.k. in Ar-satd. soln. contg. $CdSO_4$ and ~1 mol L^{-1} *tert*-BuOH.	731104
5.1.68	***N,N*-Dimethyl-4-nitrosoaniline**							
	$Cd^+ + 4\text{-}Me_2NC_6H_4NO \rightarrow$	~1.4×10^{10}				p.r.	D.k. at 440 nm in Ar-satd. soln. contg. Cd^{2+}.	680066
5.1.69	**Riboflavine**							
	$Cd^+ + RF \rightarrow Cd^{2+} + [RF]^{\cdot -}$	5.1×10^9	7.0		~22	p.r.	P.b.k. in Ar-satd. soln. contg. $CdSO_4$ and ~1 mol L^{-1} *tert*-BuOH.	731104
5.2	**1,4,10-Trioxa-7,13-diazacyclopentadecanecadmium(I) ion**							
5.2.1	**Benzil**							
	$Cd^+ 21 + C_6H_5COCOC_6H_5 \rightarrow C_6H_5COC\dot{O}^-C_6H_5 + Cd^{2+} 21$	2.2×10^9				p.r.	D.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, coronand (21), $Cd(ClO_4)_2$ and benzil.	93A362
5.2.2	**Benzophenone**							
	$Cd^+ 21 + (C_6H_5)_2CO \rightarrow Cd^{2+} 21 + (C_6H_5)_2\dot{C}O^-$	1.3×10^9				p.r.	P.b.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, coronand (21), $Cd(ClO_4)_2$ and benzophenone.	93A362

TABLE 5. Rate constants for cadmium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
5.2	**1,4,10-Trioxa-7,13-diazacyclopentadecanecadmium(I) ion** — Continued							
5.2.3	**4,4'-Dimethoxybenzophenone**							
	Cd^+ 21 + $(4\text{-}CH_3OC_6H_4)_2CO \rightarrow$ $(4\text{-}CH_3OC_6H_4)_2\dot{C}O^- + Cd^{2+}$ 21	8×10^8				p.r.	D.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, coronand (21), $Cd(ClO_4)_2$ and 4,4'-dimethoxybenzophenone.	93A362
5.2.4	**Duroquinone**							
	Cd^+ 21 + DQ $\rightarrow Cd^{2+}$ 21 + $[DQ]^{\cdot-}$	2.0×10^9				p.r.	P.b.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, coronand (21), $Cd(ClO_4)_2$ and duroquinone.	93A362
5.3	**1,4,10,13-Tetraoxa-7,16-diazacycloctadecanecadmium(I) ion**							
5.3.1	**Acetophenone**							
	Cd^+ 22 + $C_6H_5COCH_3 \rightarrow Cd^{2+}$ 22 + $C_6H_5\dot{C}O^-CH_3$	4×10^7				p.r.	C.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, coronand (22), $Cd(ClO_4)_2$ and acetophenone.	93A362
5.3.2	**Benzil**							
	Cd^+ 22 + $C_6H_5COCOC_6H_5 \rightarrow$ $C_6H_5COC\dot{O}^-C_6H_5 + Cd^{2+}$ 22	1.6×10^9				p.r.	D.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, coronand (22), $Cd(ClO_4)_2$ and benzil.	93A362
5.3.3	**Benzophenone**							
	Cd^+ 22 + $(C_6H_5)_2CO \rightarrow Cd^{2+}$ 22 + $(C_6H_5)_2\dot{C}O^-$	1.1×10^9				p.r.	P.b.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, coronand (22), $Cd(ClO_4)_2$ and benzophenone.	93A362
5.3.4	**4,4'-Dimethoxybenzophenone**							
	Cd^+ 22 + $(4\text{-}CH_3OC_6H_4)_2CO \rightarrow$ $(4\text{-}CH_3OC_6H_4)_2\dot{C}O^- + Cd^{2+}$ 22	4.7×10^8				p.r.	D.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, coronand (22), $Cd(ClO_4)_2$ and 4,4'-dimethoxybenzophenone.	93A362
5.3.5	**Duroquinone**							
	Cd^+ 22 + DQ $\rightarrow Cd^{2+}$ 22 + $[DQ]^{\cdot-}$	2.0×10^9				p.r.	P.b.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, coronand (22), $Cd(ClO_4)_2$ and duroquinone.	93A362
5.3.6	**9-Fluorenone**							
	Cd^+ 22 + $C_{13}H_8O \rightarrow Cd^{2+}$ 22 + $[C_{13}H_8O]^{\cdot-}$	1.9×10^9				p.r.	P.b.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, coronand (22), $Cd(ClO_4)_2$ and fluorenone.	93A362
5.4	**4,7,13,16,21-Pentaoxa-1,10-diazabicyclo[8.8.5]tricosanecadmium(I) ion**							
5.4.1	**Benzophenone**							
	Cd^+ 221 + $(C_6H_5)_2CO \rightarrow Cd^{2+}$ 221 + $(C_6H_5)_2\dot{C}O^-$	2.7×10^8				p.r.	P.b.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, cryptand (221), $Cd(ClO_4)_2$ and benzophenone.	93A362
5.4.2	**4,4'-Dimethoxybenzophenone**							
	Cd^+ 221 + $(4\text{-}CH_3OC_6H_4)_2CO \rightarrow$ $(4\text{-}CH_3OC_6H_4)_2\dot{C}O^- + Cd^{2+}$ 221	2.5×10^8				p.r.	D.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, cryptand (221), $Cd(ClO_4)_2$ and 4,4'-dimethoxybenzophenone.	93A362
5.4.3	**Duroquinone**							
	Cd^+ 221 + DQ $\rightarrow Cd^{2+}$ 221 + $[DQ]^{\cdot-}$	1.8×10^9				p.r.	P.b.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, cryptand (221), $Cd(ClO_4)_2$ and duroquinone.	93A362
5.4.4	**9-Fluorenone**							
	Cd^+ 221 + $C_{13}H_8O \rightarrow Cd^{2+}$ 221 + $[C_{13}H_8O]^{\cdot-}$	1.8×10^9				p.r.	P.b.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, cryptand (221), $Cd(ClO_4)_2$ and fluorenone.	93A362

TABLE 5. Rate constants for cadmium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
5.5	**4,7,13,16,21,24-Hexaoxa-1,10-diazabicyclo[8.8.8]hexacosanecadmium(I) ion**							
5.5.1	**Benzophenone**							
	Cd^+ 222 + $(C_6H_5)_2CO \rightarrow Cd^{2+}$ 222 + $(C_6H_5)_2\dot{C}O^-$	1.3×10^8				p.r.	P.b.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, cryptand (222), $Cd(ClO_4)_2$ and benzophenone.	93A362
5.5.2	**Duroquinone**							
	Cd^+ 222 + DQ $\rightarrow Cd^{2+}$ 222 + $[DQ]^{\cdot-}$	1.0×10^9				p.r.	P.b.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, cryptand (222), $Cd(ClO_4)_2$ and duroquinone.	93A362
5.5.3	**9-Fluorenone**							
	Cd^+ 222 + $C_{13}H_8O \rightarrow Cd^{2+}$ 222 + $[C_{13}H_8O]^{\cdot-}$	1.1×10^9				p.r.	P.b.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, cryptand (222), $Cd(ClO_4)_2$ and fluorenone.	93A362
5.6	**1,4,8,11-Tetrazacyclotetradecanecadmium(I) ion**							
5.6.1	**Nitrous oxide**							
	$Cd(cyclam)^+ + N_2O \rightarrow$	4.5×10^7	5-7		23	p.r.	D.k. in 0-36% N_2O-satd. soln. contg. 0.4 mol L^{-1} *tert*-BuOH and 0.01 mol L^{-1} $Cd(cyclam)^{2+}$.	80A380
5.7	**Ethylenediaminetetraacetatocadmate(I) ion**							
5.7.1	**Ethylenediaminetetraacetatocadmate(I) ion**							
	$CdEDTA^{3-} + CdEDTA^{3-} \rightarrow$	4×10^7	11.3	0.16		p.r.	D.k at 350 nm in soln. contg. 0.01 mol L^{-1} $CdSO_4$ and 0.02 mol L^{-1} EDTA.	701228
5.7.2	**Bromate ion**							
	$CdEDTA^{3-} + BrO_3^- \rightarrow$	8.9×10^6	11.3	0.16		p.r.	D.k. at 350 nm in soln. contg. 0.01 mol L^{-1} $CdSO_4$, 0.02 mol L^{-1} EDTA and (5-20) $\times 10^{-5}$ mol L^{-1} BrO_3^-; studied at 3-90 °C, E_a = 4.6 kJ mol^{-1}.	701228
5.7.3	**Iodate ion**							
	$CdEDTA^{3-} + IO_3^- \rightarrow$	2.7×10^8	11.3	0.16		p.r.	D.k. at 350 nm in soln. contg. 0.01 mol L^{-1} $CdSO_4$, 0.02 mol L^{-1} EDTA and (5-20) $\times 10^{-5}$ mol L^{-1} IO_3^-.	701228
5.7.4	**Hydrogen peroxide**							
	$CdEDTA^{3-} + H_2O_2 \rightarrow CdEDTA^{2-} + {}^{\cdot}OH + OH^-$	2×10^9	11.5			p.r.	D.k. in soln. contg. $CdEDTA^{2-}$. Value obtained by computer fit.	80A072
5.7.5	**Nitrite ion**							
	$CdEDTA^{3-} + NO_2^- \rightarrow$	3.2×10^6	11.3	0.16		p.r.	D.k. at 350 nm in soln. contg. 0.01 mol L^{-1} $CdSO_4$, 0.02 mol L^{-1} EDTA and (5-20) $\times 10^{-5}$ mol L^{-1} NO_2^-; studied at 3-90 °C; E_a = 8.4 kJ mol^{-1}.	701228
5.7.6	**Nitrate ion**							
	$CdEDTA^{3-} + NO_3^- \rightarrow$	1.7×10^7	11.3	0.16		p.r.	D.k. at 350 nm in soln. contg. 0.01 mol L^{-1} $CdSO_4$, 0.02 mol L^{-1} EDTA and (5-20) $\times 10^{-5}$ mol L^{-1} NO_3^-.	701228
5.7.7	**Ethylenediaminetetraacetatoplumbate(II) ion**							
	$CdEDTA^{3-} + PbEDTA^{2-} \rightarrow$	4×10^6	11.5	0.25		p.r.	D.k.; value obtained by computer fit.	80A072
5.8	**Ethylenediaminecadmium(I) ion**							
5.8.1	**Bromate ion**							
	$Cd(en)_n^+ + BrO_3^- \rightarrow$	1.3×10^8	11.4	0.64		p.r.	D.k. at 350 nm in soln. contg. 0.01 mol L^{-1} $CdSO_4$, 0.02 mol L^{-1} $enSO_4$ and (5-20) $\times 10^{-5}$ mol L^{-1} BrO_3^-.	701228

TABLE 5. Rate constants for cadmium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
5.8	**Ethylenediaminecadmium(I) ion** — Continued							
5.8.2	**Iodate ion**							
	$Cd(en)_n^+ + IO_3^- \rightarrow$	2.5×10^9	11.4	0.64		p.r.	D.k. at 350 nm in soln. contg. 0.01 mol L^{-1} $CdSO_4$, 0.02 mol L^{-1} $enSO_4$ and (5-20) $\times 10^{-5}$ mol L^{-1} IO_3^-.	701228
5.8.3	**Nitrite ion**							
	$Cd(en)_n^+ + NO_2^- \rightarrow$	1.1×10^9	11.4	0.64		p.r.	D.k. at 350 nm in soln. contg. 0.01 mol L^{-1} $CdSO_4$, 0.02 mol L^{-1} $enSO_4$ and (5-20) $\times 10^{-5}$ mol L^{-1} NO_2^-.	701228
5.8.4	**Nitrate ion**							
	$Cd(en)_n^+ + NO_3^- \rightarrow$	4.5×10^8	11.4	0.64		p.r.	D.k. at 350 nm in soln. contg. 0.01 mol L^{-1} $CdSO_4$, 0.02 mol L^{-1} $enSO_4$ and (5-20) $\times 10^{-5}$ mol L^{-1} NO_3^-.	701228
5.9	**Glycinatocadmium(I) ion**							
5.9.1	**Bromate ion**							
	$CdGly + BrO_3^- \rightarrow$	6.1×10^7	10.5	0.21		p.r.	D.k. at 350 nm in soln. contg. 0.01 mol L^{-1} $CdSO_4$, 0.02 mol L^{-1} glycine and (5-20) $\times 10^{-5}$ mol L^{-1} BrO_3^-.	701228
5.9.2	**Iodate ion**							
	$CdGly + IO_3^- \rightarrow$	1.8×10^9	10.5	0.21		p.r.	D.k. at 350 nm in soln. contg. 0.01 mol L^{-1} $CdSO_4$, 0.02 mol L^{-1} glycine and (5-20) $\times 10^{-5}$ mol L^{-1} IO_3^-.	701228
5.9.3	**Nitrite ion**							
	$CdGly + NO_2^- \rightarrow$	8.5×10^8	10.5	0.21		p.r.	D.k. at 350 nm in soln. contg. 0.01 mol L^{-1} $CdSO_4$, 0.02 mol L^{-1} glycine and (5-20) $\times 10^{-5}$ mol L^{-1} NO_2^-.	701228
5.9.4	**Nitrate ion**							
	$CdGly + NO_3^- \rightarrow$	2.4×10^8	10.5	0.21		p.r.	D.k. at 350 nm in soln. contg. 0.01 mol L^{-1} $CdSO_4$, 0.02 mol L^{-1} glycine and (5-20) $\times 10^{-5}$ mol L^{-1} NO_3^-.	701228
5.10	**Nitrilotriacetatocadmium(I) ion**							
5.10.1	**Nitrilotriacetatocadmium(I) ion**							
	$CdNTA^{2-} + CdNTA^{2-} \rightarrow$	8×10^8	10.7	0.10		p.r.	D.k. at 350 nm in soln. contg. 0.01 mol L^{-1} $CdSO_4$, 0.02 mol L^{-1} NTA.	701228
5.10.2	**Bromate ion**							
	$CdNTA^{2-} + BrO_3^- \rightarrow$	1.0×10^7	10.7	0.10		p.r.	D.k. at 350 nm in soln. contg. 0.01 mol L^{-1} $CdSO_4$, 0.02 mol L^{-1} NTA and (5-20) $\times 10^{-5}$ mol L^{-1} BrO_3^-.	701228
5.10.3	**Iodate ion**							
	$CdNTA^{2-} + IO_3^- \rightarrow$	6.1×10^8	10.7	0.10		p.r.	D.k. at 350 nm in soln. contg. 0.01 mol L^{-1} $CdSO_4$, 0.02 mol L^{-1} NTA and (5-20) $\times 10^{-5}$ mol L^{-1} IO_3^-.	701228
5.10.4	**Nitrite ion**							
	$CdNTA^{2-} + NO_2^- \rightarrow$	4.2×10^7	10.7	0.10		p.r.	D.k. at 350 nm in soln. contg. 0.01 mol L^{-1} $CdSO_4$, 0.02 mol L^{-1} NTA and (5-20) $\times 10^{-5}$ mol L^{-1} NO_2^-.	701228
5.10.5	**Nitrate ion**							
	$CdNTA^{2-} + NO_3^- \rightarrow$	4.5×10^7	10.7	0.10		p.r.	D.k. at 350 nm in soln. contg. 0.01 mol L^{-1} $CdSO_4$, 0.02 mol L^{-1} NTA and (5-20) $\times 10^{-5}$ mol L^{-1} NO_3^-.	701228

TABLE 5. Rate constants for cadmium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
5.11	**1-Hydroxyethylcadmium(II) ion**							
5.11.1	**Water**							
	$CdCHOHCH_3^+ + H_2O \rightarrow Cd^{2+} +$ EtOH + OH^-	$2.6 \times 10^2 s^{-1}$				p.r.	Condy. change in soln. contg. 5×10^{-4} mol L^{-1} $CdSO_4$ and EtOH.	751064
5.12	**1-Hydroxy-1-methylethylcadmium(II) ion**							
5.12.1	**Water**							
	$CdC(CH_3)_2OH^+ + H_2O \rightarrow Cd^{2+} +$ 2-PrOH + OH^-	1.6×10^2 s^{-1}				p.r.	Condy. change in soln. contg. 5×10^{-4} mol L^{-1} $CdSO_4$ and 2-PrOH.	751064
5.13	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatocadmate(II) radical anion**							
5.13.1	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatocadmate(II) radical anion**							
	$[CdTPPS]^{\cdot 5-} + [CdTPPS]^{\cdot 5-} \rightarrow$	5.2×10^8	12			p.r.	D.k. in N_2-satd. soln. contg. 0.1 mol L^{-1} 2-PrOH and $CdTPPS^{4-}$; reaction suggested to be disproportionation; ΔG = 29 kJ mol^{-1}.	83C026

TABLE 6. Rate constants for cobalt transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.1	**Cobalt(I) ion**							
6.1.1	**Dibromine radical ion**							
	$Co^+ + Br_2^{\bullet-} \rightarrow 2\,Br^- + Co^{2+}$	1.0×10^{10}				f.p./pi	D.k. in deaerated soln. contg. 0.001 mol L^{-1} NaBr and 0.01-0.05 mol L^{-1} Co^{2+}.	707726
6.1.2	**Bromate ion**							
	$Co^+ + BrO_3^- \rightarrow$	4.8×10^9 7.1×10^9		0.019 $\rightarrow$0	25	p.r.	D.k. at 320 nm in deaerated soln. contg. 0.001-0.01 mol L^{-1} Co^{2+}, 0.1 mol L^{-1} *tert*-BuOH, 2.5×10^{-5} mol L^{-1} BrO_3^- and 0-0.1 mol L^{-1} $NaClO_4$.	761072
6.1.3	**Cobalt(I) ion**							
	$Co^+ + Co^+ \rightarrow$	$\leq 2 \times 10^9$		0.019	25	p.r.	D.k. at 370 nm in soln. contg. 0.1 mol L^{-1} Co^{2+} and 0.1 mol L^{-1} MeOH, 2-PrOH or *tert*-BuOH.	751027
6.1.4	**Tris(ethylenediamine)cobalt(III) ion**							
	$Co^+ + Co(en)_3^{3+} \rightarrow Co^{2+} + Co(en)_3^{2+}$	2.9×10^8		$\rightarrow$0	29	p.r.	D.k. at 320 nm in deaerated soln. contg. 0.01-0.05 mol L^{-1} $CoSO_4$, 0.001 mol L^{-1} MeOH and (0.5-1.0) $\times$ 10^{-4} mol L^{-1} Co(III) complex.	761136
6.1.5	**Hexaamminecobalt(III) ion**							
	$Co^+ + Co(NH_3)_6^{3+} \rightarrow Co^{2+} + Co(NH_3)_6^{3+}$	3.3×10^8		$\rightarrow$0	29	p.r.	D.k. in deaerated soln. contg. 0.01-0.05 mol L^{-1} $CoSO_4$, 0.001 mol L^{-1} MeOH and (0.5-1.0) $\times$ 10^{-4} mol L^{-1} Co(III) complex.	761136
6.1.6	**Pentaammine(aqua)cobalt(III) ion**							
	$Co^+ + Co(NH_3)_5(H_2O)^{3+} \rightarrow Co^{2+} + Co(NH_3)_5(H_2O)^{2+}$	3.7×10^8		$\rightarrow$0	29	p.r.	D.k. in deaerated soln. contg. 0.01-0.05 mol L^{-1} $CoSO_4$, 0.001 mol L^{-1} MeOH and (0.5-1.0) $\times$ 10^{-4} mol L^{-1} Co(III) complex.	761136
6.1.7	**Pentaammine(fluoro)cobalt(III) ion**							
	$Co^+ + Co(NH_3)_5F^{2+} \rightarrow Co^{2+} + Co(NH_3)_5F^+$	6.8×10^8		$\rightarrow$0	29	p.r.	D.k. in deaerated soln. contg. 0.01-0.05 mol L^{-1} $CoSO_4$, 0.001 mol L^{-1} MeOH and (0.5-1.0) $\times$ 10^{-4} mol L^{-1} Co(III) complex.	761136
6.1.8	**Pentaammine(chloro)cobalt(III) ion**							
	$Co^+ + Co(NH_3)_5Cl^{2+} \rightarrow Co^{2+} + Co(NH_3)_5Cl^+$	8.5×10^8		$\rightarrow$0	29	p.r.	D.k. in deaerated soln. contg. 0.01-0.05 mol L^{-1} $CoSO_4$, 0.001 mol L^{-1} MeOH and (0.5-1.0) $\times$ 10^{-4} mol L^{-1} Co(III) complex.	761136
6.1.9	**Pentaammine(bromo)cobalt(III) ion**							
	$Co^+ + Co(NH_3)_5Br^{2+} \rightarrow Co^{2+} + Co(NH_3)_5Br^+$	1.1×10^9		$\rightarrow$0	29	p.r.	D.k. in deaerated soln. contg. 0.01-0.05 mol L^{-1} $CoSO_4$, 0.001 mol L^{-1} MeOH and (0.5-1.0) $\times$ 10^{-4} mol L^{-1} Co(III) complex.	761136
6.1.10	**Tetraamminediaquacobalt(III) ion**							
	$Co^+ + Co(NH_3)_4(H_2O)_2^{3+} \rightarrow Co^{2+} + Co(NH_3)_4(H_2O)_2^{2+}$	4.4×10^8		$\rightarrow$0	29	p.r.	D.k. in deaerated soln. contg. 0.01-0.05 mol L^{-1} $CoSO_4$, 0.001 mol L^{-1} MeOH and (0.5-1.0) $\times$ 10^{-4} mol L^{-1} Co(III) complex.	761136
6.1.11	**Trioxalatocobaltate(III) ion**							
	$Co^+ + Co(C_2O_4)_3^{3-} \rightarrow Co^{2+} + Co(C_2O_4)_3^{4-}$	1.8×10^{10}		$\rightarrow$0	29	p.r.	D.k. in deaerated soln. contg. 0.01-0.05 mol L^{-1} $CoSO_4$, 0.001 mol L^{-1} MeOH and (0.5-1.0) $\times$ 10^{-4} mol L^{-1} Co(III) complex.	761136

TABLE 6. Rate constants for cobalt transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.1	**Cobalt(I) ion** — Continued							
6.1.12	**Trinitrotrisamminecobalt(III)**							
	$Co^+ + Co(NH_3)_3(NO_2)_3 \rightarrow Co^{2+} + Co(NH_3)_3(NO_2)_3^-$	7.6×10^9		→0	29	p.r.	D.k. in deaerated soln. contg. 0.01-0.05 mol L^{-1} $CoSO_4$, 0.001 mol L^{-1} MeOH and (0.5-1.0) × 10^{-4} mol L^{-1} Co(III) complex.	761136
6.1.13	**2,2'-Bipyridinecobalt(II) ion**							
	$Co^+ + Co(bpy)^{2+} \rightarrow Co^{2+} + Co(bpy)^+$	1.2×10^9		0.2	25	p.r.	D.k. in deaerated soln. contg. *tert*-BuOH, Co^{2+} and 2,2'-bipyridine.	85A034
6.1.14	**4,4'-Dimethyl-2,2'-bipyridinecobalt(II) ion**							
	$Co^+ + Co(4,4'\text{-}Me_2bpy)^{2+} \rightarrow Co^{2+} + Co(4,4'\text{-}Me_2bpy)^+$	1.0×10^9		0.2	25	p.r.	D.k. in deaerated soln. contg. *tert*-BuOH, Co^{2+} and 4,4'-dimethyl-2,2'-bipyridine.	85A034
6.1.15	**Copper(II) ion**							
	$Co^+ + Cu^{2+} \rightarrow$	4.1×10^8		0.019	25	p.r.	D.k. at 320 nm in soln. contg. 0.01 mol L^{-1} Co^{2+} and 0.1 mol L^{-1} *tert*-BuOH.	761072
6.1.16	**Hydrogen peroxide**							
	$Co^+ + H_2O_2 \rightarrow Co^{2+} + {}^{\bullet}OH + OH^-$	1.6×10^9			25	p.r.	D.k.; studied at 1-30 °C, E_a = 13.0 kJ mol^{-1}.	761072
6.1.17	**Iodate ion**							
	$Co^+ + IO_3^- \rightarrow$	4.3×10^9		0.019	25	p.r.	D.k. at 320 nm in soln. contg. 0.01 mol L^{-1} Co^{2+} and 0.1 mol L^{-1} *tert*-BuOH.	761072
6.1.18	**Permanganate ion**							
	$Co^+ + MnO_4^- \rightarrow$	1.0×10^{10}		~0.004	20	p.r.	D.k. in soln. contg. 0.2, 0.72 or 1.38 × 10^{-3} mol L^{-1} Co^{2+} and 10^{-5} mol L^{-1} MnO_4^-.	650385
6.1.19	**Nitrous oxide**							
	$Co^+ + N_2O \rightarrow CoO^+ + N_2$	1.0×10^9			25	p.r.	D.k. at 320 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} Co^{2+}.	761072
6.1.20	**Nitrate ion**							
	$Co^+ + NO_3^- \rightarrow$	1.8×10^9		0.019	25	p.r.	D.k. at 320 nm in soln. contg. 0.01 mol L^{-1} Co^{2+} and 0.1 mol L^{-1} *tert*-BuOH.	761072
6.1.21	**Oxygen**							
	$Co^+ + O_2 \rightarrow$	6.0×10^9			25	p.r.	D.k. at 320 nm in O_2-satd. soln. contg. 0.1 mol L^{-1} Co^{2+} and 0.1 mol L^{-1} formate. Evidence indicates product may be CoO_2^+.	761072
6.1.22	**Hydroxyl**							
	$Co^+ + {}^{\bullet}OH \rightarrow$	~8×10^9			25	p.r.	Estimated from decay of Co^+ in absence of ${}^{\bullet}OH$ scavengers.	751027
6.1.23	**Peroxodisulfate ion**							
	$Co^+ + S_2O_8^{2-} \rightarrow Co^{2+} + SO_4^{\bullet-} + SO_4^{2-}$	2.8×10^9		0.019	25	p.r.	D.k. in deaerated soln. contg. 0.01 mol L^{-1} Co^{2+} and (0.5-10) × 10^{-4} mol L^{-1} $S_2O_8^{2-}$.	761072
6.1.24	**Tris(2,2'-bipyridine)ruthenium(II) ion**							
	$Co^+ + Ru(bpy)_3^{2+} \rightarrow Co^{2+} + Ru(bpy)_3^+$	1.8×10^9	6.9		24	p.r.	P.b.k. at 510 nm in soln. contg. 1.6 or 4.0 × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 0.0025 mol L^{-1} $CoSO_4$ and 0.17 mol L^{-1} *tert*-BuOH.	78A002 771093
6.1.25	**Allyl alcohol**							
	$Co^+ + H_2C{=}CHCH_2OH \rightarrow Co(\text{allyl alcohol})^+$	~10^8			25	p.r.	D.k. at 320 nm in deaerated soln. contg. 0.01 mol L^{-1} Co^{2+}, 0.0012 mol L^{-1} allyl alcohol and 1.24 mol L^{-1} MeOH.	761072

TABLE 6. Rate constants for cobalt transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.1	**Cobalt(I) ion** — Continued							
6.1.26	**9,10-Anthraquinone**							
	$Co^{+} + AQ \rightarrow Co^{2+} + [AQ]^{\cdot -}$	1.1×10^9	7.0		~22	p.r.	P.b.k. at ~400 nm in deaerated soln. contg. ~1 mol L^{-1} *tert*-BuOH and ~5×10^{-5} mol L^{-1} AQ.	731104
6.1.27	**Benzophenone**							
	$Co^{+} + (C_6H_5)_2CO \rightarrow Co^{2+} + (C_6H_5)_2\dot{C}O^{-}$	2.5×10^9	7.0			p.r.	P.b.k. in soln. contg. ~1 mol L^{-1} *tert*-BuOH and ~5×10^{-5} mol L^{-1} benzophenone.	751032
6.1.28	**1,4-Benzoquinone**							
	$Co^{+} + Q \rightarrow Co^{2+} + Q^{\cdot -}$	5.1×10^9	4.7		25	p.r.	P.b.k. at 430 nm in deaerated soln. contg. 1 mol L^{-1} *tert*-BuOH, 0.1 mol L^{-1} $CoSO_4$ and (2-4) $\times 10^{-5}$ mol L^{-1} Q.	761134
		4.8×10^9	7.0			p.r.	P.b.k. in soln. contg. ~1 mol L^{-1} *tert*-BuOH and ~5×10^{-5} mol L^{-1} Q.	751032
6.1.29	**2-Methyl-1,4-naphthoquinone**							
	$Co^{+} + 2\text{-}CH_3NQ \rightarrow Co^{2+} + [2\text{-}CH_3NQ]^{\cdot -}$	4.1×10^9	7.0, 7.3		~22	p.r.	P.b.k. at ~400 nm in deaerated soln. contg. ~1 mol L^{-1} *tert*-BuOH and ~5×10^{-5} mol L^{-1} 2-CH_3-NQ.	751032 731047 731104
6.1.30	**1,4-Naphthoquinone-2-sulfonate ion**							
	$Co^{+} + 2\text{-}SO_3NQ^{-} \rightarrow Co^{2+} + [2\text{-}SO_3NQ]^{\cdot 2-}$	6.8×10^9	7.0		~22	p.r.	P.b.k. at ~400 nm in deaerated soln. contg. ~1 mol L^{-1} *tert*-BuOH and ~5×10^{-5} mol L^{-1} 2-SO_3NQ^{-}.	731104
6.1.31	**Riboflavine**							
	$Co^{+} + RF \rightarrow Co^{2+} + [RF]^{\cdot -}$	2.6×10^9	7.0		~22	p.r.	P.b.k. at 560 nm in deaerated soln. contg. ~1 mol L^{-1} *tert*-BuOH and ~10^{-4} mol L^{-1} RF.	731104
6.2	**Pentakis(cyano-*C*)cobaltate(I) ion**							
6.2.1	**Water**							
	$Co(CN)_5^{4-} + H_2O \rightarrow Co(CN)_5(H)^{3-} + OH^{-}$	1.1×10^5 s^{-1}	~13		20	p.r.	D.k. at 280-330 nm in soln. contg. 100 atm (0.1 mol L^{-1}) H_2; $k = 1.9 \times 10^4$ s^{-1} in D_2O supports proton transfer mechanism.	710097
6.3	**Nitrilotriacetatocobaltate(I) ion**							
6.3.1	**Nitrilotriacetatocobaltate(I) ion**							
	$CoNTA^{2-} + CoNTA^{2-} \rightarrow [CoNTA]_2^{4-}$	2.8×10^8	7			p.r.	D.k. at 360 nm in deaerated soln. contg. $CoNTA^{-}$, *tert*-BuOH and 0.001 mol L^{-1} phosphate.	79A255
6.4	**2,3,9,10-Tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraenecobalt(I) ion**							
6.4.1	**Tris(2,2'-bipyridine)cobalt(III) ion**							
	$Co(Me_4tetraeneN_4)^{+} + Co(bpy)_3^{3+} \rightarrow$	8.5×10^7	6.5	0.002		p.r.	D.k. at 700 nm in soln. contg. 1 mol L^{-1} *tert*-BuOH, 5×10^{-4} mol L^{-1} CoL^{2+} and (2.5-5.0) $\times 10^{-5}$ mol L^{-1} $Co(bpy)_3^{3+}$.	761001
6.4.2	**Tris(2,2'-bipyridine)chromium(III) ion**							
	$Co(Me_4tetraeneN_4)^{+} + Cr(bpy)_3^{3+} \rightarrow$	1.6×10^8	6.5	0.002		p.r.	D.k. at 700 nm in soln. contg. 1 mol L^{-1} *tert*-BuOH, 5×10^{-4} mol L^{-1} CoL^{2+} and (2.5-5.0) $\times 10^{-5}$ mol L^{-1} $Cr(bpy)_3^{3+}$.	761001

TABLE 6. Rate constants for cobalt transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.4	**2,3,9,10-Tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraenecobalt(I) ion — Continued**							
6.4.3	**Hydrogen ion**							
	$Co(Me_4tetraeneN_4)^+ + H^+ \rightarrow Co(Me_4tetraeneN_4)(H)^{2+}$	1.6×10^5	0.25-1.25	0.06-0.6		p.r.	D.k. at 700 nm in Ar-satd. soln. contg. 2 mol L^{-1} 2-PrOH and 0.001 mol L^{-1} CoL^{2+}.	761001
6.4.4	**Oxygen**							
	$Co(Me_4tetraeneN_4)^+ + O_2 \rightarrow Co(Me_4tetraeneN_4)(O_2)^+$	1.1×10^9	6.5	0.02		p.r.	D.k. at 700 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 0.007 mol L^{-1} CoL^{2+} and $(7.5\text{-}25) \times 10^{-5}$ mol L^{-1} O_2.	761001
6.4.5	**Acetic acid**							
	$Co(Me_4tetraeneN_4)^+ + CH_3CO_2H \rightarrow Co(Me_4tetraeneN_4)(H)^{2+} + CH_3CO_2^-$	6.2×10^4	4.8	0.01-0.05		p.r.	D.k. at 700 nm in Ar-satd. soln. contg. 2 mol L^{-1} 2-PrOH, 0.002 mol L^{-1} CoL^{2+} and 0.002-0.01 mol L^{-1} acetate.	761001
6.4.6	**9,10-Anthraquinone-2,6-disulfonate ion**							
	$Co(Me_4tetraeneN_4)^+ + 2,6\text{-}diSO_3AQ^{2-} \rightarrow Co(Me_4tetraeneN_4)^{2+} + [2,6\text{-}diSO_3AQ]^{\cdot 3-}$	3.8×10^9	6.5	0.004		p.r.	D.k. at 700 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} CoL^{2+} and $(1.25\text{-}5.0) \times 10^{-5}$ mol L^{-1} $2,6\text{-}diSO_3AQ^{2-}$.	761001
6.4.7	**Indigomonosulfonate ion**							
	$Co(Me_4tetraeneN_4)^+ + IMS^- \rightarrow Co(Me_4tetraeneN_4)^{2+} + [IMS]^{\cdot 2-}$	4.9×10^9	6.5	0.004		p.r.	D.k. at 700 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} CoL^{2+} and $(1.25\text{-}5.0) \times 10^{-5}$ mol L^{-1} IMS^-.	761001
6.4.8	**Riboflavine**							
	$Co(Me_4tetraeneN_4)^+ + RF \rightarrow Co(Me_4tetraeneN_4)^{2+} + [RF]^{\cdot -}$	1.0×10^9	6.5	0.004		p.r.	D.k. at 700 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} CoL^{2+} and $(1.25\text{-}5.0) \times 10^{-5}$ mol L^{-1} RF.	761001
6.5	***N-meso*-5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecobalt(I) ion**							
6.5.1	**Water**							
	N-meso-$Co(4,11\text{-}dieneN_4)^+ + H_2O \rightarrow$	1.8×10^4 s^{-1}			25	p.r.	D.k. in soln. contg. 0.5 mol L^{-1} *tert*-BuOH; reaction suggested to proceed via Co-N bond rupture.	91A513
6.5.2	***N-rac*-5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecobalt(II) ion**							
	N-meso-$Co(4,11\text{-}dieneN_4)^+ +$ *N-rac*-$Co(4,11\text{-}dieneN_4)^{2+} \rightarrow$ *N-meso*-$Co(4,11\text{-}dieneN_4)^{2+} +$ *N-rac*-$Co(4,11\text{-}dieneN_4)^+$	$\geq 1 \times 10^7$	7		25	p.r.	Calcd. from study of d.k. in soln. contg. mixtures of *N-rac*-CoL^{2+} and *N-meso*-CoL^{2+} $(0.2\text{-}1.8) \times 10^{-3}$ mol L^{-1} total, 0.5 mol L^{-1} *tert*-BuOH and 0.02 mol L^{-1} phosphate buffer.	91A513
6.5.3	**Carbon dioxide**							
	N-meso-$Co(4,11\text{-}dieneN_4)^+ + CO_2 \rightarrow$ *N-meso*-$Co(4,11\text{-}dieneN_4)(CO_2)^+$	1.6×10^7	5.8		25	p.r.	D.k. at 630 nm in soln. satd. with 1-100% CO_2 in N_2 contg. $(0.4\text{-}1.0) \times 10^{-3}$ mol L^{-1} CoL^{2+}, 0.5 mol L^{-1} *tert*-BuOH and $NaHCO_3$; $k_r = 2.7$ s^{-1}.	91A513
6.5.4	**Carbon monoxide**							
	N-meso-$Co(4,11\text{-}dieneN_4)^+ + CO \rightarrow$ *N-meso*-$Co(4,11\text{-}dieneN_4)(CO)^+$	8.3×10^8			25	p.r.	D.k. at 630 nm in soln. contg. *N-meso*-CoL^{2+}, 9.5×10^{-4} mol L^{-1} CO and 0.5 mol L^{-1} *tert*-BuOH; $k_r = 11$ s^{-1}.	91A513
6.5.5	**Hydrogen ion**							
	N-meso-$Co(4,11\text{-}dieneN_4)^+ + H^+ \rightarrow$ *N-meso*-$Co(4,11\text{-}dieneN_4)(H)^{2+}$	2.3×10^9		0.015	25	p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 0.5 mol L^{-1} *tert*-BuOH; $k_r = <10^{-4}$ s^{-1}.	91A513
6.5.6	**Formic acid**							
	N-meso-$Co(4,11\text{-}dieneN_4)^+ + HCO_2H \rightarrow$ *N-meso*-$Co(4,11\text{-}dieneN_4)(H)^{2+} + HCO_2^-$	1.8×10^8		0.02	25	p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 0.5 mol L^{-1} *tert*-BuOH.	91A513

TABLE 6. Rate constants for cobalt transients — Continued

Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.5 *N-meso*-5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecobalt(I) ion — Continued							
6.5.7 Acetic acid							
N-meso-Co(4,11-dieneN$_4$)$^+$ + CH_3CO_2H → *N-meso*-Co(4,11-dieneN$_4$)(H)$^{2+}$ + $CH_3CO_2^-$	8×10^7		0.1	25	p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 0.5 mol L^{-1} *tert*-BuOH.	91A513
6.5.8 Dihydrogen phosphate ion							
N-meso-Co(4,11-dieneN$_4$)$^+$ + $H_2PO_4^-$ → *N-meso*-Co(4,11-dieneN$_4$)(H)$^{2+}$ + HPO_4^{2-}	1.2×10^8		0.1	25	p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 0.5 mol L^{-1} *tert*-BuOH.	91A513
6.5.9 Nitrous oxide							
N-meso-Co(4,11-dieneN$_4$)$^+$ + N_2O →	1×10^7			25	p.r.		91A513
6.6 *N-rac*-5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecobalt(I) ion							
6.6.1 First-order reaction							
N-rac-Co(4,11-dieneN$_4$)$^+$ →	2.3×10^3 s^{-1}			25	p.r.	D.k. in soln. contg. 0.5 mol L^{-1} *tert*-BuOH; reaction suggested to proceed via Co-N bond rupture. At pH 12.7 k = 6.6×10^2 s^{-1}.	91A513
	2.7×10^3 s^{-1}	9-10	0.001		p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH and 5×10^{-4} mol L^{-1} CoL^{2+}. Authors reported k = 48 L mol^{-1} s^{-1}. Reaction assumed to be proton transfer from water to form the hydride.	761001
6.6.2 Boric acid							
N-rac-Co(4,11-dieneN$_4$)$^+$ + H_3BO_3 → Co(4,11-dieneN$_4$)(H)$^{2+}$ + $H_2BO_3^-$	7×10^4		0.1	25	p.r.	D.k. at 630 nm in Ar-satd. soln. contg. (1-10) × 10^{-4} mol L^{-1} CoL^{2+} and 0.5 mol L^{-1} *tert*-BuOH.	91A513 89A098
6.6.3 Carbon monoxide							
N-rac-Co(4,11-dieneN$_4$)$^+$ + CO → *prim-N-rac*-Co(4,11-dieneN$_4$)(CO)$^+$	5.0×10^8	6		25	p.r.	D.k. at 630 nm in soln. contg. 0.001 mol L^{-1} CoL^{2+}, 9.5×10^{-4} mol L^{-1} CO and 0.5 mol L^{-1} *tert*-BuOH; k_r = 3.1 s^{-1}.	91A513 89A098
6.6.4 Carbon dioxide							
N-rac-Co(4,11-dieneN$_4$)$^+$ + CO_2 → *prim-N-rac*-Co(4,11-dieneN$_4$)(CO$_2$)$^+$	1.7×10^8	3.5-6		25	p.r.	D.k. at 630 nm in soln. satd. with 1-100% CO_2 in N_2 contg. (0.4-1.0) × 10^{-3} mol L^{-1} CoL^{2+} and 0.5 mol L^{-1} *tert*-BuOH; $\Delta H‡$ = 29 kJ mol^{-1}, $\Delta S‡$ = 10.5 J K^{-1} mol^{-1}; k_r = 0.38 s^{-1}. For *sec*-isomer, formed via addition of $CO_2^{\bullet-}$ to *N-rac*-Co(4,11-dieneN$_4$)$^{2+}$, k_r = 1.6 s^{-1}.	91A513 89A098
6.6.5 Bicarbonate ion							
N-rac-Co(4,11-dieneN$_4$)$^+$ + HCO_3^- → Co(4,11-dieneN$_4$)(H)$^{2+}$ + CO_3^{2-}	2.5×10^6		0.1	25	p.r.	D.k. at 630 nm in Ar-satd. soln. contg. (1-10) × 10^{-4} mol L^{-1} CoL^{2+} and 0.5 mol L^{-1} *tert*-BuOH.	91A513 89A098
6.6.6 Tris(2,2'-bipyridine)cobalt(III) ion							
N-rac-Co(4,11-dieneN$_4$)$^+$ + Co(bpy)$_3^{3+}$ →	1.2×10^9	9.2	0.016-0.028		p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 0.005 mol L^{-1} CoL^{2+} and (2-10) × 10^{-4} mol L^{-1} Co(bpy)$_3^{3+}$.	761001
6.6.7 Tris(ethylenediamine)cobalt(III) ion							
N-rac-Co(4,11-dieneN$_4$)$^+$ + Co(en)$_3^{3+}$ →	7.9×10^6	9.2	0.016-0.028		p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 0.005 mol L^{-1} CoL^{2+} and (2-10) × 10^{-4} mol L^{-1} Co(en)$_3^{3+}$.	761001

TABLE 6. Rate constants for cobalt transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.6	***N-rac*-5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecobalt(I) ion** — Continued							
6.6.8	**Hexaamminecobalt(III) ion**							
	N-rac-Co(4,11-dieneN$_4$)$^+$ + Co(NH$_3$)$_6^{3+}$ →	7.5×10^6	9.2	0.016-0.028		p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 0.005 mol L^{-1} CoL^{2+} and (2-10) × 10^{-4} mol L^{-1} Co(NH$_3$)$_6^{3+}$.	761001
6.6.9	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienedihydroxycobalt(III) ion**							
	N-rac-Co(4,11-dieneN$_4$)$^+$ + Co(4,11-dieneN$_4$)(OH)$_2^+$ →	4.0×10^6	9.2	0.016-0.028		p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 0.005 mol L^{-1} CoL^{2+} and (2-10) × 10^{-4} mol L^{-1} Co(4,11-dieneN$_4$)(OH)$_2^+$.	761001
6.6.10	**Dihydroxy(2,3,9,10-tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraene)cobalt(III) ion**							
	N-rac-Co(4,11-dieneN$_4$)$^+$ + Co(Me$_4$tetraeneN$_4$)(OH)$_2^+$ →	6.7×10^6	9.2	0.016-0.028		p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 0.005 mol L^{-1} CoL^{2+} and (2-10) × 10^{-4} mol L^{-1} Co(Me$_4$tetraeneN$_4$)(OH)$_2^+$.	761001
6.6.11	**Tris(2,2'-bipyridine)chromium(III) ion**							
	N-rac-Co(4,11-dieneN$_4$)$^+$ + Cr(bpy)$_3^{3+}$ →	1.2×10^9	9.2	0.016-0.028		p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 0.005 mol L^{-1} CoL^{2+} and (2-10) × 10^{-4} mol L^{-1} Cr(bpy)$_3^{3+}$.	761001
6.6.12	**Tris(2,2'-bipyridine)iron(III) ion**							
	N-rac-Co(4,11-dieneN$_4$)$^+$ + Fe(bpy)$_3^{3+}$ →	2.3×10^7	9.2	0.016-0.028		p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 0.005 mol L^{-1} CoL^{2+} and (2-10) × 10^{-4} mol L^{-1} Fe(bpy)$_3^{3+}$.	761001
6.6.13	**Hydrogen ion**							
	N-rac-Co(4,11-dieneN$_4$)$^+$ + H$^+$ → *prim-N-rac*-Co(4,11-dieneN$_4$)(H)$^{2+}$	3.1×10^9	3.5-4.2	0.015		p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH and 0.005 mol L^{-1} CoL^{2+}; $k_r = 1.2 \times 10^{-2}$ s^{-1} [91A513]. For *sec*-isomer formed by addition of H to *N-rac*-Co(4,11-dieneN$_4$)$^+$, $K = 3.2 \times 10^{11}$ L mol^{-1} [91A513].	761001
6.6.14	**Ammonium ion**							
	N-rac-Co(4,11-dieneN$_4$)$^+$ + NH$_4^+$ → Co(4,11-dieneN$_4$)(H)$^{2+}$ + NH$_3$	6.8×10^5	7.0	0.015-0.1		p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 1.5 × 10^{-3} mol L^{-1} CoL^{2+} and 0.01-0.1 mol L^{-1} NH$_4^+$.	761001
6.6.15	**Nitrous oxide**							
	N-rac-Co(4,11-dieneN$_4$)$^+$ + N$_2$O →	2×10^7			25	p.r.		*91A513*
		2.5×10^7				p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 0.002-0.008 mol L^{-1} N$_2$O, 0.005 mol L^{-1} Co(4,11-dieneN$_4$)$^{2+}$ and 1 mol L^{-1} *tert*-BuOH. Product suggested to be Co(III) complex.	78A200
		3.9×10^7	9.2	0.01		p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 0.003 mol L^{-1} CoL^{2+}, (7.5-25) × 10^{-4} mol L^{-1} N$_2$O and 0.001 mol L^{-1} tetraborate. Product suggested to be Co(III) complex.	761001
6.6.16	**Oxygen**							
	N-rac-Co(4,11-dieneN$_4$)$^+$ + O$_2$ → Co(4,11-dieneN$_4$)(O$_2$)$^+$	1.7×10^9	9.2	0.02		p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 0.007 mol L^{-1} CoL^{2+} and (7.5-25) × 10^{-5} mol L^{-1} O$_2$.	761001

TABLE 6. Rate constants for cobalt transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.6	***N-rac*-5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecobalt(I) ion** — Continued							
6.6.17	**Hydrogen phosphate ion**							
	N-rac-Co(4,11-dieneN$_4$)$^+$ + HPO_4^{2-} → Co(4,11-dieneN$_4$)(H)$^{2+}$ + PO_4^{3-}	1.0×10^5	10.0	0.06-0.3		p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 5×10^{-4} mol L^{-1} CoL^{2+} and 0.02-0.1 mol L^{-1} HPO_4^{2-}.	761001
6.6.18	**Dihydrogen phosphate ion**							
	N-rac-Co(4,11-dieneN$_4$)$^+$ + $H_2PO_4^-$ → *prim-N-rac*-Co(4,11-dieneN$_4$)(H)$^{2+}$ + HPO_4^{2-}	8×10^7 1.2×10^8		0.1 0.008	25	p.r.	D.k. at 630 nm in Ar-satd. soln. contg. (1-10) $\times 10^{-4}$ mol L^{-1} CoL^{2+} and 0.5 mol L^{-1} *tert*-BuOH.	91A513 89A098
		9.8×10^7	5.5	0.005-0.01		p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 5×10^{-4} mol L^{-1} CoL^{2+} and 0.001-0.01 mol L^{-1} $H_2PO_4^-$.	761001
6.6.19	**Hexaammineruthenium(II) ion**							
	N-rac-Co(4,11-dieneN$_4$)$^+$ + $Ru(NH_3)_6^{2+}$ →	4.0×10^8	9.2	0.016-0.028		p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 0.005 mol L^{-1} CoL^{2+} and (2-10) $\times 10^{-4}$ mol L^{-1} $Ru(NH_3)_6^{2+}$.	761001
6.6.20	**Pentaammine(nitroso)ruthenium(III) ion**							
	N-rac-Co(4,11-dieneN$_4$)$^+$ + $Ru(NH_3)_5NO^{3+}$ →	3.9×10^7	9.2	0.016-0.028		p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 0.005 mol L^{-1} CoL^{2+} and (2-10) $\times 10^{-4}$ mol L^{-1} mol L^{-1} $Ru(NH_3)_5NO^{3+}$.	761001
6.6.21	**Acetic acid**							
	N-rac-Co(4,11-dieneN$_4$)$^+$ + CH_3CO_2H → Co(4,11-dieneN$_4$)(H)$^{2+}$ + $CH_3CO_2^-$	1.1×10^8		0.1	25	p.r.	D.k. at 630 nm in Ar-satd. soln. contg. (1-10) $\times 10^{-4}$ mol L^{-1} CoL^{2+} and 0.5 mol L^{-1} *tert*-BuOH.	91A513 89A098
		7.5×10^7	4.8	0.01-0.05		p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 0.002 mol L^{-1} CoL^{2+} and 0.002-0.01 mol L^{-1} acetate.	761001
6.6.22	**9,10-Anthraquinone-2-sulfonate ion**							
	N-rac-Co(4,11-dieneN$_4$)$^+$ + 2-SO_3AQ^- → *N-rac*-Co(4,11-dieneN$_4$)$^{2+}$ + [2-SO_3AQ]$^{\cdot 2-}$	4.4×10^9	9.2	0.004		p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} CoL^{2+} and (1.25-5.0) $\times 10^{-5}$ mol L^{-1} 2-SO_3AQ^-.	761001
6.6.23	**3-Benzoylpyridine**							
	N-rac-Co(4,11-dieneN$_4$)$^+$ + 3-C_6H_5COpy →	4.6×10^8	9.2	0.004		p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} CoL^{2+} and (1.25-5.0) $\times 10^{-5}$ mol L^{-1} 3-C_6H_5COpy.	761001
6.6.24	**9-Fluorenone**							
	N-rac-Co(4,11-dieneN$_4$)$^+$ + $C_{13}H_8O$ → *N-rac*-Co(4,11-dieneN$_4$)$^{2+}$ + [$C_{13}H_8O$]$^{\cdot -}$	4.3×10^9	9.2	0.004		p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} CoL^{2+} and (1.25-5.0) $\times 10^{-5}$ mol L^{-1} fluorenone.	761001
6.6.25	**Formic acid**							
	N-rac-Co(4,11-dieneN$_4$)$^+$ + HCO_2H → Co(4,11-dieneN$_4$)(H)$^{2+}$ + HCO_2^-	1.7×10^8		0.1	25	p.r.	D.k. at 630 nm in soln. contg. (1-10) $\times 10^{-4}$ mol L^{-1} CoL^{2+} and *tert*-BuOH.	89A098
6.6.26	**2-Hydroxy-2,2-dimethylethyl**							
	N-rac-Co(4,11-dieneN$_4$)$^+$ + $^{\cdot}CH_2C(CH_3)_2OH$ →	2×10^8			25	p.r.	D.k. in soln. contg. 0.5 mol L^{-1} *tert*-BuOH.	91A513

TABLE 6. Rate constants for cobalt transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.6	***N-rac*-5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecobalt(I) ion** — Continued							
6.6.27	**Iodomethane**							
	N-rac-Co(4,11-dieneN$_4$)$^+$ + CH_3I →	4.7×10^8	9.2	0.015		p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} CoL^{2+} and (1.25-5.0) × 10^{-5} mol L^{-1} CH_3I.	761001
6.6.28	**2-Methyl-1,4-naphthoquinone**							
	N-rac-Co(4,11-dieneN$_4$)$^+$ + 2-CH_3NQ → *N-rac*-Co(4,11-dieneN$_4$)$^{2+}$ + [2-CH_3NQ]$^{\bullet-}$	4.6×10^9	9.2	0.004		p.r.	D.k. at 630 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} CoL^{2+} and (1.25-5.0) × 10^{-5} mol L^{-1} 2-CH_3-NQ.	761001
6.7	**5,7,7,12,12,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,14-dienecobalt(I) ion**							
6.7.1	**Water**							
	Co(4,14-dieneN$_4$)$^+$ + H_2O → Co(4,14-dieneN$_4$)(H)$^{2+}$ + OH^-	1.1×10^3 s^{-1}	9-10	0.001		p.r.	D.k. at 590 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH and 5 × 10^{-4} mol L^{-1} CoL^{2+}. Authors reported k = 20 L mol^{-1} s^{-1}.	761001
6.7.2	**Hydrogen ion**							
	Co(4,14-dieneN$_4$)$^+$ + H^+ → Co(4,14-dieneN$_4$)(H)$^{2+}$	1.2×10^9	3.5-4.2	0.015		p.r.	D.k. at 590 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH and 5 × 10^{-3} mol L^{-1} CoL^{2+}.	761001
6.7.3	**Nitrous oxide**							
	Co(4,14-dieneN$_4$)$^+$ + N_2O →	9.0×10^6	9.2	0.01		p.r.	D.k. at 590 nm in soln. contg. 0.003 mol L^{-1} CoL^{2+} and (7.5-25) × 10^{-4} mol L^{-1} N_2O. Product suggested to be Co(III) complex.	761001
6.7.4	**Oxygen**							
	Co(4,14-dieneN$_4$)$^+$ + O_2 → Co(4,14-dieneN$_4$)(O_2)$^+$	9.0×10^8	9.2	0.02		p.r.	D.k. at 590 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 0.007 mol L^{-1} CoL^{2+} and (7.5-25) × 10^{-4} mol L^{-1} O_2.	761001
6.7.5	**Dihydrogen phosphate ion**							
	Co(4,14-dieneN$_4$)$^+$ + $H_2PO_4^-$ → Co(4,14-dieneN$_4$)(H)$^{2+}$ + HPO_4^{2-}	3.0×10^7	5.5	0.005-0.01		p.r.	D.k. at 590 nm in Ar-satd. soln. contg. 1 mol L^{-1} *tert*-BuOH, 5 × 10^{-4} mol L^{-1} CoL^{2+} and 0.001-0.01 mol L^{-1} $H_2PO_4^-$.	761001
6.8	**2,2'-Bipyridinecobalt(I) ion**							
6.8.1	**Ascorbate radical anion**							
	Co(bpy)$_n^+$ + $^{\bullet}A^-$ + H^+ → Co(bpy)$_n^{2+}$ + AH^-	1×10^{10}	5-7		25	p.r.	D.k. in soln. contg. (0.3-10) × 10^{-4} mol L^{-1} of both $CoSO_4$ and 2,2'-bipyridine, and 0.001 mol L^{-1} ascorbate; n = 1 or 2.	82A278
6.9	**2,2'-Bipyridinecobalt(I) ion**							
6.9.1	**Bis(2,2'-bipyridine)cobalt(II) ion**							
	Co(bpy)$^+$ + Co(bpy)$_2^{2+}$ → Co(bpy)$^{2+}$ + Co(bpy)$_2^+$	2.1×10^9		0.2	25	p.r.	D.k. in deaerated soln. contg. *tert*-BuOH, Co^{2+} and 2,2'-bipyridine. k_r = 1.1×10^7 L mol^{-1} s^{-1}; K = 225.	85A034
6.10	**Bis(2,2'-bipyridine)cobalt(I) ion**							
6.10.1	**Tris(2,2'-bipyridine)cobalt(II) ion**							
	Co(bpy)$_2^+$ + Co(bpy)$_3^{2+}$ → Co(bpy)$_2^{2+}$ + Co(bpy)$_3^+$	2.0×10^9		0.2	25	p.r.	D.k. in deaerated soln. contg. *tert*-BuOH, Co^{2+} and 2,2'-bipyridine; K = 200.	85A034

TABLE 6. Rate constants for cobalt transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.10	**Bis(2,2'-bipyridine)cobalt(I) ion** — Continued							
6.10.2	**Hydrogen ion**							
	$Co(bpy)_2^+ + H^+ \rightarrow Co(bpy)_2(H)^{2+}$	$\sim 1 \times 10^7$			25	p.r.	D.k. at 610 nm in soln. contg. $CoSO_4$ and 2,2'-bipyridine; pK_a of $Co(bpy)_2(H)^{2+}$ = 6.9 [84A112].	82A278
6.11	**Tris(2,2'-bipyridine)cobalt(I) ion**							
6.11.1	**2,2'-Bipyridine, conjugate acid**							
	$Co(bpy)_3^+ + bpyH^+ \rightarrow Co(bpy)_3^{2+} + [bpyH]^\cdot$	1.8×10^8		~0.25	25	p.r.	D.k. at 610 nm in soln. contg. Co^{2+}, $(0.5\text{-}1.9) \times 10^{-3}$ mol L^{-1} 2,2'-bipyridine and 0.1 mol L^{-1} formate; $k_r = 4.5 \times 10^9$ L mol^{-1} s^{-1}; $K = 4.1 \times 10^{-2}$.	83C017
6.12	**4,4'-Dimethyl-2,2'-bipyridinecobalt(I) ion**							
6.12.1	**Bis(4,4'-dimethyl-2,2'-bipyridine)cobalt(II) ion**							
	$Co(4,4'\text{-}Me_2bpy)^+ + Co(4,4'\text{-}Me_2bpy)_2^{2+} \rightarrow Co(4,4'\text{-}Me_2bpy)^{2+} + Co(4,4'\text{-}Me_2bpy)_2^+$	1.8×10^9		0.2	25	p.r.	D.k. in deaerated soln. contg. *tert*-BuOH, Co^{2+} and 4,4'-dimethyl-2,2'-bipyridine. $k_r = 2.0 \times 10^7$ L mol^{-1} s^{-1}; $K = 125$.	85A034
6.13	**4,4'-Dimethyl-2,2'-bipyridinecobalt(I) ions**							
6.13.1	**Ascorbate radical anion**							
	$Co(4,4'\text{-}Me_2bpy)_n^+ + {}^\cdot A^- + H^+ \rightarrow Co(4,4'\text{-}Me_2bpy)_n^{2+} + AH^-$	1×10^{10}	5-7		25	p.r.	D.k. in soln. contg. $(0.3\text{-}10) \times 10^{-4}$ mol L^{-1} of both $CoSO_4$ and 4,4'-dimethyl-2,2'-bipyridine, and 0.001 mol L^{-1} ascorbate; n = 1 or 2.	82A278
6.14	**4,4'-Dimethyl-2,2'-bipyridinecobalt(I) ion, protonated**							
6.14.1	**Ascorbate radical anion**							
	$Co(4,4'\text{-}Me_2bpy)_n(H)^{2+} + {}^\cdot A^- \rightarrow Co(4,4'\text{-}Me_2bpy)_n^{2+} + AH^-$	$\sim 1 \times 10^9$	5-7		25	p.r.	n = 1 or 2.	82A278
6.15	**Bis(4,4'-dimethyl-2,2'-bipyridine)cobalt(I) ion**							
6.15.1	**Tris(4,4'-dimethyl-2,2'-bipyridine)cobalt(II) ion**							
	$Co(4,4'\text{-}Me_2bpy)_2^+ + Co(4,4'\text{-}Me_2bpy)_3^{2+} \rightarrow Co(4,4'\text{-}Me_2bpy)_2^{2+} + Co(4,4'\text{-}Me_2bpy)_3^+$	2.5×10^9		0.2	25	p.r.	D.k. in deaerated soln. contg. *tert*-BuOH, Co^{2+} and 4,4'-dimethyl-2,2'-bipyridine. $k_r = 7.5 \times 10^7$ L mol^{-1} s^{-1}; $K = 50$ at $I = 0.1$.	85A034
6.15.2	**Hydrogen ion**							
	$Co(4,4'\text{-}Me_2bpy)_2^+ + H^+ \rightarrow Co(4,4'\text{-}Me_2bpy)_2(H)^{2+}$	$\sim 2 \times 10^8$			25	p.r.		82A278
6.16	**Tris(4,4'-dimethyl-2,2'-bispyridine)cobalt(I) ion**							
6.16.1	**Tris(4,4'-dimethyl-2,2'-bipyridine)cobalt(III) ion**							
	$Co(4,4'\text{-}Me_2bpy)_3^+ + Co(4,4'\text{-}Me_2bpy)_3^{3+} \rightarrow$	$\sim 1 \times 10^9$	5-7		25	p.r.	D.k. in soln. contg. 1×10^{-4} mol L^{-1} of Co(II) complex, 1×10^{-5} mol L^{-1} Co(III) complex and 0.1 mol L^{-1} 2-PrOH.	82A278
6.16.2	**4,4'-Dimethyl-2,2'-bipyridine, conjugate monoacid**							
	$Co(4,4'\text{-}Me_2bpy)_3^+ + 4,4'\text{-}Me_2bpyH^+ \rightarrow Co(4,4'\text{-}Me_2bpy)_3^{2+} + [4,4'\text{-}Me_2bpyH]^\cdot$	4.3×10^8	4.4		25	p.r.	D.k. at 610 nm in soln. contg. 0.13 mol L^{-1} 2-PrOH, 0.03 mol L^{-1} acetic acid, 0.001 mol L^{-1} $CoSO_4$ and 0.003-0.004 mol L^{-1} 4,4'-dimethyl-2,2'-bipyridine; $k_r = 3.3 \times 10^9$ L mol^{-1} s^{-1} at pH 10.2.	83C017

TABLE 6. Rate constants for cobalt transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.17	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatocobaltate(I) ion**							
6.17.1	**Nitrous oxide**							
	$CoTPPS^{5-} + N_2O \rightarrow$	$\leq 3 \times 10^2$	13		21	p.r.	D.k. in N_2O-satd. soln. contg. 1.5 mol L^{-1} 2-PrOH.	83A088
6.17.2	**Iodomethane**							
	$CoTPPS^{5-} + CH_3I \rightarrow CoTPPS^{4-} + {}^{\bullet}CH_3 + I^-$	3×10^5	8		21	p.r.	D.k. at 495 and 510 nm and p.b.k. at 550 nm in N_2O-satd. soln. contg. 1.5 mol L^{-1} 2-PrOH, $(0.5\text{-}1) \times 10^{-3}$ mol L^{-1} methyl iodide, $(2\text{-}7) \times 10^{-5}$ mol L^{-1} $CoTPPS^{4-}$ and 3×10^{-4} mol L^{-1} borate.	83A088
6.18	**Cobal(I)amin**							
6.18.1	**Nitrous oxide**							
	B12s + $N_2O \rightarrow$	2.3×10^2 1.6×10^2	6.1 8.0		18-22	p.r.	D.k. at 385 nm and p.b.k. at 313 nm in N_2O-satd. soln. contg. 2×10^{-5} mol L^{-1} cob(II)alamin, 0.1 mol L^{-1} formate and 0.01 mol L^{-1} phosphate buffer. Effect of [buffer] on k reported.	771018
6.18.2	**Hydroxocob(III)alamin**							
	B12s + B12a $\rightarrow$ B12r + B12r	1.5×10^7	3.9-4.2		22	p.r.	D.k. at 390 and 460 nm in He- or CO_2-satd. soln. contg. 6×10^{-5} mol L^{-1} cob(II)alamin, $(0.6\text{-}2.4) \times 10^{-5}$ mol L^{-1} cob(III) alamin and 0.1 mol L^{-1} 2-PrOH; k decreases from 1.0×10^7 to 2.9×10^4 L mol^{-1} s^{-1} as pH increases from 7.8 to 11.1.	78A373
6.19	**3,10,17,24-Tetrasulfophthalocyaninecobaltate(I) ion**							
6.19.1	**Hydrogen peroxide**							
	$Co(tspc)^{5-} + H_2O_2 \rightarrow$	$\sim 2.5 \times 10^6$				p.r.	D.k. in N_2O-satd. soln. contg. 0.1 mol L^{-1} formate, 4×10^{-7} mol L^{-1} H_2O_2 and 6×10^{-5} mol L^{-1} $Co(tspc)^{4-}$	83A238
6.19.2	**Tris(2,2'-bipyridine)ruthenium(III) ion**							
	$Co(tspc)^{5-} + Ru(bpy)_3^{3+} \rightarrow Co(tspc)^{4-} + Ru(bpy)_3^{2+}$	2.9×10^8	1 3			f.p./oq	D.k. at 520 nm in deaerated soln. contg. 0.001-0.1 mol L^{-1} HCl, 0.001-0.01 mol L^{-1} $Ru(bpy)_3^{2+}$ and $Co(tspc)^{4-}$ (OQ).	79A090
6.20	**3,10,17,24-Tetrasulfophthalocyaninecobaltate(I) ion dimer**							
6.20.1	**First-order reaction**							
	$[Co(tspc)]_2^{10-} \rightarrow 2\ Co(tspc)^{5-}$	4.4 s^{-1}	1			f.p.	D.k. at 535 nm in deaerated soln. contg. $Co(tspc)^{4-}$, 2-PrOH and $HClO_4$.	78A300
6.21	***N*-Methyltetrakis(4-sulfonatophenyl)porphinatocobaltate(II) radical anion**							
6.21.1	**First-order reaction**							
	$[Co(N\text{-Me})TPPS]^{4-} \rightarrow CH_3CoTPPS^{4-}$	2.0×10^2 s^{-1}				p.r.	D.k. and p.b.k. at 530 nm in Ar-satd. soln. contg. $(1\text{-}10) \times 10^{-5}$ mol L^{-1} Co(*N*-Me)$TPPS^{3-}$ and 1% 2-PrOH.	92G183
6.22	**Pentaamminecobalt(II) ion**							
6.22.1	**First-order reaction**							
	$Co(NH_3)_5^{2+} \rightarrow Co(NH_3)_4^{2+} + NH_3$	4.1×10^6 s^{-1}	3			f.p.	Condy. change in Ar-satd. soln. contg. $Co(NH_3)_5Cl^{2+}$ and 0.001 mol L^{-1} HCl. Reaction preceded by fast elimination of Cl from $Co(NH_3)_5Cl^{2+}$.	79A168

TABLE 6. Rate constants for cobalt transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.23	**Tetraamminecobalt(II) ion**							
6.23.1	**First-order reaction**							
	$Co(NH_3)_4^{2+} \rightarrow Co(NH_3)_3^{2+} + NH_3$	4.8×10^5 s^{-1}	3			f.p.	Condy. change in Ar-satd. soln. contg. $Co(NH_3)_5Cl^{2+}$ and 0.001 mol L^{-1} HCl.	79A168
6.24	**Tris(ammine)cobalt(II) ion**							
6.24.1	**First-order reaction**							
	$Co(NH_3)_3^{2+} \rightarrow Co(NH_3)_2^{2+} + NH_3$	6.4×10^4 s^{-1}	3-4.5			p.r.	Condy. change in Ar-satd. soln. contg. $Co(NH_3)_6^{3+}$ or $Co(NH_3)_5Cl^{2+}$ or $Co(NH_3)_5F^{2+}$ or $Co(NH_3)_4Cl_2^+$ or $Co(NH_3)_4Cl(H_2O)^{2+}$ and *tert*-BuOH.	77A234 761149
6.25	**Bis(ammine)cobalt(II) ion**							
6.25.1	**First-order reaction**							
	$Co(NH_3)_2^{2+} \rightarrow Co(NH_3)^{2+} + NH_3$	8.6×10^3 s^{-1}	3-4.5			p.r.	Condy. change in Ar-satd. soln. contg. $Co(NH_3)_6^{3+}$ or $Co(NH_3)_5Cl^{2+}$ or $Co(NH_3)_5F^{2+}$ or $Co(NH_3)_4Cl_2^+$ or $Co(NH_3)_4Cl(H_2O)^{2+}$ and *tert*-BuOH.	761149
6.26	**Amminecobalt(II) ion**							
6.26.1	**First-order reaction**							
	$Co(NH_3)^{2+} \rightarrow Co^{2+} + NH_3$	1.1×10^3 s^{-1}	3-4.5			p.r.	Condy. change in Ar-satd. soln. contg. $Co(NH_3)_6^{3+}$ or $Co(NH_3)_5Cl^{2+}$ or $Co(NH_3)_5F^{2+}$ or $Co(NH_3)_4Cl_2^+$ or $Co(NH_3)_4Cl(H_2O)^{2+}$ and *tert*-BuOH.	761149
6.27	**Tris(ethylenediamine)cobalt(II) ion**							
6.27.1	**First-order reaction**							
	$Co(en)_3^{2+} \rightarrow Co(en)_2^{2+} + en$	6.8×10^2 s^{-1}	2.3-4.6		25	p.r.	Condy. change in Ar-satd. soln. contg. $Co(en)_3^{3+}$ and 0.2 mol L^{-1} *tert*-BuOH; $k = 1.5 \times 10^4$ s^{-1} calcd. for N-Co(II) bond rupture [77A234].	90A303
6.27.2	**Hydrogen ion**							
	$Co(en)_3^{2+} + H^+ \rightarrow Co(en)_2^{2+} + enH^+$	6.6×10^6	2.3-4.6		25	p.r.	Condy. change in Ar-satd. soln. contg. $Co(en)_3^{3+}$ and 0.2 mol L^{-1} *tert*-BuOH.	90A303
6.28	**Bis(ethylenediamine)cobalt(II) ion**							
6.28.1	**First-order reaction**							
	$Co(en)_2^{2+} \rightarrow Co(en)^{2+} + en$	50 s^{-1}	2.3-4.6		25	p.r.	Condy. change in Ar-satd. soln. contg. $Co(en)_3^{3+}$ and 0.2 mol L^{-1} *tert*-BuOH; $k = 1.4 \times 10^3$ s^{-1} calcd. for N-Co(II) bond rupture [77A234].	90A303
6.28.2	**Hydrogen ion**							
	$Co(en)_2^{2+} + H^+ \rightarrow Co(en)^{2+} + enH^+$	1.4×10^6	2.3-4.6		25	p.r.	Condy. change in Ar-satd. soln. contg. $Co(en)_3^{3+}$ and 0.2 mol L^{-1} *tert*-BuOH.	90A303
6.29	**Ethylenediaminecobalt(II) ion**							
6.29.1	**First-order reaction**							
	$Co(en)^{2+} \rightarrow Co^{2+} + en$	14 s^{-1}	2.3-4.6		25	p.r.	Condy. change in Ar-satd. soln. contg. $Co(en)_3^{3+}$ and 0.2 mol L^{-1} *tert*-BuOH; $k = 1.7 \times 10^2$ s^{-1} calcd. for N-Co(II) bond rupture [77A234].	90A303
6.29.2	**Hydrogen ion**							
	$Co(en)^{2+} + H^+ \rightarrow Co^{2+} + enH^+$	3.2×10^5	2.3-4.6		25	p.r.	Condy. change in Ar-satd. soln. contg. $Co(en)_3^{3+}$ and 0.2 mol L^{-1} *tert*-BuOH.	90A303

TABLE 6. Rate constants for cobalt transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.30	**Bis(diethylenetriamine)cobalt(II) ion**							
6.30.1	**First-order reaction**							
	$Co(dien)_2^{2+} \rightarrow$	1.8×10^4 s^{-1}	2.5-4.5		25	p.r.	Condy. change in Ar-satd. soln. contg. $Co(dien)_2^{3+}$ and 0.2 mol L^{-1} *tert*-BuOH. Rate constant refers to N-Co(II) bond rupture.	77A234
6.31	**Diethylenetriaminecobalt(II) ion**							
6.31.1	**First-order reaction**							
	$Co(dien)^{2+} \rightarrow$	8.7×10^2 s^{-1}	2.5-4.5		25	p.r.	Condy. change in Ar-satd. soln. contg. $Co(dien)_2^{3+}$ and 0.2 mol L^{-1} *tert*-BuOH. Rate constant refers to N-Co(II) bond rupture.	77A234
6.32	**Triethylenetetraminecobalt(II) ion**							
6.32.1	**First-order reaction**							
	$Co(trien)^{2+} \rightarrow$	2.1×10^3 s^{-1}	2.5-4.5		25	p.r.	Condy. change in Ar-satd. soln. contg. $Co(trien)^{3+}$ and 0.2 mol L^{-1} *tert*-BuOH. Rate constant refers to N-Co(II) bond rupture.	77A234
6.32.2	**Oxygen**							
	$Co(trien)^{2+} + O_2 + OH^- \rightarrow Co(trien)(O_2)(OH)^+$	2.2×10^5	9.1-12.6	0.2		f.p.	P.b.k. at 310 nm in soln. contg. 2×10^{-5} mol L^{-1} (trien)Co(μ-OH,μ-O_2)Co(trien)$^{3+}$. Product suggested to react with $Co(trien)(H_2O)_2^{2+}$ to give (trien)Co(OH)O_2Co(H_2O)(trien)$^{3+}$ which gives (trien)Co(μ-OH,μ-O_2)Co(trien)$^{3+}$ with $k = 2$ s^{-1}.	91A065
6.33	**Hydroxytriethylenetetraminecobalt(II) ion**							
6.33.1	**Oxygen**							
	$Co(trien)(OH)^+ + O_2 \rightarrow Co(trien)(O_2)(OH)^+$	2.1×10^4	9.1-12.6	0.2		f.p.	P.b.k. at 310 nm in soln. contg. 2×10^{-5} mol L^{-1} (trien)Co(μ-OH,μ-O_2)Co(trien)$^{3+}$. Product suggested to react with $Co(OH)(trien)(H_2O)_2^+$ to give (trien)Co(OH)O_2Co(OH)(trien)$^{2+}$ which gives (trien)Co(μ-OH,μ-O_2)Co(trien)$^{3+}$ with $k = 4 \times 10^{-2}$ s^{-1}.	91A065
6.34	**Nitrito(triethylenetetramine)cobalt(II) ion**							
6.34.1	**Oxygen**							
	$Co(trien)(NO_2)^+ + O_2 \rightarrow Co(trien)(NO_2)(O_2)^+$	3.2×10^2	6.3		25	f.p.	Spectral changes in soln. contg. $Co(trien)(NO_2)_2^+$. Product suggested to react with $Co(trien)(NO_2)_2^+$, $k = 9 \times 10^2$ L mol^{-1} s^{-1}, to give (trien)Co(NO_2)(μ-O_2)Co(NO_2)(trien)$^{3+}$; the latter superoxo complex gives the peroxo complex with $k = <0.1$ s^{-1}.	92A191

TABLE 6. Rate constants for cobalt transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.35	**Tetraethyldiethylenetriaminecobalt(II) ion**							
6.35.1	**Oxygen**							
	$Co(tetraen)^{2+} + O_2 \rightarrow Co(tetraen)(O_2)^{2+}$	1.0×10^5	6.3		25	f.p.	Spectral changes in soln. contg. $Co(tetraen)(NO_2)^{2+}$. Product suggested to react with $Co(tetraen)(NO_2)^{2+}$, $k = 8.2 \times 10^4$ L mol^{-1} s^{-1} to give $(tetraen)Co(\mu\text{-}O_2)Co(tetraen)^{5+}$; the latter superoxo complex gives the peroxo complex with $k < 0.1$ s^{-1}.	92A191
6.36	**Tris(acetylacetonato)cobaltate(II) ion**							
6.36.1	**First-order reaction**							
	$Co(acac)_3^- \rightarrow Co(acac)_2 + acac^-$	8×10^3 s^{-1}			25	p.r.	Condy. change in He-satd. soln. contg. 5×10^{-4} mol L^{-1} $Co(acac)_3$, 0.1 mol L^{-1} *tert*-BuOH and varied [H$^+$].	79A297
6.36.2	**Hydrogen ion**							
	$Co(acac)_3^- + H^+ \rightarrow Co(acac)_2 + acacH$	7.2×10^8			25	p.r.	Condy. change in He-satd. soln. contg. 5×10^{-4} mol L^{-1} $Co(acac)_3$, 0.1 mol L^{-1} *tert*-BuOH and varied [H$^+$].	79A297
6.37	**Bis(acetylacetonato)cobalt(II)**							
6.37.1	**First-order reaction**							
	$Co(acac)_2 \rightarrow Co(acac)^+ + acac^-$	30 s^{-1}			25	p.r.	Condy. change in He-satd. soln. contg. 5×10^{-4} mol L^{-1} $Co(acac)_3$, 0.1 mol L^{-1} *tert*-BuOH and varied [H$^+$]; $k_r \sim 4.1 \times 10^5$ L mol^{-1} s^{-1}.	79A297
6.37.2	**Hydrogen ion**							
	$Co(acac)_2 + H^+ \rightarrow Co(acac)^+ + acacH$	3.1×10^6			25	p.r.	Condy. change in He-satd. soln. contg. 5×10^{-4} mol L^{-1} $Co(acac)_3$, 0.1 mol L^{-1} *tert*-BuOH and varied [H$^+$]; $k_r \sim 7.5 \times 10^5$ L mol^{-1} s^{-1}.	79A297
6.38	**Acetylacetonatocobalt(II) ion**							
6.38.1	**First-order reaction**							
	$Co(acac)^+ \rightarrow Co^{2+} + acac^-$	3 s^{-1}			25	p.r.	Condy. change in He-satd. soln. contg. 5×10^{-4} mol L^{-1} $Co(acac)_3$, 0.1 mol L^{-1} *tert*-BuOH and varied [H$^+$].	79A297
6.38.2	**Hydrogen ion**							
	$Co(acac)^+ + H^+ \rightarrow Co^{2+} + acacH$	7.5×10^4			25	p.r.	Condy. change in He-satd. soln. contg. 5×10^{-4} mol L^{-1} $Co(acac)_3$, 0.1 mol L^{-1} *tert*-BuOH and varied [H$^+$].	79A297
6.39	**Tris(2,2'-bipyridine)cobalt(II) ion**							
6.39.1	**First-order reaction**							
	$Co(bpy)_3^{2+} \rightarrow Co(bpy)_2^{2+} + bpy$	3.4 s^{-1}	0.5-10.5			p.r.	D.k. at 270-340 nm in Ar- or N_2O-satd. soln. contg. $(1\text{-}5) \times 10^{-5}$ mol L^{-1} $Co(bpy)_3^{3+}$ and MeOH, 2-PrOH, *tert*-BuOH or formate; $k_r = 1.4 \times 10^5$ L mol^{-1} s^{-1}. At pH 0.3 $k = 8$ s^{-1}.	79A034
6.39.2	**Tris(2,2'-bipyridine)ruthenium(III) ion**							
	$Co(bpy)_3^{2+} + Ru(bpy)_3^{3+} \rightarrow Co(bpy)_3^{3+} + Ru(bpy)_3^{2+}$	1.3×10^8		1.0		f.p./oq	Soln. contg. $Ru(bpy)_3^{2+}$ and $Co(bpy)_3^{3+}$ (OQ).	82F048

TABLE 6. Rate constants for cobalt transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.39	**Tris(2,2'-bipyridine)cobalt(II) ion** — Continued							
6.39.2	**Tris(2,2'-bipyridine)ruthenium(III) ion** — Continued							
		2.4×10^8		1.0	25	f.p./oq	D.k. at 675 nm in soln. contg. 7.5×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$ and (0.5 or 1.0) $\times 10^{-3}$ mol L^{-1} $Co(bpy)_3^{3+}$ (OQ); studied at 5-25 °C, $E_a = -11.8$ kJ mol^{-1}.	80A003
6.39.3	**Tris(4-triethylphosphonio-2,2'-bipyridine)ruthenium(III) ion**							
	$Co(bpy)_3^{2+} + Ru[4\text{-}(Et_3P)bpy]_3^{6+} \rightarrow Co(bpy)_3^{3+} + Ru[4\text{-}(Et_3P)bpy]_3^{5+}$	2.2×10^8		1.0		f.p.	Soln. contg. $Ru([4\text{-}(Et_3P)bpy]_3^{5+}$ and $Co(bpy)_3^{3+}$ (OQ).	82F048
6.39.4	**Tris(1,10-phenanthroline)ruthenium(III) ion**							
	$Co(bpy)_3^{2+} + Ru(phen)_3^{3+} \rightarrow Co(bpy)_3^{3+} + Ru(phen)_3^{2+}$	1.9×10^8		0.25		f.p./oq	P.b.k. at 420-450 nm in soln. contg. 1 $\times 10^{-4}$ mol L^{-1} $Ru(phen)_3^{2+}$, 0.25 mol L^{-1} LiCl and (2-6) $\times 10^{-4}$ mol L^{-1} $Co(bpy)_3^{3+}$ (OQ); $k = 2.5 \times 10^8$ in presence of 0.166 mol L^{-1} Na_2SO_4 and 4.8×10^7 L mol^{-1} s^{-1} in 50% aqueous acetonitrile contg. 0.25 mol L^{-1} LiCl.	85S022
6.39.5	**Tris(4,7-dimethyl-1,10-phenanthroline)ruthenium(III) ion**							
	$Co(bpy)_3^{2+} + Ru(4,7\text{-}Me_2phen)_3^{3+} \rightarrow Co(bpy)_3^{3+} + Ru(4,7\text{-}Me_2phen)_3^{2+}$	3.1×10^8		0.25		f.p./oq	P.b.k. at 420-450 nm in soln. contg. 1 $\times 10^{-4}$ mol L^{-1} $Ru(4,7\text{-}Me_2phen)_3^{2+}$, 0.25 mol L^{-1} LiCl and (2-6) $\times 10^{-4}$ mol L^{-1} $Co(bpy)_3^{3+}$ (OQ); $k = 5.1 \times 10^8$ in presence of 0.166 mol L^{-1} Na_2SO_4 and 2.2×10^7 L mol^{-1} s^{-1} in 50% aqueous acetonitrile contg. 0.25 mol L^{-1} LiCl.	85S022
6.39.6	**Tris(3,4,7,8-tetramethyl-1,10-phenanthroline)ruthenium(III) ion**							
	$Co(bpy)_3^{2+} + Ru(3,4,7,8\text{-}Me_4phen)_3^{3+} \rightarrow Co(bpy)_3^{3+} + Ru(3,4,7,8\text{-}Me_4phen)_3^{2+}$	2.0×10^7		0.25		f.p./oq	P.b.k. at 420-450 nm in 50% aqueous acetonitrile soln. contg. 1×10^{-4} mol L^{-1} $Ru(3,4,7,8\text{-}Me_4phen)_3^{2+}$, 0.25 mol L^{-1} LiCl and (2-6) $\times 10^{-4}$ mol L^{-1} $Co(bpy)_3^{3+}$ (OQ).	85S022
6.40	**Tris(1,10-phenanthroline)cobalt(II) ion**							
6.40.1	**Tris(2,2'-bipyridine)ruthenium(III) ion**							
	$Co(phen)_3^{2+} + Ru(bpy)_3^{3+} \rightarrow Co(phen)_3^{3+} + Ru(bpy)_3^{2+}$	1.4×10^8		1.0	25	f.p./oq	D.k. at 675 nm in soln. contg. 7.5×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$ and (0.25-2.0) $\times 10^{-3}$ mol L^{-1} $Co(phen)_3^{3+}$ (OQ); the same value was obtained under pseudo-first order conditions with addn. of 1.0×10^{-4} mol L^{-1} $Co(phen)_3^{2+}$; studied at 5-25 °C, $E_a = -4.6 \pm 3.7$ kJ mol^{-1}.	80A003
6.40.2	**Methylene Blue, radical cation**							
	$Co(phen)_3^{2+} + [MB]^{\cdot 2+} + H^+ \rightarrow Co(phen)_3^{3+} + MBH^{2+}$	1.3×10^8				f.p./oq	D.k. at 520 nm in soln. contg. methylene blue and $Co(phen)_3^{3+}$ (OQ).	82A290
6.41	**3,10,17,24-Tetrasulfophthalocyaninecobaltate(II) ion**							
6.41.1	**Diiodine radical ion**							
	$Co(tspc)^{4-} + I_2^{\cdot -} \rightarrow$	6.7×10^9	1	1.0		f.p.	D.k. at ≤420 nm in soln. contg. $Co(tspc)(H_2O)_{2-n}(I)^{(3+n)-}$ (n = 1, 2), 0.1 mol L^{-1} NaI and 0.1 mol L^{-1} $HClO_4$.	79A090
6.41.2	**Tris(2,2'-bipyridine)ruthenium(III) ion**							
	$Co(tspc)^{4-} + Ru(bpy)_3^{3+} \rightarrow Co(tspc)^{3-} + Ru(bpy)_3^{2+}$	4.5×10^7				f.p./oq	D.k. at 580 nm; mixed dimer contg. 0.005-0.01 mol L^{-1} $Ru(bpy)_3^{2+}$ and (1-5) $\times 10^{-6}$ mol L^{-1} $Co(tspc)^{3-}$ (OQ).	79A090

TABLE 6. Rate constants for cobalt transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.42	**Chloro(pentacyano)cobaltate(II) ion**							
6.42.1	**First-order reaction**							
	$Co(CN)_5Cl^{4-} \rightarrow Co(CN)_5^{3-} + Cl^-$	$>1 \times 10^6$ s^{-1}	4.5-5.5			p.r.	Condy. change in soln. contg. $Co(CN)_5Cl^{3-}$ and 0.5 mol L^{-1} *tert*-BuOH.	771003
6.43	**Pentacyanocobaltate(II) ion**							
6.43.1	**First-order reaction**							
	$Co(CN)_5^{3-} \rightarrow Co(CN)_4^{2-} + CN^-$	1.1×10^4 s^{-1}	4.5-5.5			p.r.	Condy. change in soln. contg. $Co(CN)_6^{3-}$ or $Co(CN)_5Cl^{3-}$ and 0.5 mol L^{-1} *tert*-BuOH.	771003
6.44	**Tetracyanocobaltate(II) ion**							
6.44.1	**First-order reaction**							
	$Co(CN)_4^{2-} \rightarrow Co(CN)_3^- + CN^-$	28 s^{-1}	4.5-5.5			p.r.	Condy. change in soln. contg. $Co(CN)_6^{3-}$ or $Co(CN)_5Cl^{3-}$ and 0.5 mol L^{-1} *tert*-BuOH.	771003
6.45	**Tris(glycinato)cobaltate(II) ion**							
6.45.1	**First-order reaction**							
	$Co(Gly)_3^- \rightarrow Co(Gly)_2 + Gly^-$	4.2×10^3 s^{-1}	3.0-4.5, 8.5		~25	p.r.	Condy. change in Ar-satd. soln. contg. 0.003 mol L^{-1} $Co(Gly)_3$ and 0.2 mol L^{-1} *tert*-BuOH.	90A303
6.45.2	**Hydrogen ion**							
	$Co(Gly)_3^- + H^+ \rightarrow Co(Gly)_2 + GlyH$	2.7×10^7	3.0-4.5		~25	p.r.	Condy. change in Ar-satd. soln. contg. 0.003 mol L^{-1} $Co(Gly)_3$ and 0.2 mol L^{-1} *tert*-BuOH.	90A303
6.46	**Bis(glycinato)cobalt(II)**							
6.46.1	**First-order reaction**							
	$Co(Gly)_2 \rightarrow Co(Gly)^+ + Gly^-$	3.5×10^2 s^{-1}	3.0-4.5, 8.5		~25	p.r.	Condy. change in Ar-satd. soln. contg. 0.003 mol L^{-1} $Co(Gly)_3$ and 0.2 mol L^{-1} *tert*-BuOH.	90A303
6.46.2	**Hydrogen ion**							
	$Co(Gly)_2 + H^+ \rightarrow Co(Gly)^+ + GlyH$	8.1×10^5	3.0-4.5		~25	p.r.	Condy. change in Ar-satd. soln. contg. 0.003 mol L^{-1} $Co(Gly)_3$ and 0.2 mol L^{-1} *tert*-BuOH.	90A303
6.47	**Glycinatocobalt(II) ion**							
6.47.1	**First-order reaction**							
	$Co(Gly)^+ \rightarrow Co^{2+} + Gly^-$	49 s^{-1}	3.0-4.5		~25	p.r.	Condy. change in Ar-satd. soln. contg. 0.003 mol L^{-1} $Co(Gly)_3$ and 0.2 mol L^{-1} *tert*-BuOH.	90A303
6.47.2	**Hydrogen ion**							
	$Co(Gly)^+ + H^+ \rightarrow Co^{2+} + GlyH$	2.1×10^4	3.0-4.5		~25	p.r.	Condy. change in Ar-satd. soln. contg. 0.003 mol L^{-1} $Co(Gly)_3$ and 0.2 mol L^{-1} *tert*-BuOH.	90A303
6.48	**Ethylenediaminetetraacetatocobaltate(II) ion**							
6.48.1	**Tris(2,2'-bipyridine)ruthenium(III) ion**							
	$CoEDTA^{2-} + Ru(bpy)_3^{3+} \rightarrow CoEDTA^- + Ru(bpy)_3^{2+}$	9×10^3	4.75		25		In 0.05 mol L^{-1} acetate buffer.	85F089
6.48.2	**5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)porphinatozinc(II) ion, radical cation**							
	$CoEDTA^{2-} + [ZnTMpyP]^{\cdot 5+} \rightarrow CoEDTA^- + ZnTMpyP^{4+}$	$\sim 2.2 \times 10^9$				f.p./oq	D.k. at 700 nm in Ar-satd. soln. contg. $ZnTMpyP^{4+}$ and $CoEDTA^-$ (OQ).	85A430

TABLE 6. Rate constants for cobalt transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.49	**1,4,8,11-Tetraazacyclotetradecanecobalt(II) ion**							
6.49.1	**Oxygen**							
	$Co(cyclam)^{2+} + O_2 \rightarrow Co(cyclam)(O_2)^{2+}$	1.2×10^7	1-7	0.001-0.1	25	f.p.	P.b.k. at 360 nm in soln. contg. (1-5) × 10^{-4} mol L^{-1} $CH_3Co(cyclam)^{2+}$ or $Co(cyclam)(O_2)^{2+}$ or $CH_3CH_2CH_2Co(cyclam)^{2+}$ and (0.25-1.26) × 10^{-3} mol L^{-1} O_2; $k_r = 63$ s^{-1} at $I = 1.0$ [80M397].	90A079
6.50	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanecobalt(II) ion**							
6.50.1	**Oxygen**							
	$Co(aneN_4)^{2+} + O_2 \rightarrow Co(aneN_4)(O_2)^{2+}$	5.0×10^6	1-7	0.001-0.1	25	f.p.	P.b.k. at 360 nm in soln. contg. 2 × 10^{-4} mol L^{-1} $CH_3Co(aneN_4)^{2+}$ or $Co(aneN_4)(O_2)^{2+}$ and (0.25-1.26) × 10^{-3} mol L^{-1} O_2; $k_r = 1.7 \times 10^4$ s^{-1}.	90A079
6.51	**1,8-Diamino-3,6,10,13,16,19-hexaazabicyclo[6.6.6]eicosanecobalt(II) ion, conjugate diacid**							
6.51.1	**Tris(1,10-phenanthroline)ruthenium(III) ion**							
	$Co(diamsarH_2)^{4+} + Ru(phen)_3^{3+} \rightarrow Co(diamsarH_2)^{5+} + Ru(phen)_3^{2+}$	7.9×10^6	1	0.2	25	f.p./oq	P.b.k. at 450 nm in soln. contg. (2-5) × 10^{-5} mol L^{-1} $Ru(phen)_3^{2+}$, 0.001-0.007 mol L^{-1} $Co(diamsar)^{3+}$ (OQ), and 0.1 mol L^{-1} HCl.	84A238
6.52	**1,8-Diamino-3,6,10,13,16,19-hexaazabicyclo[6.6.6]eicosanecobalt(II) ion**							
6.52.1	**Tris(1,10-phenanthroline)ruthenium(III) ion**							
	$Co(diamsar)^{2+} + Ru(phen)_3^{3+} \rightarrow Co(diamsar)^{3+} + Ru(phen)_3^{2+}$	9.6×10^7	8.3	0.2	25	f.p./oq	P.b.k. at 450 nm in soln. contg. (2-5) × 10^{-5} mol L^{-1} $Ru(phen)_3^{2+}$, 0.001-0.007 mol L^{-1} $Co(diamsar)^{3+}$ (OQ), 0.1 mol L^{-1} LiCl and 0.05 mol L^{-1} *N*-ethylmorpholine.	84A238
6.52.2	**Tris(5-chloro-1,10-phenanthroline)ruthenium(III) ion**							
	$Co(diamsar)^{2+} + Ru(5\text{-}Clphen)_3^{3+} \rightarrow Co(diamsar)^{3+} + Ru(5\text{-}Clphen)_3^{2+}$	1.7×10^8	8.1	0.2	25	f.p./oq	P.b.k. at 450 nm in soln. contg. 0.2 mol L^{-1} LiCl, 0.05 mol L^{-1} *N*-ethylmorpholine, (2-5) × 10^{-5} mol L^{-1} $Ru(5\text{-}Clphen)_3^{2+}$ and 0.001-0.007 mol L^{-1} $Co(diamsar)^{3+}$ (OQ).	84A238
6.52.3	**Tris(4,7-dimethyl-1,10-phenanthroline)ruthenium(III) ion**							
	$Co(diamsar)^{2+} + Ru(4,7\text{-}Me_2phen)_3^{3+} \rightarrow Co(diamsar)^{3+} + Ru(4,7\text{-}Me_2phen)_3^{2+}$	3.1×10^7	8.3	0.2	25	f.p./oq	P.b.k. at 450 nm in soln. contg. 0.2 mol L^{-1} LiCl, 0.05 mol L^{-1} *N*-ethylmorpholine, (2-5) × 10^{-5} mol L^{-1} $Ru(5\text{-}Clphen)_3^{2+}$ and 0.001-0.007 mol L^{-1} $Co(diamsar)^{3+}$ (OQ).	84A238
6.53	**8-Methyl-1,3,13,16-tetraaza-6,10,19-trithiabicyclo[6.6.6]eicosanecobalt(II) ion**							
6.53.1	**Tris(2,2'-bipyridine)ruthenium(III) ion**							
	$Co(AZAcapten)^{2+} + Ru(bpy)_3^{3+} \rightarrow Co(AZAcapten)^{3+} + Ru(bpy)_3^{2+}$	~5×10^8				f.p./oq	P.b.k. at 470 nm in soln. contg. $Ru(bpy)_3^{2+}$ and $Co(AZAcapten)^{3+}$ (OQ).	85F222
6.54	**1,3,6,8,10,13,16,19-Octaazabicyclo[6.6.6]eicosanecobalt(II) ion**							
6.54.1	**Tris(2,2'-bipyridine)ruthenium(III) ion**							
	$Co(sep)^{2+} + Ru(bpy)_3^{3+} \rightarrow Co(sep)^{3+} + Ru(bpy)_3^{2+}$	5.5×10^8		0.2	25	f.p./oq	P.b.k. at 450 nm in soln. contg. (2-5) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$ and 0.001-0.007 mol L^{-1} $Co(sep)^{3+}$ (OQ).	84A238

TABLE 6. Rate constants for cobalt transients — Continued

Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.54 1,3,6,8,10,13,16,19-Octaazabicyclo[6.6.6]eicosanecobalt(II) ion — Continued							
6.54.2 Tris(1,10-phenanthroline)ruthenium(III) ion							
$Co(sep)^{2+} + Ru(phen)_3^{3+} \rightarrow Co(sep)^{3+} + Ru(phen)_3^{2+}$	6.4×10^8		0.2	25	f.p./oq	P.b.k. at 450 nm in soln. contg. (2-5) × 10^{-5} mol L^{-1} $Ru(phen)_3^{2+}$ and 0.001-0.007 mol L^{-1} $Co(sep)^{3+}$ (OQ).	84A238
6.54.3 Tris(5-chloro-1,10-phenanthroline)ruthenium(III) ion							
$Co(sep)^{2+} + Ru(5\text{-}Clphen)_3^{3+} \rightarrow Co(sep)^{3+} + Ru(5\text{-}Clphen)_3^{2+}$	8.2×10^8		0.2	25	f.p./oq	P.b.k. at 450 nm in soln. contg. (2-5) × 10^{-5} mol L^{-1} $Ru(5\text{-}Clphen)_3^{2+}$ and 0.001-0.007 mol L^{-1} $Co(sep)^{3+}$ (OQ).	84A238
6.54.4 Tris(4,7-dimethyl-1,10-phenanthroline)ruthenium(III) ion							
$Co(sep)^{2+} + Ru(4,7\text{-}Me_2phen)_3^{3+} \rightarrow Co(sep)^{3+} + Ru(4,7\text{-}Me_2phen)_3^{2+}$	5.4×10^8		0.2	25	f.p./oq	P.b.k. at 450 nm in soln. contg. (2-5) × 10^{-5} mol L^{-1} $Ru(5\text{-}Clphen)_3^{2+}$ and 0.001-0.007 mol L^{-1} $Co(sep)^{3+}$ (OQ).	84A238
6.55 2,3,9,10-Tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraenecobalt(II) ion							
6.55.1 Tris(2,2'-bipyridine)ruthenium(III) ion							
$Co(Me_4tetraeneN_4)^{2+} + Ru(bpy)_3^{3+} \rightarrow Co(Me_4tetraeneN_4)^{3+} + Ru(bpy)_3^{2+}$	2.1×10^7		0.1	25	f.p./oq	P.b.k. at 443 nm in soln. contg. $Ru(bpy)_3^{2+}$ and $Co(Me_4tetraeneN_4)^{3+}$ (OQ).	90A221
6.56 2,3,9,10-Tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraenecobalt(II) ion, superoxide adduct							
6.56.1 2,3,9,10-Tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraenecobalt(II) ion, superoxide adduct							
$Co(Me_4tetraeneN_4)(O_2)^+ + Co(Me_4tetraeneN_4)(O_2)^+ \rightarrow$	2.1×10^3	8.0			p.r.	D.k. in soln. contg. 4×10^{-5} mol L^{-1} $Co(Me_4tetraeneN_4)^{2+}$, 0.0013 mol L^{-1} O_2 and 0.25 mol L^{-1} *tert*-BuOH.	771028
6.57 Iminodiacetatocobaltate(II) ion, superoxide adduct							
6.57.1 Iminodiacetatocobalt(II)							
$CoIDA(O_2)^- + CoIDA \rightarrow IDACo(O_2)CoIDA^-$	2.4×10^6	7			p.r.	D.k. in O_2-satd. soln. contg. 0.001 mol L^{-1} CoIDA, 0.05 mol L^{-1} formate and 0.001 mol L^{-1} phosphate.	84A284
6.58 Ethylenediaminetetraacetatocobaltate(II) ion, superoxide adduct							
6.58.1 Ethylenediaminetetraacetatocobaltate(II) ion, superoxide adduct							
$CoEDTA(O_2)^{3-} + CoEDTA(O_2)^{3-} \rightarrow$	2×10^5	9			p.r.	D.k. at 330 nm in O_2-satd. soln. contg. *0.1* mol L^{-1} formate, *0.01* mol L^{-1} borate and 2.5×10^{-4} mol L^{-1} $CoEDTA^{2-}$. Reaction suggested to generate $(Co(II)EDTA^{2-}, O_2^{2-})$ which decays with $k = 3 \times 10^{-3}$ s^{-1} to give $Co(III)EDTA^- + {}^{\bullet}OH + OH^-$.	84A249
6.59 Iminodiacetatocobalt(II), H-abstraction product							
6.59.1 Iminodiacetatocobalt(II)							
$Co[IDA\text{-}H]^{\bullet} + CoIDA \rightarrow$	3.5×10^6	7			p.r.	D.k. in N_2O-satd. soln. contg. CoIDA *and 0.001 mol L^{-1} phosphate.*	84A284
6.60 Nitrilotriacetatocobaltate(II) ion, H-abstraction product							
6.60.1 First-order reaction							
$Co[NTA\text{-}H]^{\bullet -} \rightarrow$	5×10^3 s^{-1}				p.r.	D.k. in N_2O satd. soln. contg. 4×10^{-4} mol L^{-1} $Co(NTA)^-$. Reaction followed or paralleled by second-order decay, $k = 2.5 \times 10^7$, 1×10^6, 3.8×10^5, 2×10^6 L mol^{-1} s^{-1} at pH 3.7, 5.0, 6.5 and 10.0, respectively. *For different results see the following entry.	78A436

TABLE 6. Rate constants for cobalt transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.60	**Nitrilotriacetatocobaltate(II) ion, H-abstraction product** — Continued							
6.60.2	**Nitrilotriacetatocobaltate(II) ion, H-abstraction product**							
	$Co[NTA\text{-}H]^{\bullet -} + Co[NTA\text{-}H]^{\bullet -} \rightarrow$	4.7×10^4	7			p.r.	D.k. at 250 nm in N_2O-satd. soln. contg. $CoNTA^-$ and 0.001 mol L^{-1} phosphate. *For different results see the preceding entry.	79A255
6.61	**Ethylenediaminetetraacetatocobaltate(II) ion, H-abstraction product**							
6.61.1	**First-order reaction**							
	$Co[EDTA\text{-}H]^{\bullet 2-} \rightarrow$	9×10^3 s^{-1}				p.r.	D.k. in N_2O-satd. soln. contg. 4×10^{-4} mol L^{-1} $Co(EDTA)^{2-}$. Reaction followed or paralleled by pH-dependent second-order decay, $k \sim 1.5 \times 10^4$, 3.8×10^3 and 2.5×10^4 L mol^{-1} s^{-1} at pH ~3.5, 6 and 10, respectively; values obtained from graph.	78A436
6.62	**3,10,17,24-Tetrasulfophthalocyaninecobaltate(II) ion, superoxide adduct**							
6.62.1	**3,10,17,24-Tetrasulfophthalocyaninecobaltate(II) ion, superoxide adduct**							
	$Co(tspc)(O_2)^{5-} + Co(tspc)(O_2)^{5-} \rightarrow$	3.4×10^2	7.5			p.r.	D.k. in O_2-satd. soln. contg. (1-10) $\times 10^{-6}$ mol L^{-1} $Co(tspc)^{4-}$ and phospshate buffer; unclear whether k or $2k$.	89A497
6.63	**1,4,8,11-Tetraazacyclotetradecanecobalt(II) ion, dioxygen adduct**							
6.63.1	**Iron(II) ion**							
	$Co(cyclam)(O_2)^{2+} + Fe^{2+} \rightarrow$	6.3×10^2	1		25	f.p.	D.k. at 360 nm in soln. contg. O_2, $CH_3Co(cyclam)^{2+}$, Fe^{2+} and 0.1 mol L^{-1} $HClO_4$.	90A079
6.64	**5,10,15,10-Tetrakis(1-methylpyridyl)porphinato(thiocyanato)cobalt(II) ion**							
6.64.1	**First-order reaction**							
	$CoTMpyP(SCN)^{3+} \rightarrow SCN^- + CoTMpyP^{4+}$	7×10^4 s^{-1}				p.r.	D.k. in N_2-satd. soln. contg. $Co(III)TMpyP(SCN)^{4+}$ and 5% 2-PrOH.	90B077
6.65	**Cobaltocene**							
6.65.1	**Hydrogen ion**							
	$CoCp_2 + H^+ \rightarrow$	42	0.3-2.1			p.r.	D.k. at 340 nm in Ar-satd. soln. contg. $\sim 10^{-5}$ mol L^{-1} $CoCp_2^+$ and 0.0081-0.47 mol L^{-1} H^+.	88A066
6.66	**Pentaammine(1-methyl-4,4'-bipyridinium)cobalt(III) ion, electron adduct**							
6.66.1	**Pentaammine(1-methyl-4,4'-bipyridinium)cobalt(III) ion**							
	$[Co(NH_3)_5(mbpy)]^{\bullet 3+} + Co(NH_3)_5(mbpy)^{4+} \rightarrow Co(NH_3)_5(mbpy)^{4+} + Co(NH_3)_5(mbpy)^{3+}$	5.4×10^7	7.2		25	p.r.	D.k. at 600 nm in N_2O-satd. soln. contg. (5-200) $\times 10^{-5}$ mol L^{-1} $Co(NH_3)_5(mbpy)^{4+}$ and 0.1 mol L^{-1} formate.	89A115
6.66.2	**Pentaammine(1-methyl-4,4'-bipyridinium)cobalt(III) ion, electron adduct**							
	$[Co(NH_3)_5(mbpy)]^{\bullet 3+} + [Co(NH_3)_5(mbpy)]^{\bullet 3+} \rightarrow Co(NH_3)_5(mbpy)^{4+} + [Co(NH_3)_5(mbpy)]^{\bullet 2+}$	1.2×10^8	7.2		25	p.r.	D.k. at 600 nm in N_2O-satd. soln. contg. (5-200) $\times 10^{-5}$ mol L^{-1} $Co(NH_3)_5(mbpy)^{4+}$ and 0.1 mol L^{-1} formate.	89A115

TABLE 6. Rate constants for cobalt transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.67	**Pentaammine(4-nitrobenzoato)cobalt(III) ion, electron adduct**							
6.67.1	**Oxygen**							
	$[Co(NH_3)_5O_2CC_6H_4\text{-}4\text{-}NO_2]^{\cdot++} + O_2 \rightarrow$	2.2×10^9	6.9			p.r.	D.k. in soln. contg. 0.001 mol L^{-1} pentaammine(4-nitrobenzoato)cobalt(III) ion, 0.1 mol L^{-1} formate, 1×10^{-4} mol L^{-1} O_2 and 0.023 mol L^{-1} N_2O.	771027
6.67.2	**2-Methyl-1,4-naphthoquinone**							
	$[Co(NH_3)_5O_2CC_6H_4\text{-}4\text{-}NO_2]^{\cdot++} + 2\text{-}CH_3NQ \rightarrow Co(NH_3)_5O_2CC_6H_4\text{-}4\text{-}NO_2^{2+} + [2\text{-}CH_3NQ]^{\cdot-}$	1.6×10^9	6.7			p.r.	D.k. and p.b.k. in soln. contg. 0.002 mol L^{-1} pentaammine(4-nitrobenzoato)cobalt(III) ion, 0.1 mol L^{-1} formate, 5×10^{-5} mol L^{-1} menaquinone and 0.025 mol L^{-1} N_2O.	771027
6.68	**Pentaammine[4-(aminocarbonyl)-1-(carboxymethyl)pyridinio]cobalt(III) radical anion**							
6.68.1	**Pentaammine[4-(aminocarbonyl)-1-(carboxymethyl)pyridinio]cobalt(III) ion**							
	$[Co(NH_3)_5(O_2CCH_2py\text{-}4\text{-}CONH_2)]^{\cdot2+} + Co(NH_3)_5(O_2CCH_2py\text{-}4\text{-}CONH_2)^{3+} \rightarrow Co(NH_3)_5(O_2CCH_2py\text{-}4\text{-}CONH_2)^{3+} + Co(NH_3)_5(O_2CCH_2py\text{-}4\text{-}CONH_2)^{2+}$	1.5×10^9	4.5-5.5	22		p.r.	D.k. in N_2O-satd. soln. contg. (5-30) $\times$ 10^{-5} mol L^{-1} CoL^{3+} and 0.1 mol L^{-1} 2-PrOH or formate.	83B029
6.69	**Pentaammine[4-(aminocarbonyl)-1-(carboxymethyl)pyridinio]cobalt(III) radical, protonated**							
6.69.1	**Pentaammine[4-(aminocarbonyl)-1-(carboxymethyl)pyridinio]cobalt(III) ion**							
	$[Co(NH_3)_5(HO_2CCH_2py\text{-}4\text{-}CONH_2)]^{\cdot3+} + Co(NH_3)_5(O_2CCH_2py\text{-}4\text{-}CONH_2)^{3+} \rightarrow Co(NH_3)_5(O_2CCH_2py\text{-}4\text{-}CONH_2)^{3+} + Co(NH_3)_5(O_2CCH_2py\text{-}4\text{-}CONH_2)^{2+} + H^+$	1.6×10^8	1	22		p.r.	D.k. in N_2O-satd. soln. contg. (5-30) $\times$ 10^{-5} mol L^{-1} CoL^{3+} and 0.1 mol L^{-1} 2-PrOH or formate.	83B029
6.70	**Pentaammine[4-(aminocarbonyl)-1-(1-carboxyethyl)pyridinio]cobalt(III) radical anion**							
6.70.1	**Pentaammine[4-(aminocarbonyl)-1-(1-carboxyethyl)pyridinio]cobalt(III) ion**							
	$[Co(NH_3)_5(O_2CCH(CH_3)py\text{-}4\text{-}CONH_2)]^{\cdot2+} + Co(NH_3)_5(O_2CCH(CH_3)py\text{-}4\text{-}CONH_2)^{3+} \rightarrow Co(NH_3)_5(O_2CCH(CH_3)py\text{-}4\text{-}CONH_2)^{3+} + Co(NH_3)_5(O_2CCH(CH_3)py\text{-}4\text{-}CONH_2)^{2+}$	1.4×10^9	4.5-5.5	22		p.r.	D.k. in N_2O-satd. soln. contg. (5-30) $\times$ 10^{-5} mol L^{-1} CoL^{3+} and 0.1 mol L^{-1} 2-PrOH or formate.	83B029
6.71	**Pentaammine[4-(aminocarbonyl)-1-(1-carboxyethyl)pyridinio]cobalt(III) radical, protonated**							
6.71.1	**Pentaammine[4-(aminocarbonyl)-1-(1-carboxyethyl)pyridinio]cobalt(III) ion**							
	$[Co(NH_3)_5(HO_2CCH(CH_3)py\text{-}4\text{-}CONH_2)]^{\cdot3+} + Co(NH_3)_5(O_2CCH(CH_3)py\text{-}4\text{-}CONH_2)^{3+} \rightarrow Co(NH_3)_5(O_2CCH(CH_3)py\text{-}4\text{-}CONH_2)^{3+} + Co(NH_3)_5(O_2CCH(CH_3)py\text{-}4\text{-}CONH_2)^{2+} + H^+$	1.5×10^8	1	22		p.r.	D.k. in N_2O-satd. soln. contg. (5-30) $\times$ 10^{-5} mol L^{-1} CoL^{3+} and 0.1 mol L^{-1} 2-PrOH or formate.	83B029
6.72	**Pentaammine[4-(aminocarbonyl)-1-(1-carboxypropyl)pyridinio]cobalt(III) radical anion**							
6.72.1	**Pentaammine[4-(aminocarbonyl)-1-(1-carboxypropyl)pyridinio]cobalt(III) ion**							
	$[Co(NH_3)_5(O_2C(CH_2)_3py\text{-}4\text{-}CONH_2)]^{\cdot2+} + Co(NH_3)_5(O_2C(CH_2)_3py\text{-}4\text{-}CONH_2)^{3+} \rightarrow Co(NH_3)_5(O_2C(CH_2)_3py\text{-}4\text{-}CONH_2)^{3+} + Co(NH_3)_5(O_2C(CH_2)_3py\text{-}4\text{-}CONH_2)^{2+}$	1.0×10^8	4.5-5.5	22		p.r.	D.k. in N_2O-satd. soln. contg. (5-30) $\times$ 10^{-5} mol L^{-1} CoL^{3+} and 0.1 mol L^{-1} 2-PrOH or formate.	83B029
6.73	**Pentaammine[4-(aminocarbonyl)-1-(1-carboxypropyl)pyridinio]cobalt(III) radical, protonated**							
6.73.1	**Pentaammine[4-(aminocarbonyl)-1-(1-carboxypropyl)pyridinio]cobalt(III) ion**							
	$[Co(NH_3)_5(HO_2C(CH_2)_3py\text{-}4\text{-}CONH_2)]^{\cdot3+} + Co(NH_3)_5(O_2C(CH_2)_3py\text{-}4\text{-}CONH_2)^{3+} \rightarrow Co(NH_3)_5(O_2C(CH_2)_3py\text{-}4\text{-}CONH_2)^{3+} + Co(NH_3)_5(O_2C(CH_2)_3py\text{-}4\text{-}CONH_2)^{2+} + H^+$	3.0×10^7	1	22		p.r.	D.k. in N_2O-satd. soln. contg. (5-30) $\times$ 10^{-5} mol L^{-1} CoL^{3+} and 0.1 mol L^{-1} 2-PrOH or formate.	83B029

TABLE 6. Rate constants for cobalt transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.74	**3,10,17,24-Tetrasulfophthalocyaninecobaltate(III) radical anion (reduced ligand)**							
6.74.1	**Oxygen**							
	$[Co(tspc)]^{\cdot 4-} + O_2 \rightarrow$	1.7×10^5	1-3			f.p.	D.k. at 520 nm in soln. contg. $[Co(tspc)]_2^{6-}$, 4.8 and 16×10^{-4} mol L^{-1} O_2 and 0.001-0.1 mol L^{-1} $HClO_4$.	79A090
6.75	**3,10,17,24-Tetrasulfophthalocyaninecobaltate(III) radical anion (oxidized ligand)**							
6.75.1	**2-Propanol**							
	$[Co(tspc)]^{\cdot 2-} + 2\text{-PrOH} \rightarrow$	2.6×10^3	1			f.p.	D.k. at 480 nm in soln. contg. $[Co(tspc)]_2^{6-}$, 0.1-0.6 mol L^{-1} 2-PrOH and 0.1 mol L^{-1} $HClO_4$.	79A090
6.76	**Dibromo(iminodiacetato)cobaltate(III) ion**							
6.76.1	**First-order reaction**							
	$CoIDABr_2^- \rightarrow CoIDA(Br) + Br^-$	9.5×10^3 s^{-1}	7			p.r.	P.b.k. at 270 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} NaBr, CoIDA and 0.001 mol L^{-1} phosphate.	84A284
6.77	**Bromo(iminodiacetato)cobalt(III)**							
6.77.1	**First-order reaction**							
	$CoIDA(Br) \rightarrow CoIDA^+ + Br^-$	5.4×10^2 s^{-1}	7			p.r.	D.k. at 270 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} NaBr, CoIDA and 0.001 mol L^{-1} phosphate.	84A284
6.78	**Hydroxy(iminodiacetato)cobalt(III)**							
6.78.1	**First-order reaction**							
	$CoIDA(OH) \rightarrow CoIDA^+ + OH^-$	1.2×10^4 s^{-1}	7			p.r.	D.k. in N_2O-satd. soln. contg. CoIDA and 0.001 mol L^{-1} phosphate.	84A284
6.79	**Ethylenediaminetetraacetatocobaltate(III) ion, superoxide adduct**							
6.79.1	**Ethylenediaminetetraacetatocobaltate(III) ion, superoxide adduct**							
	$CoEDTA(O_2)^{2-} + CoEDTA(O_2)^{2-} + 2\,H_2O \rightarrow O_2 + H_2O_2 + 2\,OH^- + 2\,CoEDTA^-$	3.4×10^2	9			p.r.	D.k. at 330 nm in O_2-satd. soln. contg. 0.1 mol L^{-1} formate, 5×10^{-5} mol L^{-1} $CoEDTA^-$ and 0.01 mol L^{-1} borate.	84A249
6.80	**Hydrido-*N-rac*-5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecobalt(III) ion**							
6.80.1	**Carbon dioxide radical anion**							
	N-rac-$Co(4,11\text{-dieneN}_4)(H)^{2+} + CO_2^{\cdot -} \rightarrow$	6×10^9			25	p.r.		91A513
6.81	**Hydrido-*prim-N-rac*-5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecobalt(III) ion**							
6.81.1	**2-Hydroxy-2,2-dimethylethyl**							
	prim-N-rac-$Co(4,11\text{-dieneN}_4)(H)^{2+}$ + $^{\cdot}CH_2C(CH_3)_2OH \rightarrow$ *tert*-BuOH + *N-rac*-$Co(4,11\text{-dieneN}_4)^{2+}$	2×10^8			25	p.r.	Estd. from d.k. in soln. contg. 0.5 mol L^{-1} *tert*-BuOH and $H_2PO_4^-$.	91A513
6.82	**Hydroxymethyl(5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)cobalt(III) ion**							
6.82.1	**First-order reaction**							
	$HOCH_2Co(4,11\text{-dieneN}_4)^{2+} \rightarrow$ *N-rac*-$Co(4,11\text{-dieneN}_4)^+ + HCHO + H^+$	0.1 s^{-1}	1-6			p.r.	D.k. in N_2O-satd. soln. contg. (1-10) $\times$ 10^{-4} mol L^{-1} $Co(4,11\text{-dieneN}_4)^{2+}$ and 1 mol L^{-1} MeOH.	78A200

TABLE 6. Rate constants for cobalt transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.83	**1-Hydroxyethyl(5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)cobalt(III) ion**							
6.83.1	**First-order reaction**							
	$HOCH(CH_3)Co(4,11\text{-dieneN}_4)^{2+}$ →	~2×10^3 s^{-1} 100 s^{-1}	1 7			p.r.	D.k. in N_2O-satd. soln. contg. (1-10) × 10^{-4} mol L^{-1} $Co(4,11\text{-dieneN}_4)^{2+}$ and 1 mol L^{-1} EtOH.	78A200
6.84	***5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene(2,2,2-trifluoro-1-hydroxyethyl)cobalt(III) ion***							
6.84.1	**First-order reaction**							
	$HOCH(CF_3)Co(4,11\text{-dieneN}_4)^{2+}$ →	6×10^{-2} s^{-1}	6			p.r.	D.k. in N_2O-satd. soln. contg. (1-10) × 10^{-4} mol L^{-1} $Co(4,11\text{-dieneN}_4)^{2+}$ and 1 mol L^{-1} CF_3CH_2OH.	78A200
6.85	**1,2-Dihydroxyethyl(5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)cobalt(III) ion**							
6.85.1	**First-order reaction**							
	$HOCH_2CHOHCo(4,11\text{-dieneN}_4)^{2+}$ → $HCOCH_2Co(4,11\text{-dieneN}_4)^{2+} + H_2O$	15 s^{-1} 4 s^{-1}	3.5 5.0			p.r.	D.k. in N_2O-satd. soln. contg. (1-10) × 10^{-4} mol L^{-1} $Co(4,11\text{-dieneN}_4)^{2+}$ and 1 mol L^{-1} ethylene glycol. Product decays to $Co(4,11\text{-dieneN}_4)^{3+}$ + CH_3CHO with $k = 1.3 + 1.5 \times 10^5[H^+]$ s^{-1}.	78A200
6.86	**1-Methylethyltetrakis(4-sulfonatophenyl)porphinatocobaltate(III) ion**							
6.86.1	**First-order reaction**							
	$(CH_3)_2CHCoTPPS^{4-}$ → $CoTPPS^{5-}$ + $CH_3CH{=}CH_2 + H^+$	≤3.3×10^{-1} s^{-1} 2.9 s^{-1}	8 13	21		p.r.	D.k. in N_2O-satd. soln. contg. 5×10^{-5} mol L^{-1} $CoTPPS^{4-}$ and 0.02 mol L^{-1} diisopropyl sulfoxide.	83A088
6.87	**Hydroxymethyltetrakis(4-sulfonatophenyl)porphinatocobaltate(III) ion**							
6.87.1	**First-order reaction**							
	$HOCH_2CoTPPS^{4-}$ → $CoTPPS^{5-}$ + HCHO + H^+	3.6×10^2 s^{-1}	8	21		p.r.	D.k. at 565 nm and p.b.k. at 450 and 490 nm in N_2O-satd. soln. contg. 5×10^{-5} mol L^{-1} $CoTPPS^{4-}$ and 1.5 mol L^{-1} MeOH.	83A088
6.88	**1-Hydroxy-1-methylethyltetrakis(4-sulfonatophenyl)porphinatocobaltate(III) ion**							
6.88.1	**First-order reaction**							
	$HO(CH_3)_2CCoTPPS^{4-}$ → $CoTPPS^{5-}$ + $CH_3COCH_3 + H^+$	6.2×10^3 s^{-1}	8	21		p.r.	D.k. at 555 nm and p.b.k. at 450 and 515 nm in N_2O-satd. soln. contg. 5×10^{-5} mol L^{-1} $CoTPPS^{4-}$ and 1.5 mol L^{-1} 2-PrOH.	83A088
6.89	**(Methyl)-3,10,17,24-tetrasulfophthalocyaninecobaltate(III) ion**							
6.89.1	**Water**							
	$CH_3Co(tspc)^{4-} + H_2O$ → $Co(tspc)^{3-} + CH_4 + OH^-$	3.0 s^{-1}	6.1			p.r.	D.k. at 450 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} DMSO and 2×10^{-5} mol L^{-1} $Co(tspc)^{4-}$. Reaction preceded by first-order process, $k = 2.5 \times 10^3$ s^{-1}, suggested to represent radical migration from ligand to metal center.	89A150

TABLE 6. Rate constants for cobalt transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.90	**(2-Hydroxy-2,2-dimethylethyl)-3,10,17,24-tetrasulfophthalocyaninecobaltate(III) ion**							
6.90.1	**First-order reaction**							
	$HOC(CH_3)_2CH_2Co(tspc)^{4-} \rightarrow (CH_3)_2C{=}CH_2Co(tspc)^{3-} + OH^-$	15 s^{-1}	6.1			p.r.	D.k. in N_2O-satd. soln. contg. *tert*-BuOH and Co(tspc)$^{4-}$. Reaction preceded by first-order process, $k = 2 \times 10^3$ s^{-1}, suggested to represent radical migration from ligand to metal center. Reaction followed by first-order process, $k = 4$ s^{-1}, suggested to represent formation of Co(tspc)$^{3-}$ and $(CH_3)_2C{=}CH_2$.	89A150
6.91	**(2-Hydroxy-1-methylpropyl)-3,10,17,24-tetrasulfophthalocyaninecobaltate(III) ion**							
6.91.1	**Water**							
	$CH_3CHOHCH(CH_3)Co(tspc)^{4-} + H_2O \rightarrow Co(tspc)^{3-} + OH^- + CH_3CH{=}CHCH_3$	6 s^{-1}	6.1			p.r.	D.k. in N_2O-satd. soln. contg. 2-butene and Co(tspc)$^{4-}$. Reaction preceded by first-order process, $k = 2.4 \times 10^3$ s^{-1}, suggested to represent radical migration from ligand to metal center.	89A150
6.92	**(2-Hydroxyethyl)-3,10,17,24-tetrasulfophthalocyaninecobaltate(III) ion**							
6.92.1	**First-order reaction**							
	$HOCH_2CH_2Co(tspc)^{4-} \rightarrow Co(tspc)^{3-} + OH^- + H_2C{=}CH_2$	5 s^{-1}	6.1			p.r.	D.k. in N_2O-satd. soln. contg. ethylene and Co(tspc)$^{4-}$. Reaction preceded by first-order process, $k = 1.2 \times 10^3$ s^{-1}, suggested to represent radical migration from ligand to metal center.	89A150
6.93	**(2-Hydroxy-1-methylethyl)-3,10,17,24-tetrasulfophthalocyaninecobaltate(III) ion**							
6.93.1	**First-order reaction**							
	$HOCH_2CH(CH_3)Co(tspc)^{4-} \rightarrow Co(tspc)^{3-} + OH^- + CH_3CH{=}CH_2$	8 s^{-1}	6.1			p.r.	D.k. in N_2O-satd. soln. contg. 2-butene and Co(tspc)$^{4-}$. Reaction preceded by first-order process, $k = 1.0 \times 10^3$ s^{-1}, suggested to represent radical migration from ligand to metal center.	89A150
6.94	**Bromocob(III)alamin**							
6.94.1	**Water**							
	B12-Br + $H_2O \rightarrow$ B12a + Br^-	6.4×10^2 s^{-1}	~4.5	0.01-0.11	22	p.r.	D.k. at 365 or 380 nm in N_2O-satd. soln. contg. cob(II)alamin and 0.01-0.11 mol L^{-1} bromide ion. Reaction preceded by first-order process, $k = -1 \times 10^4$ s^{-1}, suggested to represent loss of Br^- from initially formed dibromine adduct.	79A046

TABLE 6. Rate constants for cobalt transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.95	**Pentaammine(pyridine)cobalt(III) ion, OH adduct**							
6.95.1	**First-order reaction**							
	* $[Co(NH_3)_5pyOH]^{\cdot 3+}$	8.5×10^3 s^{-1}	2.9-7.2			p.r.	D.k. at 330 nm in N_2O-satd. soln. contg. $Co(NH_3)_5py^{3+}$; suggested to represent ligand modification. Followed by another process which is second-order at pH 3 and pH 9 ($k = 1.8 \times 10^5$ and 1.9×10^7 L mol^{-1} s^{-1}, respectively) and first-order but pH-dependent between pH 5.2 ($k = 6.0$ s^{-1}) and pH 7.8 ($k = 125$ s^{-1}); latter process suggested to represent disproportionation of coordinated radical in competition with intramolecular electron transfer ($k = 2.3 \times 10^{-2}$ s^{-1} at pH 3 and 11 s^{-1} at pH 7) or deprotonation by OH^- of coordinated radical ($k = 1.8 \times 10^8$ L mol^{-1} s^{-1}). *For different observations concerning the decay of $[Co(NH_3)_5pyOH]^{\cdot 3+}$ see the following entry.	79A213
6.95.2	**Pentaammine(pyridine)cobalt(III) ion, OH adduct**							
	* $[Co(NH_3)_5pyOH]^{\cdot 3+} + [Co(NH_3)_5pyOH]^{\cdot 3+}$	6.5×10^8	5.9		22	p.r.	D.k. in N_2O-satd. soln. contg. (1-20) $\times 10^{-4}$ mol L^{-1} $Co(NH_3)_5py^{3+}$; followed by two first-order processes, $k = 40$ and 0.3 s^{-1}, respectively. *For different observations concerning the decay of $[Co(NH_3)_5pyOH]^{\cdot 3+}$ see the preceding entry.	76A265
6.95.3	**Oxygen**							
	$[Co(NH_3)_5pyOH]^{\cdot 3+} + O_2 \rightarrow$	4.4×10^8	5.2			p.r.	D.k. at 330 nm in N_2O-satd. soln. contg. $Co(NH_3)_5py^{3+}$.	79A213
6.96	**Pentaammine(nicotinamide)cobalt(III) ion, OH adduct**							
6.96.1	**Pentaammine(nicotinamide)cobalt(III) ion, OH adduct**							
	$[Co(NH_3)_5naOH]^{\cdot 3+} + [Co(NH_3)_5naOH]^{\cdot 3+} \rightarrow$	1.5×10^9	5.9		22	p.r.	D.k. in N_2O-satd. soln. contg. (1-20) $\times 10^{-4}$ mol L^{-1} $Co(NH_3)_5na^{3+}$.	76A265
6.97	**Pentaammine(isonicotinamide)cobalt(III) ion, OH adduct**							
6.97.1	**Pentaammine(isonicotinamide)cobalt(III) ion, OH adduct**							
	$[Co(NH_3)_5isnOH]^{\cdot 3+} + [Co(NH_3)_5isnOH]^{\cdot 3+} \rightarrow$	3.0×10^9	5.9		22	p.r.	D.k. in N_2O-satd. soln. contg. (1-20) $\times 10^{-4}$ mol L^{-1} $Co(NH_3)_5isn^{3+}$.	76A265
6.98	**Tris(2,2'-bipyridine)cobalt(III) ion, OH adduct**							
6.98.1	***Ferricyanide ion***							
	$[Co(bpy)_2(bpyOH)]^{\cdot 3+} + Fe(CN)_6^{3-} \rightarrow$	2.1×10^8	~6			p.r.	D.k. at 370-440 nm in N_2O-satd. soln. contg. (1-2) $\times 10^{-4}$ mol L^{-1} $Co(bpy)_3^{3+}$.	90A015
6.98.2	**Oxygen**							
	$[Co(bpy)_2(bpyOH)]^{\cdot 3+} + O_2 \rightarrow$	5.5×10^5	~6			p.r.	D.k. at 375 and 425 nm in N_2O-satd. soln. contg. 6.0×10^{-4} mol L^{-1} $Co(bpy)_3^{3+}$.	90A015

TABLE 6. Rate constants for cobalt transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.99	**Cobalt(III) ion**							
6.99.1	**Thionine semiquinone, conjugate monoacid**							
	$Co^{3+} + [ThH]^{\cdot+} \rightarrow Co^{2+} + Th^{+} + H^{+}$	3.0×10^9	2.5	0.2		f.p./oq	D.k. of semithionine in soln. contg. Co^{2+} and thionine (OQ).	777315
6.100	**Chlorocobalt(III) ion**							
6.100.1	**2,3,9,10-Tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraenecobalt(II) ion**							
	$CoCl^{2+} + Co(Me_4taeneN_4)^{2+} \rightarrow Co^{2+} + Co(Me_4taeneN_4)Cl^{2+}$	1.5×10^7	0		25	f.p.	D.k. at 540 nm in deaerated soln.	79A016
6.100.2	***N-rac*-5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecobalt(II) ion**							
	$CoCl^{2+} + N\text{-}rac\text{-}Co(4,11\text{-}dieneN_4)^{2+} \rightarrow Co^{2+} + Co(4,11\text{-}dieneN_4)Cl^{2+}$	1.6×10^6	2	0.1	25	f.p.	D.k. at 340 nm in deaerated soln.	79A016
6.100.3	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanecopper(II) ion**							
	$CoCl^{2+} + Cu(aneN_4)^{2+} \rightarrow Co^{2+} + Cu(aneN_4)Cl^{2+}$	4.5×10^3	0		25	f.p.	P.b.k. at 344 nm in soln. contg. 5×10^{-5} mol L^{-1} $Co(NH_3)_5Cl^{2+}$, 0.01-0.9 mol L^{-1} Cl^- and Co^{2+}.	83A271
6.100.4	**Iron(II) ion**							
	$CoCl^{2+} + Fe^{2+} \rightarrow Co^{2+} + FeCl^{2+}$	1.0×10^4	0		25	f.p.	Spectral changes in soln. contg. 5×10^{-5} mol L^{-1} $Co(NH_3)_5Cl^{2+}$, 0.5-0.9 mol L^{-1} Cl^- and Co^{2+}.	83A271
6.100.5	**5,7-Dimethyl-1,4,8,11-tetraazacyclotetradeca-4,7-dienenickel(II) ion**							
	$CoCl^{2+} + Ni(Me_2\text{-}4,7\text{-}dieneN_4)^{2+} \rightarrow Co^{2+} + Ni(Me_2\text{-}4,7\text{-}dieneN_4)Cl^{2+}$	1.2×10^7	0		25	f.p.	P.b.k. at 344 nm in soln. contg. 5×10^{-5} mol L^{-1} $Co(NH_3)_5Cl^{2+}$, 0.01-0.9 mol L^{-1} Cl^- and Co^{2+}.	83A013 83A271
6.100.6	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanenickel(II) ion**							
	$CoCl^{2+} + Ni(aneN_4)^{2+} \rightarrow Co^{2+} + Ni(aneN_4)Cl^{2+}$	5.3×10^7	0		25	f.p.	P.b.k. at 344 nm in soln. contg. 5×10^{-5} mol L^{-1} $Co(NH_3)_5Cl^{2+}$, 0.01-0.9 mol L^{-1} Cl^- and Co^{2+}.	83A271
6.100.7	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienenickel(II) ion**							
	$CoCl^{2+} + Ni(4,11\text{-}dieneN_4)^{2+} \rightarrow Co^{2+} + Ni(4,11\text{-}dieneN_4)Cl^{2+}$	7.9×10^5	0		25	f.p.	P.b.k. at 344 nm in soln. contg. 5×10^{-5} mol L^{-1} $Co(NH_3)_5Cl^{2+}$, 0.01-0.9 mol L^{-1} Cl^- and Co^{2+}.	83A271
6.100.8	**2,3,9,10-Tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraenenickel(II) ion**							
	$CoCl^{2+} + Ni(Me_4taeneN_4)^{2+} \rightarrow Co^{2+} + Ni(Me_4taeneN_4)Cl^{2+}$	1.6×10^5	0		25	f.p.	P.b.k. at 344 nm in soln. contg. 5×10^{-5} mol L^{-1} $Co(NH_3)_5Cl^{2+}$, 0.01-0.9 mol L^{-1} Cl^- and Co^{2+}.	83A271
6.101	**Aqua(methyl)nitrilotriacetatocobaltate(III) ion**							
6.101.1	**Water**							
	$CH_3CoNTA(H_2O)^- + H_2O \rightarrow {}^{\cdot}CH_3 + CoNTA(H_2O)_2^-$	60 s^{-1}	6.2-6.5			p.r.	D.k. at 310 nm in soln. contg. 0.1 mol L^{-1} DMSO, $(0.5\text{-}4) \times 10^{-3}$ mol L^{-1} $CoNTA^-$, 5×10^{-5} mol L^{-1} O_2 or $(0.1\text{-}1) \times 10^{-4}$ mol L^{-1} O_2 and 0.001 mol L^{-1} $CoNTA^-$. k obtained as intercept from plot of k_{obs}^{-1} vs $[O_2]^{-1}$ or $[CoNTA^-]$; $k_r = 1.6 \times 10^8$ L mol^{-1} s^{-1} [88A343].	89A204
6.101.2	**Methyl**							
	$CH_3CoNTA(H_2O)^- + {}^{\cdot}CH_3 + H_2O \rightarrow CoNTA(H_2O)_2^- + C_2H_6$	3.8×10^7				p.r.	D.k. in N_2O-satd. soln. contg. $CoSO_4$, NTA and DMSO.	89A204 88A343

TABLE 6. Rate constants for cobalt transients — Continued

Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.102 Aqua(hydroxymethyl)nitrilotriacetatocobaltate(III) ion							
6.102.1 Water							
$HOCH_2CoNTA(H_2O)^- + H_2O \rightarrow {}^{\cdot}CH_2OH + CoNTA(H_2O)_2^-$	6.9×10^3 s^{-1} 3.9×10^4 s^{-1} 5.5×10^5 s^{-1}	4-7		7 25 55	p.r.	D.k. at 260 nm in N_2O-satd. soln. contg. (1-50) $\times 10^{-4}$ mol L^{-1} CoNTA$^-$ and 0.2-1 mol L^{-1} MeOH; $pK_a = 4.7$. $\Delta H‡ = 66.9$ kJ mol^{-1}, $\Delta S‡ = 68.2$ J K^{-1} mol^{-1}. $k_r = 9.7 \times 10^7$, 2.0×10^8 and 4.1×10^8 L mol^{-1} s^{-1} at 7, 25 and 55 °C respectively. $\Delta H‡ = 20$ kJ mol^{-1}, $\Delta S‡ = -19.2$ J K^{-1} mol^{-1}.	88A343
6.102.2 Hydroxymethyl							
$HOCH_2CoNTA(H_2O)^- + {}^{\cdot}CH_2OH + H_2O \rightarrow CoNTA(H_2O)_2^- + HOCH_2CH_2OH$	5×10^8			25	p.r.	Calcd. from d.k. at 260 nm in N_2O-satd. soln. contg. (1-50) $\times 10^{-4}$ mol L^{-1} CoNTA$^-$ and 0.2-1 mol L^{-1} MeOH.	88A343
6.103 Aqua(1-hydroxyethyl)nitrilotriacetatocobaltate(III) ion							
6.103.1 1-Hydroxyethyl							
$HOCH(CH_3)CoNTA(H_2O)^- + CH_3\dot{C}HOH + H_2O \rightarrow CoNTA(H_2O)_2^-$ + other products	3×10^8			25	p.r.	Calcd. from d.k. at 260 nm in N_2O-satd. soln. contg. (1-50) $\times 10^{-4}$ mol L^{-1} CoNTA$^-$ and 0.2-1 mol L^{-1} EtOH, CH_3CHO and butane-2,3-diol detected as products.	88A343
6.103.2 Water							
$HOCH(CH_3)CoNTA(H_2O)^- + H_2O \rightarrow CH_3\dot{C}HOH + CoNTA(H_2O)_2^-$	1.0×10^5 s^{-1}	4-7		25	p.r.	D.k. at 260 nm in N_2O-satd. soln. contg. (1-50) $\times 10^{-4}$ mol L^{-1} CoNTA$^-$ and 0.2-1 mol L^{-1} EtOH; $pK_a = 3.9$; $k_r = 9.7 \times 10^7$ L mol^{-1} s^{-1}.	88A343
6.104 Aqua(carboxymethyl)nitrilotriacetatocobaltate(III) ion							
6.104.1 First-order reaction							
$O_2CCH_2CoNTA(H_2O)^{2-} \rightarrow$	8.8×10^2 s^{-1}			25	p.r.	D.k. in N_2O-satd. soln. contg. CoNTA$^-$ and acetate. Reaction suggested to represent an isomerization.	88A343
6.104.2 Water							
$O_2CCH_2CoNTA(H_2O)^{2-} + H_2O \rightarrow {}^{\cdot}CH_2CO_2^- + CoNTA(H_2O)_2^-$	$\leq 1 \times 10^3$ s^{-1}	4-7		25	p.r.	D.k. at 260 nm in N_2O-satd. soln. contg. (1-50) $\times 10^{-4}$ mol L^{-1} CoNTA$^-$ and 0.2-1 mol L^{-1} AcOH; $k_r = 1.5 \times 10^7$ L mol^{-1} s^{-1}.	88A343
6.105 Aqua(1-ethoxyethyl)nitrilotriacetatocobaltate(III) ion							
6.105.1 Water							
$C_2H_5OCH(CH_3)CoNTA(H_2O)^- + H_2O \rightarrow CH_3\dot{C}HOC_2H_5 + CoNTA(H_2O)_2^-$	4.0×10^5 s^{-1}	4-7		25	p.r.	D.k. at 260 nm in N_2O-satd. soln. contg. (1-50) $\times 10^{-4}$ mol L^{-1} CoNTA$^-$ and 0.2-1 mol L^{-1} Et_2O; $k_r = 4.9 \times 10^7$ L mol^{-1} s^{-1}.	88A343
6.106 Aqua(1-hydroxy-1-methylethyl)nitrilotriacetatocobaltate(III) ion							
6.106.1 Water							
$HOC(CH_3)_2CoNTA(H_2O)^- + H_2O \rightarrow (CH_3)_2\dot{C}OH + CoNTA(H_2O)_2^-$	3.7×10^4 s^{-1}	4-7		25	p.r.	D.k. at 260 nm in N_2O-satd. soln. contg. (1-50) $\times 10^{-4}$ mol L^{-1} CoNTA$^-$ and 0.2-1 mol L^{-1} 2-PrOH; $pK_a = 4.5$; $k_r = 2.3 \times 10^7$ L mol^{-1} s^{-1}.	88A343

TABLE 6. Rate constants for cobalt transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.106	**Aqua(1-hydroxy-1-methylethyl)nitrilotriacetatocobaltate(III) ion** — Continued							
6.106.2	**1-Hydroxy-1-methylethyl**							
	$HOC(CH_3)_2CoNTA(H_2O)^- + (CH_3)_2\dot{C}OH \rightarrow CoNTA(H_2O)_2^- +$ other products	1.5×10^7	6-8		25	p.r.	Calcd. from d.k. at 260 nm in N_2O-satd. soln. contg. (1-50) $\times 10^{-4}$ mol L^{-1} CoNTA$^-$ and 0.2-1 mol L^{-1} 2-PrOH; acetone detected as product.	88A343
6.107	**Aqua(bromo)nitrilotriacetatocobaltate(III) ion**							
6.107.1	**Water**							
	$CoNTA(Br)(H_2O)^- + H_2O \rightarrow CoNTA(H_2O)_2 + Br^-$	5.6 s^{-1} 610 s^{-1}	4.9 10.4		25	p.r.	D.k. in N_2O-satd. soln. contg. CoNTA$^-$ and Br$^-$.	88A343
6.108	**Aqua(hydroxymethyl)[*N*-(2-hydroxyethyl)-*N*,*N*',*N*'-ethylenediaminetriacetato]cobaltate(III) ion**							
6.108.1	**First-order reaction**							
	$HOCH_2CoHEDTA(H_2O)^- \rightarrow$	1.8×10^{-2} s^{-1} 1.0×10^{-2} s^{-1}	4.1 10.3		25	p.r.	D.k.; pK_a = 9.0.	88A343
6.108.2	**Water**							
	$HOCH_2CoHEDTA(H_2O)^- + H_2O \rightarrow {}^{\cdot}CH_2OH + CoHEDTA(H_2O)^-$	≤60 s^{-1}			25	p.r.	D.k.; $k_r = 1.25 \times 10^7$ L mol^{-1} s^{-1}.	88A343
6.109	***O*-Sulfito(tetraethylenepentamine)cobalt(III) ion**							
6.109.1	**First-order reaction**							
	$Co(tetren)OSO_2^+ + H^+ \rightarrow Co(tetren)(OH)^{2+} + SO_2$	3.1×10^3 s^{-1}			25	f.p.	D.k. at 290 nm in soln. contg. 3.4×10^{-4} mol L^{-1} Co(tetren)SO_3^+ and varied [$HClO_4$]. Reaction also investigated as a function of [MeOH], [CH_3CN] and [DMSO].	88A405
6.110	**Decaammine-μ-peroxidodicobalt(III) ion**							
6.110.1	**Tris(2,2'-bipyridine)ruthenium(III) ion**							
	$[Co(NH_3)_5]_2(O_2)^{4+} + Ru(bpy)_3^{3+} \rightarrow [Co(NH_3)_5]_2(O_2)^{5+} + Ru(bpy)_3^{2+}$	1.3×10^7	0			f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, $[(NH_3)_5Co]_2(O_2)^{5+}$ (OQ) and 1 mol L^{-1} HCl.	81A065
6.111	**μ-Amido-μ-peroxidooctakisamminedicobalt(III) ion**							
6.111.1	**Tris(2,2'-bipyridine)ruthenium(III) ion**							
	$NH_2[Co(NH_3)_4]_2(O_2)^{3+} + Ru(bpy)_3^{3+} \rightarrow NH_2[Co(NH_3)_4]_2(O_2)^{4+} + Ru(bpy)_3^{2+}$	3.4×10^5	0			f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, $NH_2[Co(NH_3)_4]_2(O_2)^{4+}$ (OQ) and 1 mol L^{-1} HCl.	81A065
6.112	**μ-Amido-μ-peroxidotetrakis(ethylenediamine)dicobalt(III) ion**							
6.112.1	**Tris(2,2'-bipyridine)ruthenium(III) ion**							
	$NH_2[Co(en)_2]_2(O_2)^{3+} + Ru(bpy)_3^{3+} \rightarrow NH_2[Co(en)_2]_2(O_2)^{4+} + Ru(bpy)_3^{2+}$	2.5×10^6	0			f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, $NH_2[Co(en)_2]_2(O_2)^{4+}$ (OQ) and 1 mol L^{-1} HCl; $k = 7.6 \times 10^5$ L mol^{-1} s^{-1} detd. by s.f.	81A065
6.113	**μ-Amido-μ-peroxidotetrakis(2,2'-bipyridine)dicobalt(III) ion**							
6.113.1	**Tris(2,2'-bipyridine)ruthenium(III) ion**							
	$NH_2[Co(bpy)_2]_2(O_2)^{3+} + Ru(bpy)_3^{3+} \rightarrow NH_2[Co(bpy)_2]_2(O_2)^{4+} + Ru(bpy)_3^{2+}$	3.0×10^8	0			f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, $NH_2[Co(bpy)_2]_2(O_2)^{4+}$ (OQ) and 1 mol L^{-1} HCl.	81A065

TABLE 6. Rate constants for cobalt transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
6.114	**μ-Amido-μ-peroxidotetrakis(1,10-phenanthroline)dicobalt(III) ion**							
6.114.1	**Tris(2,2'-bipyridine)ruthenium(III) ion**							
	$NH_2[Co(phen)_2]_2(O_2)^{3+} + Ru(bpy)_3^{3+} \rightarrow NH_2[Co(phen)_2]_2(O_2)^{4+} + Ru(bpy)_3^{2+}$	3.6×10^8	0			f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, $NH_2[Co(phen)_2]_2(O_2)^{4+}$ (OQ) and 1 mol L^{-1} HCl.	81A065
6.115	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatocobaltate(III), radical cation**							
6.115.1	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatocobaltate(III), radical cation**							
	$[CoTPPS]^{\cdot 2-} + [CoTPPS]^{\cdot 2-} \rightarrow$	2.1×10^9	7			p.r.	D.k. at 700 nm in N_2O-satd. soln. contg. 0.01 mol L^{-1} KBr.	86S115

TABLE 7. Rate constants for chromium transients

No.	Reaction		k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
7.1	**Chromium(I) ion**								
7.1.1	**First-order reaction**								
	$Cr^{+} \rightarrow$		$\leq 5 \times 10^3$ s^{-1}	3.0-4.3		22	p.r.	D.k. at 350 nm in Ar-satd. soln. contg. Cr(II). Reaction thought to be $Cr^{+} + H_2O$ in competition with $Cr^{+} + H_2O_2$. H_2 detected as product.	741142
7.2	**Chromium(II) ion**								
7.2.1	**Permanganate ion**								
	$Cr^{2+} + MnO_4^{-} \rightarrow$		4×10^9			20	p.r.	D.k. at 545 nm in soln. contg. 10^{-5} mol L^{-1} MnO_4^{-} and $(0.2\text{-}1.9) \times 10^{-3}$ mol L^{-1} Cr^{3+}.	650385
7.2.2	**Hydrogen peroxide**								
	$Cr^{2+} + H_2O_2 \rightarrow CrOH^{2+} + {}^{\bullet}OH$		7.1×10^4		1.0	25	f.p.	D.k. in soln. contg. $\geq 1 \times 10^{-4}$ mol L^{-1} $CrCHCl_2^{2+}$ (or $CrCH_2OCH_3^{2+}$) and $(0.19\text{-}2.58) \times 10^{-3}$ mol L^{-1} H_2O_2; s.f. experiments gave the same value.	83A047
7.2.3	**Oxygen**								
	$Cr^{2+} + O_2 \rightarrow CrO_2^{2+}$		1.6×10^8	2.6-4.3	0.1	25	p.r.	P.b.k at 300 nm in soln. contg. 0.5 mol L^{-1} *tert*-BuOH, $(2 \text{ or } 10) \times 10^{-3}$ mol L^{-1} Cr^{3+} and $(2.6 \text{ or } 13) \times 10^{-4}$ mol L^{-1} O_2.	761134 751063
			1.9×10^8	3.4		25	p.r.	C.k. with 1,4-benzoquinone in soln. contg. O_2, 10^{-2} mol L^{-1} Cr^{3+} and 0.5 mol L^{-1} *tert*-BuOH; assumed $k(Cr^{2+} +$ 1,4-benzoquinone$) = 3.2 \times 10^8$ L mol^{-1} s^{-1}.	761134
			1.6×10^8	1-3			p.r.	P.b.k. at 290 nm in soln. contg. $(1\text{-}40) \times 10^{-3}$ mol L^{-1} Cr^{3+} and $(0.25\text{-}1.25) \times 10^{-3}$ mol L^{-1} O_2.	751215
7.2.4	**9,10-Anthraquinone-2,6-disulfonate ion**								
	$Cr^{2+} + 2,6\text{-}diSO_3AQ^{2-} \rightarrow Cr^{3+} +$ $[2,6\text{-}diSO_3AQ]^{\bullet 3-}$		2.8×10^9	7.0			p.r.	P.b.k. in soln. contg. ~1 mol L^{-1} *tert*-BuOH, 5×10^{-3} mol L^{-1} $Cr(ClO_4)_3$, 5×10^{-5} mol L^{-1} $2,6\text{-}diSO_3AQ^{2-}$ and $\sim 1 \times 10^{-3}$ mol L^{-1} phosphates.	751032
7.2.5	**1,4-Benzoquinone**								
	$Cr^{2+} + Q \rightarrow Cr^{3+} + Q^{\bullet -}$	*	3.2×10^8	3.4	0.1	25	p.r.	P.b.k. at 410 nm in soln. contg. 0.5 mol L^{-1} *tert*-BuOH, 10^{-2} mol L^{-1} Cr^{3+} and $(2.5\text{-}37.5) \times 10^{-5}$ mol L^{-1} Q.	761134
		*	3.5×10^9	7.0			p.r.	P.b.k. in soln. contg. ~1 mol L^{-1} *tert*-BuOH, 5×10^{-3} mol L^{-1} $Cr(ClO_4)_3$, 5×10^{-5} mol L^{-1} Q and $\sim 1 \times 10^{-3}$ mol L^{-1} phosphates.	751032
								* Unexplained discrepancy in these data.	
7.2.6	**Tetranitromethane**								
	$Cr^{2+} + C(NO_2)_4 \rightarrow Cr^{3+} + {}^{\bullet}NO_2 +$ $C(NO_2)_3^{-}$		1.2×10^8	3.4	0.1	25	p.r.	P.b.k. at 350 nm in deaerated soln. contg. ~1 mol L^{-1} *tert*-BuOH, 10^{-2} mol L^{-1} Cr^{3+} and $(3.18\text{-}18.6) \times 10^{-5}$ mol L^{-1} tetranitromethane.	761134

TABLE 7. Rate constants for chromium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
7.3	***trans*-Diaqua-1,4,8,11-tetraazacyclotetradecanechromium(II) ion**							
7.3.1	**1,1'-Dimethyl-4,4'-bipyridinium**							
	trans-Cr(cyclam)$(H_2O)_2^{2+}$ + MV^{2+} → *trans*-Cr(cyclam)$(H_2O)_2^{3+}$ + $MV^{\bullet+}$	4.5×10^5 [Cl^-]	1.3-3	0.05	25	f.p./rq	P.b.k. at 600 nm in soln. contg. *trans*-Cr(cyclam)$(NH_3)_2^{3+}$, $MV^{\bullet+}$ (RQ) and (1-50) × 10^{-3} mol L^{-1} H^+. Reaction preceded by rapid aquation of Cr(cyclam)$(NH_3)_2^{2+}$. Rate proportional to [Cl^-].	90A428
7.3.2	**Benzyl bromide**							
	trans-Cr(cyclam)$(H_2O)_2^{2+}$ + $C_6H_5CH_2Br$ → $BrCr(cyclam)(H_2O)^{2+}$ + $C_6H_5\dot{C}H_2$ + H_2O	9.2×10^3				f.p./rq	Soln. contg. *trans*-Cr(cyclam)$(NH_3)_2^{3+}$ and $MV^{\bullet+}$ (RQ); monitored by reaction of benzyl radical with $MV^{\bullet+}$. Reaction preceded by rapid aquation of Cr(cyclam)$(NH_3)_2^{2+}$.	90A428
7.3.3	***tert*-Butyl hydroperoxide**							
	trans-Cr(cyclam)$(H_2O)_2^{2+}$ + $(CH_3)_3COOH$ → *trans*-Cr(cyclam)$(H_2O)_2^{3+}$ + $^{\bullet}CH_3$ + CH_3COCH_3 + OH^-	1.5×10^5				f.p./rq	Soln. contg. *trans*-Cr(cyclam)$(NH_3)_2^{3+}$ and $MV^{\bullet+}$ (RQ); monitored by reaction of methyl radical with $MV^{\bullet+}$. Reaction preceded by rapid aquation of Cr(cyclam)$(NH_3)_2^{2+}$.	90A428
7.4	**Tris(2,2'-bipyridine)chromium(II) ion**							
7.4.1	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanesilver(II) ion**							
	$Cr(bpy)_3^{2+}$ + $Ag(aneN_4)^{2+}$ → $Cr(bpy)_3^{3+}$ + $Ag(aneN_4)^+$	1.3×10^8	4	0.03		p.r	N_2-satd. soln. contg. alcohol as OH scavenger.	88A334
7.4.2	**Tris(2,2'-bipyridine)silver(II) ion**							
	$Cr(bpy)_3^{2+}$ + $Ag(bpy)_3^{2+}$ → $Cr(bpy)_3^{3+}$ + $Ag(bpy)_3^+$	3.7×10^8	4	0.1		p.r	N_2-satd. soln. contg. alcohol as OH scavenger.	88A334
7.4.3	**Tris(2,2'-bipyridine)cobalt(III) ion**							
	$Cr(bpy)_3^{2+}$ + $Co(bpy)_3^{3+}$ → $Cr(bpy)_3^{3+}$ + $Co(bpy)_3^{2+}$	1.1×10^8	5.8	0.15	23	f.p./rq	D.k. at 560 nm in Ar-satd. soln. contg. $Cr(bpy)_3^{3+}$, EDTA (RQ) or $C_2O_4^{2-}$ (RQ) and $Co(bpy)_3^{3+}$.	88A514
7.4.4	**Tris(1,10-phenanthroline)cobalt(III) ion**							
	$Cr(bpy)_3^{2+}$ + $Co(phen)_3^{3+}$ → $Cr(bpy)_3^{3+}$ + $Co(phen)_3^{2+}$	1.3×10^8	5.8	0.15	23	f.p./rq	D.k. at 560 nm in Ar-satd. soln. contg. $Cr(bpy)_3^{3+}$, EDTA (RQ) or $C_2O_4^{2-}$ (RQ) and $Co(phen)_3^{3+}$.	88A514
7.4.5	**1,4,8,11-Tetraazacyclotetradecanecobalt(III) ion**							
	$Cr(bpy)_3^{2+}$ + $Co(cyclam)^{3+}$ → $Cr(bpy)_3^{3+}$ + $Co(cyclam)^{2+}$	4.4×10^7	~0		25	f.p./rq	D.k. in soln. contg. (0.6-8) × 10^{-4} mol L^{-1} $Co(cyclam)^{3+}$, (0.8-2.5) × 10^{-5} mol L^{-1} $Cr(bpy)_3^{3+}$, $Co(cyclam)^{2+}$ (RQ) and 1.0 mol L^{-1} H_2SO_4.	89A050
7.4.6	**3,10,17,24-Tetrasulfophthalocyaninecobaltate(II) radical cation**							
	$Cr(bpy)_3^{2+}$ + $[Co(tspc)]^{\bullet 3-}$ → $Cr(bpy)_3^{3+}$ + $Co(tspc)^{4-}$	8.2×10^8	2			f.p./rq	P.b.k. at 560 nm in soln. contg. mixed dimer, ≤ 10^{-6} mol L^{-1} $Co(tspc)^{4-}$ (RQ), (5-10) × 10^{-3} mol L^{-1} $Cr(bpy)_3^{3+}$ and 10^{-2} mol L^{-1} $HClO_4$.	79A090
7.4.7	**Iron(III) ion**							
	$Cr(bpy)_3^{2+}$ + Fe^{3+} → $Cr(bpy)_3^{3+}$ + Fe^{2+}	9.2×10^8 9.1×10^8 1.0×10^8	0 1 1	1.0 1.0 0.15	25	f.p./rq	D.k. at 560 nm in Ar-satd. soln. contg. $Cr(bpy)_3^{3+}$, Fe^{2+} (RQ), $HClO_4$ and excess Fe^{3+}.	88A104
		1.0×10^9	0		15	f.p./rq	D.k. in soln. contg. $Cr(bpy)_3^{3+}$, Fe^{2+} (RQ) and 1 mol L^{-1} $HClO_4$.	84E387
7.4.8	**Chloroiron(III) complexes**							
	$Cr(bpy)_3^{2+}$ + $FeCl_x^{(3-x)+}$ → $Cr(bpy)_3^{3+}$ + $FeCl_x^{(2-x)+}$	1.4×10^9	0		15	f.p./rq	D.k. in soln. contg. $Cr(bpy)_3^{3+}$, $FeCl_x^{(2-x)+}$ (RQ) and 1 mol L^{-1} HCl.	84E387

TABLE 7. Rate constants for chromium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
7.4	**Tris(2,2'-bipyridine)chromium(II) ion — Continued**							
7.4.8	**Chloroiron(III) complexes — Continued**							
		1.4×10^9	0	1	~23	f.p./rq	D.k. at 420 nm in soln. contg. $Cr(bpy)_3^{3+}$, 1 mol L^{-1} HCl and $FeCl_x^{(2-x)+}$ (RQ).	81A060
7.4.9	**Sulfatoiron(III) ion**							
	$Cr(bpy)_3^{2+} + FeSO_4^+ \rightarrow Cr(bpy)_3^{3+} + FeSO_4$	7.3×10^8	3	0.2		f.p./rq	D.k. in soln. contg. 5×10^{-5} mol L^{-1} $Cr(bpy)_3^{3+}$ and 2×10^{-3} mol L^{-1} $FeSO_4^+$ (RQ).	767517
7.4.10	**Oxygen**							
	$Cr(bpy)_3^{2+} + O_2 \rightarrow Cr(bpy)_3^{3+} + O_2^{\cdot-}$	6.0×10^5	5.8	0.15	22	f.p./rq	D.k. at 560 nm in soln. contg. (1.0-3.3) $\times 10^{-4}$ mol L^{-1} $Cr(bpy)_3^{3+}$, 0.05 or 0.1 mol L^{-1} oxalate (RQ) or 1.4×10^{-3} mol L^{-1} EDTA (RQ) and varied $[O_2]$.	88A233
7.4.11	**Tetraammine(difluoro)platinum(IV) ion**							
	$Cr(bpy)_3^{2+} + Pt(NH_3)_4F_2^{2+} \rightarrow Cr(bpy)_3^{3+} + Pt(NH_3)_4F_2^+$	4.0×10^5		0.1	20	f.p./rq	Air-satd. soln. contg. $Cr(bpy)_3^{3+}$ and EDTA (RQ).	92A471
7.4.12	**Tris(2,2'-bipyridine)ruthenium(III) ion**							
	$Cr(bpy)_3^{2+} + Ru(bpy)_3^{3+} \rightarrow Cr(bpy)_3^{3+} + Ru(bpy)_3^{2+}$	2.6×10^9	3	0.2		f.p./rq or oq	D.k. in soln. contg. 1×10^{-4} mol L^{-1} $Cr(bpy)_3^{3+}$ (OQ) and 3.3×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$ (RQ).	767517
7.4.13	**Sulfur dioxide**							
	$Cr(bpy)_3^{2+} + SO_2 \rightarrow Cr(bpy)_3^{3+} + SO_2^{\cdot-}$	3.0×10^7	~0		25	f.p./rq	D.k. in soln. contg. (1-5) $\times 10^{-3}$ mol L^{-1} $Co(cyclam)^{2+}$ (RQ), (1-7.5) $\times 10^{-3}$ mol L^{-1} SO_2, $Cr(bpy)_3^{3+}$ and 1.0 mol L^{-1} H_2SO_4; $k = 3.4 \times 10^7$ L mol^{-1} s^{-1} in the presence of 1.0 mol L^{-1} $HClO_4$.	89A050
7.4.14	**Uranyl(VI) ion**							
	$Cr(bpy)_3^{2+} + UO_2^{2+} \rightarrow Cr(bpy)_3^{3+} + UO_2^+$	1.6×10^6	1.7	0.1	25	f.p./rq	D.k. at 560 nm in soln. contg. 5×10^{-5} mol L^{-1} $Cr(bpy)_3^{3+}$, ~5×10^{-6} mol L^{-1} $Cr(bpy)_3^{2+}$, (6-15) $\times 10^{-5}$ mol L^{-1} UO_2^+ (RQ) and (2.5-10) $\times 10^{-4}$ mol L^{-1} UO_2^{2+}; $[H^+] = 0.02$ mol L^{-1}.	88A065
7.4.15	**Tetranitromethane**							
	$Cr(bpy)_3^{2+} + C(NO_2)_4 \rightarrow Cr(bpy)_3^{3+} + C(NO_2)_3^- + {}^{\cdot}NO_2$	~3×10^9	7		22	f.p.		88A233
7.5	**Tris(2,2'-bipyridine)chromium(III), EDTA radical addn. product**							
7.5.1	**Tris(2,2'-bipyridine)chromium(III) ion**							
	$Cr(bpy)_2(bpy\text{-}'EDTA')^+ + Cr(bpy)_3^{3+} \rightarrow Cr(bpy)_2(bpy\text{-}'EDTA')^{2+} + Cr(bpy)_3^{2+}$	1.4×10^9			25	f.p./rq	D.k. at 605 nm in soln. contg. $Cr(bpy)_3^{3+}$ and EDTA (RQ); transient suggested to be ligand addition product (of EDTA radical).	89A289
7.6	**Tris(4,4'-dimethyl-2,2'-bipyridine)chromium(II) ion**							
7.6.1	**Tris(ethylenediamine)cobalt(III) ion**							
	$Cr(4,4'\text{-}Me_2bpy)_3^{2+} + Co(en)_3^{3+} \rightarrow Cr(4,4'\text{-}Me_2bpy)_3^{3+} + Co(en)_3^{2+}$	6.6×10^4	5.8	0.15	23	f.p./rq	D.k. at 560 nm in Ar-satd. soln. contg. $Cr(4,4'\text{-}Me_2bpy)_3^{3+}$, EDTA (RQ) or $C_2O_4^{2-}$ (RQ) and $Co(en)_3^{3+}$.	88A514
7.6.2	**Tris(2,2'-bipyridine)cobalt(III) ion**							
	$Cr(4,4'\text{-}Me_2bpy)_3^{2+} + Co(bpy)_3^{3+} \rightarrow Cr(4,4'\text{-}Me_2bpy)_3^{3+} + Co(bpy)_3^{2+}$	2.8×10^8	5.8	0.15	23	f.p./rq	D.k. at 560 nm in Ar-satd. soln. contg. $Cr(4,4'\text{-}Me_2bpy)_3^{3+}$, EDTA (RQ) or $C_2O_4^{2-}$ (RQ) and $Co(bpy)_3^{3+}$.	88A514

TABLE 7. Rate constants for chromium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
7.6	**Tris(4,4'-dimethyl-2,2'-bipyridine)chromium(II) ion** — Continued							
	7.6.3 Tris(1,10-phenanthroline)cobalt(III) ion							
	$Cr(4,4'\text{-}Me_2bpy)_3^{2+} + Co(phen)_3^{3+} \rightarrow Cr(4,4'\text{-}Me_2bpy)_3^{3+} + Co(phen)_3^{2+}$	3.6×10^8	5.8	0.15	23	f.p./rq	D.k. at 560 nm in Ar-satd. soln. contg. $Cr(4,4'\text{-}Me_2bpy)_3^{3+}$, EDTA (RQ) or $C_2O_4^{2-}$ (RQ) and $Co(phen)_3^{3+}$.	88A514
	7.6.4 1,4,8,11-Tetraazacyclotetradecanecobalt(III) ion							
	$Cr(4,4'\text{-}Me_2bpy)_3^{2+} + Co(cyclam)^{3+} \rightarrow Cr(4,4'\text{-}Me_2bpy)_3^{3+} + Co(cyclam)^{2+}$	$\sim 7 \times 10^8$	~0		25	f.p./rq	D.k. in soln. contg. $(0.6\text{-}8) \times 10^{-4}$ mol L^{-1} $Co(cyclam)^{3+}$, $(0.8\text{-}2.5) \times 10^{-5}$ mol L^{-1} $Cr(4,4'\text{-}Me_2bpy)_3^{3+}$, $Co(cyclam)^{2+}$ (RQ) and 1.0 mol L^{-1} H_2SO_4.	89A050
	7.6.5 Chloroiron(III) complexes							
	$Cr(4,4'\text{-}Me_2bpy)_3^{2+} + FeCl_x^{(3-x)+} \rightarrow Cr(4,4'\text{-}Me_2bpy)_3^{3+} + FeCl_x^{(2-x)+}$	1.1×10^{10}	0	1	~23	f.p./rq	D.k. in soln. contg. $Cr(4,4'\text{-}Me_2bpy)_3^{3+}$, 1 mol L^{-1} HCl and $FeCl_x^{(2-x)+}$ (RQ).	81A060
	7.6.6 Sulfatoiron(III) ion							
	$Cr(4,4'\text{-}Me_2bpy)_3^{2+} + FeSO_4^{+} \rightarrow Cr(4,4'\text{-}Me_2bpy)_3^{3+} + FeSO_4$	7.0×10^8	1.2	0.15	~25	p.r.	D.k. at 420 nm in Ar-satd. soln. contg. $Cr(4,4'\text{-}Me_2bpy)_3^{3+}$, 0.05 mol L^{-1} H_2SO_4, 0.52 mol L^{-1} 2-PrOH and $FeSO_4$.	81A060
	7.6.7 Oxygen							
	$Cr(4,4'\text{-}Me_2bpy)_3^{2+} + O_2 \rightarrow Cr(4,4'\text{-}Me_2bpy)_3^{3+} + O_2^{\cdot -}$	1.4×10^7	5.8	0.15	22	f.p./rq	D.k. at 560 or 480 nm in soln. contg. $(1.0\text{-}1.6) \times 10^{-4}$ mol L^{-1} $Cr(4,4'\text{-}Me_2bpy)_3^{3+}$, 0.05 mol L^{-1} oxalate (RQ) or 1.4×10^{-3} mol L^{-1} EDTA (RQ) and varied $[O_2]$.	88A233
		1.8×10^7	5.8	0.15	22	f.p./rq	D.k. at 560 nm in soln. contg. $(1.0\text{-}1.6) \times 10^{-4}$ mol L^{-1} $Cr(4,4'\text{-}Me_2bpy)_3^{3+}$, 0.01 mol L^{-1} Fe^{2+} (RQ) and varied $[O_2]$.	88A233
	7.6.8 Tetraammine(difluoro)platinum(IV) ion							
	$Cr(4,4'\text{-}Me_2bpy)_3^{2+} + Pt(NH_3)_4F_2^{2+} \rightarrow Cr(4,4'\text{-}Me_2bpy)_3^{3+} + Pt(NH_3)_4F_2^{+}$	1.6×10^6		0.1	20	f.p./rq	Air-satd. soln. contg. $Cr(4,4'\text{-}Me_2bpy)_3^{3+}$ and EDTA (RQ).	92A471
	7.6.9 Uranyl(VI) ion							
	$Cr(4,4'\text{-}Me_2bpy)_3^{2+} + UO_2^{2+} \rightarrow Cr(4,4'\text{-}Me_2bpy)_3^{3+} + UO_2^{+}$	$\sim 1.6 \times 10^7$	2.7	0.1	25	f.p./rq	D.k. at 560 nm in soln. contg. 8×10^{-5} mol L^{-1} $Cr(4,4'\text{-}Me_2bpy)_3^{3+}$, $\sim 8 \times 10^{-6}$ mol L^{-1} $Cr(4,4'\text{-}Me_2bpy)_3^{2+}$, $(1.5\text{-}3) \times 10^{-4}$ mol L^{-1} UO_2^{+} (RQ) and $(0.5\text{-}2.0) \times 10^{-3}$ mol L^{-1} UO_2^{2+}; $[H^+] = 0.002$ mol L^{-1}; k obtained by extrapolation to higher values of the $[UO_2^{+}]/[UO_2^{2+}]$ ratio.	88A065
7.7	**Tris(4,4'-diphenyl-2,2'-bipyridine)chromium(II) ion**							
	7.7.1 Chloroiron(III) complexes							
	$Cr(4,4'\text{-}Ph_2bpy)_3^{2+} + FeCl_x^{(3-x)+} \rightarrow Cr(4,4'\text{-}Ph_2bpy)_3^{3+} + FeCl_x^{(2-x)+}$	1.6×10^9	0	1	~23	f.p./rq	D.k. in soln. contg. $Cr(4,4'\text{-}Ph_2bpy)_3^{3+}$, 1 mol L^{-1} HCl and $FeCl_x^{(2-x)+}$ (RQ).	81A060
7.8	**Tris(1,10-phenanthroline)chromium(II) ion**							
	7.8.1 Tris(2,2'-bipyridine)cobalt(III) ion							
	$Cr(phen)_3^{2+} + Co(bpy)_3^{3+} \rightarrow Cr(phen)_3^{3+} + Co(bpy)_3^{2+}$	2.0×10^8	5.8	0.15	23	f.p./rq	D.k. at 430 nm in Ar-satd. soln. contg. $Cr(phen)_3^{3+}$, EDTA (RQ) or $C_2O_4^{2-}$ (RQ) and $Co(bpy)_3^{3+}$.	88A514
	7.8.2 Tris(1,10-phenanthroline)cobalt(III) ion							
	$Cr(phen)_3^{2+} + Co(phen)_3^{3+} \rightarrow Cr(phen)_3^{3+} + Co(phen)_3^{2+}$	2.0×10^8	5.8	0.15	23	f.p./rq	D.k. at 430 nm in Ar-satd. soln. contg. $Cr(phen)_3^{3+}$, EDTA (RQ) or $C_2O_4^{2-}$ (RQ) and $Co(phen)_3^{3+}$.	88A514

TABLE 7. Rate constants for chromium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
7.8	**Tris(1,10-phenanthroline)chromium(II) ion** — Continued							
7.8.3	**1,4,8,11-Tetraazacyclotetradecanecobalt(III) ion**							
	$Cr(phen)_3^{2+} + Co(cyclam)^{3+} \rightarrow Cr(phen)_3^{3+} + Co(cyclam)^{2+}$	1.3×10^8	~0		25	f.p./rq	D.k. in soln. contg. $(0.6\text{-}8) \times 10^{-4}$ mol L^{-1} $Co(cyclam)^{3+}$, $(0.8\text{-}2.5) \times 10^{-5}$ mol L^{-1} $Cr(phen)_3^{3+}$, $Co(cyclam)^{2+}$ (RQ) and 1.0 mol L^{-1} H_2SO_4.	89A050
7.8.4	**Chloroiron(III) complexes**							
	$Cr(phen)_3^{2+} + FeCl_x^{(3-x)+} \rightarrow Cr(phen)_3^{3+} + FeCl_x^{(2-x)+}$	1.3×10^9	0	1	~23	f.p./rq	D.k. in soln. contg. $Cr(phen)_3^{3+}$, 1 mol L^{-1} HCl and $FeCl_x^{(2-x)+}$ (RQ).	81A060
7.8.5	**Oxygen**							
	$Cr(phen)_3^{2+} + O_2 \rightarrow Cr(phen)_3^{3+} + O_2^{\cdot-}$	1.5×10^6	5.8	0.15	22	f.p./rq	D.k. at 430, 450 or 690 nm in soln. contg. $(1.0\text{-}3.3) \times 10^{-4}$ mol L^{-1} $Cr(phen)_3^{3+}$, 0.05 or 0.1 mol L^{-1} oxalate (RQ) or 1.4×10^{-3} mol L^{-1} EDTA (RQ) and varied $[O_2]$.	88A233
7.8.6	**Sulfur dioxide**							
	$Cr(phen)_3^{2+} + SO_2 \rightarrow Cr(phen)_3^{3+} + SO_2^{\cdot-}$	9.5×10^7	~0		25	f.p./rq	D.k. in soln. contg. $(1\text{-}5) \times 10^{-3}$ mol L^{-1} $Co(cyclam)^{2+}$ (RQ), $(1\text{-}2.5) \times 10^{-3}$ mol L^{-1} SO_2, $Cr(phen)_3^{3+}$ and 1.0 mol L^{-1} H_2SO_4.	89A050
7.8.7	**Uranyl(VI) ion**							
	$Cr(phen)_3^{2+} + UO_2^{2+} \rightarrow Cr(phen)_3^{3+} + UO_2^{+}$	2.4×10^6	2.7	0.1	25	f.p./rq	D.k. at 430 nm in soln. contg. 8×10^{-5} mol L^{-1} $Cr(phen)_3^{3+}$, $\sim 8 \times 10^{-6}$ mol L^{-1} $Cr(phen)_3^{2+}$, 1.5×10^{-4} mol L^{-1} UO_2^{+} (RQ) and $1\text{-}2 \times 10^{-3}$ mol L^{-1} UO_2^{2+}; $[H^+] = 0.002$ mol L^{-1}.	88A065
7.9	**Tris(1,10-phenanthroline)chromium(III), EDTA radical addn. product**							
7.9.1	**Tris(1,10-phenanthroline)chromium(III) ion**							
	$Cr(phen)_2(phen\text{-}'EDTA')^{+} + Cr(phen)_3^{3+} \rightarrow Cr(phen)_2(phen\text{-}'EDTA')^{2+} + Cr(phen)_3^{2+}$	1.7×10^9			25	f.p./rq	D.k. at 605 nm in soln. contg. $Cr(phen)_3^{3+}$ and EDTA (RQ); transient suggested to be ligand addition product (of EDTA radical).	89A289
7.10	**Tris(1,10-phenanthroline)chromium(III), carboxyl radical addn. product**							
7.10.1	**Tris(1,10-phenanthroline)chromium(III) ion**							
	$Cr(phen)_2(phen\text{-}CO_2)^{2+} + Cr(phen)_3^{3+} \rightarrow Cr(phen)_2(phen\text{-}CO_2)^{3+} + Cr(phen)_3^{2+}$	8.2×10^8			25	f.p./rq	D.k. at 605 nm in soln. contg. $Cr(phen)_3^{3+}$ and $C_2O_4^{2-}$ (RQ); transient suggested to be ligand addition product (of $^{\cdot}CO_2^{-}$ radical).	89A289
7.11	**Tris(5-chloro-1,10-phenanthroline)chromium(II) ion**							
7.11.1	**Tris(2,2'-bipyridine)cobalt(III) ion**							
	$Cr(5\text{-}Clphen)_3^{2+} + Co(bpy)_3^{3+} \rightarrow Cr(5\text{-}Clphen)_3^{3+} + Co(bpy)_3^{2+}$	1.2×10^8	5.8	0.15	23	f.p./rq	D.k. at 440 nm in Ar-satd. soln. contg. $Cr(5\text{-}Clphen)_3^{3+}$, EDTA (RQ) or $C_2O_4^{2-}$ (RQ) and $Co(bpy)_3^{3+}$.	88A514
7.11.2	**Tris(1,10-phenanthroline)cobalt(III) ion**							
	$Cr(5\text{-}Clphen)_3^{2+} + Co(phen)_3^{3+} \rightarrow Cr(5\text{-}Clphen)_3^{3+} + Co(phen)_3^{2+}$	1.6×10^8	5.8	0.15	23	f.p./rq	D.k. at 440 nm in Ar-satd. soln. contg. $Cr(5\text{-}Clphen)_3^{3+}$, EDTA (RQ) or $C_2O_4^{2-}$ (RQ) and $Co(phen)_3^{3+}$.	88A514
7.11.3	**1,4,8,11-Tetraazacyclotetradecanecobalt(III) ion**							
	$Cr(5\text{-}Clphen)_3^{2+} + Co(cyclam)^{3+} \rightarrow Cr(5\text{-}Clphen)_3^{3+} + Co(cyclam)^{2+}$	1.7×10^7	~0		25	f.p./rq	D.k. in soln. contg. $(0.6\text{-}8) \times 10^{-4}$ mol L^{-1} $Co(cyclam)^{3+}$, $(0.8\text{-}2.5) \times 10^{-5}$ mol L^{-1} $Cr(5\text{-}Clphen)_3^{3+}$, $Co(cyclam)^{2+}$ (RQ) and 1.0 mol L^{-1} H_2SO_4.	89A050

TABLE 7. Rate constants for chromium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
7.11	**Tris(5-chloro-1,10-phenanthroline)chromium(II) ion** — Continued							
7.11.4	**Chloroiron(III) complexes**							
	$Cr(5\text{-}Clphen)_3^{2+} + FeCl_x^{(3-x)+} \rightarrow Cr(5\text{-}Clphen)_3^{3+} + FeCl_x^{(2-x)+}$	6.1×10^8	0	1	~23	f.p./rq	D.k. in soln. contg. $Cr(5\text{-}Clphen)_3^{3+}$, 1 mol L^{-1} HCl and $FeCl_x^{(2-x)+}$ (RQ).	81A060
7.11.5	**Oxygen**							
	$Cr(5\text{-}Clphen)_3^{2+} + O_2 \rightarrow Cr(5\text{-}Clphen)_3^{3+} + O_2^{\bullet-}$	2.5×10^5	5.8	0.15	22	f.p./rq	D.k. at 440 nm in soln. contg. (1.0-1.6) $\times 10^{-4}$ mol L^{-1} $Cr(5\text{-}Clphen)_3^{3+}$, 0.05 mol L^{-1} oxalate (RQ) and varied $[O_2]$.	88A233
7.11.6	**Tetraammine(difluoro)platinum(IV) ion**							
	$Cr(5\text{-}Clphen)_3^{2+} + Pt(NH_3)_4F_2^{2+} \rightarrow Cr(5\text{-}Clphen)_3^{3+} + Pt(NH_3)_4F_2^{+}$	1.1×10^5		0.1	20	f.p./rq	Air-satd. soln. contg. $Cr(5\text{-}Clphen)_3^{3+}$ and EDTA (RQ).	92A471
7.11.7	**Sulfur dioxide**							
	$Cr(5\text{-}Clphen)_3^{2+} + SO_2 \rightarrow Cr(5\text{-}Clphen)_3^{3+} + SO_2^{\bullet-}$	6.8×10^6	~0		25	f.p./rq	D.k. in soln. contg. $(1\text{-}5) \times 10^{-3}$ mol L^{-1} Co(cyclam)$^{2+}$ (RQ), $(1\text{-}11) \times 10^{-3}$ mol L^{-1} SO_2, $Cr(5\text{-}Clphen)_3^{3+}$ and 1.0 mol L^{-1} H_2SO_4.	89A050
7.11.8	**Uranyl(VI) ion**							
	$Cr(5\text{-}Clphen)_3^{2+} + UO_2^{2+} \rightarrow Cr(5\text{-}Clphen)_3^{3+} + UO_2^{+}$	5.4×10^5	2.7	0.1	25	f.p./rq	D.k. at 440 nm in soln. contg. 8×10^{-5} mol L^{-1} $Cr(5\text{-}Clphen)_3^{3+}$, $\sim 8 \times 10^{-6}$ mol L^{-1} $Cr(5\text{-}Clphen)_3^{2+}$, 1.5×10^{-4} mol L^{-1} UO_2^{+} (RQ) and $1\text{-}2 \times 10^{-3}$ mol L^{-1} UO_2^{2+}; $[H^+] = 0.002$ mol L^{-1}.	88A065
7.12	**Tris(5-chloro-1,10-phenanthroline)chromium(III), EDTA radical addn. product**							
7.12.1	**Tris(5-chloro-1,10-phenanthroline)chromium(III) ion**							
	$Cr(5\text{-}Clphen)_2(5\text{-}Clphen\text{-}'EDTA')^{+} + Cr(5\text{-}Clphen)_3^{3+} \rightarrow Cr(5\text{-}Clphen)_2(5\text{-}Clphen\text{-}'EDTA')^{2+} + Cr(5\text{-}Clphen)_3^{2+}$	1.4×10^9			25	f.p./rq	D.k. at 605 nm in soln. contg. $Cr(5\text{-}Clphen)_3^{3+}$ and EDTA (RQ); transient suggested to be ligand addition product (of EDTA radical).	89A289
7.13	**Tris(5-chloro-1,10-phenanthroline)chromium(III), carboxyl radical addn. product**							
7.13.1	**Tris(5-chloro-1,10-phenanthroline)chromium(III) ion**							
	$Cr(5\text{-}Clphen)_2(5\text{-}Clphen\text{-}CO_2)^{2+} + Cr(5\text{-}Clphen)_3^{3+} \rightarrow Cr(5\text{-}Clphen)_2(5\text{-}Clphen\text{-}CO_2)^{3+} + Cr(5\text{-}Clphen)_3^{2+}$	1.1×10^9			25	f.p./rq	D.k. at 605 nm in soln. contg. $Cr(5\text{-}Clphen)_3^{3+}$ and $C_2O_4^{2-}$ (RQ); transient suggested to be ligand addition product (of $^{\bullet}CO_2^{-}$ radical).	89A289
7.14	**Tris(5-bromo-1,10-phenanthroline)chromium(II) ion**							
7.14.1	**Chloroiron(III) complexes**							
	$Cr(5\text{-}Brphen)_3^{2+} + FeCl_x^{(3-x)+} \rightarrow Cr(5\text{-}Brphen)_3^{3+} + FeCl_x^{(2-x)+}$	1.4×10^9	0	1	~23	f.p./rq	D.k. in soln. contg. $Cr(5\text{-}Brphen)_3^{3+}$, 1 mol L^{-1} HCl and $FeCl_x^{(2-x)+}$ (RQ).	81A060
7.15	**Tris(5-methyl-1,10-phenanthroline)chromium(II) ion**							
7.15.1	**Tris(ethylenediamine)cobalt(III) ion**							
	$Cr(5\text{-}Mephen)_3^{2+} + Co(en)_3^{3+} \rightarrow Cr(5\text{-}Mephen)_3^{3+} + Co(en)_3^{2+}$	1.6×10^4	5.8	0.15	23	f.p./rq	D.k. at 480 or 685 nm in Ar-satd. soln. contg. $Cr(5\text{-}Mephen)_3^{3+}$, EDTA (RQ) or $C_2O_4^{2-}$ (RQ) and $Co(en)_3^{3+}$.	88A514
7.15.2	**1,4,8,11-Tetraazacyclotetradecanecobalt(III) ion**							
	$Cr(5\text{-}Mephen)_3^{2+} + Co(cyclam)^{3+} \rightarrow Cr(5\text{-}Mephen)_3^{3+} + Co(cyclam)^{2+}$	1.1×10^7	~0		25	f.p./rq	D.k. in soln. contg. $(0.6\text{-}8) \times 10^{-4}$ mol L^{-1} Co(cyclam)$^{3+}$, $(0.8\text{-}2.5) \times 10^{-5}$ mol L^{-1} $Cr(5\text{-}Mephen)_3^{3+}$, Co(cyclam)$^{2+}$ (RQ) and 1.0 mol L^{-1} H_2SO_4.	89A050
7.15.3	**Chloroiron(III) complexes**							
	$Cr(5\text{-}Mephen)_3^{2+} + FeCl_x^{(3-x)+} \rightarrow Cr(5\text{-}Mephen)_3^{3+} + FeCl_x^{(2-x)+}$	2.0×10^9	0	1	~23	f.p./rq	D.k. in soln. contg. $Cr(5\text{-}Mephen)_3^{3+}$, 1 mol L^{-1} HCl and $FeCl_x^{(2-x)+}$ (RQ).	81A060

TABLE 7. Rate constants for chromium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
7.15	**Tris(5-methyl-1,10-phenanthroline)chromium(II) ion — Continued**							
7.15.4	**Oxygen**							
	$Cr(5\text{-Mephen})_3^{2+} + O_2 \rightarrow Cr(5\text{-Mephen})_3^{3+} + O_2^{\cdot-}$	2.2×10^6	5.8	0.15	22	f.p./rq	D.k. at 480 nm in soln. contg. (1.0-1.6) $\times 10^{-4}$ mol L^{-1} $Cr(5\text{-Mephen})_3^{3+}$, 0.05 mol L^{-1} oxalate (RQ) and varied $[O_2]$.	88A233
7.15.5	**Sulfur dioxide**							
	$Cr(5\text{-Mephen})_3^{2+} + SO_2 \rightarrow Cr(5\text{-Mephen})_3^{3+} + SO_2^{\cdot-}$	1.7×10^8	~0		25	f.p./rq	D.k. in soln. contg. (1-5) $\times 10^{-3}$ mol L^{-1} $Co(cyclam)^{2+}$ (RQ), SO_2, $Cr(5\text{-Mephen})_3^{3+}$ and 1.0 mol L^{-1} H_2SO_4.	89A050
7.16	**Tris(4,7-dimethyl-1,10-phenanthroline)chromium(II) ion**							
7.16.1	**Tris(ethylenediamine)cobalt(III) ion**							
	$Cr(4,7\text{-Me}_2\text{phen})_3^{2+} + Co(en)_3^{3+} \rightarrow Cr(4,7\text{-Me}_2\text{phen})_3^{3+} + Co(en)_3^{2+}$	1.1×10^5	5.8	0.15	23	f.p./rq	D.k. at 440 nm in Ar-satd. soln. contg. $Cr(4,7\text{-Me}_2\text{phen})_3^{3+}$, EDTA (RQ) or $C_2O_4^{2-}$ (RQ) and $Co(en)_3^{3+}$.	88A514
7.16.2	**Tris(2,2'-bipyridine)cobalt(III) ion**							
	$Cr(4,7\text{-Me}_2\text{phen})_3^{2+} + Co(bpy)_3^{3+} \rightarrow Cr(4,7\text{-Me}_2\text{phen})_3^{3+} + Co(bpy)_3^{2+}$	3.5×10^8	5.8	0.15	23	f.p./rq	D.k. at 440 nm in Ar-satd. soln. contg. $Cr(4,7\text{-Me}_2\text{phen})_3^{3+}$, EDTA (RQ) or $C_2O_4^{2-}$ (RQ) and $Co(bpy)_3^{3+}$.	88A514
7.16.3	**Tris(1,10-phenanthroline)cobalt(III) ion**							
	$Cr(4,7\text{-Me}_2\text{phen})_3^{2+} + Co(phen)_3^{3+} \rightarrow Cr(4,7\text{-Me}_2\text{phen})_3^{3+} + Co(phen)_3^{2+}$	4.1×10^8	5.8	0.15	23	f.p./rq	D.k. at 440 nm in Ar-satd. soln. contg. $Cr(4,7\text{-Me}_2\text{phen})_3^{3+}$, EDTA (RQ) or $C_2O_4^{2-}$ (RQ) and $Co(phen)_3^{3+}$.	88A514
7.16.4	**1,4,8,11-Tetraazacyclotetradecanecobalt(III) ion**							
	$Cr(4,7\text{-Me}_2\text{phen})_3^{2+} + Co(cyclam)^{3+} \rightarrow Cr(4,7\text{-Me}_2\text{phen})_3^{3+} + Co(cyclam)^{2+}$	$\sim 7 \times 10^8$	~0		25	f.p./rq	D.k. in soln. contg. (0.6-8) $\times 10^{-4}$ mol L^{-1} $Co(cyclam)^{3+}$, (0.8-2.5) $\times 10^{-5}$ mol L^{-1} $Cr(4,7\text{-Me}_2\text{phen})_3^{3+}$, $Co(cyclam)^{2+}$ (RQ) and 1.0 mol L^{-1} H_2SO_4.	89A050
7.16.5	**Sulfatoiron(III) ion**							
	$Cr(4,7\text{-Me}_2\text{phen})_3^{2+} + FeSO_4^{+} \rightarrow Cr(4,7\text{-Me}_2\text{phen})_3^{3+} + FeSO_4$	7.1×10^8	1.2	0.15	~25	p.r.	D.k. at 420 nm in Ar-satd. soln. contg. $Cr(4,7\text{-Me}_2\text{phen})_3^{3+}$, 0.05 mol L^{-1} H_2SO_4, 0.52 mol L^{-1} 2-PrOH and $FeSO_4$; $k = 7 \times 10^9$ L mol^{-1} s^{-1} interpolated from quenching rate plot.	81A060
7.16.6	**Oxygen**							
	$Cr(4,7\text{-Me}_2\text{phen})_3^{2+} + O_2 \rightarrow Cr(4,7\text{-Me}_2\text{phen})_3^{3+} + O_2^{\cdot-}$	2.5×10^7	5.8	0.15	22	f.p./rq	D.k. at 430 nm in soln. contg. (1.0-1.6) $\times 10^{-4}$ mol L^{-1} $Cr(4,7\text{-Me}_2\text{phen})_3^{3+}$, 0.05 mol L^{-1} oxalate (RQ) or 1.4×10^{-3} mol L^{-1} EDTA (RQ) and varied $[O_2]$.	88A233
7.17	**Tris(5,6-dimethyl-1,10-phenanthroline)chromium(II) ion**							
7.17.1	**1,4,8,11-Tetraazacyclotetradecanecobalt(III) ion**							
	$Cr(5,6\text{-Me}_2\text{phen})_3^{2+} + Co(cyclam)^{3+} \rightarrow Cr(5,6\text{-Me}_2\text{phen})_3^{3+} + Co(cyclam)^{2+}$	1.6×10^7	~0		25	f.p./rq	D.k. in soln. contg. (0.6-8) $\times 10^{-4}$ mol L^{-1} $Co(cyclam)^{3+}$, (0.8-2.5) $\times 10^{-5}$ mol L^{-1} $Cr(5,6\text{-Me}_2\text{phen})_3^{3+}$, $Co(cyclam)^{2+}$ (RQ) and 1.0 mol L^{-1} H_2SO_4.	89A050
7.17.2	**Chloroiron(III) complexes**							
	$Cr(5,6\text{-Me}_2\text{phen})_3^{2+} + FeCl_x^{(3-x)+} \rightarrow Cr(5,6\text{-Me}_2\text{phen})_3^{3+} + FeCl_x^{(2-x)+}$	2.7×10^9	0	1	~23	f.p./rq	D.k. in soln. contg. $Cr(5,6\text{-Me}_2\text{phen})_3^{3+}$, 1 mol L^{-1} HCl and $FeCl_x^{(2-x)+}$ (RQ).	81A060
7.17.3	**Sulfatoiron(III) ion**							
	$Cr(5,6\text{-Me}_2\text{phen})_3^{2+} + FeSO_4^{+} \rightarrow Cr(5,6\text{-Me}_2\text{phen})_3^{3+} + FeSO_4$	4.8×10^8	1.2	0.15	~25	p.r.	D.k. at 420 nm in Ar-satd. soln. contg. $Cr(5,6\text{-Me}_2\text{phen})_3^{3+}$, 0.05 mol L^{-1} H_2SO_4, 0.52 mol L^{-1} 2-PrOH and $FeSO_4$.	81A060

TABLE 7. Rate constants for chromium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
7.17	**Tris(5,6-dimethyl-1,10-phenanthroline)chromium(II) ion — Continued**							
7.17.4	**Sulfur dioxide**							
	$Cr(5,6\text{-}Me_2phen)_3^{2+} + SO_2 \rightarrow Cr(5,6\text{-}Me_2phen)_3^{3+} + SO_2^{\bullet-}$	2.8×10^8	~0		25	f.p./rq	D.k. in soln. contg. (1-5) × 10^{-3} mol L^{-1} Co(cyclam)$^{2+}$ (RQ), SO_2, $Cr(5,6\text{-}Me_2phen)_3^{3+}$ and 1.0 mol L^{-1} H_2SO_4.	89A050
7.18	**Tris(5-phenyl-1,10-phenanthroline)chromium(II) ion**							
7.18.1	**Chloroiron(III) complexes**							
	$Cr(5\text{-}Phphen)_3^{2+} + FeCl_x^{(3-x)+} \rightarrow Cr(5\text{-}Phphen)_3^{3+} + FeCl_x^{(2-x)+}$	~1.9×10^9	0	1	~23	f.p./rq	D.k. in soln. contg. $Cr(5\text{-}Phphen)_3^{3+}$, 1 mol L^{-1} HCl and $FeCl_x^{(2-x)+}$ (RQ).	81A060
7.19	**Tris(4,7-diphenyl-1,10-phenanthroline)chromium(II) ion**							
7.19.1	**Chloroiron(III) complexes**							
	$Cr(4,7\text{-}Ph_2phen)_3^{2+} + FeCl_x^{(3-x)+} \rightarrow Cr(4,7\text{-}Ph_2phen)_3^{3+} + FeCl_x^{(2-x)+}$	1.4×10^9	0	1	~23	f.p./rq	D.k. at 420 nm in soln. contg. $Cr(4,7\text{-}Ph_2phen)_3^{3+}$, 1 mol L^{-1} HCl and $FeCl_x^{(2-x)+}$ (RQ).	81A060
7.20	**Bis(2,2'-bipyridine(oxalato)chromate(II)**							
7.20.1	**First-order reaction**							
	$Cr(bpy)_2(C_2O_4) \rightarrow$	8.9×10^3 s^{-1}			23	p.r.	D.k. in soln. contg. 10^{-3} mol L^{-1} $Cr(bpy)_2(C_2O_4)^+$ and 0.1 mol L^{-1} *tert*-BuOH; reaction involves ligand loss.	87A309
7.21	**2,2'-Bipyridinebis(oxalato)chromate(II) ion**							
7.21.1	**First-order reaction**							
	$Cr(bpy)(C_2O_4)_2^{2-} \rightarrow$	7.4×10^4 s^{-1}			23	p.r.	D.k. in soln. contg. 10^{-3} mol L^{-1} $Cr(bpy)(C_2O_4)_2^-$ and 0.1 mol L^{-1} *tert*-BuOH; reaction involves ligand loss.	87A309
7.22	**Bis(1,10-phenanthroline)(oxalato)chromate(II)**							
7.22.1	**First-order reaction**							
	$Cr(phen)_2(C_2O_4) \rightarrow$	9.8×10^3 s^{-1}			23	p.r.	D.k. in soln. contg. 10^{-3} mol L^{-1} $Cr(phen)_2(C_2O_4)^+$ and 0.1 mol L^{-1} *tert*-BuOH; reaction involves ligand loss.	87A309
7.23	**Bis(oxalato)phenanthrolinechromate(II) ion**							
7.23.1	**First-order reaction**							
	$Cr(phen)(C_2O_4)_2^{2-} \rightarrow$	8.0×10^4 s^{-1}			23	p.r.	D.k. in soln. contg. 10^{-3} mol L^{-1} $Cr(phen)(C_2O_4)_2^-$ and 0.1 mol L^{-1} *tert*-BuOH; reaction involves ligand loss.	87A309
7.24	**Tris(acetylacetonato)chromate(II) ion**							
7.24.1	**First-order reaction**							
	$Cr(acac)_3^- \rightarrow Cr(acac)_2 + acac^-$	>2×10^5 s^{-1}	<5		25	p.r.	Condy. change in He-satd. soln. contg. (2-5) × 10^{-4} mol L^{-1} $Cr(acac)_3$ and 0.1 mol L^{-1} *tert*-BuOH.	79A297
7.25	**Bis(acetylacetonato)chromate(II)**							
7.25.1	**Hydrogen ion**							
	$Cr(acac)_2 + H^+ \rightarrow Cr(acac)^+ + acacH$	4×10^7	3.2-5		25	p.r.	Condy. change in He-satd. soln. contg. (2-5) × 10^{-4} mol L^{-1} $Cr(acac)_3$ and 0.1 mol L^{-1} *tert*-BuOH.	79A297

TABLE 7. Rate constants for chromium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
7.25	**Bis(acetylacetonato)chromate(II)** — Continued							
7.25.2	**First-order reaction**							
	$Cr(acac)_2 \rightarrow Cr(acac)^+ + acac^-$	3×10^3 s^{-1}	3.2-5		25	p.r.	Condy. change in He-satd. soln. contg. (2-5) $\times 10^{-4}$ mol L^{-1} $Cr(acac)_3$ and 0.1 mol L^{-1} *tert*-BuOH; $k_r = 1.6 \times 10^9$ L mol^{-1} s^{-1}.	79A297
7.26	**Acetonylacetonatochromium(II) ion**							
7.26.1	**Hydrogen ion**							
	$Cr(acac)^+ + H^+ \rightarrow Cr^{2+} + acacH$	4×10^6	3.2-5		25	p.r.	Condy. change in He-satd. soln. contg. (2-5) $\times 10^{-4}$ mol L^{-1} $Cr(acac)_3$ and 0.1 mol L^{-1} *tert*-BuOH.	79A297
7.26.2	**First-order reaction**							
	$Cr(acac)^+ \rightarrow Cr^{2+} + acac^-$	3×10^2 s^{-1}	3.2-5		25	p.r.	Condy. change in He-satd. soln. contg. (2-5) $\times 10^{-4}$ mol L^{-1} $Cr(acac)_3$ and 0.1 mol L^{-1} *tert*-BuOH; $k_r = 2.7 \times 10^8$ L mol^{-1} s^{-1}.	79A297
7.27	**Hydridochromium(III) ion**							
7.27.1	**Hydrogen ion**							
	$CrH^{2+} + H^+ \rightarrow Cr^{3+} + H_2$	1.9×10^4	1, 2			p.r.	D.k. in soln. contg. (2-10) $\times 10^{-4}$ mol L^{-1} Cr^{2+} and 0.1 mol L^{-1} isobutyric acid.	82A315
		1.0×10^4 3.2×10^3	0.7-2	0.2 $\rightarrow$0	26	f.p./pi	D.k. at 330, 380 and 420 nm in soln. contg. 10^{-1} mol L^{-1} $Cr(ClO_4)_2$ and 0.01-0.2 mol L^{-1} H^+; $k_H/k_D = 4.8$; $\Delta H^{\ddagger} = 26.4$ kJ mol^{-1}; $\Delta S^{\ddagger} = -79.9$ J mol^{-1} K^{-1}; studied at 14.4-48.1 °C.	81A337
		1.8×10^4	0-2	var	22	p.r.	D.k. in Ar-satd. soln. contg. (1-20) $\times 10^{-4}$ mol L^{-1} Cr^{2+}; $k < 1$ s^{-1} for $CrH^{2+} + H_2O$.	741142
7.27a	**Hydroxymethylchromium(III) ion**							
7.27a.1	**Water**							
	$CrCH_2OH^{2+} + H_2O \rightarrow Cr^{3+} + MeOH + OH^-$	0.20 s^{-1}	5.65			p.r.	D.k. in N_2O-satd. soln. contg. 2×10^{-4} mol L^{-1} Cr^{2+}, 0.1 mol L^{-1} MeOH and 0.009 mol L^{-1} acetate buffer; k depends on pH and [acetate].	84A036
7.28	**Dihydroxymethylchromium(III) ion**							
7.28.1	**First-order reaction**							
	$CrCH(OH)_2^{2+} \rightarrow H_2O + CrCHO^{2+}$	1.0×10^2 s^{-1}	2.8-6			p.r.	D.k. and p.b.k. in N_2O-satd. soln. contg. Cr(II) and formaldehyde; product suggested to react with formaldehyde giving CO and MeOH, $k \sim 1$ L mol^{-1} s^{-1}.	85A084
7.28a	**1-Hydroxyethylchromium(III) ion**							
7.28a.1	**Water**							
	$CrCHOHCH_3^{2+} + H_2O \rightarrow Cr^{3+} + EtOH + OH^-$	0.72 s^{-1}	4.95			p.r.	D.k. in N_2O-satd. soln. contg. 5×10^{-4} mol L^{-1} Cr^{2+}, 0.1 mol L^{-1} EtOH and 0.009 mol L^{-1} acetate buffer; k depends on pH and [acetate].	84A036

TABLE 7. Rate constants for chromium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
7.29	**2-Hydroxyethylchromium(III) ion**							
7.29.1	**Hydrogen ion**							
	$CrCH_2CH_2OH^{2+} + H^+ \rightarrow Cr^{3+} + H_2O + H_2C{=}CH_2$	1.4×10^4				p.r.	D.k. at 300 nm in soln. contg. Cr^{2+} and satd. with ethylene/N_2O. For reaction with H_2O, $k = 2$ s^{-1}.	91A477
		1.4×10^4	2.5-4	0.05	24	f.p./pi	D.k. at 390 nm in soln. contg. 5.0×10^{-4} mol L^{-1} Cr^{2+}, 2.0×10^{-2} mol L^{-1} N_2O, 8.8×10^{-4} mol L^{-1} ethylene and $(1.0\text{-}30) \times 10^{-4}$ mol L^{-1} $HClO_4$; studied at 13.2-42.6 °C.; $\Delta H‡ = 66.1$ kJ mol^{-1}; $\Delta S‡ = 57.7$ J mol^{-1} K^{-1}	82A030
		1.5×10^4	2-3	0.01	25	f.p.	D.k. at 390 nm in soln. contg. $\sim 1 \times 10^{-3}$ mol L^{-1} Cr^{2+}, $\sim 2 \times 10^{-5}$ mol L^{-1} $HOCH_2CH_2Co(dmgBF_2)_2py$ and $(1.0\text{-}10) \times 10^{-3}$ mol L^{-1} $HClO_4$.	82A030
		3.6×10^4	1.4-2.6	0.5	25	f.p.	D.k. at 390 nm in soln. contg. Cr^{2+}, $(NH_3)_5CoO_2CCH_2CH_2OH^{2+}$ and $(2.5\text{-}40) \times 10^{-3}$ mol L^{-1} $HClO_4$.	82A030
7.29a	**1-Hydroxy-1-methylethylchromium(III) ion**							
7.29a.1	**Water**							
	$CrC(CH_3)_2OH^{2+} + H_2O \rightarrow Cr^{3+} +$ 2-PrOH + OH^-	1.5 s^{-1}	5.05			p.r.	D.k. at 390 nm in N_2O-satd. soln. contg. 5×10^{-4} mol L^{-1} Cr^{2+}, 1 mol L^{-1} 2-PrOH and 0.01 mol L^{-1} acetate buffer; k depends on pH and [acetate].	84A036
7.30	**2-Hydroxy-1-methylethylchromium(III) ion**							
7.30.1	**Hydrogen ion**							
	$CrCH(CH_3)CH_2OH^{2+} + H^+ \rightarrow Cr^{3+} + H_2O + CH_3CH{=}CH_2$	1.1×10^5				p.r.	D.k. at 300 nm in soln. contg. Cr^{2+} and satd. with propylene/N_2O. For reaction with H_2O, $k = 21$ s^{-1}.	91A477
7.31	**2-Hydroxy-1,2-dimethylethylchromium(III) ion**							
7.31.1	**Hydrogen ion**							
	$CrCH(CH_3)CH(CH_3)OH^{2+} + H^+ \rightarrow Cr[CH(CH_3){=}CH(CH_3)]^{3+} + H_2O$	9.8×10^4	3-7			p.r.	D.k. at 300 nm in soln. contg. Cr^{2+} and satd. with 2-butene/N_2O. For reaction of $CrCH(CH_3)CH(CH_3)OH^{2+}$ with H_2O, $k = 230$ s^{-1}. For reaction of the product to give Cr^{3+} + 2-butene, $k = 0.8 + 6.7[H^+]$ s^{-1} at pH 1-5.	91A477
7.32	**2-Hydroxy-2,2-dimethylethylchromium(III) ion**							
7.32.1	**Hydrogen ion**							
	$CrCH_2C(CH_3)_2OH^{2+} + H^+ \rightarrow Cr^{3+} + H_2O + CH_2{=}C(CH_3)_2$	2.7×10^6	2-4			p.r.	D.k. in N_2O-satd. soln. contg. 0.18-0.48 mol L^{-1} *tert*-BuOH and $(5\text{-}10) \times 10^{-4}$ mol L^{-1} Cr^{2+}. For reaction with H_2O, $k = 160$ s^{-1}.	92A073
7.33	**2-Ethoxyethylchromium(III) ion**							
7.33.1	**Hydrogen ion**							
	$CrCH_2CH_2OC_2H_5^{2+} + H^+ \rightarrow Cr^{3+} + H_2C{=}CH_2 + EtOH$	4.6×10^3	1.8-3.5			p.r.	D.k. at 315 nm in N_2O-satd. soln. contg. $(1\text{-}10) \times 10^{-3}$ mol L^{-1} Cr(II) perchlorate and 0.5 mol L^{-1} Et_2O.	85A331

TABLE 7. Rate constants for chromium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
7.34	**1-Carboxy-1-hydroxyethylchromium(III) ion**							
7.34.1	**Hydrogen ion**							
	$CrCOH(CH_3)CO_2H^{2+} + H^+ \rightarrow Cr^{3+} + CH_3CH(OH)CO_2H$	2.8×10^2	0-1		22	p.r.	D.k. in Ar-satd. soln. contg. 0.15-1 mol L^{-1} lactic acid, (1-15) $\times$ 10^{-4} mol L^{-1} Cr^{2+} and 0.1-1 mol L^{-1} $HClO_4$. For reaction with H_2O, $k = 4.7 \times 10^2$ s^{-1}.	741146
7.35	**2-Carboxy-2,2-dimethylethylchromium(III) ion**							
7.35.1	**Hydrogen ion**							
	$CrCH_2C(CH_3)_2CO_2H^{2+} + H^+ \rightarrow Cr^{3+} + (CH_3)_3CCO_2H$	60	0-1		22	p.r.	D.k. in Ar-satd. soln. contg. 0.15-1 mol L^{-1} trimethylacetic acid, (1-15) $\times$ 10^{-4} mol L^{-1} Cr^{2+} and 0.1-1 mol L^{-1} $HClO_4$. For reaction with H_2O, $k = 1.8 \times 10^2$ s^{-1}.	741146
7.36	**2-Ammonio-2,2-dimethylethylchromium(III) ion**							
7.36.1	**First-order reaction**							
	$CrCH_2C(CH_3)_2NH_3^{3+} \rightarrow Cr^{3+} + NH_3 + CH_2{=}C(CH_3)_2$	0.015 s^{-1}	1-3			p.r.	D.k. in N_2O-satd. soln. contg. 0.08-0.09 mol L^{-1} 2-methyl-2-propanamine and (1-10) $\times$ 10^{-4} mol L^{-1} Cr^{2+}.	92A073
7.37	***cis*-Diammine(aqua)(1,4,8,11-tetraazacyclotetradecane)chromium(III) ion**							
7.37.1	**First-order reaction**							
	cis-$[Cr(cyclam)(H_2O)(NH_3)_2]^{3+} \rightarrow$ *cis*-$[Cr(cyclam)(H_2O)(NH_3)]^{3+} + NH_3$	~3 $\times$ 10^5 s^{-1}	2.7-5.4		22-27	f.p.	Condy. change (from $NH_3 + H^+ \rightarrow NH_4^+$) in soln. contg. (0.6-3.0) $\times$ 10^{-3} mol L^{-1} *cis*-$[Cr(cyclam)(NH_3)_2]^{3+}$; transient has p$K$ ~4.6.	88F171
7.38	***trans*-Dihydroxy-1,4,8,11-tetraazacyclotetradecanechromium(III), OH reaction product**							
7.38.1	**First-order reaction**							
	trans-$Cr(cyclam)(OH)_2^+/OH \rightarrow$	2.9×10^3 s^{-1}	9.5-9.6		22	p.r.	D.k. at 320 nm in soln. contg. (1-5) $\times$ 10^{-3} mol L^{-1} *trans*-$Cr(cyclam)(OH)_2^+$; reaction is suggested to represent the conversion from Cr(III) to Cr(IV); k = 5.3×10^3, 1.1×10^4 and 1.1×10^4 s^{-1} at pH 3.1, 4.3, and 10.9, respectively.	87B063
7.39	**Chromate(V)**							
7.39.1	**Silver(II) ion**							
	$Cr(V) + Ag^{2+} \rightarrow Cr(VI) + Ag^+$	5.8×10^7	1		21	p.r.	D.k. at 270 nm in Ar-satd. soln. contg. 10^{-4} mol L^{-1} $Cr_2O_7^{2-}$ (mostly $HCrO_4^-$), 2×10^{-5} mol L^{-1} Ag^+ and 0.1 mol L^{-1} $HClO_4$.	89A422
7.40	**Chromate(V) ion**							
7.40.1	**Hydroxyl**							
	$CrO_4^{3-} + {}^{\bullet}OH \rightarrow CrO_4^{2-} + OH^-$	5×10^{10}				p.r.	P.b.k. at 365 nm in deaerated soln. contg. 1.6×10^{-5} mol L^{-1} CrO_4^{2-}.	650044

TABLE 8. Rate constants for copper transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
8.1	**Copper(0) chloride complex**							
8.1.1	**First-order reaction**							
	$CuCl_3^{3-} \rightarrow Cu^0 + 3\ Cl^-$	4.7×10^7 s^{-1}	5.8			p.r.	P.b.k. at 380 nm in soln. contg. (1-25) × 10^{-4} mol L^{-1} CuCl and 2 mol L^{-1} NaCl; 80% $CuCl_3^{2-}$, 20% $CuCl_2^-$; reaction includes $CuCl_2^{2-} \rightarrow Cu^0 + 2\ Cl^-$.	86G256
8.2	**Copper atom**							
8.2.1	**Copper(I) chloride complex**							
	$Cu^0 + Cu^I \rightarrow Cu^0\text{-}Cu^I$	2.1×10^9	5.8			p.r.	Computer anal. of changes in absorption in soln. contg. (1-25) × 10^{-4} mol L^{-1} CuCl, 2 mol L^{-1} NaCl and MeOH.	86G256
8.3	**Copper(I) chloride complex with copper(0)**							
8.3.1	**First-order reaction**							
	$Cu^0\text{-}Cu^I \rightarrow Cu_2^+$	4.9×10^7 s^{-1}	5.8			p.r.	Computer anal. of changes in absorption in soln. contg. (1-25) × 10^{-4} mol L^{-1} CuCl, 2 mol L^{-1} NaCl and MeOH.	86G256
8.4	**Copper(I) ion complex with copper(0)**							
8.4.1	**Copper(I) chloride complex**							
	$Cu_2^+ + Cu^I \rightarrow$	1.3×10^8	5.8			p.r.	Computer anal. of changes in absorption in soln. contg. (1-25) × 10^{-4} mol L^{-1} CuCl, 2 mol L^{-1} NaCl and MeOH. Product of this reaction decays with k = 4.8×10^5 s^{-1}.	86G256
8.5	**Copper(I) ion**							
8.5.1	**Cerium(IV) sulfate complex**							
	$Cu^+ + Ce(SO_4)_3^{2-} \rightarrow Cu^{2+} + Ce^{3+} + 3\ SO_4^{2-}$	7.0×10^8	0.8			p.r.	D.k. at 360 nm in soln. contg. 0.03 mol L^{-1} $Ce_2(SO_4)_3$, 0.1 mol L^{-1} $CuSO_4$ and 0.1 mol L^{-1} H_2SO_4. Value obtained by computer fit.	93A517
8.5.2	**Sulfate radical ion**							
	$Cu^+ + SO_4^{\bullet-} \rightarrow Cu^{2+} + SO_4^{2-}$	1.6×10^{10}	<0			p.r.	D.k. at 450 nm in soln. contg. 0.03 mol L^{-1} $Ce_2(SO_4)_3$, 0.1 mol L^{-1} $CuSO_4$ and 1.1 or 2.0 mol L^{-1} H_2SO_4. Value obtained by computer fit.	93A517
8.5.3	**Dihydroxycopper(III) ion**							
	$Cu^+ + Cu(OH)_2^+ \rightarrow 2\ Cu^{2+} + 2\ OH^-$	1.8×10^9 1.6×10^9	4.8 6	0.003	25	p.r.	Estimated from decay of Cu(III) in deaerated solutions. Degree of hydrolysis deduced from conductivity experiments [700512].	720844
		3.6×10^9				p.r.	D.k. at 300 nm in Ar-satd. soln. contg. 5 × 10^{-4} mol L^{-1} Cu^{2+}; $[Cu^+] = 1.2[Cu(III)]$.	710174
8.5.4	**Iron(III) ion**							
	$Cu^+ + Fe^{3+} \rightarrow Cu^{2+} + Fe^{2+}$	1.3×10^7	2.1			p.r.	D.k. at 238 nm in soln. contg. 10^{-3} mol L^{-1} Fe^{2+}, 10^{-2} mol L^{-1} Cu^{2+}, (3-15) × 10^{-5} mol L^{-1} Fe^{3+} and $HClO_4$; also determined values in H_2SO_4 soln.	79G260 761074
8.5.5	**Permanganate ion**							
	$Cu^+ + MnO_4^- \rightarrow Cu^{2+} + MnO_4^{2-}$	6.4×10^9		0.004	25	p.r.	Measured by the rate of depletion of the MnO_4^- absorption.	720844

TABLE 8. Rate constants for copper transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
8.5	**Copper(I) ion** — Continued							
8.5.5	**Permanganate ion** — Continued							
		8×10^9	2		20	p.r.	D.k. in soln. contg. 10^{-5} mol L^{-1} MnO_4^-, 1×10^{-2} mol L^{-1} Cu^{2+} and 0.01 mol L^{-1} $HClO_4$. Dependence of k on [Cu^{2+}] detected.	650385
8.5.6	**Hydrogen atom**							
	$Cu^+ + H^\cdot \rightarrow CuH^+$	~10^{10}	5.6			p.r.	P.b.k. at 340 nm in soln. contg. 10^{-3} mol L^{-1} $CuSO_4$ and 100 atm H_2; obtained by computer simulation of p.b.k. for initial [$H^\cdot$] = [Cu^+] in the range (5-40) $\times 10^{-6}$ mol L^{-1}.	82A104
8.5.7	**Hydrogen peroxide**							
	$Cu^+ + H_2O_2 \rightarrow Cu^+O_2H^- + H^+$	4.7×10^3	2.3			phot.	Sector method.	737514
8.5.8	**Perhydroxyl**							
	$Cu^+ + HO_2^\cdot + H_2O \rightarrow H_2O_2 + Cu^{2+} + OH^-$	2.3×10^9	2.3			phot.	Sector method; assume $k(HO_2^\cdot + Cu^{2+}) = 3.4 \times 10^7$ L mol^{-1} s^{-1} and $k(H_2O_2 + Cu^+) = 4.7 \times 10^3$ L mol^{-1} s^{-1}.	737514
8.5.9	**Superoxide radical anion**							
	$Cu^+ + O_2^{\cdot -} + 2\,H_2O \rightarrow Cu^{2+} + H_2O_2 + 2\,OH^-$	~10^{10}	~3-6.5			p.r.	D.k. at 245 nm in O_2-satd. soln. contg. Cu^{2+} and formate. Estimated from dependence of the rate of decay of $HO_2^\cdot/O_2^{\cdot -}$ on pH, [Cu^{2+}] and dose per pulse.	730112
8.5.10	**Oxygen**							
	$Cu^+ + O_2 \rightarrow Cu^{2+} + O_2^{\cdot -}$	4.6×10^5	2.1			γ-r.	Estimated from calculations involving competing reactions and change in Fe^{3+} concn. in mixt. of O_2, Cu^{2+}, Fe^{3+}, 3×10^{-3} mol L^{-1} Fe^{2+} and H_2SO_4; $k = 1.0 \times 10^6$ L mol^{-1} s^{-1} in $HClO_4$.	79G260 761074
8.5.11	**Tris(2,2′-bipyridine)ruthenium(III) ion**							
	$Cu^+ + Ru(bpy)_3^{3+} \rightarrow Cu^{2+} + Ru(bpy)_3^{2+}$	9.7×10^8	0.3		25	f.p./oq	P.b.k. at 450 nm in soln. contg. 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 0.01-0.06 mol L^{-1} Cu^{2+} (OQ) and 0.5 mol L^{-1} sulfuric acid; k = 4.3×10^8 and 3×10^8 L mol^{-1} s^{-1} in 0.5 and 2.4 mol L^{-1} $HClO_4$, respectively.	78A090
		3.4×10^8		1.0	21	f.p./oq	P.b.k. in deoxygenated soln. contg. $Ru(bpy)_3^{2+}$ and Cu^{2+} (OQ).	78F683
		1×10^8	0	1.9	24	f.p./oq	D.k. at 480 nm in soln. contg. $Ru(bpy)_3^{2+}$, Cu^{2+} (OQ) and 1 mol L^{-1} $HClO_4$.	771093
8.5.12	**Tris(4,4′-dimethyl-2,2′-bipyridine)ruthenium(III) ion**							
	$Cu^+ + Ru(4,4'\text{-}Me_2bpy)_3^{3+} \rightarrow Cu^{2+} + Ru(4,4'\text{-}Me_2bpy)_3^{2+}$	8.7×10^7	0.3		25	f.p./oq	P.b.k. at 450 nm in soln. contg. 10^{-5} mol L^{-1} $Ru(4,4'\text{-}Me_2bpy)_3^{2+}$, 0.01-0.06 mol L^{-1} Cu^{2+} (OQ) and 0.5 mol L^{-1} sulfuric acid.	78A090
8.5.13	**Tris(1,10-phenanthroline)ruthenium(III) ion**							
	$Cu^+ + Ru(phen)_3^{3+} \rightarrow Cu^{2+} + Ru(phen)_3^{2+}$	1.2×10^9	0.3		25	f.p./oq	P.b.k. at 450 nm in soln. contg. 10^{-5} mol L^{-1} $Ru(phen)_3^{2+}$, 0.01-0.06 mol L^{-1} Cu^{2+} (OQ) and 0.5 mol L^{-1} sulfuric acid.	78A090
8.5.14	**Tris(5-bromo-1,10-phenanthroline)ruthenium(III) ion**							
	$Cu^+ + Ru(5\text{-}Brphen)_3^{3+} \rightarrow Cu^{2+} + Ru(5\text{-}Brphen)_3^{2+}$	2.3×10^9	0.3		25	f.p./oq	P.b.k. at 450 nm in soln. contg. 10^{-5} mol L^{-1} $Ru(5\text{-}Brphen)_3^{2+}$, 0.01-0.06 mol L^{-1} Cu^{2+} (OQ) and 0.5 mol L^{-1} sulfuric acid.	78A090

TABLE 8. Rate constants for copper transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
8.5	**Copper(I) ion** — Continued							
8.5.15	**Tris(5-chloro-1,10-phenanthroline)ruthenium(III) ion**							
	$Cu^+ + Ru(5\text{-}Clphen)_3^{3+} \rightarrow Cu^{2+} + Ru(5\text{-}Clphen)_3^{2+}$	2.7×10^9	0.3		25	f.p./oq	P.b.k. at 450 nm in soln. contg. 10^{-5} mol L^{-1} $Ru(5\text{-}Clphen)_3^{2+}$, 0.01-0.06 mol L^{-1} Cu^{2+} (OQ) and 0.5 mol L^{-1} sulfuric acid.	78A090
8.5.16	**Tris(5-methyl-1,10-phenanthroline)ruthenium(III) ion**							
	$Cu^+ + Ru(5\text{-}Mephen)_3^{3+} \rightarrow Cu^{2+} + Ru(5\text{-}Mephen)_3^{2+}$	1.0×10^9	0.3		25	f.p./oq	P.b.k. at 450 nm in soln. contg. 10^{-5} mol L^{-1} $Ru(5\text{-}Mephen)_3^{2+}$, 0.01-0.06 mol L^{-1} Cu^{2+} (OQ) and 0.5 mol L^{-1} sulfuric acid.	78A090
8.5.17	**Tris(4,7-dimethyl-1,10-phenanthroline)ruthenium(III) ion**							
	$Cu^+ + Ru(4,7\text{-}Me_2phen)_3^{3+} \rightarrow Cu^{2+} + Ru(4,7\text{-}Me_2phen)_3^{2+}$	1.4×10^8	0.3		25	f.p./oq	P.b.k. at 450 nm in soln. contg. 10^{-5} mol L^{-1} $Ru(4,7\text{-}Me_2phen)_3^{2+}$, 0.01-0.06 mol L^{-1} Cu^{2+} (OQ) and 0.5 mol L^{-1} sulfuric acid.	78A090
8.5.18	**Tris(5,6-dimethyl-1,10-phenanthroline)ruthenium(III) ion**							
	$Cu^+ + Ru(5,6\text{-}Me_2phen)_3^{3+} \rightarrow Cu^{2+} + Ru(5,6\text{-}Me_2phen)_3^{2+}$	5.4×10^8	0.3		25	f.p./oq	P.b.k. at 450 nm in soln. contg. 10^{-5} mol L^{-1} $Ru(5,6\text{-}Me_2phen)_3^{2+}$, 0.01-0.06 mol L^{-1} Cu^{2+} (OQ) and 0.5 mol L^{-1} sulfuric acid.	78A090
8.5.19	**Tris(3,4,7,8-tetramethyl-1,10-phenanthroline)ruthenium(III) ion**							
	$Cu^+ + Ru(3,4,7,8\text{-}Me_4phen)_3^{3+} \rightarrow Cu^{2+} + Ru(3,4,7,8\text{-}Me_4phen)_3^{2+}$	6.0×10^7	0.3		25	f.p./oq	P.b.k. at 450 nm in soln. contg. 10^{-5} mol L^{-1} $Ru(3,4,7,8\text{-}Me_4phen)_3^{2+}$, 0.01-0.06 mol L^{-1} Cu^{2+} (OQ) and 0.5 mol L^{-1} sulfuric acid.	78A090
8.5.20	**Tris(5-phenyl-1,10-phenanthroline)ruthenium(III) ion**							
	$Cu^+ + Ru(5\text{-}Phphen)_3^{3+} \rightarrow Cu^{2+} + Ru(5\text{-}Phphen)_3^{2+}$	1.1×10^9	0.3		25	f.p./oq	P.b.k. at 450 nm in soln. contg. 10^{-5} mol L^{-1} $Ru(5\text{-}Phphen)_3^{2+}$, 0.01-0.06 mol L^{-1} Cu^{2+} (OQ) and 0.5 mol L^{-1} sulfuric acid.	78A090
8.5.21	**Acrylamide**							
	$Cu^+ + H_2C{=}CHCONH_2 \rightarrow Cu(acrylamide)^+$	2×10^9	2.5			p.r.	Measured from the effect of [acrylamide] on the yield and rate of formation of $Cu(acrylamide)^+$; $k_r = 1.1 \times 10^5$ s^{-1}.	78A322
8.5.22	**Fumaric acid**							
	$Cu^+ + trans\text{-}HO_2CCH{=}CHCO_2H \rightarrow Cu(fumaric\ acid)^+$	1.7×10^9	3.7		22	p.r.	P.b.k. in N_2O-satd. soln. contg. 0.01 mol L^{-1} $CuSO_4$, 1.0 mol L^{-1} MeOH and (1-100) $\times 10^{-5}$ mol L^{-1} fumaric acid; $k_r = 2.4 \times 10^5$ s^{-1}.	751092
8.5.23	**Hydroxymethyl**							
	$Cu^+ + {}^{\bullet}CH_2OH \rightarrow CuCH_2OH^+$	$\sim 6 \times 10^9$	3-5			p.r.	Estd. from dependence of yield of intermediate and its rate of decomposition on Cu^+ yield; He-satd. soln. contg. Cu^{2+} and MeOH; $K = \sim 5 \times 10^3$ L mol^{-1}.	80A278
		$\sim 10^{10}$	4.5			p.r.	Estimated from rate of growth and decay of $CuCH_2OH^+$; $k_r \sim 10^6$ s^{-1}.	78A322
8.5.24	**2-Hydroxyethyl**							
	$Cu^+ + {}^{\bullet}CH_2CH_2OH \rightarrow H_2C{=}CH_2 + OH^- + Cu^{2+}$	1.9×10^{10}	4.5			γ-r.	Estimated from yields of Cu(I) in γ-radiolysis of $Cu^{2+} + C_2H_4$ solutions.	78A322
8.5.25	**Maleic acid**							
	$Cu^+ + cis\text{-}HO_2CCH{=}CHCO_2H \rightarrow Cu(maleic\ acid)^+$	2.0×10^9	3.7		22	p.r.	P.b.k. in N_2O-satd. soln. contg. 0.01 mol L^{-1} $CuSO_4$, 1.0 mol L^{-1} MeOH and (1-100) $\times 10^{-5}$ mol L^{-1} maleic acid; $k_r = 1.8 \times 10^5$ s^{-1}.	751092

TABLE 8. Rate constants for copper transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
8.5	**Copper(I) ion** — Continued							
8.5.26	**Tetranitromethane**							
	$Cu^+ + C(NO_2)_4 \rightarrow Cu^{2+} + {}^{\cdot}NO_2 + C(NO_2)_3^-$	4.7×10^8	4.9		25	p.r.	P.b.k. at 350 nm in soln. contg. 0.01 mol L^{-1} Cu^{2+} and (3-12) $\times 10^{-5}$ mol L^{-1} tetranitromethane.	761134
		4.2×10^8				p.r.	P.b.k. in O_2-free soln. contg. 5×10^{-3} mol L^{-1} Cu^{2+} and 6.0×10^{-5} mol L^{-1} tetranitromethane.	640133
8.6	**Copper(I) chloride**							
8.6.1	**Tris(2,2′-bipyridine)ruthenium(III) ion**							
	$CuCl + Ru(bpy)_3^{3+} \rightarrow CuCl^+ + Ru(bpy)_3^{2+}$	3.5×10^9	1	1.0	21	f.p./oq	P.b.k. in deoxygenated soln. contg. $Ru(bpy)_3^{2+}$, 0.1 mol L^{-1} $HClO_4$, 0.5 mol L^{-1} NaCl and Cu(II) (OQ); 75% $CuCl^+$.	78F683
8.7	**Tetraformatocuprate(I) ion**							
8.7.1	**Tris(2,2′-bipyridine)ruthenium(III) ion**							
	$Cu(HCO_2)_4^{3-} + Ru(bpy)_3^{3+} \rightarrow Cu(HCO_2)_4^{2-} + Ru(bpy)_3^{2+}$	2.1×10^9	1	1.0	21	f.p./oq	P.b.k. in deoxygenated soln. contg. $Ru(bpy)_3^{2+}$, 0.1 mol L^{-1} $HClO_4$, 0.5 mol L^{-1} formate and Cu(II) (OQ); 80% $Cu(HCO_2)_4^{2-}$.	78F683
8.8	**Tetraacetatocuprate(I) ion**							
8.8.1	**Tris(2,2′-bipyridine)ruthenium(III) ion**							
	$Cu(OAc)_4^{3-} + Ru(bpy)_3^{3+} \rightarrow Cu(OAc)_4^{2-} + Ru(bpy)_3^{2+}$	2.3×10^9	1	1.0	21	f.p./oq	P.b.k. in deoxygenated soln. contg. $Ru(bpy)_3^{2+}$, 0.1 mol L^{-1} $HClO_4$, 0.5 mol L^{-1} acetate ion and Cu(II) (OQ); 90% $Cu(OAc)_4^{2-}$.	78F683
8.9	**Ethylenediaminetetraacetatocuprate(I) ion**							
8.9.1	**1-Hydroxybutyl**							
	$CuEDTA^{3-} + CH_3(CH_2)_2\dot{C}HOH \rightarrow CH_3(CH_2)_2CHOHCuEDTA^{3-}$	5×10^9	7.5			p.r.	P.b.k. at 440 nm in soln. contg. $CuEDTA^{2-}$ and *n*-BuOH. Value obtained from computer fit.	80A153
8.10	**Bis(alaninato)cuprate(I)**							
8.10.1	**Bis(alaninato)hydroxycopper(II)**							
	$Cu(Ala)_2^- + HOCu(Ala)_2 \rightarrow 2\,Cu(Ala)_2 + OH^-$	1.2×10^9	7.5			p.r.	D.k. at 300 nm in N_2O-satd. soln. contg. 2 $\times 10^{-4}$ mol L^{-1} $Cu(Ala)_2$, $k = 9 \times 10^8$ L mol^{-1} s^{-1} in Ar-satd. soln.	89G017
8.11	**Bleomycin-copper(I) complex**							
8.11.1	**Hydrogen peroxide**							
	BLM-Cu(I) + $H_2O_2 \rightarrow$ BLM-Cu(III) + OH^-	3.2×10^3	7			p.r.	P.b.k. at 435 nm in N_2O-satd. soln. contg. 2×10^{-2} mol L^{-1} formate, 10^{-3} mol L^{-1} H_2O_2 and 5×10^{-5} mol L^{-1} BLM-Cu(II); $k_{obs} = 1.3 \times 10^3$ L mol^{-1} s^{-1}; chain reaction with chain length ~2.5.	87A184
8.12	**3,6,10,13,16,19-Hexaazabicyclo[6.6.6]eicosanecopper(I) ion**							
8.12.1	**Hydrogen ion**							
	$Cu(sar)^+ + H^+ \rightarrow Cu(sarH)^{2+}$	2×10^{10}	3-5		25	p.r.	Condy. change in He-satd. soln. contg. 0.01 mol L^{-1} EtOH, $HClO_4$ and $Cu(sar)^{2+}$; subsequent protonation was observed with $k = 2 \times 10^7$ L mol^{-1} s^{-1}.	91A387

TABLE 8. Rate constants for copper transients — Continued

Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
8.13 1,4,8,11-Tetraazacyclotetradecanecopper(I) ion							
8.13.1 Water							
$Cu(cyclam)^+ + H_2O \rightarrow Cu(cyclam)(H)^{2+} + OH^-$	5.4×10^4 s^{-1}	5.1			p.r.	D.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} formate and (2-30) $\times 10^{-5}$ mol L^{-1} $Cu(cyclam)^{2+}$.	82A320
8.14 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanecopper(I) ion							
8.14.1 Water							
$Cu(aneN_4)^+ + H_2O \rightarrow Cu(aneN_4)(H)^{2+} + OH^-$	2.8×10^4 s^{-1}	6.0			p.r.	D.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} MeOH and (2-30) $\times 10^{-5}$ mol L^{-1} $Cu(aneN_4)^{2+}$.	82A320
8.14.2 2-Propanol							
$Cu(aneN_4)^+ + 2\text{-PrOH} \rightarrow$	5.0×10^5	acid			f.p./pi	D.k. in deaerated soln. contg. $Cu(aneN_4)^{2+}$ and 10^{-5}–10^{-2} mol L^{-1} 2-PrOH.	81A239
8.15 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecopper(I) ion							
8.15.1 Water							
$Cu(4,11\text{-dieneN}_4)^+ + H_2O \rightarrow Cu(4,11\text{-dieneN}_4)(H)^{2+} + OH^-$	1.5×10^5 s^{-1}	6.0			p.r.	D.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} MeOH and (2-30) $\times 10^{-5}$ mol L^{-1} $Cu(4,11\text{-dieneN}_4)^{2+}$.	80A189
8.15.2 Tris(2,2′-bipyridine)cobalt(III) ion							
$Cu(4,11\text{-dieneN}_4)^+ + Co(bpy)_3^{3+} \rightarrow$	1.2×10^7	7.0	0.016-0.028		p.r.	D.k. in Ar-satd. soln. contg. (2.5-5.0) $\times 10^{-3}$ mol L^{-1} $Cu(4,11\text{-dieneN}_4)^{2+}$, (2.5-10) $\times 10^{-4}$ mol L^{-1} $Co(bpy)_3^{3+}$ and 1 mol L^{-1} *tert*-BuOH.	761039
8.15.3 Tris(2,2′-bipyridine)chromium(III) ion							
$Cu(4,11\text{-dieneN}_4)^+ + Cr(bpy)_3^{3+} \rightarrow Cu(4,11\text{-dieneN}_4)^{2+} + Cr(bpy)_3^{2+}$	3.7×10^6	4	0.01		p.r	D.k. and/or p.b.k. in N_2-satd. soln. contg. $Cu(4,11\text{-dieneN}_4)^{2+}$ and alcohol.	88A334
	3.7×10^6	7.0	0.016-0.028		p.r.	D.k. in Ar-satd. soln. contg. (2.5-5.0) $\times 10^{-3}$ mol L^{-1} $Cu(4,11\text{-dieneN}_4)^{2+}$, (2.5-10) $\times 10^{-4}$ mol L^{-1} $Cr(bpy)_3^{3+}$ and 1 mol L^{-1} *tert*-BuOH.	761039
8.15.4 Hydrogen ion							
$Cu(4,11\text{-dieneN}_4)^+ + H^+ \rightarrow$	5.0×10^6	<1.3	0.06-0.3		p.r.	D.k. in Ar-satd. soln. contg. 3×10^{-3} mol L^{-1} $Cu(4,11\text{-dieneN}_4)^{2+}$ and 1 mol L^{-1} *tert*-BuOH. Reaction suggested to involve proton transfer to the metal centre to give a hydrido complex.	761039
8.15.5 Nitrous oxide							
$Cu(4,11\text{-dieneN}_4)^+ + N_2O \rightarrow$	1.7×10^6	7.0			p.r.	D.k. in Ar-satd. soln. contg. 3×10^{-3} mol L^{-1} $Cu(4,11\text{-dieneN}_4)^{2+}$, (7.5-25) $\times 10^{-4}$ mol L^{-1} N_2O and 1 mol L^{-1} *tert*-BuOH.	761039
8.15.6 Oxygen							
$Cu(4,11\text{-dieneN}_4)^+ + O_2 \rightarrow Cu(4,11\text{-dieneN}_4)O_2^+$	2.6×10^7	7.0			p.r.	D.k. in Ar-satd. soln. contg. 3×10^{-3} mol L^{-1} $Cu(4,11\text{-dieneN}_4)^{2+}$, (7.5-25) $\times 10^{-4}$ mol L^{-1} O_2 and 1 mol L^{-1} *tert*-BuOH.	761039
8.15.7 Hexaammineruthenium(III) ion							
$Cu(4,11\text{-dieneN}_4)^+ + Ru(NH_3)_6^{3+} \rightarrow Cu(4,11\text{-dieneN}_4)^{2+} + Ru(NH_3)_6^{2+}$	7.1×10^4	4	0.01		p.r	D.k. and/or p.b.k. in N_2-satd. soln. contg. $Cu(4,11\text{-dieneN}_4)^{2+}$ and alcohol.	88A334
	7.2×10^4	7.0	0.016-0.028		p.r.	D.k. in Ar-satd. soln. contg. (2.5-5.0) $\times 10^{-3}$ mol L^{-1} $Cu(4,11\text{-dieneN}_4)^{2+}$, (2.5-10) $\times 10^{-4}$ mol L^{-1} $Ru(NH_3)_6^{3+}$ and 1 mol L^{-1} *tert*-BuOH.	761039

TABLE 8. Rate constants for copper transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
8.15	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecopper(I) ion** — Continued							
8.15.8	**9,10-Anthraquinone-2,6-disulfonate ion**							
	$Cu(4,11\text{-dieneN}_4)^+ + 2,6\text{-di}SO_3AQ^{2-} \rightarrow$	4.3×10^9	7.0	0.004		p.r.	D.k. in Ar-satd. soln. contg. 3×10^{-3} mol L^{-1} $Cu(4,11\text{-dieneN}_4)^{2+}$, $(2.5\text{-}5) \times 10^{-4}$ mol L^{-1} quinone and 1 mol L^{-1} *tert*-BuOH.	761039
8.15.9	**9,10-Anthraquinone-2-sulfonate ion**							
	$Cu(4,11\text{-dieneN}_4)^+ + 2\text{-}SO_3AQ^- \rightarrow$	1.1×10^9	7.0	0.004		p.r.	D.k. in Ar-satd. soln. contg. 3×10^{-3} mol L^{-1} $Cu(4,11\text{-dieneN}_4)^{2+}$, $(2.5\text{-}5) \times 10^{-4}$ mol L^{-1} quinone and 1 mol L^{-1} *tert*-BuOH.	761039
8.15.10	**1,4-Benzoquinone**							
	$Cu(4,11\text{-dieneN}_4)^+ + Q \rightarrow$	2.6×10^9	7.0	0.004		p.r.	D.k. in Ar-satd. soln. contg. 3×10^{-3} mol L^{-1} $Cu(4,11\text{-dieneN}_4)^{2+}$, $(2.5\text{-}5) \times 10^{-4}$ mol L^{-1} benzoquinone and 1 mol L^{-1} *tert*-BuOH.	761039
8.15.11	**Iodomethane**							
	$Cu(4,11\text{-dieneN}_4)^+ + CH_3I \rightarrow$	3.1×10^6	9.2	0.01		p.r.	D.k. in Ar-satd. soln. contg. 3×10^{-3} mol L^{-1} $Cu(4,11\text{-dieneN}_4)^{2+}$, $(2.5\text{-}5) \times 10^{-4}$ mol L^{-1} CH_3I and 1 mol L^{-1} *tert*-BuOH.	761039
8.16	**2,3,9,10-Tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraenecopper(I) ion**							
8.16.1	**Tris(2,2′-bipyridine)cobalt(III) ion**							
	$Cu(Me_4\text{tetraeneN}_4)^+ + Co(bpy)_3^{3+} \rightarrow Cu(Me_4\text{tetraeneN}_4)^{2+} + Co(bpy)_3^{2+}$	5.6×10^6	4	0.01		p.r	D.k. and/or p.b.k. in N_2-satd. soln. contg. $Cu(Me_4\text{tetraeneN}_4)^{2+}$ and alcohol.	88A334
8.16.2	**Tris(ethylenediamine)cobalt(III) ion**							
	$Cu(Me_4\text{tetraeneN}_4)^+ + Co(en)_3^{3+} \rightarrow Cu(Me_4\text{tetraeneN}_4)^{2+} + Co(en)_3^{2+}$	3.3	6	0.01		p.r	D.k. and/or p.b.k. in N_2-satd. soln. contg. $Cu(Me_4\text{tetraeneN}_4)^{2+}$ and alcohol.	88A334
8.16.3	**Hexaammineruthenium(III) ion**							
	$Cu(Me_4\text{tetraeneN}_4)^+ + Ru(NH_3)_6^{3+} \rightarrow Cu(Me_4\text{tetraeneN}_4)^{2+} + Ru(NH_3)_6^{2+}$	1.2×10^5	4	0.01		p.r	D.k. and/or p.b.k. in N_2-satd. soln. contg. $Cu(Me_4\text{tetraeneN}_4)^{2+}$ and alcohol.	88A334
8.17	**α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,11,13,15-pentaenecopper(I) ion**							
8.17.1	**Tris(2,2′-bipyridine)cobalt(III) ion**							
	$Cu(Me_2\text{pyo}[14]\text{trieneN}_4)^+ + Co(bpy)_3^{3+} \rightarrow Cu(Me_2\text{pyo}[14]\text{trieneN}_4)^{2+} + Co(bpy)_3^{2+}$	2.5×10^7	4	0.01		p.r	D.k. and/or p.b.k. in N_2-satd. soln. contg. $Cu(Me_2\text{pyo}[14]\text{trieneN}_4)^{2+}$ and alcohol.	88A334
8.17.2	**Hexaammineruthenium(III) ion**							
	$Cu(Me_2\text{pyo}[14]\text{trieneN}_4)^+ + Ru(NH_3)_6^{3+} \rightarrow Cu(Me_2\text{pyo}[14]\text{trieneN}_4)^{2+} + Ru(NH_3)_6^{2+}$	1.5×10^6	4	0.01		p.r	D.k. and/or p.b.k. in N_2-satd. soln. contg. $Cu(Me_2\text{pyo}[14]\text{trieneN}_4)^{2+}$ and alcohol.	88A334
8.17.3	**Tris(2,2′-bipyridine)rhodium(II) ion**							
	$Cu(Me_2\text{pyo}[14]\text{trieneN}_4)^+ + Rh(bpy)_3^{2+} \rightarrow Cu(Me_2\text{pyo}[14]\text{trieneN}_4)^{2+} + Rh(bpy)_3^+$	1.3×10^7	4	0.7		p.r	D.k. and/or p.b.k. in N_2-satd. soln. contg. $Cu(Me_2\text{pyo}[14]\text{trieneN}_4)^{2+}$ and alcohol.	88A334
8.18	**Bis(2,2′-bipyridine)copper(I) ion**							
8.18.1	**Hydrogen peroxide**							
	$Cu(bpy)_2^+ + H_2O_2 \rightarrow Cu(bpy)_2^{2+} + {}^{\bullet}OH + OH^-$	1.5×10^3	7			p.r.	D.k. in soln. contg. 3×10^{-5} mol L^{-1} $Cu(bpy)_2^{2+}$, 0.05 mol L^{-1} formate and $(1\text{-}4) \times 10^{-4}$ mol L^{-1} H_2O_2.	85A059

TABLE 8. Rate constants for copper transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
8.18	**Bis(2,2′-bipyridine)copper(I) ion — Continued**							
8.18.2	**Oxygen**							
	$Cu(bpy)_2^+ + O_2 \rightarrow Cu(bpy)_2^{2+} + O_2^{\cdot-}$	5.8×10^4	7			p.r.	D.k. in O_2-satd. soln. contg. 0.02 mol L^{-1} formate, 1.96×10^{-6} mol L^{-1} SOD and $(1\text{-}4) \times 10^{-5}$ mol L^{-1} $Cu(bpy)_2^{2+}$.	85A059
8.18.3	**Superoxide radical anion**							
	$Cu(bpy)_2^+ + O_2^{\cdot-} + 2\,H^+ \rightarrow H_2O_2 + Cu(bpy)_2^{2+}$	1.8×10^8	7			p.r.	D.k. in air-satd. soln. contg. 0.02 mol L^{-1} formate and $(1\text{-}7) \times 10^{-7}$ mol L^{-1} $Cu(bpy)_2^{2+}$.	85A059
8.19	**Bis(1,10-phenanthroline)copper(I) ion**							
8.19.1	**Hydrogen peroxide**							
	$Cu(phen)_2^+ + H_2O_2 \rightarrow Cu(phen)_2^{2+} + {}^{\cdot}OH + OH^-$	9.4×10^2	7			p.r.	D.k. in soln. contg. 3×10^{-5} mol L^{-1} $Cu(phen)_2^{2+}$, 0.05 mol L^{-1} formate and $(5\text{-}45) \times 10^{-4}$ mol L^{-1} H_2O_2; [85G297] shows ·OH is not formed directly but through decomposition of a metal-peroxo complex, and k is about 1100 L mol^{-1} s^{-1}.	83A299
8.19.2	**Oxygen**							
	$Cu(phen)_2^+ + O_2 \rightarrow Cu(phen)_2^{2+} + O_2^{\cdot-}$	5.0×10^4	7			p.r.	D.k. in O_2-satd. soln. contg. 0.02 mol L^{-1} formate, and 1.2×10^{-6} mol L^{-1} SOD and $\sim(1\text{-}8) \times 10^{-5}$ mol L^{-1} $Cu(phen)_2^{2+}$.	83A299
8.19.3	**Superoxide radical anion**							
	$Cu(phen)_2^+ + O_2^{\cdot-} + 2\,H^+ \rightarrow H_2O_2 + Cu(phen)_2^{2+}$	3.0×10^8	7			p.r.	D.k. at 435 nm in soln. contg. 0.05 mol L^{-1} formate and 10^{-3} mol L^{-1} phosphate; 1,10-phenanthroline/Cu^{2+} concn. = 2.0-2.5.	83A299
8.20	**Bis(5-chloro-1,10-phenanthroline)copper(I) ion**							
8.20.1	**Oxygen**							
	$Cu(5\text{-}Clphen)_2^+ + O_2 \rightarrow Cu(5\text{-}Clphen)_2^{2+} + O_2^{\cdot-}$	5.0×10^3	7			p.r.	D.k. in O_2-satd. soln. contg. 0.02 mol L^{-1} formate, 1.96×10^{-6} mol L^{-1} SOD and $(0.1\text{-}1) \times 10^{-4}$ mol L^{-1} $Cu(5\text{-}Clphen)_2^{2+}$.	85A059
8.20.2	**Superoxide radical anion**							
	$Cu(5\text{-}Clphen)_2^+ + O_2^{\cdot-} + 2\,H^+ \rightarrow H_2O_2 + Cu(5\text{-}Clphen)_2^{2+}$	2.1×10^8	7			p.r.	D.k. in air-satd. soln. contg. 0.02 mol L^{-1} formate and $(1\text{-}7) \times 10^{-7}$ mol L^{-1} $Cu(5\text{-}Clphen)_2^{2+}$.	85A059
8.21	**Bis(5-nitro-1,10-phenanthroline)copper(I) ion**							
8.21.1	**Hydrogen peroxide**							
	$Cu(5\text{-}NO_2phen)_2^+ + H_2O_2 \rightarrow Cu(5\text{-}NO_2phen)_2^{2+} + {}^{\cdot}OH + OH^-$	4.4×10^2	7			p.r.	D.k. in soln. contg. 3×10^{-5} mol L^{-1} $Cu(5\text{-}NO_2phen)_2^{2+}$, 0.05 mol L^{-1} formate and $(1\text{-}5) \times 10^{-4}$ mol L^{-1} H_2O_2.	85A059
8.21.2	**Oxygen**							
	$Cu(5\text{-}NO_2phen)_2^+ + O_2 \rightarrow Cu(5\text{-}NO_2phen)_2^{2+} + O_2^{\cdot-}$	5.8×10^2	7			p.r.	D.k. in O_2-satd. soln. contg. 0.02 mol L^{-1} formate and 1.96×10^{-6} mol L^{-1} SOD and $(1\text{-}4) \times 10^{-5}$ mol L^{-1} $Cu(5\text{-}NO_2phen)_2^{2+}$.	85A059
8.21.3	**Superoxide radical anion**							
	$Cu(5\text{-}NO_2phen)_2^+ + O_2^{\cdot-} + 2\,H^+ \rightarrow H_2O_2 + Cu(5\text{-}NO_2phen)_2^{2+}$	8.3×10^8	7			p.r.	D.k. in air-satd. soln. contg. 0.02 mol L^{-1} formate and $(1\text{-}6) \times 10^{-7}$ mol L^{-1} $Cu(5\text{-}NO_2phen)_2^{2+}$.	85A059

TABLE 8. Rate constants for copper transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
8.22	**Bis(5-methyl-1,10-phenanthroline)copper(I) ion**							
8.22.1	**Hydrogen peroxide**							
	$Cu(5\text{-Mephen})_2^+ + H_2O_2 \rightarrow Cu(5\text{-Mephen})_2^{2+} + {}^{\bullet}OH + OH^-$	1.6×10^3	7			p.r.	D.k. in soln. contg. 3×10^{-5} mol L^{-1} $Cu(5\text{-Mephen})_2^{2+}$, 0.05 mol L^{-1} formate and $(1\text{-}4) \times 10^{-3}$ mol L^{-1} H_2O_2.	85A059
8.22.2	**Oxygen**							
	$Cu(5\text{-Mephen})_2^+ + O_2 \rightarrow Cu(5\text{-Mephen})_2^{2+} + O_2^{\bullet-}$	6.6×10^4	7			p.r.	D.k. in O_2-satd. soln. contg. 0.02 mol L^{-1} formate, 1.96×10^{-6} mol L^{-1} SOD and $(1\text{-}4) \times 10^{-5}$ mol L^{-1} $Cu(5\text{-Mephen})_2^{2+}$.	85A059
8.22.3	**Superoxide radical anion**							
	$Cu(5\text{-Mephen})_2^+ + O_2^{\bullet-} + 2\,H^+ \rightarrow H_2O_2 + Cu(5\text{-Mephen})_2^{2+}$	2.3×10^8	7			p.r.	D.k. in air-satd. soln. contg. 0.02 mol L^{-1} formate and $(1\text{-}4) \times 10^{-7}$ mol L^{-1} $Cu(5\text{-Mephen})_2^{2+}$.	85A059
8.23	**Bis(2,9-dimethyl-1,10-phenanthroline)copper(I) ion**							
8.23.1	**Superoxide radical anion**							
	$Cu(2,9\text{-}Me_2phen)_2^+ + O_2^{\bullet-} + 2\,H^+ \rightarrow H_2O_2 + Cu(2,9\text{-}Me_2phen)_2^{2+}$	2.4×10^8	7			p.r.	D.k. in air-satd. soln. contg. 0.02 mol L^{-1} formate and $(1\text{-}6) \times 10^{-7}$ mol L^{-1} $Cu(2,9\text{-}Me_2phen)_2^{2+}$.	85A059
8.24	**5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)porphinatocopper(II), radical anion**							
8.24.1	**5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)porphinatocopper(II), radical anion**							
	$[CuTMpyP]^{\bullet 3+} + [CuTMpyP]^{\bullet 3+} \rightarrow$	9.1×10^8	6.8			p.r.	D.k. in N_2O-satd. soln. contg. $CuTMpyP^{4+}$ and 2-PrOH; disproportionation reaction; $\Delta G = 27$ kJ mol^{-1}.	83C026
8.24.2	**Hydrogen ion**							
	$[CuTMpyP]^{\bullet 3+} + H^+ \rightarrow [CuTMpyPH]^{\bullet 4+}$	$\geq 2 \times 10^7$	0.9-1.5		21	p.r.	P.b.k. at 640 nm in deoxygenated soln. contg. 2-PrOH, 0.001 mol L^{-1} $CuTMpyP^{4+}$ and varied $[H^+]$.	92A390
8.25	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatocuprate(II), radical anion**							
8.25.1	**Hydrogen ion**							
	$[CuTPPS]^{\bullet 5-} + H^+ \rightarrow [CuTPPSH]^{\bullet 4-}$	5×10^7	3.5-4.1		21	p.r.	P.b.k. at 650 nm in deoxygenated soln. contg. 2-PrOH, 4.5×10^{-5} mol L^{-1} $CuTPPS^{4-}$ and $(0.8\text{-}3.4) \times 10^{-4}$ mol L^{-1} H^+.	92A390
8.26	**Tetrakis-4-(*N*,*N*,*N*-trimethylammonio)phenylporphinecopper(II), radical anion**							
8.26.1	**Hydrogen ion**							
	$[CuTAPP]^{\bullet 3+} + H^+ \rightarrow [CuTAPPH]^{\bullet 4+}$	8×10^6	2.4-3.0		21	p.r.	P.b.k. at 640 nm in deoxygenated soln. contg. 2-PrOH, $CuTAPP^{4+}$ and varied $[H^+]$.	92A390
8.27	**Hydridocopper(II) ion**							
8.27.1	**Water**							
	$CuH^+ + H_2O \rightarrow Cu^{2+} + H_2 + OH^-$	4×10^3 s^{-1}	3-6			p.r.	D.k. at 340 nm in soln. contg. $(2\text{-}10) \times 10^{-4}$ mol L^{-1} $CuSO_4$ satd. with 100 atm H_2.	82A104

TABLE 8. Rate constants for copper transients — Continued

No. Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
8.28 Methylcopper(II) ion							
8.28.1 Hydrogen ion							
$CuCH_3^+ + H^+ \rightarrow Cu^{2+} + CH_4$	2×10^3	1			p.r.	D.k. in N_2O-satd. soln. contg. 9×10^{-4} mol L^{-1} $CuSO_4$, 0.09 mol L^{-1} DMSO and 2×10^{-4} mol L^{-1} Cr^{2+}. Authors reported k = 200 s^{-1} at pH 1.	86A115
8.28.2 Methylcopper(II) ion							
$CuCH_3^+ + CuCH_3^+ \rightarrow 2\ Cu^+ + C_2H_6$	9×10^6	≥2.5			p.r.	D.k. in N_2O-satd. soln. contg. 9×10^{-4} mol L^{-1} $CuSO_4$, 0.09 mol L^{-1} DMSO and 2×10^{-4} mol L^{-1} Cr^{2+}.	86A115
8.29 Carboxylatocopper(II)							
8.29.1 Copper(I) ion							
$CuCO_2 + Cu^+ \rightarrow Cu_2^+ + CO_2$	~10^8	7.3			p.r.	D.k. at 480 nm in Ar-satd. soln. contg. 1×10^{-4} mol L^{-1} $Cu(ClO_4)_2$ and 0.01 mol L^{-1} formate.	91A367
8.29.2 Copper(II) ion							
$CuCO_2 + Cu^{2+} \rightarrow 2\ Cu^+ + CO_2$	5×10^8	7.3			p.r.	D.k. at 480 nm in N_2O-satd. soln. contg. $(1\text{-}3) \times 10^{-4}$ mol L^{-1} $Cu(ClO_4)_2$ and 5×10^{-3} mol L^{-1} formate.	91A367
8.29.3 Oxalatocuprate(II) ions							
$CuCO_2 + Cu(C_2O_4)_n^{(2-n)+} \rightarrow$	2×10^9		0.1		f.p.	D.k. in soln. contg. 2×10^{-4} mol L^{-1} Cu(II), 10^{-2} mol L^{-1} oxalate, varied [O_2] and pH; value refers to basic form of $CuCO_2$. For an acidic form of $CoCO_2$, k = 1×10^7 L mol^{-1} s^{-1}.	80A239
8.29.4 Oxygen							
$CuCO_2 + O_2 \rightarrow$	3×10^7		0.1		f.p.	D.k. in soln. contg. 2×10^{-4} mol L^{-1} Cu(II), 10^{-2} mol L^{-1} oxalate, varied [O_2] and pH; value refers to basic form of $CuCO_2$. For an acidic form of $CoCO_2$, k = 4×10^5 L mol^{-1} s^{-1}.	80A239
8.30 2-Ammonio-1-carboxyethylcopper(II) ion							
8.30.1 First-order reaction							
$CuCH(CH_2NH_3)CO_2^+ \rightarrow Cu^{2+} + NH_3 + CH_2{=}CHCO_2^-$	2.7×10^4 s^{-1} 1.1×10^4 s^{-1}	≤3 >3.5			p.r.	D.k. at 380 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} β-alanine, $(3.5\text{-}11) \times 10^{-5}$ mol L^{-1} Cu^+ and $(0\text{-}1) \times 10^{-3}$ mol L^{-1} Cu^{2+}.	92A134
8.31 2-Ammonioethylcopper(II) ion							
8.31.1 First-order reaction							
$CuCH_2CH_2NH_3^{2+} \rightarrow CuCH{=}CH_2^{2+} + NH_3$	2.4 s^{-1}	2.3-3.5			p.r.	D.k. at 370 nm in N_2O-satd. soln. contg. 0.05-0.1 mol L^{-1} ethylamine, $(2.5\text{-}8.0) \times 10^{-4}$ mol L^{-1} $CuSO_4$ and $(0.5\text{-}1.0) \times 10^{-4}$ mol L^{-1} Cu^+. Complex formed by reaction of Cu^+ with $^{\bullet}CH_2CH_2NH_3^+$, k = 1.1×10^9 L mol^{-1} s^{-1}.	93A473
8.32 2-Hydroxy-2,2-dimethylethylcopper(II) ion							
8.32.1 First-order reaction							
$CuCH_2C(CH_3)_2OH^+ \rightarrow CH_2{=}C(CH_3)_2 + Cu^{2+} + OH^-$	2.2×10^5 s^{-1}	2.7			p.r.	D.k. in N_2O-satd. soln. contg. $(5\text{-}20) \times 10^{-4}$ mol L^{-1} $CuSO_4$, $(5\text{-}30) \times 10^{-5}$ mol L^{-1} Cu^+, $(5\text{-}30) \times 10^{-5}$ mol L^{-1} Cr(III), and 0.1-1 mol L^{-1} *tert*-BuOH. $k = 5.0 \times 10^4 + 8.6 \times 10^7[H_3O^+]$ s^{-1}.	88A410

TABLE 8. Rate constants for copper transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
8.33	**2-Ammonio-2,2-dimethylethylcopper(II) ion**							
8.33.1	**First-order reaction**							
	$CuCH_2C(CH_3)_2NH_3^{2+} \rightarrow Cu^{2+} + CH_2{=}C(CH_3)_2 + NH_3$	7.0 s^{-1}	1.5-3			p.r.	D.k. at 375 nm in N_2O-satd. soln. contg. (0.39-1.1) × 10^{-4} mol L^{-1} Cu^+, (0-5) × 10^{-4} mol L^{-1} $CuSO_4$ and 0.02-0.2 mol L^{-1} 2-methyl-2-propanamine.	92A073
8.34	**1,3-Diammonio-2-propylcopper(II) ion**							
8.34.1	**First-order reaction**							
	$CuCH(CH_2NH_3^+)_2^+ \rightarrow$	2.0 s^{-1}	3.0-3.8			p.r.	D.k. in N_2O-satd. soln. contg. 0.05-0.1 mol L^{-1} 1,3-propanediamine, (0-2.5) × 10^{-4} mol L^{-1} $CuSO_4$ and (0.62-1.2) × 10^{-4} mol L^{-1} Cu^+. Complex formed by reaction of Cu^+ with $^{\bullet}CH(CH_2NH_3^+)_2$, k = 4.2 × 10^8 L mol^{-1} s^{-1}.	93A473
8.35	**2-(Dimethylammonio)-1-(dimethylammoniomethyl)ethylcopper(II) ion**							
8.35.1	**First-order reaction**							
	$CuCH(CH_2NMe_2H^+)_2^+ \rightarrow$	150 s^{-1}	2.2-3.8			p.r.	D.k. in N_2O-satd. soln. contg. 0.05-0.1 mol L^{-1} *N,N,N′,N′*-tetramethyl-1,3-propanediamine, 0-0.001 mol L^{-1} $CuSO_4$ and (0.05-0.13) × 10^{-3} mol L^{-1} Cu^+. Complex formed by reaction of Cu^+ with $^{\bullet}CH(CH_2NMe_2H^+)_2$, k = 4.2 × 10^8 L mol^{-1} s^{-1}.	93A473
8.36	**2-(Dimethylammonio)ethylcopper(II) ion**							
8.36.1	**First-order reaction**							
	$CuCH_2CH_2NEt_2H^{2+} \rightarrow CuCH{=}CH_2^{2+} + (C_2H_5)_2NH$	190 s^{-1}	2.2-3.8			p.r.	D.k. at 370 nm in N_2O-satd. soln. contg. 0.05-0.1 mol L^{-1} triethylamine, (0-8) × 10^{-4} mol L^{-1} $CuSO_4$ and (0.59-1.10) × 10^{-4} mol L^{-1} Cu^+. Complex formed by reaction of Cu^+ with $^{\bullet}CH_2CH_2NEt_2H^+$, k = 7.5 × 10^8 L mol^{-1} s^{-1}.	93A473
8.37	**2-Carboxy-2,2-dimethylethylcopper(II) ion**							
8.37.1	**First-order reaction**							
	$CuCH_2C(CH_3)_2CO_2H^+ \rightarrow Cu^+ + {}^{\bullet}CH_2C(CH_3)_2CO_2H$	1.6 × 10^5 s^{-1}	3.0			p.r.	Calculated from the intercept of plot of rate of formation of complex on [Cu^+] in N_2O-satd. soln. contg. 0.001 mol L^{-1} Cu^{2+}, 0.05 mol L^{-1} $(CH_3)_3CCO_2H$ and (5-30) × 10^{-5} mol L^{-1} Cu^+; k_r = 2.4 × 10^9 L mol^{-1} s^{-1}.	90A474
8.37.2	**Copper(II) ion**							
	$CuCH_2C(CH_3)_2CO_2H^+ + Cu^{2+} + H^+ \rightarrow 2\ Cu^{2+} + (CH_3)_3CCO_2H$	1 × 10^7	3.0			p.r.	D.k. in N_2O-satd. soln. contg. varied [Cu^{2+}], 0.05 mol L^{-1} $(CH_3)_3CCO_2H$ and 1 × 10^{-4} mol L^{-1} Cu^+.	90A474
8.38	**2-Ammonio-2-carboxypropylcopper(II) ion**							
8.38.1	**First-order reaction**							
	$CuCH_2C(CH_3)(NH_3)CO_2^+ \rightarrow Cu^{2+} + NH_3 + CH_2{=}C(CH_3)CO_2^-$	2.7 s^{-1}	3			p.r.	D.k. at 300 and 350 nm in N_2O-satd. soln. contg. 0.05 mol L^{-1} 2-methylalanine, (5-15) × 10^{-5} mol L^{-1} Cu^+ and (3-100) × 10^{-3} mol L^{-1} Cu^{2+}.	92A215

TABLE 8. Rate constants for copper transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
8.39	**Copper(II) ion, complex with cyclohexene**							
8.39.1	**2-Hydroxycyclohexyl**							
	$Cu(cyclohexene)^+ + \dot{C}HCHOH(CH_2)_4^- \rightarrow c\text{-}C_6H_{10} + CuCHCH(OH)(CH_2)_4^+$	2.6×10^9	1-5.5			p.r.	P.b.k. in N_2O-satd. soln. contg. (5-20) × 10^{-4} mol L^{-1} $CuSO_4$, (5-40) × 10^{-5} mol L^{-1} Cu^+, (5-40) × 10^{-5} mol L^{-1} Cr(III), 0.02-0.15 mol L^{-1} cyclohexene and 0.15-0.65 mol L^{-1} acetonitrile.	91A152
8.40	**4-Hydroxyphenoxycopper(II) ion, conjugate base**							
8.40.1	**4-Hydroxyphenoxycopper(II) ion, conjugate base**							
	$CuOC_6H_4\text{-}4\text{-}O + CuOC_6H_4\text{-}4\text{-}O \rightarrow$	3.8×10^7	7.0			f.p.	D.k. at 425 nm in soln. contg. Cu^+ and 1 × 10^{-4} mol L^{-1} hydroquinone.	78A449
8.41	**(1-Hydroxybutyl)ethylenediaminetetraacetatocuprate(II) ion**							
8.41.1	**Nitrite ion**							
	$CH_3(CH_2)_2CHOHCuEDTA^{3-} + NO_2^- \rightarrow$	4×10^5	7.5			p.r.	D.k. at 440 nm in soln. contg. $CuEDTA^{2-}$ and 1-butanol.	80A153
8.42	**Bis(1,10-phenanthroline)(2-hydroxyethyl)copper(II) ion**							
8.42.1	**First-order reaction**							
	$HOCH_2CH_2Cu(phen)_2^+ \rightarrow Cu(phen)_2^{2+} + H_2C{=}CH_2 + OH^-$	1.1×10^4 s^{-1}	4-10			p.r.	D.k. at 430 nm in ethylene-satd. soln. contg. $Cu(phen)_2^{2+}$.	88A392
8.43	**Bis(1,10-phenanthroline)(2-hydroxy-2,2-dimethylethyl)copper(II) ion**							
8.43.1	**First-order reaction**							
	$HOC(CH_3)_2CH_2Cu(phen)_2^+ \rightarrow Cu(phen)_2^{2+} + CH_2{=}C(CH_3)_2 + OH^-$	1.7×10^3 s^{-1}	4-10			p.r.	D.k. in He-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH and $Cu(phen)_2^{2+}$.	88A392
8.43a	**Aminomethyl(glycinato)copper(II)**							
8.43a.1	**Oxygen**							
	$(Gly)CuCH_2NH_2 + O_2 \rightarrow$	2×10^5 6×10^5	6.3 7.7			f.p.	Estd. from dependence of d.k. in soln. contg. 2×10^{-4} mol L^{-1} Cu(II) and 10^{-3} mol L^{-1} glycine on $[O_2]$.	84A293
8.44	**α-2,12-Dimethyl-3,7,11,17,tetraazabicyclo[11.3.1]heptadeca-1(17),2,11,13,15-pentaenecopper(II) ion OH-adduct**							
8.44.1	**First-order reaction**							
	$Cu(Me_2pyo[14]trieneN_4)(OH)^{2+} \rightarrow$	6.3×10^5 s^{-1}	3,5, 4.5	0.1		p.r.	D.k. in N_2O-satd. soln. contg. $Cu(Me_2\text{-}3,4,5\text{-}pyo[14]trieneN_4)^{2+}$ and $NaClO_4$; the product is a Cu(I) species formed by intramolecular reduction which decays with $k = 1.6 \times 10^3$ s^{-1}.	86A210
8.45	**Copper(III)**							
8.45.1	**Iron(II) ion**							
	$Cu(III) + Fe^{2+} \rightarrow Cu^{2+} + Fe^{3+}$	3.3×10^8	2.1			p.r.	P.b.k. at 238 nm in soln. contg. (5-30) × 10^{-4} mol L^{-1} Fe^{2+}, 10^{-2} mol L^{-1} Cu^{2+}, 5 × 10^{-5} mol L^{-1} Fe^{3+} and H_2SO_4; $k = 1.3 \times 10^8$ L mol^{-1} s^{-1} in $HClO_4$.	79G260 761074
8.45.2	**Hydrogen peroxide**							
	$Cu(III) + H_2O_2 \rightarrow$	2×10^6				γ-r.	Estimated from computer simulation based on G for HCHO and Cu^+ in N_2O-satd. soln. contg. Cu^{2+}, CH_3OH and H_2O_2.	88G016

TABLE 8. Rate constants for copper transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
8.45	**Copper(III)** — Continued							
8.45.3	**Methanol**							
	$Cu(III) + MeOH \rightarrow {}^{\bullet}CH_2OH + Cu^{2+} + H^+$	$\leq 4 \times 10^5$				γ-r.	Estimated from computer simulation based on G for HCHO and Cu^+ in N_2O-satd. soln. contg. Cu^{2+}, CH_3OH and H_2O_2.	88G016
8.46	**Dihydroxycopper(III) ion**							
8.46.1	**First-order reaction**							
	$Cu(OH)_2^+ \rightarrow CuOH^+ + {}^{\bullet}OH$	4.2×10^4 s^{-1} 2.8×10^4 s^{-1}	3.5 3.65			p.r.	Estimated from decay of Cu(III) in the presence of Br^-, CH_3OH, H_2O_2 etc. Values of k_r taken to be same as $k(Cu^{2+} + {}^{\bullet}OH)$; $K = 1.3 \times 10^{-4}$ and 9.0×10^{-5} L mol^{-1} at pH 3.5 and 3.65, respectively.	710174
8.46.2	**Nitrilotriacetatocuprate(II) ion**							
	$Cu(OH)_2^+ + CuNTA^- \rightarrow Cu^{2+} + CuNTA$	1.2×10^8	3.9			p.r.	N_2O-satd. soln. contg. 0.001 mol L^{-1} $CuSO_4$ and (2-8) $\times 10^{-5}$ mol L^{-1} NTA.	78A436
8.47	**Trihydroxycopper(III)**							
8.47.1	**Trihydroxycopper(III)**							
	$Cu(OH)_3 + Cu(OH)_3 \rightarrow$	$<2.5 \times 10^7$	6	0.004	25	p.r.		720844
		2.3×10^7	6			p.r.	D.k. at 300 nm in N_2O-satd. soln. contg. 5×10^{-4} mol L^{-1} Cu^{2+}.	710174
8.47.2	**Nitritocopper(II) ion**							
	$Cu(OH)_3 + CuNO_2^+ \rightarrow$	$\sim 3 \times 10^9$	5.2			p.r.	D.k. at 300 nm in N_2O-satd. soln. contg. NO_2^-.	710174
8.47.3	**Glycinatocopper(II) ion**							
	$Cu(OH)_3 + Cu(Gly)^+ \rightarrow$	8.1×10^7	5.5			p.r.	D.k. in N_2O-satd. soln. contg. 0.001 mol L^{-1} $CuSO_4$ and (1-100) $\times 10^{-6}$ mol L^{-1} glycine.	710775
8.47.4	**2-Methyl-1,4-naphthoquinone**							
	$Cu(OH)_3 + 2\text{-}CH_3NQ \rightarrow$	2.0×10^9	9.0,10.6			p.r.	40% of Cu(III) claimed to react by electron transfer. Cu(III) formed by ${}^{\bullet}OH + Cu(ClO_4)_2$; 20.3% and 39% electron transfer at pH 8.0 and 10.6, respectively, in $CuSO_4$ soln.	731047
8.48	**Amminecopper(III) complex**							
8.48.1	**Amminecopper(III) complex**							
	$Cu^{III}(NH_3)_n + Cu^{III}(NH_3)_n \rightarrow$	1.5×10^7	11.1			p.r.	D.k. in N_2O-satd. soln. contg. (5-50) $\times 10^{-5}$ mol L^{-1} $CuSO_4$ and $[NH_3] = 1.9[CuSO_4]$.	710775
8.49	**Ethylenediaminecopper(III) complex**							
8.49.1	**First-order reaction**							
	$Cu^{III}(en)_n \rightarrow$	<3 s^{-1} 120 s^{-1}	5.8 11.6			p.r.	D.k. in N_2O-satd. soln. contg. (5-50) $\times 10^{-5}$ mol L^{-1} $CuSO_4$ and $[en] = 1.9[CuSO_4]$.	710775
8.49.2	**Ethylenediaminecopper(III) complex**							
	$Cu^{III}(en)_n + Cu^{III}(en)_n \rightarrow$	2.8×10^5 2.0×10^7	5.8 11.6			p.r.	D.k. in N_2O-satd. soln. contg. (5-50) $\times 10^{-5}$ mol L^{-1} $CuSO_4$ and $[en] = 1.9[CuSO_4]$.	710775

TABLE 8. Rate constants for copper transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
8.50	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanecopper(III) ion**							
8.50.1	**First-order reaction**							
	$Cu(aneN_4)^{3+} \rightarrow$	6.1 s^{-1}	1	1.0	25	f.p.	D.k. at 360 nm in soln. contg. 0.01-1 mol L^{-1} Cl^- and (1-2) × 10^{-5} mol L^{-1} $Cu(aneN_4)^{2+}$.	83A271
8.51	**Chloro-5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecopper(III) ion**							
8.51.1	**Chloride ion**							
	$Cu(4,11\text{-}dieneN_4)Cl^{2+} + Cl^- \rightarrow Cu(4,11\text{-}dieneN_4)^{2+} + Cl_2^{\bullet-}$	1.5 × 10^3	1		22	f.p.	D.k. in N_2O-satd. soln. contg. (1-5) × 10^{-4} mol L^{-1} $Cu(4,11\text{-}dieneN_4)^{2+}$, 0.1 mol L^{-1} Cl^-, 0.001-0.01 mol L^{-1} H_2O_2 and 0.1 mol L^{-1} H^+; k_r = 1.5 × 10^8 L mol^{-1} s^{-1}.	79A080
8.52	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecopper(III) ion**							
8.52.1	**First-order reaction**							
	$Cu(4,11\text{-}dieneN_4)^{3+} \rightarrow$	0.36 s^{-1}	1	1.0	25	f.p.	D.k. at 340 or 400 nm in soln. contg. 0.01-1 mol L^{-1} Cl^- and (0.4-1.0) × 10^{-4} mol L^{-1} $Cu(4,11\text{-}dieneN_4)^{2+}$.	83A271
8.52.2	**Chloride ion**							
	$Cu(4,11\text{-}dieneN_4)^{3+} + Cl^- \rightarrow$	0.63	1	1.0	25	f.p.	D.k. at 340 or 400 nm in soln. contg. 0.01-1 mol L^{-1} Cl^- and (0.4-1.0) × 10^{-4} mol L^{-1} $Cu(4,11\text{-}dieneN_4)^{2+}$.	83A271
8.52.3	**Hydrogen peroxide**							
	$Cu(4,11\text{-}dieneN_4)^{3+} + H_2O_2 \rightarrow Cu(4,11\text{-}dieneN_4)^{2+} + H^+ + HO_2^{\bullet}$	7.0 × 10^2	1		22	f.p.	D.k. in soln. contg. $Cu(4,11\text{-}dieneN_4)^{2+}$ and (1-10) × 10^{-3} mol L^{-1} H_2O_2.	79A080
8.52.4	**Azide ion**							
	$Cu(4,11\text{-}dieneN_4)^{3+} + N_3^- \rightarrow Cu(4,11\text{-}dieneN_4)^{2+} + {}^{\bullet}N_3$	2.5 × 10^4	1		22	f.p.	D.k. in soln. contg. $Cu(4,11\text{-}dieneN_4)^{2+}$, (8-40) × 10^{-4} mol L^{-1} azide ion, 0.1 mol L^{-1} Cl^-, 0.1 mol L^{-1} H^+ and $Co(NH_3)_5Cl^{2+}$.	79A080
8.53	**1,4,8,11-Tetraazacyclotetradecane(hydrido)copper(III) ion**							
8.53.1	**Hydrogen ion**							
	$Cu(cyclam)(H)^{2+} + H^+ \rightarrow Cu^+ + cyclamH_2^{2+}$	~2 × 10^8	6.0			p.r.	D.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} MeOH and (2-30) × 10^{-5} mol L^{-1} $Cu(cyclam)^{2+}$.	82A320
8.54	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecane(hydrido)copper(III) ion**							
8.54.1	**Hydrogen ion**							
	$Cu(aneN_4)(H)^{2+} + H^+ \rightarrow Cu^+ + aneN_4H_2^{2+}$	1.6 × 10^6	<5.5			p.r.	D.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} formate and (2-30) × 10^{-5} mol L^{-1} $Cu(aneN_4)^{2+}$.	82A320
8.55	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene(hydrido)copper(III) ion**							
8.55.1	**Hydrogen ion**							
	$Cu(4,11\text{-}dieneN_4)(H)^{2+} + H^+ \rightarrow Cu^+ + 4,11\text{-}dieneN_4H_2^{2+}$	6 × 10^6	4.0-5.5			p.r.	D.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} MeOH and (2-30) × 10^{-5} mol L^{-1} $Cu(4,11\text{-}dieneN_4)^{2+}$.	80A189

TABLE 8. Rate constants for copper transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
8.56	**2,2,4,11,11,13-Hexamethyl-1,5,10,14-tetraazacyclooctadeca-4,13-diene(hydrido)copper(III) ion**							
8.56.1	**Hydrogen ion**							
	$Cu(4,13\text{-dieneN}_4)(H)^{2+} + H^+ \rightarrow Cu^+ + 4,13\text{-dieneN}_4H_2^{2+}$	$\sim 6 \times 10^8$	6.1			p.r.	D.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} formate and (2-30) $\times$ 10^{-5} mol L^{-1} $Cu(4,13\text{-dieneN}_4)^{2+}$; k was estimated from rate constants measured at pH 6.1 and 7.0.	82A320
8.57	**Bis(glycine)copper(III) complex**							
8.57.1	**First-order reaction**							
	$Cu^{III}(Gly)_2 \rightarrow$	6.0×10^3 s^{-1} 2.2×10^4 s^{-1}	6.1 7.5			p.r.	D.k. in N_2O-satd. soln. contg. (5-50) $\times$ 10^{-5} mol L^{-1} $CuSO_4$ and [glycine] = 1.9[$CuSO_4$].	710775
8.58	**Bis(alanine)copper(III) complex**							
8.58.1	**First-order reaction**							
	$Cu^{III}(Ala)_2 \rightarrow$	8.0×10^3 s^{-1}	6.3			p.r.	D.k. in N_2O-satd. soln. contg. (5-50) $\times$ 10^{-5} mol L^{-1} $CuSO_4$ and [alanine] = 1.9[$CuSO_4$].	710775
8.59	**Bis(β-alanine)copper(III) complex**							
8.59.1	**First-order reaction**							
	$Cu^{III}(\beta\text{-Ala})_2 \rightarrow$	7.0×10^3 s^{-1}	5.8			p.r.	D.k. in N_2O-satd. soln. contg. (5-50) $\times$ 10^{-5} mol L^{-1} $CuSO_4$ and [β-alanine] = 1.9[$CuSO_4$].	710775
8.60	**Bis(α-aminobutyric acid)copper(III) complex**							
8.60.1	**First-order reaction**							
	Cu^{III}(α-aminobutyric acid)$_2 \rightarrow$	5.0×10^3 s^{-1}	6.1			p.r.	D.k. in N_2O-satd. soln. contg. (5-50) $\times$ 10^{-5} mol L^{-1} $CuSO_4$ and [α-aminobutyric acid] = 1.9[$CuSO_4$].	710775
8.61	**Bis(β-aminobutyric acid)copper(III) complex**							
8.61.1	**First-order reaction**							
	Cu^{III}(β-aminobutyric acid)$_2 \rightarrow$	4.5×10^3 s^{-1}	6.0			p.r.	D.k. in N_2O-satd. soln. contg. (5-50) $\times$ 10^{-5} mol L^{-1} $CuSO_4$ and [β-aminobutyric acid] = 1.9[$CuSO_4$].	710775
8.62	**Bis(γ-aminobutyric acid)copper(III) complex**							
8.62.1	**First-order reaction**							
	Cu^{III}(γ-aminobutyric acid)$_2 \rightarrow$	1.2×10^3 s^{-1}	4.8			p.r.	D.k. in N_2O-satd. soln. contg. (5-50) $\times$ 10^{-5} mol L^{-1} $CuSO_4$ and [γ-aminobutyric acid] = 1.9[$CuSO_4$].	710775
8.63	**Bis(α-aminoisobutyric acid)copper(III) complex**							
8.63.1	**First-order reaction**							
	Cu^{III}(α-aminoisobutyric acid)$_2 \rightarrow$	1.5×10^3 s^{-1} 2.5×10^3 s^{-1}	6.2 7.3			p.r.	D.k. in N_2O-satd. soln. contg. (5-50) $\times$ 10^{-5} mol L^{-1} $CuSO_4$ and [α-aminoisobutyric acid] = 1.9[$CuSO_4$].	710775
8.64	**Hydroperoxocopper(III) ion**							
8.64.1	**First-order reaction**							
	$CuO_2H^{2+} \rightarrow Cu(I) + O_2 + H^+$	2.2×10^3 s^{-1}				p.r.	D.k. in O_2-satd. soln. contg. 1×10^{-4} mol L^{-1} Cu^{2+}, 0.05 mol L^{-1} formate and 0.01 mol L^{-1} arginine. Reactant includes $[Cu(HCO_2^-)(HO_2)]^+$.	87A160

TABLE 8. Rate constants for copper transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
8.65	**Methylcopper(III) ion**							
8.65.1	**First-order reaction**							
	$CuCH_3^{2+} \rightarrow$	7×10^2 s^{-1}	6			p.r.	D.k. in N_2O-satd. soln. contg. $CuSO_4$ and DMSO.	78F301
8.66	**Trichloromethylcopper(III) ion**							
8.66.1	**Water**							
	$CuCCl_3^{2+} + H_2O \rightarrow Cu^+ + HOCCl_3 + H^+$	0.9 s^{-1}	6			p.r.	D.k. in Ar-satd. soln. contg. (2-10) $\times 10^{-5}$ mol L^{-1} $CuSO_4$ and (1-10) $\times 10^{-2}$ mol L^{-1} $CHCl_3$; $CuCHCl_2^+$ also present. Authors did not distinguish between the two species.	80A277
8.67	**2-Hydroxyethylcopper(III) ion**							
8.67.1	**First-order reaction**							
	$CuCH_2CH_2OH^{2+} + \rightarrow Cu^+ + H^+ + -OCH_2CH_2-$	3.3×10^2 s^{-1}	6			p.r.	D.k. in N_2O-ethylene (1:1) satd. soln. contg. (1-5) $\times 10^{-4}$ mol L^{-1} $CuSO_4$.	80A277
8.68	**Carboxymethylcopper(III) ion**							
8.68.1	**Water**							
	$CuCH_2CO_2^+ + H_2O \rightarrow Cu^+ + H^+ + HOCH_2CO_2^-$	2.8 s^{-1}	6			p.r.	D.k. in N_2O-satd. soln. contg. $CuSO_4$ and acetate; an initial process with $k = 1 \times 10^2$ s^{-1} was also reported.	80A277
8.69	**1-Carboxyethylcopper(III) ion**							
8.69.1	**Water**							
	$CuCH(CH_3)CO_2^+ + H_2O \rightarrow Cu^+ + H^+ + CH_3CHOHCO_2^-$	0.2 s^{-1}	6			p.r.	D.k. in N_2O-satd. soln. contg. (5-10) $\times 10^{-5}$ mol L^{-1} $CuSO_4$ and 0.01 mol L^{-1} propionate; an initial process with $k = 8.6 \times 10^3$ s^{-1} was also reported.	80A277
8.70	**2-Hydroxy-2,2-dimethylethylcopper(III) ion**							
8.70.1	**Water**							
	$CuCH_2C(CH_3)_2OH^{2+} + H_2O \rightarrow Cu^+ + H^+ + HOCH_2C(CH_3)_2OH$	4.5×10^2 s^{-1}	6			p.r.	D.k. in N_2O-satd. soln. contg. (1-5) $\times 10^{-5}$ mol L^{-1} $CuSO_4$ and 0.1 mol L^{-1} *tert*-BuOH.	80A277
8.71	**1,2-Dicarboxy-2-hydroxyethylcopper(III) ion**							
8.71.1	**First-order reaction**							
	$CuCH(CO_2)C(OH)CO_2 \rightarrow$	1 s^{-1}	6			p.r.	D.k. in N_2O-satd. soln. contg. (5-10) $\times 10^{-5}$ mol L^{-1} $CuSO_4$ and (2.5-10) $\times 10^{-4}$ mol L^{-1} fumarate; an initial process with $k = 2 \times 10^2$ s^{-1} was also reported.	80A277
8.72	**2-Carboxy-2,2-dimethylethylcopper(III) ion**							
8.72.1	**First-order reaction**							
	$CuCH_2C(CH_3)_2CO_2H^{2+} \rightarrow Cu^+ + CO_2 + CH_2{=}C(CH_3)_2 + H^+$	0.03 s^{-1}	3.0-4.0			p.r.	D.k. at 400 nm in N_2O-satd. soln. contg. 0.05 mol L^{-1} trimethylacetic acid, (5-30) $\times 10^{-4}$ mol L^{-1} Cu^{2+} and ((5-30) $\times 10^{-5}$ mol L^{-1} Cu^+.	90A474
8.73	**2-Ammonio-2-carboxypropylcopper(III) ion**							
8.73.1	**First-order reaction**							
	$CuCH_2C(CH_3)(NH_3)CO_2^{2+} \rightarrow Cu^+ + CO_2 + CH_2{=}C(CH_3)NH_3^+$	0.15 s^{-1}	3			p.r.	D.k. in N_2O-satd. soln. contg. 0.05 mol L^{-1} 2-methylalanine and (0.5-2.0) $\times 10^{-3}$ mol L^{-1} Cu^{2+}.	92A215

TABLE 8. Rate constants for copper transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
8.74	**Benzylcopper(III) ion**							
8.74.1	**First-order reaction**							
	$CuCH_2C_6H_5^{2+} \rightarrow Cu^{2+} + C_6H_5\dot{C}H_2$	1.2×10^6 s^{-1}				f.p.	D.k. in deaerated soln. contg. (0.4-1.2) × 10^{-3} mol L^{-1} $Co(NH_3)_5(C_6H_5CH_2CO_2)^{2+}$ and $Cu(ClO_4)_2$; $k_r = 2.8 \times 10^6$ L mol^{-1} s^{-1}. In soln. contg. 10% acetonitrile and dibenzyl ketone, $k = 1.3 \times 10^6$ s^{-1} and $k_r = 2.5 \times 10^7$ L mol^{-1} s^{-1} at 20 °C; $E_a = 7.0$ kJ mol^{-1}, log $A = 7.58$, studied at 1-60 °C [92A148].	93A346
		1.1×10^6 s^{-1}	2.8		27	f.p.	D.k. at 375 nm in soln. contg. ~0.002 mol L^{-1} $Co(NH_3)(C_6H_5CH_2CO_2)^{2+}$ and 0.001-0.004 mol L^{-1} $CuSO_4$: $k_r = 2.1 \times 10^7$ L mol^{-1} s^{-1}.	84A367
8.74.2	**Water**							
	$CuCH_2C_6H_5^{2+} + H_2O \rightarrow Cu^+ + C_6H_5CH_2OH + H^+$	4.3×10^4 s^{-1}				f.p.	D.k. in soln. contg. $Co(NH_3)_5(C_6H_5CH_2CO_2)^{2+}$ and $Cu(ClO_4)_2$; in soln. contg. dibenzyl ketone, $Cu(ClO_4)_2$ and 10% acetonitrile $k = 3.5 \times 10^5$ s^{-1} at 20 °C; $E_a = 6.9$ kJ mol^{-1}, log $A = 6.61$, studied at 1-60 °C [92A148].	93A346
		~1.2×10^4 s^{-1}	2.8		27	f.p.	D.k. in soln. contg. ~0.002 mol L^{-1} $[Co(NH_3)_5OCOCH_2C_6H_5]^{2+}$ and 0.001-0.004 mol L^{-1} $CuSO_4$.	84A367
8.75	**(4-Chlorophenyl)methylcopper(III) ion**							
8.75.1	**First-order reaction**							
	$CuCH_2C_6H_4$-4-$Cl^{2+} \rightarrow Cu^{2+}$ + 4-$ClC_6H_4\dot{C}H_2$	1.5×10^6 s^{-1}				f.p.	D.k. in soln. contg. $Co(NH_3)_5$(4-$ClC_6H_4CH_2CO_2)^{2+}$ and $Cu(ClO_4)_2$; $k_r = 1.6 \times 10^6$ L mol^{-1} s^{-1}.	93A346
8.75.2	**Water**							
	$CuCH_2C_6H_4$-4-$Cl^{2+} + H_2O \rightarrow Cu^+$ + 4-$ClC_6H_4CH_2OH + H^+$	3.3×10^4 s^{-1}				f.p.	D.k. in soln. contg. $Co(NH_3)_5$(4-$ClC_6H_4CH_2CO_2)^{2+}$ and $Cu(ClO_4)_2$.	93A346
8.76	**2-Hydroxyphenoxycopper(III) ion**							
8.76.1	**2-Hydroxyphenoxycopper(III) ion**							
	$CuOC_6H_4$-2-OH^{2+} + $CuOC_6H_4$-2-$OH^{2+} \rightarrow$	1.6×10^6	2.0	→0		f.p.	D.k. at 380 nm in soln. contg. (1.5-20) × 10^{-2} mol L^{-1} Cu^{2+} and 1×10^{-4} mol L^{-1} catechol.	78A449 757592
8.77	**3-Hydroxyphenoxycopper(III) ion**							
8.77.1	**First-order reaction**							
	$CuOC_6H_4$-3-$OH^{2+} \rightarrow$	3.0×10^3 s^{-1}	2-6			f.p.	D.k. at 420 nm in soln. contg. (2-300) × 10^{-4} mol L^{-1} Cu^{2+} and 2×10^{-3} mol L^{-1} resorcinol.	79A272
8.77.2	**3-Hydroxyphenoxycopper(III) ion**							
	$CuOC_6H_4$-3-OH^{2+} + $CuOC_6H_4$-3-$OH^{2+} \rightarrow$	5.0×10^9	2-6	0.04		f.p.	D.k. at 420 nm in soln. contg. > 10^{-2} mol L^{-1} Cu^{2+} and 2×10^{-3} mol L^{-1} resorcinol.	79A272
8.78	**4-Hydroxyphenoxycopper(III) ion, conjugate base**							
8.78.1	**4-Hydroxyphenoxycopper(III) ion, conjugate base**							
	$CuOC_6H_4$-4-$O^+ + CuOC_6H_4$-4-$O^+ \rightarrow$	1.6×10^6	7.0	→0		f.p.	D.k. at 425 nm in soln. contg. Cu^{2+} and 1×10^{-4} mol L^{-1} hydroquinone.	78A449

TABLE 8. Rate constants for copper transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
8.79	**3-Hydroxy-5-methylphenoxycopper(III) ion**							
8.79.1	**First-order reaction**							
	$CuOC_6H_3$-5-CH_3-3-OH^{2+} →	3.0×10^3 s^{-1}	2-6			f.p.	D.k. at 420 nm in soln. contg. (2-300) × 10^{-4} mol L^{-1} Cu^{2+} and 2×10^{-3} mol L^{-1} 5-methylresorcinol.	79A272
8.79.2	**3-Hydroxy-5-methylphenoxycopper(III) ion**							
	$CuOC_6H_3$-5-CH_3-3-OH^{2+} + $CuOC_6H_3$-5-CH_3-3-OH^{2+} →	5.0×10^9	2-6	0.04		f.p.	D.k. at 420 nm in soln. contg. > 10^{-2} mol L^{-1} Cu^{2+} and 2×10^{-3} mol L^{-1} 5-methylresorcinol.	79A272
8.80	**(4-Methoxyphenyl)methylcopper(III) ion**							
8.80.1	**First-order reaction**							
	$CuCH_2C_6H_4$-4-OCH_3^{2+} → Cu^{2+} + 4-$CH_3OC_6H_4\dot{C}H_2$	6.2×10^5 s^{-1}				f.p.	D.k. in soln. contg. $Co(NH_3)_5$(4-$CH_3OC_6H_4CH_2CO_2)^{2-}$ and $Cu(ClO_4)_2$; k_r = 8.0×10^6 L mol^{-1} s^{-1}.	93A346
8.80.2	**Water**							
	$CuCH_2C_6H_4$-4-OCH_3^{2+} + H_2O → Cu^+ + 4-$CH_3OC_6H_4CH_2OH$ + H^+	1.5×10^4 s^{-1}				f.p.	D.k. in soln. contg. $Co(NH_3)_5$(4-$CH_3OC_6H_4CH_2CO_2)^{2-}$ and $Cu(ClO_4)_2$.	93A346
8.81	**(4-Methylphenyl)methylcopper(III) ion**							
8.81.1	**First-order reaction**							
	$CuCH_2C_6H_4$-4-CH_3^{2+} → Cu^{2+} + 4-$CH_3C_6H_4\dot{C}H_2$	7.9×10^5 s^{-1}				f.p.	D.k. in soln. contg. $Co(NH_3)_5$(4-$CH_3C_6H_4CH_2CO_2)^{2-}$ and $Cu(ClO_4)_2$; k_r = 5.7×10^6 L mol^{-1} s^{-1}.	93A346
8.81.2	**Water**							
	$CuCH_2C_6H_4$-4-CH_3^{2+} + H_2O → Cu^+ + 4-$CH_3C_6H_4CH_2OH$ + H^+	3.4×10^4 s^{-1}				f.p.	D.k. in soln. contg. $Co(NH_3)_5$(4-$CH_3C_6H_4CH_2CO_2)^{2-}$ and $Cu(ClO_4)_2$.	93A346
8.82	**Bis(glycinato)methylcopper(III) ion**							
8.82.1	**Methyl**							
	$(Gly)_2CuCH_3$ + $^{\bullet}CH_3$ → $Cu(Gly)_2$ + C_2H_6	$>5 \times 10^9$				γ-r.	Estd. from yield of ethane in low-dose experiments.	90A421
8.83	**β-Alaninato(2-aminoethyl)copper(III)**							
8.83.1	**Water**							
	(β-Ala)$CuCH_2CH_2NH_2$ + H_2O → $Cu(\beta\text{-Ala}) + H_2NCH_2CH_2OH + H^+$	1.2×10^1 s^{-1}				f.p.	D.k. in soln. contg. $Cu(\beta\text{-Ala})_2$; the transient is from reaction of the Cu(II) complex with aminoalkyl radical.	81F406
8.83.2	**Hydroxide ion**							
	(β-Ala)$CuCH_2CH_2NH_2$ + OH^- → $Cu(\beta\text{-Ala}) + H_2NCH_2CH_2OH$	4.0×10^8				f.p.	D.k. in soln. contg. $Cu(\beta\text{-Ala})_2$.	81F406
8.84	***cis*-Aqua(hydroxymethyl)(nitrilotriacetato)cuprate(III) ion**							
8.84.1	**Hexaamminecobalt(III) ion**							
	cis-$[HOCH_2Cu(NTA)(H_2O)]^-$ + $Co(NH_3)_6^{3+}$ →	3.8×10^5	5-8			p.r.	D.k. in N_2O-satd. soln. contg. $CuSO_4$, nitrilotriacetate ion and MeOH; $^{\bullet}CH_2OH$ in the complex may be ionized to $^{\bullet}CH_2O^-$ in this pH region.	86B151
8.84.2	**Hexaammineruthenium(III) ion**							
	cis-$[HOCH_2Cu(NTA)(H_2O)]^-$ + $Ru(NH_3)_6^{3+}$ →	1.8×10^8	5-8			p.r.	D.k. in N_2O-satd. soln. contg. $CuSO_4$, nitrilotriacetate ion and MeOH; $^{\bullet}CH_2OH$ in the complex may be ionized to $^{\bullet}CH_2O^-$ in this pH region.	86B151

TABLE 8. Rate constants for copper transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
8.84	***cis*-Aqua(hydroxymethyl)(nitrilotriacetato)cuprate(III) ion** — Continued							
8.84.3	**Ferricyanide ion**							
	cis-$[HOCH_2Cu(NTA)(H_2O)]^-$ + $Fe(CN)_6^{3-}$ →	1.9×10^7	5-8			p.r.	D.k. in N_2O-satd. soln. contg. $CuSO_4$, nitrilotriacetate ion and MeOH; $^{\bullet}CH_2OH$ in the complex may be ionized to $^{\bullet}CH_2O^-$ in this pH region.	86B151
8.84.4	***cis*-Diaqua(nitrilotriacetato)copper(II) ion**							
	cis-$[HOCH_2Cu(NTA)(H_2O)]^-$ + *cis*-$[Cu(NTA)(H_2O)_2]^-$ + H_2O → *cis*-$[Cu(NTA)(H_2O)_2]^-$ + *cis*-$[Cu(NTA)(H_2O)_2]^{2-}$ + HCHO + H^+	4.0×10^5	5-8			p.r.	D.k. at 425 nm in N_2O-satd. soln. contg. (1-100) × 10^{-5} mol L^{-1} $CuSO_4$, 0.001 mol L^{-1} nitrilotriacetate ion and 0.1 mol L^{-1} MeOH; $^{\bullet}CH_2OH$ in the complex may be ionized to $^{\bullet}CH_2O^-$ in this pH region.	86B151
8.85	***cis*-Aqua(1-hydroxyethyl)(nitrilotriacetato)cuprate(III) ion**							
8.85.1	***cis*-Diaqua(nitrilotriacetato)copper(II) ion**							
	cis-$[HOCH(CH_3)Cu(NTA)(H_2O)]^-$ + *cis*-$[Cu(NTA)(H_2O)_2]^-$ + H_2O → *cis*-$[Cu(NTA)(H_2O)_2]^-$ + *cis*-$[Cu(NTA)(H_2O)_2]^{2-}$ + CH_3CHO + H^+	1.3×10^6	5-8			p.r.	D.k. in N_2O-satd. soln. contg. $CuSO_4$, nitrilotriacetate ion and EtOH.	86B151
8.86	***cis*-Aqua(1-hydroxy-1-methylethyl)(nitrilotriacetato)cuprate(III) ion**							
8.86.1	***cis*-Diaqua(nitrilotriacetato)copper(II) ion**							
	cis-$[HOC(CH_3)_2Cu(NTA)(H_2O)]^-$ + *cis*-$[Cu(NTA)(H_2O)_2]^-$ + H_2O → *cis*-$[Cu(NTA)(H_2O)_2]^-$ + *cis*-$[Cu(NTA)(H_2O)_2]^{2-}$ + CH_3COCH_3 + H^+	1.5×10^6	5-8			p.r.	D.k. in N_2O-satd. soln. contg. $CuSO_4$, nitrilotriacetate ion and 2-PrOH.	86B151

TABLE 9. Rate constants for iron transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
9.1	**Bis(2,2′-bipyridine)dicyanoferrate(II), electron adduct**							
9.1.1	**Dicyanobis(2,2′-bipyridine)iron(III) ion**							
	$Fe(bpy)_2(CN)_2^- + Fe(bpy)_2(CN)_2^+ \rightarrow 2\ Fe(bpy)_2(CN)_2$	3.1×10^{10}				f.p./pi or p.r.	D.k. in soln. contg. $Fe(bpy)_2(CN)_2$.	90A499
9.2	**Dicyanobis(4,4′-dimethyl-2,2′-bipyridine)ferrate(II), electron adduct**							
9.2.1	**Dicyanobis(4,4′-dimethyl-2,2′-bipyridine)iron(III) ion**							
	$Fe(4,4'\text{-}Me_2bpy)_2(CN)_2^- + Fe(4,4'\text{-}Me_2bpy)_2(CN)_2^+ \rightarrow 2\ Fe(4,4'\text{-}Me_2bpy)_2(CN)_2$	3.0×10^{10}				f.p./pi or p.r.	D.k. in soln. contg. $Fe(4,4'\text{-}Me_2bpy)_2(CN)_2$.	90A499
9.3	**2,2′-Bipyridinetetracyanoferrate(II) ion, electron adduct**							
9.3.1	**Tetracyano(2,2′-bipyridine)ferrate(III) ion**							
	$Fe(bpy)(CN)_4^{3-} + Fe(bpy)(CN)_4^- \rightarrow 2\ Fe(bpy)(CN)_4^{2-}$	1.8×10^{10}				f.p./pi	D.k. at 370 nm in soln. contg. $Fe(bpy)(CN)_4^{2-}$.	90A499 90A171 91A067
9.3.2	**1,1′-Dimethyl-4,4′-bipyridinium**							
	$Fe(bpy)(CN)_4^{3-} + MV^{2+} \rightarrow Fe(bpy)(CN)_4^{2-} + MV^{\bullet+}$	9.0×10^9				f.p./pi	D.k. in soln. contg. $Fe(bpy)(CN)_4^{2-}$ and MV^{2+}. Value obtained from computer fit.	91A067
9.4	**Tetracyano(4,4′-dimethyl-2,2′-bipyridine)ferrate(II) ion, electron adduct**							
9.4.1	**Tetracyano(4,4′-dimethyl-2,2′-bipyridine)ferrate(III) ion**							
	$Fe(4,4'\text{-}Me_2bpy)(CN)_4^{3-} + Fe(4,4'\text{-}Me_2bpy)(CN)_4^- \rightarrow 2\ Fe(4,4'\text{-}Me_2bpy)(CN)_4^{2-}$	1.2×10^{10}				f.p./pi or p.r.	D.k. in soln. contg. $Fe(4,4'\text{-}Me_2bpy)(CN)_4^{2-}$.	90A499 90A171
9.4.2	**1,1′-Dimethyl-4,4′-bipyridinium**							
	$Fe(4,4'\text{-}Me_2bpy)(CN)_4^{3-} + MV^{2+} \rightarrow Fe(4,4'\text{-}Me_2bpy)(CN)_4^{2-} + MV^{\bullet+}$	9.4×10^9				f.p./pi or p.r.	D.k. in soln. contg. $Fe(4,4'\text{-}Me_2bpy)(CN)_4^{2-}$.	90A499
9.5	**Iron(II) oxalate**							
9.5.1	**Iron(III) oxalate**							
	$Fe(C_2O_4) + Fe(C_2O_4)^+ \rightarrow Fe^{2+} + {}^-O_2CCO_2^- + Fe(C_2O_4)^+$	2.5×10^6	~0.8	1.0	22	f.p./pi	D.k. in soln. contg. added Fe^{3+}, 5×10^{-4} mol L^{-1} oxalate and 0.14 mol L^{-1} H^+; Log A = 12.9, E_a = 37 kJ mol^{-1}; studied at 18.5-46.8°C.	727193
9.5.2	**Iron(III) ion**							
	$Fe(C_2O_4) + Fe^{3+} \rightarrow Fe^{2+} + {}^-O_2CCO_2^- + Fe^{3+}$	1.0×10^5	~0.8	1.0	22	f.p.	D.k. in soln. contg. (1-14) $\times 10^{-4}$ mol L^{-1} ferric oxalate and 0.15 mol L^{-1} H^+; Log A = 17.7, E_a = 71 kJ mol^{-1}; studied at 18.3-31.8°C.	727193
9.6	**Pentacyanoferrate(II) ion**							
9.6.1	**2-Methylpyrazine**							
	$Fe(CN)_5^{3-} + 2\text{-Mepz} \rightarrow Fe(CN)_5(2\text{-Mepz})^{3-}$	4.8×10^2	8-10	0.1	25	f.p.	D.k. at 440-470 nm in soln. contg. $Fe(CN)_5(2\text{-Mepz})^{3-}$ and 0.1-9.6 mol L^{-1} 2-methylpyrazine; at 1 and 50°C, k = 44 and 4.6×10^3 L mol^{-1} s^{-1}, respectively, giving $\Delta H‡$ = 67 kJ mol^{-1} and $\Delta S‡$ = 32 J K^{-1} mol^{-1}. Product suggested to be N1 isomer which rearranges to N4 isomer.	81A238

TABLE 9. Rate constants for iron transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
9.7	**Pentacyanonitrosylferrate(II) ion**							
9.7.1	**2-Hydroxy-2,2-dimethylethyl**							
	$Fe(CN)_5NO^{3-} + {}^{\bullet}CH_2C(CH_3)_2OH \rightarrow [Fe(CN)_5N(O)CH_2C(CH_3)_2OH]^{3-}$	2.5×10^9	6.0-7.5			p.r.	P.b.k. and d.k. at 380 nm in Ar-satd. soln. contg. $Fe(CN)_5NO^{2-}$ and 0.3 mol L^{-1} *tert*-BuOH.	79A134
9.7.2	**2-Amino-2-carboxy-2-methylethyl**							
	$Fe(CN)_5NO^{3-} + {}^{\bullet}CH_2C(CH_3)(NH_3^+)CO_2^- \rightarrow [Fe(CN)_5N(O)CH_2C(CH_3)(NH_3^+)CO_2^-]^{3-}$	1.6×10^9	6.0-7.5			p.r.	P.b.k. and d.k. at 380 nm in Ar-satd. soln. contg. $Fe(CN)_5NO^{2-}$ and 0.3 mol L^{-1} α-aminoisobutyrate ion.	79A134
9.7.3	**(*N*-Acetyl-*N*-methylamino)methyl**							
	$Fe(CN)_5NO^{3-} + {}^{\bullet}CH_2N(CH_3)C(O)CH_3 \rightarrow [Fe(CN)_5N(O)CH_2N(CH_3)C(O)CH_3]^{3-}$	3.5×10^{10}	6.0-7.5			p.r.	P.b.k. and d.k. at 380 nm in Ar-satd. soln. contg. $Fe(CN)_5NO^{2-}$ and 0.3 mol L^{-1} *N,N*-dimethylacetamide.	79A134
9.7.4	**2-Amino-2-methylpropyl, conjugate acid**							
	$Fe(CN)_5NO^{3-} + {}^{\bullet}CH_2C(CH_3)_2NH_3^+ \rightarrow [Fe(CN)_5N(O)CH_2C(CH_3)_2NH_3]^{2-}$	1.2×10^{10}	6.0-7.5			p.r.	P.b.k. and d.k. at 380 nm in Ar-satd. soln. contg. $Fe(CN)_5NO^{2-}$ and 0.3 mol L^{-1} *tert*-butylamine.	79A134
9.7.5	**2-Carboxy-2-hydroxy-2-methylethyl, anion**							
	$Fe(CN)_5NO^{3-} + {}^{\bullet}CH_2C(CH_3)(OH)CO_2^- \rightarrow [Fe(CN)_5N(O)CH_2COH(CH_3)CO_2]^{4-}$	6.3×10^8	6.0-7.5			p.r.	P.b.k. and d.k. at 380 nm in Ar-satd. soln. contg. $Fe(CN)_5NO^{2-}$ and 0.3 mol L^{-1} α-hydroxyisobutyrate ion.	79A134
9.7.6	**2-Carboxy-2,2-dimethylethyl anion**							
	$Fe(CN)_5NO^{3-} + {}^{\bullet}CH_2C(CH_3)_2CO_2^- \rightarrow [Fe(CN)_5N(O)CH_2C(CH_3)_2CO_2]^{4-}$	2.0×10^9	6.3			p.r.	P.b.k. and d.k. at 380 nm in Ar-satd. soln. contg. $Fe(CN)_5NO^{2-}$ and 0.3 mol L^{-1} pivalate ion.	79A134
9.8	**Acetonitrile(aqua)-2,3,9,10-tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraeneiron(II) ion**							
9.8.1	**Carbon monoxide**							
	$Fe(tim)(CH_3CN)(H_2O)^{2+} + CO \rightarrow Fe(tim)CO(CH_3CN)^{2+} + H_2O$	7.1×10^3		0.5	23	f.p.	D.k. at 550 nm in soln. contg. 9.8×10^{-4} mol L^{-1} CO, ~10^{-5} mol L^{-1} $Fe(tim)CO(H_2O)^{2+}$ and 0.031-2.55 mol L^{-1} acetonitrile; $k_r = 1.2 \times 10^{-3}$ s^{-1} [84M388].	84A403
9.9	**Diaqua(2,3,9,10-tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraeneiron(II) ion**							
9.9.1	**Carbon monoxide**							
	$Fe(tim)(H_2O)_2^{2+} + CO \rightarrow Fe(tim)CO(H_2O)^{2+} + H_2O$	1.3×10^6		0.5	23	f.p.	D.k. at 650 nm in soln. contg. CO and $Fe(tim)CO(H_2O)^{2+}$ (pseudo-first order reaction) or Ar-satd. to remove CO (second order reaction); $k_r = 1.8 \times 10^{-3}$ s^{-1} [84M388].	84A403
9.10	**5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)porphinatoiron(II) ion**							
9.10.1	**Carbon monoxide**							
	$FeTMpyP^{4+} + CO \rightarrow FeTMpyP(CO)^{4+}$	6.8×10^6	8			p.r.	D.k. at 450 nm in soln. contg. 0.1 mol L^{-1} formate, 0.005-0.022 mol L^{-1} N_2O, (1-9) × 10^{-4} mol L^{-1} CO and (2-3) × 10^{-5} mol L^{-1} $FeTMpyP^{5+}$.	82A119
9.11	**α,α,α,β-Tetrakis(*N*-methylisonicotinamidophenyl)porphinatoiron(II) ion**							
9.11.1	**Carbon monoxide**							
	$FePFP^{4+} + CO \rightarrow FePFP(CO)^{4+}$	2.9×10^5	7.9	0.1		p.r.	D.k. at 440 nm in soln. contg. 0.1 mol L^{-1} formate, 0.005-0.022 mol L^{-1} N_2O, (1-9) × 10^{-4} mol L^{-1} CO and (2-3) × 10^{-5} mol L^{-1} $FePFP^{5+}$.	86A154

TABLE 9. Rate constants for iron transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
9.12	**Iron(II) deuteroporphyrin (2-propanol)$_2$**							
9.12.1	**Trichloromethyl**							
	$FeDP(2\text{-}PrOH)_2 + {}^{\bullet}CCl_3 \rightarrow CCl_3FeDP(2\text{-}PrOH)_2$	$\sim 2 \times 10^9$	7.2			p.r.	D.k. at 412 nm in soln. contg. 10^{-4} mol L^{-1} Fe(III) deuteroporphyrin, 6.5 mol L^{-1} 2-PrOH, 0.034 mol L^{-1} acetone, (0.25-1.0) $\times$ 10^{-4} mol L^{-1} CCl_4 and 6.2×10^{-3} mol L^{-1} phosphate. Reaction is followed by first-order process, $k = 70$ s^{-1}; suggested to represent structural rearrangement.	80A011
9.13	**Tris(2,2′-bipyridine)iron(II) ion, OH-adduct**							
9.13.1	**First-order reaction**							
	$Fe(bpy)_2(bpyOH)^{2+} \rightarrow$	1.4×10^3 s^{-1}				p.r.	D.k. at 400 nm in N_2O-satd. soln. contg. (0.32-1.0) $\times$ 10^{-4} mol L^{-1} $Fe(bpy)_3^{2+}$. At 520 nm decay is mixed order; $k = 1 \times 10^3$ s^{-1} from condy. change at pH 4 and 9.	90A105
		1.3×10^3 s^{-1}	7		20	p.r.	D.k. at 400 nm in N_2O-satd. soln. contg. $Fe(bpy)_3^{2+}$. At 520 nm decay is mixed order suggesting existence of at least two isomers.	82A343
9.13.2	**Ferricyanide ion**							
	$Fe(bpy)_2(bpyOH)^{2+} + Fe(CN)_6^{3-} \rightarrow$	† 2.1×10^5	~6			p.r.	D.k. at 375 and 620 nm in N_2O-satd. soln. contg. 8.0×10^{-4} mol L^{-1} $Fe(CN)_6^{3-}$.	90A015
		† 8×10^5	~6			p.r.	D.k. at 825 nm in N_2O-satd. soln. contg. (0.8-2.0) $\times$ 10^{-3} mol L^{-1} $Fe(CN)_6^{3-}$.	90A015
							† Wavelength dependence of k attributed to the presence of more than one form of the reactant.	
9.13.3	**Oxygen**							
	$Fe(bpy)_2(bpyOH)^{2+} + O_2 \rightarrow$	† 4×10^6	~6			p.r.	D.k. at 400 nm in N_2O-satd. soln. contg. 6.0 $\times$ 10^{-4} mol L^{-1} O_2.	90A015
		† 7.6×10^6	~6			p.r.	D.k. at 525 nm in N_2O-satd. soln. contg. 6.0 $\times$ 10^{-4} mol L^{-1} O_2.	90A015
							† Wavelength dependence of k attributed to the presence of more than one form of the reactant.	
9.14	**Bis(2,2′-bipyridine)dicyanoferrate(II), OH reaction product**							
9.14.1	**First-order reaction**							
	$Fe(bpy)_2(CN)_2/OH \rightarrow$	$\sim 3 \times 10^3$ s^{-1}	4, nat			p.r.	D.k. at 310, 330, 515-530 nm in N_2O-satd. soln. contg. (3.1-5.6) $\times$ 10^{-5} mol L^{-1} $Fe(bpy)_2(CN)_2$. From condy. measurements $k = 4 \times 10^3$ s^{-1}. At pH 9.0, 9.5 d.k. is complex. Reactant suggested to be a mixture of $[Fe(bpy)_2(CN)_2]^+$ and various ${}^{\bullet}OH$ adducts.	90A015
9.15	**Hydroperoxide-iron(III) iron(II) complex**							
9.15.1	**First-order reaction**							
	$FeHO_2Fe^{4+} \rightarrow Fe^{3+} + FeHO_2^+$	1.8×10^4 s^{-1} 2.5×10^4 s^{-1}	0.1- 0.3	1.0	20 25	p.r.	D.k. at 450 nm in O_2-satd. soln. contg. $Fe(ClO_4)_2$ and $HClO_4$; $E_a = 48$ kJ mol^{-1}; studied at 20-40°C. For the equilibrium $Fe^{3+}HO_2^- + Fe^{2+} \rightleftarrows FeHO_2Fe^{4+}$ $K = 22$, 27, 33, 37.5 L mol^{-1} at 20, 25, 30 and 40°C, respectively.	730038

TABLE 9. Rate constants for iron transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
9.16	**Hydridoiron(III) ion**							
9.16.1	**Hydrogen ion**							
	$FeH^{2+} + H^+ \rightarrow Fe^{3+} + H_2$	1.1×10^4	0.1-1.0	0.1-1.0	19-24	p.r.	D.k. at 320-370 nm in deaerated soln. contg. $Fe(ClO_4)_2$ and $HClO_4$.	690434
9.17	**Hydroperoxide-iron(III) complex**							
9.17.1	**First-order reaction**							
	$FeHO_2^{2+} \rightarrow Fe^{3+} + HO_2^-$	1.8×10^3 s^{-1}	0.1-0.3	1.0	20,25	p.r.	Calcd. from d.k. at 450 nm in O_2-satd. soln. contg. $Fe(ClO_4)_2$ and $HClO_4$; $E_a = 8.8$ kJ mol^{-1}; studied at 20-40°C.	730038
9.18	**Hydroperoxide-sulfatoiron(III) complex**							
9.18.1	**First-order reaction**							
	$FeHO_2SO_4 \rightarrow FeSO_4^+ + HO_2^-$	$\sim 10^4$ s^{-1}	0.1-0.3		22	p.r.	Estd. from d.k. at 450 nm in O_2-satd. soln. contg. $(1.5\text{-}2.3) \times 10^{-2}$ mol L^{-1} Fe^{2+} and 0-0.13 mol L^{-1} sulfate. For the equilibrium $Fe^{3+}HO_2^- + SO_4^{2-} \rightleftarrows FeHO_2SO_4$, $K = 90$ L mol^{-1}.	731022
9.19	**Hydroperoxide-sulfatoiron(III) iron(II) complex**							
9.19.1	**First-order reaction**							
	$FeHO_2FeSO_4^{2+} \rightarrow FeSO_4Fe^{3+} + HO_2^-$	$\sim 10^4$ s^{-1}	0.1-0.3		22	p.r.	Estd. from d.k. at 450 nm in O_2-satd. soln. contg. $(1.5\text{-}2.3) \times 10^{-2}$ mol L^{-1} Fe^{2+} and 0-0.13 mol L^{-1} sulfate. For the equilibrium $FeHO_2Fe^{4+} + SO_4^{2-} \rightleftarrows FeHO_2FeSO_4^{2+}$, $K = 100$ L mol^{-1}.	731022
9.20	**Hydridoiron(III) protoporphyrin**							
9.20.1	**Water**							
	Fe(III)PP(H) + $H_2O \rightarrow$ Fe(III)PP + $H_2 + OH^-$	2.5×10^3 s^{-1}	10			p.r.	D.k. in Ar-satd. soln. contg. 2×10^{-5} mol L^{-1} Fe(II) protoporphyrin and 0.1 mol L^{-1} *tert*-BuOH. In N_2O-satd. soln. contg. $(2\text{-}10) \times 10^{-5}$ mol L^{-1} Fe(II)PP and 0.1 mol L^{-1} formate, $k = 2.0 \times 10^3$ s^{-1}.	85A006
9.21	**Hydroxymethyliron(III) protoporphyrin**							
9.21.1	**Water**							
	$HOCH_2$Fe(III)PP + $H_2O \rightarrow$ Fe(III)PP + MeOH + OH^-	2.5×10^2 s^{-1}	10			p.r.	D.k. in N_2O-satd. soln. contg. 2×10^{-5} mol L^{-1} Fe(II) protoporphyrin and 0.1 mol L^{-1} MeOH.	85A006
9.22	**1-Hydroxyethyliron(III) protoporphyrin**							
9.22.1	**Water**							
	CH_3CHOHFe(III)PP + $H_2O \rightarrow$ Fe(III)PP + EtOH + OH^-	2.5×10^2 s^{-1}	10			p.r.	D.k. in N_2O-satd. soln. contg. 2×10^{-5} mol L^{-1} Fe(II) protoporphyrin and 0.1 mol L^{-1} EtOH.	85A006
9.23	**1-Hydroxy-1-methylethyliron(III) protoporphyrin**							
9.23.1	**Water**							
	$(CH_3)_2C(OH)$Fe(III)PP + $H_2O \rightarrow$ Fe(III)PP + 2-PrOH + OH^-	3.0×10^2 s^{-1}	10			p.r.	D.k. in N_2O-satd. soln. contg. 2×10^{-5} mol L^{-1} Fe(II) protoporphyrin and 0.1 mol L^{-1} 2-PrOH.	85A006

TABLE 9. Rate constants for iron transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
9.24	**2-Hydroxyethyliron(III) protoporphyrin**							
9.24.1	**First-order reaction**							
	$HOCH_2CH_2Fe(III)PP \rightarrow Fe(III)PP + H_2C{=}CH_2 + OH^-$	80 s^{-1}	10-13			p.r.	D.k. in ethylene-N_2O (9:1) satd. soln. contg. (1-3) × 10^{-5} mol L^{-1} Fe(II) protoporphyrin.	86A511
9.25	**2-Hydroxy-1-methylethyliron(III) protoporphyrin**							
9.25.1	**First-order reaction**							
	$HOCH_2CH(CH_3)Fe(III)PP \rightarrow Fe(III)PP + CH_3CH{=}CH_2 + OH^-$	40 s^{-1}	10-13			p.r.	D.k. in propylene-N_2O (9:1) satd. soln. contg. (1-3) × 10^{-5} mol L^{-1} Fe(II) protoporphyrin.	86A511
9.26	**Trifluoromethyliron(III) deuteroporphyrin (2-propoxy)(2-propanol)**							
9.26.1	**Iron(II) deuteroporphyrin (2-propoxy)(2-propanol)**							
	$CF_3Fe(III)DP(2\text{-}PrO^-)(2\text{-}PrOH) + Fe(II)DP(2\text{-}PrO^-)(2\text{-}PrOH) \rightarrow CF_2FeDP(2\text{-}PrO^-)(2\text{-}PrOH) + Fe(III)DP(2\text{-}PrO^-)(2\text{-}PrOH) + F^-$	5.1 × 10^6	12.7			p.r.	P.b.k. at 460 nm in CF_2Br-satd. soln. contg. 6.5 mol L^{-1} 2-PrOH, (0.6-2) × 10^{-4} mol L^{-1} Fe(II) deuteroporphyrin and 0.05 mol L^{-1} NaOH; CF_2FeDP is suggested to hydrolyze slowly to give FeDP(CO).	87A232
9.27	**Tris(1,10-phenanthroline)iron(III) ion**							
9.27.1	**Iron(II) ion**							
	$Fe(phen)_3^{3+} + Fe^{2+} \rightarrow Fe(phen)_3^{2+} + Fe^{3+}$	5.4 × 10^4 6.4 × 10^4	0 1.1	1.0 0.10	25	f.p./oq	Absorbance changes at 450 nm in soln. contg. 3.0 × 10^{-6} mol L^{-1} $Ru(bpy)_3^{2+}$, 2.5 × 10^{-6} mol L^{-1} $Fe(phen)_3^{2+}$, 4.0 × 10^{-3} mol L^{-1} Fe^{3+} (OQ), 3.0 × 10^{-5} mol L^{-1} Fe^{2+} and 1.0 or 0.076 mol L^{-1} H^+, respectively.	777164
9.28	**Aqua(methyl)nitrilotriacetatoferrate(III) ion**							
9.28.1	**First-order reaction**							
	$CH_3FeNTA(H_2O)^- \rightarrow FeNTA(H_2O)^- + {}^{\bullet}CH_3$	9 × 10^3 s^{-1} 1.1 × 10^3 s^{-1}	4-8 10.5			p.r.	D.k. in N_2O-satd. soln. contg. 0.002-0.006 mol L^{-1} NTA, (0.5-5.0) × 10^{-3} mol L^{-1} $FeSO_4$ and 0.1-0.5 mol L^{-1} DMSO; k_r = 2.1 × 10^7 and 5.3 × 10^6 L mol^{-1} s^{-1} at pH 4-8 and 10.5, respectively.	88A426
9.28.2	**Methyl**							
	$CH_3FeNTA(H_2O)^- + {}^{\bullet}CH_3 \rightarrow FeNTA(H_2O)^- + C_2H_6$	5.5 × 10^8	4-8			p.r.	Calcd. from concn. dependence of d.k. in N_2O-satd. soln. contg. 0.002-0.006 mol L^{-1} NTA, (0.5-5.0) × 10^{-3} mol L^{-1} $FeSO_4$ and 0.1-0.5 mol L^{-1} DMSO; at pH 10.5, $k \sim 2 \times 10^7$ L mol^{-1} s^{-1}.	88A426
9.29	**Carboxylato(nitrilotriacetato)ferrate(III) ion**							
9.29.1	**First-order reaction**							
	$[CO_2FeNTA]^{2-} \rightarrow FeNTA^- + CO_2^{\bullet-}$	140 s^{-1}	7			p.r.	Calcd. from concn. dependence of d.k. in N_2O-satd. soln. contg. $FeSO_4$, formate, NTA, with and without $Co(NH_3)_6^{3+}$ or Fe(III); $k_r = 1.5 \times 10^7$ L mol^{-1} s^{-1}.	88A184
9.29.2	**Carbon dioxide radical anion**							
	$[CO_2FeNTA]^{2-} + CO_2^{\bullet-} + H_2O \rightarrow FeNTA^- + CO_2 + CO + 2\ OH^-$	1.9 × 10^7	7			p.r.	Calcd. from concn. dependence of d.k. in N_2O-satd. soln. contg. formate and $FeSO_4$ with and without $Co(NH_3)_6^{3+}$, NTA or Fe(III).	88A184

TABLE 9. Rate constants for iron transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
9.30	**Carboxylato(2-hydroxyethylethylenediaminetriacetato)ferrate(III) ion**							
9.30.1	**First-order reaction**							
	$CO_2FeHEDTA^{2-} \rightarrow FeHEDTA^- + CO_2^{\bullet -}$	25	7			p.r.	Calcd. from concn. dependence of d.k. in N_2O-satd. soln. contg. ferrous ammonium sulfate, formate, HEDTA, with and without $Co(NH_3)_6^{3+}$ or Fe(III); $k_r = 6.2 \times 10^6$ L mol^{-1} s^{-1}.	88A184
9.30.2	**Carbon dioxide radical anion**							
	$CO_2FeHEDTA^{2-} + CO_2^{\bullet -} + H_2O \rightarrow FeHEDTA^- + CO_2 + CO + 2\ OH^-$	4.5×10^6	7			p.r.	Calcd. from concn. dependence of d.k. in N_2O-satd. soln. contg. formate, ferrous ammonium sulfate and HEDTA with and without $Co(NH_3)_6^{3+}$ or Fe(III).	88A184
9.31	**Diethylenetriaminepentaacetatoferrate(III), DTPA radical adduct**							
9.31.1	**First-order reaction**							
	$DTPAFe^{III}DTPA^{\bullet} \rightarrow DTPAFe^{III}DTPA_f^{\bullet}$	2.1×10^4 s^{-1}	8-11	0.1		p.r.	Calcd. from d.k. in N_2O-satd. soln. contg. 0.1 mol L^{-1} $NaClO_4$, 0.001 mol L^{-1} DTPA, and (4.5-143) $\times 10^{-6}$ mol L^{-1} $FeDTPA^{2-}$. Reaction suggested to represent rearrangement of the ligand radical. Product reacts with parent complex, $k = 2.5 \times 10^7$ L mol^{-1} s^{-1} at pH 8-10.	89A135
9.32	**Tetracyano(2,2′-bipyridine)ferrate(III) ion**							
9.32.1	**1,1′-Dimethyl-4,4′-bipyridinium radical cation**							
	$Fe(bpy)(CN)_4^- + MV^{\bullet +} \rightarrow Fe(bpy)(CN)_4^{2-} + MV^{2+}$	1.8×10^{10}				f.p./pi	D.k. in soln. contg. $Fe(bpy)(CN)_4^{2-}$ and MV^{2+}. Value obtained from computer fit.	91A067
9.33	**Sulfatoiron(III) ion**							
9.33.1	**First-order reaction**							
	$FeSO_4^+ \rightarrow SO_4^{2-} + Fe^{3+}$	6.5×10^3 s^{-1}	2.1		20	f.p.	D.k. at 450 nm in Ar-satd. soln. contg. 0.001 mol L^{-1} $K_2S_2O_8$ and 7.5×10^{-5} mol L^{-1} Fe^{2+}; value obtained from computer fit.	90A261
	$FeSO_4^+ \rightarrow SO_4^{\bullet -} + Fe^{2+}$	~5×10^4 s^{-1}	2.1		20	f.p.	D.k. at 450 nm in Ar-satd. soln. contg. 0.001 mol L^{-1} $K_2S_2O_8$ and 7.5×10^{-5} mol L^{-1} Fe^{2+}; value obtained from computer fit; $k_r = 3 \times 10^8$ L mol^{-1} s^{-1}.	90A261
9.34	**Ferricyanide ion**							
9.34.1	**3,4-Dimethoxyphenoxide ion**							
	$Fe(CN)_6^{3-} + 3,4\text{-}(CH_3O)_2C_6H_3O^- \rightarrow Fe(CN)_6^{4-} + 3,4\text{-}(CH_3O)_2C_6H_3O^{\bullet}$	2.7×10^4	13.5		20	p.r.	P.b.k. in N_2O-satd. soln. contg. (1-10) $\times$ 10^{-3} mol L^{-1} $K_4Fe(CN)_6$, ~0.04 mol L^{-1} 3,4-dimethoxyphenoxide ion and Br^-; $k_r = 6.5 \times 10^5$ L mol^{-1} s^{-1}.	91A455
9.34.2	**5-Hydroxyindole, conjugate base**							
	$Fe(CN)_6^{3-} + 5\text{-InH-O}^- \rightarrow Fe(CN)_6^{4-} + 5\text{-InH-O}^{\bullet}$	4.0×10^6	13.5		20	f.p./pi	P.b.k. at 500 nm in Ar-satd. soln. contg. (2-4) $\times$ 10^{-3} mol L^{-1} $K_4Fe(CN)_6$ and 0.1 mol L^{-1} 2-chloroethanol.	90C007
9.34.3	**5-Hydroxyindole-3-acetate ion, conjugate base**							
	$Fe(CN)_6^{3-} + R\text{-InH-O}^- \rightarrow Fe(CN)_6^{4-} + R\text{-InH-O}^{\bullet}$	2.7×10^6	13.5		20	f.p./pi	P.b.k. at 500 nm in Ar-satd. soln. contg. (2-4) $\times$ 10^{-3} mol L^{-1} $K_4Fe(CN)_6$ and 0.1 mol L^{-1} 2-chloroethanol.	90C007

TABLE 9. Rate constants for iron transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
9.34	**Ferricyanide ion** — Continued							
9.34.4	**5-Hydroxytryptophan, conjugate base**							
	$Fe(CN)_6^{3-}$ + 5-(O^-)TrpH → $Fe(CN)_6^{4-}$ + 5-($O^\bullet$)TrpH	2.1×10^6	13.5		20	f.p./pi	P.b.k. at 500 nm in Ar-satd. soln. contg. (2-4) × 10^{-3} mol L^{-1} $K_4Fe(CN)_6$ and 0.1 mol L^{-1} 2-chloroethanol; $k_r = 2.8 \times 10^4$ L mol^{-1} s^{-1}.	90C007
		1.6×10^6	13.5		20	p.r.	P.b.k. at 500 nm in N_2O-satd. soln. contg. 1 × 10^{-4} mol L^{-1} $K_4Fe(CN)_6$ and 0.1 mol L^{-1} azide ion; $k_r = 2.7 \times 10^4$ L mol^{-1} s^{-1}.	90C007
9.34.5	**Sesamol, conjugate base**							
	$Fe(CN)_6^{3-}$ + 3,4-$(CH_2O_2)C_6H_3O^-$ → $Fe(CN)_6^{4-}$ + 3,4-$(CH_2O_2)C_6H_3O^\bullet$	2.4×10^5	13.5		20	p.r.	P.b.k. in N_2O-satd. soln. contg. (1-10) × 10^{-3} mol L^{-1} $K_4Fe(CN)_6$, ~0.04 mol L^{-1} sesamol and Br^-; $k_r = 8.2 \times 10^5$ L mol^{-1} s^{-1}.	91A455
9.34.6	**Serotonin, conjugate base**							
	$Fe(CN)_6^{3-}$ + R-InH-O^- → $Fe(CN)_6^{4-}$ + R-InH-$O^\bullet$	5.9×10^6	13.7		20	f.p./pi	P.b.k. at 500 nm in Ar-satd. soln. contg. (2-4) × 10^{-3} mol L^{-1} $K_4Fe(CN)_6$ and 0.1 mol L^{-1} 2-chloroethanol; $k_r = 1 \times 10^5$ L mol^{-1} s^{-1}.	90C007
9.34.7	***N,N,N′,N′*-Tetramethyl-*p*-phenylenediamine**							
	$Fe(CN)_6^{3-}$ + TMPD → $Fe(CN)_6^{4-}$ + $[TMPD]^{\bullet+}$	5.4×10^6	9.1		20	f.p./pi	P.b.k. in Ar-satd. soln. contg. (2-4) × 10^{-3} mol L^{-1} $K_4Fe(CN)_6$ and 0.1 mol L^{-1} 2-chloroethanol; $k_r = 1.4 \times 10^5$ L mol^{-1} s^{-1}.	90C007
		9.8×10^6	13.5		20	p.r.	P.b.k. at 500 nm in N_2O-satd. soln. contg. 0.01 mol L^{-1} $K_4Fe(CN)_6$ and 0.1 mol L^{-1} azide ion.	90C007
9.35	**Carboxyferricenium**							
9.35.1	***N,N,N′,N′*-Tetramethyl-*p*-phenylenediamine**							
	$Fc^+CO_2^-$ + TMPD → $FcCO_2^-$ + $[TMPD]^{\bullet+}$	7.2×10^8	8		20	p.r.	P.b.k. at 565 nm in N_2O-satd. soln. contg. (1-5) × 10^{-3} mol L^{-1} $FcCO_2^-$, (0.05-0.2) mol L^{-1} SCN^- and (1-5) × 10^{-5} mol L^{-1} TMPD.	92A363
9.36	**1,1′-Dicarboxyferricenium**							
9.36.1	**3,5-Dimethoxyphenoxide ion**							
	$Fc^+(CO_2^-)_2$ + 3,5-$(CH_3O)_2C_6H_3O^-$ → $Fc(CO_2^-)_2$ + 3,5-$(CH_3O)_2C_6H_3O^\bullet$	6×10^5 2×10^6	7.0 8.0		20	p.r.	P.b.k. in N_2O-satd. soln. contg. Br^-; $k_r = 1.1 \times 10^9$ and 7.0×10^8 L mol^{-1} s^{-1} at pH 7.0 and 8.0, respectively.	91A455
9.36.2	**2,6-Dimethoxyphenoxide ion**							
	$Fc^+(CO_2^-)_2$ + 2,6-$(CH_3O)_2C_6H_5O^-$ → $Fc(CO_2^-)_2$ + 2,6-$(CH_3O)_2C_6H_3O^\bullet$	6.5×10^6	7.0		20	p.r.	P.b.k. in N_2O-satd. soln. contg. Br^-.	91A455
9.36.3	***N,N,N′,N′*-Tetramethyl-*p*-phenylenediamine**							
	$Fc^+(CO_2^-)_2$ + TMPD → $Fc(CO_2^-)_2$ + $[TMPD]^{\bullet+}$	9.3×10^8	8		20	p.r.	P.b.k. at 565 nm in N_2O-satd. soln. contg. (1-5) × 10^{-3} mol L^{-1} $Fc(CO_2^-)_2$, (0.05-0.2) mol L^{-1} SCN^- and (1-5) × 10^{-5} mol L^{-1} TMPD.	92A363
9.37	**Hydroxymethylferricenium**							
9.37.1	***N,N,N′,N′*-Tetramethyl-*p*-phenylenediamine**							
	Fc^+CH_2OH + TMPD → $FcCH_2OH$ + $[TMPD]^{\bullet+}$	1.7×10^8	8		20	p.r.	P.b.k. at 565 nm in N_2O-satd. soln. contg. (1-5) × 10^{-3} mol L^{-1} $FcCH_2OH$, (0.05-0.2) mol L^{-1} SCN^- and (1-5) × 10^{-5} mol L^{-1} TMPD.	92A363

TABLE 9. Rate constants for iron transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
9.38	**(Dimethylaminomethyl)ferricenium**							
9.38.1	***N,N,N′,N′*-Tetramethyl-*p*-phenylenediamine**							
	$Fc^+CH_2N(CH_3)_2$ + TMPD → $FcCH_2N(CH_3)_2$ + $[TMPD]^{\cdot+}$	2.2×10^8	8		20	p.r.	P.b.k. at 565 nm in N_2O-satd. soln. contg. $(1\text{-}5) \times 10^{-3}$ mol L^{-1} $FcCH_2N(CH_3)_2$, (0.05-0.2) mol L^{-1} SCN^- and $(1\text{-}5) \times 10^{-5}$ mol L^{-1} TMPD.	92A363
9.38.2	**3,4-Dimethoxyphenol**							
	$Fc^+CH_2N(CH_3)_2$ + 3,4-$(CH_3O)_2C_6H_3OH$ → $FcCH_2N(CH_3)_2$ + 3,4-$(CH_3O)_2C_6H_3O^{\cdot}$ + H^+	8.7×10^5	7.0		20	p.r.	P.b.k. in N_2O-satd. soln. contg. Br^-; $k_r = 2.9 \times 10^7$ L mol^{-1} s^{-1}.	91A455
9.39	**Tris(2,2′-bipyridine)iron(III) ion, OH-adduct**							
9.39.1	**First-order reaction**							
	$Fe(bpy)_2(bpyOH)^{3+}$ →	8.6×10^2 s^{-1}	3		20	p.r.	D.k. at 400 nm in N_2O-satd. soln. contg. 1×10^{-4} mol L^{-1} $Fe(bpy)_3^{3+}$.	82A343
9.40	**Tris(2,2′-bipyridine)iron(III) ion, H-adduct**							
9.40.1	**First-order reaction**							
	$Fe(bpy)_2(bpyH)^{3+}$ →	6×10^4 s^{-1}	3		20	p.r.	D.k. at 400 nm in Ar-satd. soln. contg. 1×10^{-4} mol L^{-1} $Fe(bpy)_3^{3+}$ and 0.5 mol L^{-1} *tert*-BuOH.	82A343
9.41	**5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)porphineiron(III)-superoxide complex**							
9.41.1	**Superoxide radical anion**							
	$[FeTMpyP\text{-}O_2]^{4+}$ + $O_2^{\cdot-}$ + 2 H^+ → $FeTMpyP^{5+}$ + H_2O_2 + O_2	2.3×10^9	8.1			p.r.	Calcd. from equil. concn. formed in O_2-satd. soln. of Fe(III) complex ; in presence of formate $k = 7.6 \times 10^8$ L mol^{-1} s^{-1}, difference attributed to change in ionic strength.	82A119
9.42	**Methyliron(IV) deuteroporphyrin (2-propanol)$_2$**							
9.42.1	**Iron(II) deuteroporphyrin (2-propanol)$_2$**							
	$CH_3Fe(IV)DP(2\text{-}PrOH)_2$ + $Fe(II)DP(2\text{-}PrOH)_2$ → $CH_3Fe(III)DP(2\text{-}PrOH)_2$ + $Fe(III)DP(2\text{-}PrOH)_2$	4×10^8	7			p.r.	D.k. at 470 nm in soln. contg. 6.5 mol L^{-1} 2-PrOH, 10^{-4} mol L^{-1} Fe(III) deuteroporphyrin and CH_3Cl.	81A123
9.43	**Iron(III) deuteroporphyrin (2-propanol)$_2$, $^{\cdot}CHCl_2$ radical adduct**							
9.43.1	**First-order reaction**							
	$FeDP(2\text{-}PrOH)_2/^{\cdot}CHCl_2$ →	~10^3 s^{-1}	7.2			p.r.	D.k. in soln. contg. 10^{-4} mol L^{-1} Fe(III) deuteroporphyrin, 6.5 mol L^{-1} 2-PrOH and chloroform.	80A011
9.44	**Iron(III) deuteroporphyrin (2-propoxy)(2-propanol), $^{\cdot}CF_3$ reaction product**							
9.44.1	**First-order reaction**							
	$FeDP(2\text{-}PrO^-)(2\text{-}PrOH)/^{\cdot}CF_3$ →	2.8×10^3 s^{-1}	12.7			p.r.	D.k. at 520 nm in CF_3Br-satd. soln. contg. 6.5 mol L^{-1} 2-PrOH, varied concn. of Fe(III) deuteroporphyrin and 0.05 mol L^{-1} NaOH. Species suggested to be Fe(IV)-CF_3 adduct or $Fe(III)DP^+$ (oxidized porphyrin).	87A232

TABLE 9. Rate constants for iron transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
9.45	**Iron(III) deuteroporphyrin dimethyl ester (2-propanol)$_2$, 1-hydroxy-1-methylethylperoxyl adduct**							
9.45.1	**First-order reaction**							
	$(CH_3)_2C(OH)OOFeDPDME(2\text{-}PrOH)_2 \rightarrow [Fe(III)DPDME(2\text{-}PrOH)_2]^{\cdot+} + (CH_3)_2C(OH)OO^-$	$\sim 4 \times 10^7$ s^{-1}	0-2			p.r.	Calcd. from d.k. at 660 nm in air-satd. soln. contg. 6.5 mol L^{-1} 2-PrOH, 1×10^{-4} mol L^{-1} Fe(III) deuteroporphyrin dimethyl ester and 0.01-1 mol L^{-1} H$^+$.	85A311
	$(CH_3)_2C(OH)OOFeDPDME(2\text{-}PrOH)_2 \rightarrow Fe(III)DPDME(2\text{-}PrOH)_2 + (CH_3)_2C(OH)OO^{\cdot}$	$\sim 2 \times 10^8$ s^{-1}	0-2			p.r.	Calcd. from d.k. at 660 nm in air-satd. soln. contg. 6.5 mol L^{-1} 2-PrOH, 1×10^{-4} mol L^{-1} Fe(III) deuteroporphyrin dimethyl ester and 0.01-1 mol L^{-1} H$^+$; $k_r = \sim 6 \times 10^7$ L mol^{-1} s^{-1}.	85A311
9.46	**Ferrate(IV) ion**							
9.46.1	**First-order reaction**							
	$FeO(OH)_n^{2-n} \rightarrow$	~ 2 s^{-1}	14		25	p.r.	D.k. in N_2O-satd. soln. contg. $(1\text{-}3.5) \times 10^{-5}$ mol L^{-1} $Fe(OH)_4^-$ and 1 mol L^{-1} NaOH.	86A018
9.47	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatoferrate(III) radical cation**							
9.47.1	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatoferrate(III) radical cation**							
	$[FeTPPS]^{\cdot 2-} + [FeTPPS]^{\cdot 2-} \rightarrow$	1.3×10^9	7			p.r.	D.k. at 700 nm in N_2O-satd. soln. contg. 0.01 mol L^{-1} KBr.	86S115
9.48	**Carbonatoiron(IV)**							
9.48.1	**Carbonatoiron(IV)**							
	$Fe^{IV}(CO_3)_m + Fe^{IV}(CO_3)_m \rightarrow$	1.3×10^5	13			p.r.	D.k. at 420 nm in N_2O-satd. soln. contg. Fe(III) and carbonate; unclear whether k or $2k$.	90A278
9.49	**Iron(IV) pyrophosphate**							
9.49.1	**Iron(IV) pyrophosphate**							
	$FeO(P_2O_7)_2^{6-} + FeO(P_2O_7)_2^{6-} \rightarrow (P_2O_7)_2FeOOFe(P_2O_7)_2^{12-}$	1.0×10^6	10		25	p.r.	D.k. at 420 nm in N_2O-satd. soln. contg. $(4\text{-}10) \times 10^{-4}$ mol L^{-1} Fe(III) and 0.1 mol L^{-1} Na pyrophosphate. Computer simulation suggested that k could be 10-20% lower; unclear whether k or $2k$.	90A373
9.49.2	**Hydrogen peroxide**							
	$FeO(P_2O_7)_2^{6-} + H_2O_2 \rightarrow FeOH(P_2O_7)_2^{6-} + O_2^{\cdot-} + H^+$	3.9×10^5	10		25	p.r.	D.k. at 420 nm in N_2O-satd. soln. contg. $(1\text{-}10) \times 10^{-4}$ mol L^{-1} Fe(III) and 0.1 mol L^{-1} Na pyrophosphate. Average of values obtained with and without added H_2O_2.	90A373
9.49.3	**Manganese(II) pyrophosphate**							
	$FeO(P_2O_7)_2^{6-} + Mn(P_2O_7)_n^{(4n-2)-} \rightarrow$	1.2×10^6	10		25	p.r.	D.k. in N_2O-satd. soln. contg. 0.1 mol L^{-1} pyrophosphate and $(1\text{-}13) \times 10^{-5}$ mol L^{-1} Mn(II) pyrophosphate.	90A373
9.49.4	**Iron(II) pyrophosphate**							
	$FeO(P_2O_7)_2^{6-} + Fe(P_2O_7)_n^{(4n-2)-} \rightarrow$	1.6×10^6	10		25	p.r.	D.k. in N_2O-satd. soln. contg. 0.1 mol L^{-1} pyrophosphate and Fe(II) pyrophosphate.	90A373
9.49.5	**Cobalt(II) pyrophosphate**							
	$FeO(P_2O_7)_2^{6-} + Co(P_2O_7)_n^{(4n-2)-} \rightarrow$	5.5×10^5	10		25	p.r.	D.k. in N_2O-satd. soln. contg. 0.1 mol L^{-1} pyrophosphate and Co(II) pyrophosphate.	90A373
9.49.6	**Nickel(II) pyrophosphate**							
	$FeO(P_2O_7)_2^{6-} + Ni(P_2O_7)_n^{(4n-2)-} \rightarrow$	$<4.0 \times 10^2$	10		25	p.r.	No effect on d.k. of Fe(IV) in N_2O-satd. soln. contg. 0.1 mol L^{-1} pyrophosphate and Ni(II) pyrophosphate.	90A373

TABLE 9. Rate constants for iron transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
9.49	**Iron(IV) pyrophosphate** — Continued							
9.49.7	**Copper(II) pyrophosphate**							
	$FeO(P_2O_7)_2^{6-} + Cu(P_2O_7)_n^{(4n-2)-} \rightarrow$	$<4.0 \times 10^2$	10		25	p.r.	No effect on d.k. of Fe(IV) in N_2O-satd. soln. contg. 0.1 mol L^{-1} pyrophosphate and Cu(II) pyrophosphate.	90A373
9.49.8	**Ferrocyanide ion**							
	$FeO(P_2O_7)_2^{6-} + Fe(CN)_6^{4-} \rightarrow$	$<1 \times 10^2$	10		25	p.r.	No effect on d.k. of Fe(IV) in N_2O-satd. soln. contg. 0.1 mol L^{-1} pyrophosphate with added 0.1 mol L^{-1} ferrocyanide.	90A373
9.50	**Iron(IV) (hydroxo)undecatungstosilicate ion**							
9.50.1	**Iron(IV) (hydroxo)undecatungstosilicate ion**							
	$HOFeSiW_{11}O_{39}^{5-} +$ $HOFeSiW_{11}O_{39}^{5-} \rightarrow$	3.2×10^9 2.5×10^9	4 7		20-23	p.r.	D.k. at 355 nm in N_2O-satd. soln. contg. $(0.13\text{-}2) \times 10^{-3}$ mol L^{-1} Fe(III) complex and 0.1 mol L^{-1} $NaClO_4$.	90A253
9.51	**Dihydrogenferrate(V) ion**							
9.51.1	**Dihydrogenferrate(V) ion**							
	$H_2FeO_4^- + H_2FeO_4^- \rightarrow$	$\sim 9 \times 10^7$			25	p.r.	Calcd. from d.k. as a function of pH (6.3-13) in N_2O-satd. soln. contg. Fe(VI), 2-PrOH or EtOH and 0.001 mol L^{-1} phosphate/borate buffer.	89A354
9.51.2	**Hydrogenferrate(V) ion**							
	$H_2FeO_4^- + HFeO_4^{2-} \rightarrow$	$\sim 3 \times 10^7$			25	p.r.	Calcd. from d.k. as a function of pH (6.3-13) in N_2O-satd. soln. contg. Fe(VI), 2-PrOH or EtOH and 0.001 mol L^{-1} phosphate/borate buffer; pK_a of $H_2FeO_4^-$ = 7.5.	89A354
9.52	**Hydrogenferrate(V) ion**							
9.52.1	**Hydrogenferrate(V) ion**							
	$HFeO_4^{2-} + HFeO_4^{2-} \rightarrow$	$\sim 1.5 \times 10^7$			25	p.r.	Calcd. from d.k. as a function of pH (6.3-13) in N_2O-satd. soln. contg. Fe(VI), 2-PrOH or EtOH and 0.001 mol L^{-1} phosphate/borate buffer.	89A354
9.52.2	**Ferrate(V) ion**							
	$HFeO_4^{2-} + FeO_4^{3-} \rightarrow$	1.0×10^7			25	p.r.	Calcd. from d.k. as a function of pH (6.3-13) in N_2O-satd. soln. contg. Fe(VI), 2-PrOH or EtOH and 0.001 mol L^{-1} phosphate/borate buffer; pK_a of $HFeO_4^{2-}$ = 10.1.	89A354
9.53	**Ferrate(V) ion**							
9.53.1	**First-order reaction**							
	$FeO_4^{3-} \rightarrow$	8 s^{-1}	10.4-13		25	p.r.	D.k. in N_2O-satd. soln. contg. K_2FeO_4; the major products are Fe(III) and H_2O_2. At 15°C, k = 4 s^{-1} [86A018].	89A354

TABLE 10. Rate constants for mercury transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
10.1	**Mercury atom**							
10.1.1	**Mercury(II) ion**							
	$Hg^0 + Hg^{2+} \rightarrow Hg_2^{2+}$	5.9×10^8	3-4			p.r.	Calcd. from pH dependence of p.b.k. at 236 nm in soln. contg. $(1.5\text{-}5.9) \times 10^{-5}$ mol L^{-1} HgO.	731080
10.1.2	**Hydroxymercury(II) ion**							
	$Hg^0 + HgOH^+ \rightarrow Hg_2^{2+} + OH^-$	5.0×10^8	3-4			p.r.	Calcd. from pH dependence of p.b.k. at 236 nm in soln. contg. $(1.5\text{-}5.9) \times 10^{-5}$ mol L^{-1} HgO.	731080
10.1.3	**Mercury(II) dihydroxide**							
	$Hg^0 + Hg(OH)_2 \rightarrow Hg_2^{2+} + 2\ OH^-$	$\leq 5 \times 10^7$	3-4			p.r.	Calcd. from pH dependence of p.b.k. at 236 nm in soln. contg. $(1.5\text{-}5.9) \times 10^{-5}$ mol L^{-1} HgO.	731080
10.2	**Mercury(I) ion, complex with mercury(0)**							
10.2.1	**Mercury(I) ion, complex with mercury(0)**							
	$Hg_2^+ + Hg_2^+ \rightarrow$	* 7.5×10^9	2.3			p.r.	D.k. at 285 nm in Ar-satd. soln. contg. Hg_2^{2+} and $HClO_4$,	92A466
		* 1.6×10^9	1.0-3.5	≤0.2		p.r.	D.k. at 300 nm in Ar-satd. soln. contg. $HgSO_4$ and $HClO_4$; average of 8 values; $k = 2.5 \times 10^9$ L mol^{-1} s^{-1} in presence of 1 mol L^{-1} $HClO_4$. In strong acid observed initial slow component attributed to presence of Hg_2H^{2+}.	79A063
		* 7×10^9	1.9	≤0.017		p.r.	D.k. at 285 nm in Ar-satd. soln. contg. 0.01 mol L^{-1} *tert*-BuOH and $Hg_2(ClO_4)_2$.	720290
							* Unexplained discrepancy in these data.	
10.2.2	**Mercury(I) dimer ion**							
	$Hg_2^+ + Hg_2^{2+} \rightarrow Hg_4^{3+}$	4.2×10^7	1			p.r.	P.b.k. at 390 nm in Ar-satd. soln. contg. 0.2 mol L^{-1} Hg_2^{2+} and $HClO_4$; $k_r = 7 \times 10^6$ s^{-1}.	92A466
10.2.3	**Oxygen**							
	$Hg_2^+ + O_2 \rightarrow$	1.1×10^9	3, 3.5			p.r.	D.k. at 300 nm in O_2-satd. soln. contg. $HgSO_4$ and $HClO_4$; $k = \sim 7 \times 10^8$ L mol^{-1} s^{-1} at pH 0 and 1.	79A063
10.3	**Mercury(I) ion**							
10.3.1	**Mercury(I) ion**							
	$Hg^+ + Hg^+ \rightarrow Hg^0 + Hg^{2+}$	2.5×10^9 2.6×10^9	1.2 3.15			p.r.	D.k. at 360 nm in deaerated soln. contg. 0.05×10^{-3} mol L^{-1} *tert*-BuOH and 8×10^{-4} mol L^{-1} $Hg(ClO_4)_2$.	751218
		2.5×10^9 2.6×10^9	2.0 4.3	→0 →0		p.r.	D.k. at 255 nm in soln. contg. 2×10^{-3} mol L^{-1} *tert*-BuOH and 1×10^{-3} or 5×10^{-5} mol L^{-1} HgO at pH 2.0 and 4.3, respectively.	731080
10.3.2	**Tris(2,2′-bipyridine)ruthenium(III) ion**							
	$Hg^+ + Ru(bpy)_3^{3+} \rightarrow Hg^{2+} + Ru(bpy)_3^{2+}$	2.9×10^9	~1	0.23	21	f.p./oq	P.b.k. at 436 nm in deaerated soln. contg. 3.6×10^{-6} mol L^{-1} $Ru(bpy)_3^{2+}$, 1×10^{-2} mol L^{-1} $Hg(NO_3)_2$ (OQ), 0.11 mol L^{-1} HNO_3 and 0.09 mol L^{-1} $NaNO_3$; assumed $k(Hg^+ + Hg^+) = 8 \times 10^9$ L mol^{-1} s^{-1}.	84A148
10.3.3	**Tris(1,10-phenanthroline)ruthenium(III) ion**							
	$Hg^+ + Ru(phen)_3^{3+} \rightarrow Hg^{2+} + Ru(phen)_3^{2+}$	2.5×10^9	acid			f.p./oq	P.b.k. at 436 nm in deaerated soln. contg. $Ru(phen)_3^{2+}$, excess $Hg(NO_3)_2$ (OQ), HNO_3 and $NaNO_3$; assumed $k(Hg^+ + Hg^+) = 8 \times 10^9$ L mol^{-1} s^{-1}.	84A148

TABLE 10. Rate constants for mercury transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
10.3	**Mercury(I) ion** — Continued							
10.3.4	**Tris(5-chloro-1,10-phenanthroline)ruthenium(III) ion**							
	$Hg^+ + Ru(5\text{-}Clphen)_3^{3+} \rightarrow Hg^{2+} + Ru(5\text{-}Clphen)_3^{2+}$	3.9×10^9	acid			f.p./oq	P.b.k. at 436 nm in deaerated soln. contg. $Ru(5\text{-}Clphen)_3^{2+}$, excess $Hg(NO_3)_2$ (OQ), HNO_3 and $NaNO_3$; assumed $k(Hg^+ + Hg^+) = 8 \times 10^9$ L mol^{-1} s^{-1}.	84A148
10.3.5	**Tris(5,6-dimethyl-1,10-phenanthroline)ruthenium(III) ion**							
	$Hg^+ + Ru(5,6\text{-}Me_2phen)_3^{3+} \rightarrow Hg^{2+} + Ru(5,6\text{-}Me_2phen)_3^{2+}$	3.2×10^9	acid			f.p./oq	P.b.k. at 436 nm in deaerated soln. contg. $Ru(5,6\text{-}Me_2phen)_3^{2+}$, excess $Hg(NO_3)_2$ (OQ), HNO_3 and $NaNO_3$; assumed $k(Hg^+ + Hg^+) = 8 \times 10^9$ L mol^{-1} s^{-1}.	84A148
10.3.6	**Tris(4,7-dimethyl-1,10-phenanthroline)ruthenium(III) ion**							
	$Hg^+ + Ru(4,7\text{-}Me_2phen)_3^{3+} \rightarrow Hg^{2+} + Ru(4,7\text{-}Me_2phen)_3^{2+}$	3.0×10^9	acid			f.p./oq	P.b.k. at 436 nm in deaerated soln. contg. $Ru(4,7\text{-}Me_2phen)_3^{2+}$, excess $Hg(NO_3)_2$ (OQ), HNO_3 and $NaNO_3$; assumed $k(Hg^+ + Hg^+) = 8 \times 10^9$ L mol^{-1} s^{-1}.	84A148
10.3.7	**Tris(5-methyl-1,10-phenanthroline)ruthenium(III) ion**							
	$Hg^+ + Ru(5\text{-}Mephen)_3^{3+} \rightarrow Hg^{2+} + Ru(5\text{-}Mephen)_3^{2+}$	3.1×10^9	acid			f.p./oq	P.b.k. at 436 nm in deaerated soln. contg. $Ru(5\text{-}Mephen)_3^{2+}$, excess $Hg(NO_3)_2$ (OQ), HNO_3 and $NaNO_3$; assumed $k(Hg^+ + Hg^+) = 8 \times 10^9$ L mol^{-1} s^{-1}.	84A148
10.4	**Mercury(I) hydroxide**							
10.4.1	**Mercury(I) hydroxide**							
	$HgOH + HgOH \rightarrow$	2.2×10^9	7			p.r.	D.k. in Ar-satd. soln. contg. 0.05 mol L^{-1} *tert*-BuOH and HgO. In 1 mol L^{-1} KOH, $k = 3.5 \times 10^9$ L mol^{-1} s^{-1} [751218]. pK of the equilibrium $Hg^+ + H_2O \rightleftarrows HgOH + H^+$ is reported to be 5.1 [751044].	83A178
		2.2×10^9		≤0.1		p.r.	D.k. at 260 nm in soln. contg. 0.01 mol L^{-1} *tert*-BuOH and 2.0×10^{-4} mol L^{-1} HgO. Products suggested to be Hg_2O or $Hg_2(OH)_2$.	751044
10.5	**Mercury(I)**							
10.5.1	**Oxygen**							
	$Hg(I) + O_2 \rightarrow$	1.2×10^9 1.6×10^9	11.2 14			p.r.	D.k.; at pH 2.7, $k = 4.2 \times 10^8$ L mol^{-1} s^{-1}.	751218
10.6	**Mercury(I) bromide**							
10.6.1	**Mercury(I) bromide**							
	$HgBr + HgBr \rightarrow Hg_2Br_2$	4×10^9				p.r.	P.b.k. in soln. contg. $HgBr_2$.	761042
		5×10^9				p.r.	D.k. at 350 nm in soln. contg. 5×10^{-4} mol L^{-1} $HgBr_2$ and 0.01 mol L^{-1} MeOH, EtOH, 2-PrOH or formate.	761087
10.6.2	**Oxygen**							
	$HgBr + O_2 \rightarrow HgBrO_2$	$\geq 10^9$				p.r.	D.k. *in air-satd. soln. contg.* $HgBr_2$.	761042
10.6.3	**1,4-Benzoquinone**							
	$HgBr + Q \rightarrow HgBr^+ + Q^{\cdot -}$	$>10^9$	5-5.5			p.r.	P.b.k. in soln. contg. $HgBr_2$.	761042
10.6.4	**Tetranitromethane**							
	$HgBr + C(NO_2)_4 \rightarrow HgBr^+ + C(NO_2)_3^- + {}^{\cdot}NO_2$	2.2×10^9				p.r.	P.b.k. in soln. contg. $HgBr_2$.	761042

TABLE 10. Rate constants for mercury transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
10.7	**Bromomercury(I)peroxyl**							
10.7.1	**1,4-Benzoquinone**							
	$HgBrO_2 + Q \rightarrow HgBr^+ + O_2 + Q^{\cdot-}$	7×10^8				p.r.	P.b.k. in air-satd. soln. contg. $HgBr_2$.	761042
10.8	**Mercury(I) chloride**							
10.8.1	**Mercury(I) chloride**							
	$HgCl + HgCl \rightarrow Hg_2Cl_2$	3.9×10^9	7			p.r.	D.k. in Ar-satd. soln. contg. 0.05 mol L^{-1} *tert*-BuOH and $HgCl_2$.	83A178
		4.0×10^9				p.r.	P.b.k. at 235 nm and d.k. at 330 nm in Ar-satd. soln. contg. 0.1 mol L^{-1} 2-PrOH and 2×10^{-4} mol L^{-1} $HgCl_2$.	730043
10.8.2	**Oxygen**							
	$HgCl + O_2 \rightarrow HgClO_2$	$\sim 10^9$				p.r.	D.k. in air-satd. soln. contg. 5×10^{-3} mol L^{-1} $HgCl_2$.	730043
10.8.3	**Hydroxyl**							
	$HgCl + {}^{\cdot}OH \rightarrow HgCl^+ + OH^-$	$\sim 10^{10}$	5.0			p.r.	Estd. from the yield of Hg_2Cl_2 in Ar-satd. soln. contg. 2×10^{-4} mol L^{-1} $HgCl_2$.	730043
10.8.4	**1,4-Benzoquinone**							
	$HgCl + Q \rightarrow HgCl^+ + Q^{\cdot-}$	3.0×10^9				p.r.	P.b.k. in soln. contg. $HgCl_2$.	761042
		3.9×10^9	5.1		25	p.r.	P.b.k. at 430 nm in deaeratead soln. contg. 1 mol L^{-1} *tert*-BuOH and 6×10^{-3} mol L^{-1} $HgCl_2$.	761134
10.8.5	**Tetranitromethane**							
	$HgCl + C(NO_2)_4 \rightarrow HgCl^+ + C(NO_2)_3^- + {}^{\cdot}NO_2$	4.5×10^9				p.r.	D.k. at 270 nm and p.b.k. at 370 nm in Ar-satd. soln. contg. 0.2 mol L^{-1} 2-PrOH and 10^{-3} mol L^{-1} $HgCl_2$.	730043
10.9	**Chloromercury(I)peroxyl**							
10.9.1	**1,4-Benzoquinone**							
	$HgClO_2 + Q \rightarrow HgCl^+ + O_2 + Q^{\cdot-}$	6×10^8				p.r.	P.b.k. in air-satd. soln. contg. $HgCl_2$.	761042
		1.1×10^9	5.1		25	p.r.	P.b.k. in O_2-satd. soln. contg. $HgCl_2$, 1,4-benzoquinone and 1 mol L^{-1} *tert*-BuOH.	761134
10.10	**Mercury(I) cyanide**							
10.10.1	**Mercury(I) cyanide**							
	$HgCN + HgCN \rightarrow Hg_2(CN)_2$	* 6.0×10^9				p.r.	P.b.k. in soln. contg. $Hg(CN)_2$.	761042
		* 1.7×10^9		≤0.2		p.r.	D.k. at 285 nm in deaerated soln. contg. 0.005 mol L^{-1} formate and 2×10^{-4} mol L^{-1} $Hg(CN)_2$.	751203
							* Unexplained discrepancy in these data.	
10.10.2	***Oxygen***							
	$HgCN + O_2 \rightarrow HgCN^+ + O_2^{\cdot-}$	4×10^9				p.r.	P.b.k. in air-satd. soln. contg. $Hg(CN)_2$.	761042
10.10.3	**Hydroxyl**							
	$HgCN + {}^{\cdot}OH \rightarrow$	3.1×10^9				p.r.	Estimated from initial decay of HgCN in the absence of OH scavengers.	751203
10.10.4	**Hydroxymethyl**							
	$HgCN + {}^{\cdot}CH_2OH \rightarrow$	4.0×10^9				p.r.	Estimated from initial decay of HgCN in the presence of methanol.	751203
10.10.5	***1-Hydroxyethyl***							
	$HgCN + CH_3\dot{C}HOH \rightarrow$	3.9×10^9				p.r.	Estimated from initial decay of HgCN in the presence of ethanol.	751203

TABLE 10. Rate constants for mercury transients — Continued

No.	Reaction	k (L·mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
10.10	**Mercury(I) cyanide** — Continued							
10.10.6	**1-Hydroxy-1-methylethyl**							
	$HgCN + (CH_3)_2\dot{C}OH \rightarrow$	2.4×10^9				p.r.	Estimated from initial decay of HgCN in the presence of 2-propanol.	751203
10.10.7	**2-Hydroxy-2,2-dimethylethyl**							
	$HgCN + {}^{\bullet}CH_2C(CH_3)_2OH \rightarrow$	1.6×10^9				p.r.	Estimated from initial decay of HgCN in the presence of *tert*-BuOH.	751203
10.10.8	**1,4-Benzoquinone**							
	$HgCN + Q \rightarrow HgCN^+ + Q^{\bullet-}$	3.5×10^9				p.r.	P.b.k. in soln. contg. $Hg(CN)_2$.	761042
10.10.9	**Tetranitromethane**							
	$HgCN + C(NO_2)_4 \rightarrow HgCN^+ + C(NO_2)_3^- + {}^{\bullet}NO_2$	3.1×10^9				p.r.	P.b.k. in soln. contg. $Hg(CN)_2$.	761042
10.11	**Mercury(I) iodide**							
10.11.1	**Mercury(I) iodide**							
	$HgI + HgI \rightarrow Hg_2I_2$	2.5×10^9				p.r.	P.b.k. in soln. contg. HgI_2.	761042
10.11.2	**Oxygen**							
	$HgI + O_2 \rightarrow HgIO_2$	$\geq 10^9$				p.r.	P.b.k. in air-satd. soln. contg. HgI_2.	761042
10.11.3	**1,4-Benzoquinone**							
	$HgI + Q \rightarrow HgI^+ + Q^{\bullet-}$	$>10^9$				p.r.	P.b.k. in soln. contg. HgI_2.	761042
10.11.4	**Tetranitromethane**							
	$HgI + C(NO_2)_4 \rightarrow HgI^+ + C(NO_2)_3^- + {}^{\bullet}NO_2$	1.4×10^9				p.r.	P.b.k. in soln. contg. HgI_2.	761042
10.12	**Mercury(I) thiocyanate**							
10.12.1	**Mercury(I) thiocyanate**							
	$HgSCN + HgSCN \rightarrow Hg_2(SCN)_2$	3.0×10^9				p.r.	P.b.k. in soln. contg. $Hg(SCN)_2$.	761042
10.12.2	**Oxygen**							
	$HgSCN + O_2 \rightarrow HgSCNO_2$	$\geq 10^9$				p.r.	P.b.k. in air-satd. soln. contg. $Hg(SCN)_2$.	761042
10.12.3	**1,4-Benzoquinone**							
	$HgSCN + Q \rightarrow HgSCN^+ + Q^{\bullet-}$	$>10^9$				p.r.	P.b.k. in soln. contg. $Hg(SCN)_2$.	761042
10.12.4	**Tetranitromethane**							
	$HgSCN + C(NO_2)_4 \rightarrow HgSCN^+ + C(NO_2)_3^- + {}^{\bullet}NO_2$	2.8×10^9				p.r.	P.b.k. in soln. contg. $Hg(SCN)_2$.	761042
10.13	**Thiocyanatomercury(I)peroxyl**							
10.13.1	**1,4-Benzoquinone**							
	$HgSCNO_2 + Q \rightarrow HgSCN^+ + O_2 + Q^{\bullet-}$	1.0×10^9				p.r.	P.b.k. in air-satd. soln. contg. $Hg(SCN)_2$.	761042

TABLE 11. Rate constants for indium transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
11.1	**Indium atoms**							
11.1.1	**Indium(I) ion**							
	$In^0 + In^+ \rightarrow In_2^+$	1.5×10^9	6.8			p.r.	P.b.k. at 310 nm in Ar-satd. soln. contg. 0.005 mol L^{-1} InDr; $k_T \sim 3 \times 10^6$ s^{-1}. Product reported to disappear in second-order reaction, $k = 5 \times 10^9$ L mol^{-1} s^{-1}, suggested to represent mainly formation of In_4^{2+}.	89A492
11.2	**Indium(II) ion**							
11.2.1	**Indium(II) ion**							
	$In^{2+} + In^{2+} \rightarrow In^{3+} + In^+$	1.3×10^9	2.7-4.3	0.09	22	p.r.	D.k. in He-satd. soln. contg. 0.05 mol L^{-1} 2-PrOH. Value obtained by computer fit.	84A008
11.2.2	**Hydroxyl**							
	$In^{2+} + {}^{\bullet}OH \rightarrow In^{3+} + OH^-$	3.2×10^{10}	1.5-3.5			p.r.	D.k. in Ar-satd. soln. contg. (3-700) × 10^{-5} mol L^{-1} In^{3+}.	83A206
11.2.3	**Hydrogen peroxide**							
	$In^{2+} + H_2O_2 \rightarrow In^{3+} + {}^{\bullet}OH + OH^-$	6.0×10^8	2.7-3.3	0.09	22	p.r.	D.k. in He-satd. soln. contg. 0.05 mol L^{-1} 2-PrOH and added H_2O_2. At pH 4.3, $k = 3 \times 10^8$ L mol^{-1} s^{-1}. Value obtained by computer fit.	84A008
11.2.4	**Hydroxymethyl**							
	$In^{2+} + {}^{\bullet}CH_2OH \rightarrow$	1.9×10^9	1.5-2.2			p.r.	D.k. in Ar-satd. soln. contg. (0.2-2) × 10^{-3} mol L^{-1} In^{3+} and 0.1 mol L^{-1} MeOH.	83A206
11.2.5	**1-Hydroxy-1-methylethyl**							
	$In^{2+} + (CH_3)_2\dot{C}OH \rightarrow CH_3COCH_3 + H^+ + In^+$	9×10^8	2.7-4.3	0.09	22	p.r.	D.k. in He-satd. soln. contg. 0.05 mol L^{-1} 2-PrOH. Value obtained by computer fit.	84A008
11.3	**Tetrakis(4-*N*-methylpyridyl)porphineindium(III) radical anion**							
11.3.1	**Sulfur dioxide**							
	$[InTMpyP]^{\bullet 4+} + SO_2 \rightarrow InTMpyP^{5+} + SO_2^{\bullet -}$	2×10^8	1			p.r.	D.k. at 700 nm in N_2-satd. soln. contg. $NaHSO_3$, $InTMpyP^{5+}$ and 0.1 mol L^{-1} HCl or $HClO_4$.	87A083
11.4	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatoindate(III) radical cation**							
11.4.1	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatoindate(III) radical cation**							
	$[InTPPS]^{\bullet 2-} + [InTPPS]^{\bullet 2-} \rightarrow$	1.3×10^9	7			p.r.	D.k. at 700 nm in N_2O-satd. soln. contg. 0.01 mol L^{-1} KBr.	86S115

TABLE 12. Rate constants for iridium transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
12.1	**Hexachloroiridate(III) ion, electron adduct**							
12.1.1	**Hexachloroiridate(III) ion, electron adduct**							
	Ir(II) + Ir(II) → Ir(I) + Ir(III)	1.7×10^9				p.r.	D.k. at 280 nm in N_2-satd. soln. contg. 3×10^{-4} mol L^{-1} $IrCl_6^{3-}$ and 0.1 mol L^{-1} 2-PrOH.	731066
12.2	**Bis(2,2′-bipyridine)([2,2′-bipyridin]-3-yl-*C*,*N*′)iridium(III) ion, conjugate acid, electron adduct**							
12.2.1	**Hydrogen ion**							
	$Ir(bpy)_2(C^3,N'\text{-Hbpy})^{2+} + H^+ \rightarrow IrH(bpy)_2(C^3,N'\text{-Hbpy})^{3+}$	2.3	0-1.7			p.r.	D.k. in soln. contg. 0.02-1 mol L^{-1} $HClO_4$, 1 mol L^{-1} 2-PrOH and (6-30) × 10^{-5} mol L^{-1} Ir(III) complex (pK_a = 3.0).	87A165
12.2.2	**Dibromine radical ion**							
	$Ir(bpy)_2(C^3,N'\text{-Hbpy})^{2+} + Br_2^{\bullet-} \rightarrow Ir(bpy)_2(C^3,N'\text{-Hbpy})^{3+} + 2\ Br^-$	2.5×10^{10}	1.0			p.r.	D.k. at 380 nm in Ar-satd. soln. contg. 0.1 mol L^{-1} NaBr, 0.9 mol L^{-1} 2-PrOH and 2×10^{-4} mol L^{-1} Ir(III) complex; pK_a of reduced complex = 0.9.	85A160
12.3	**Bis(2,2′-bipyridine)([2,2′-bipyridin]-3-yl-*C*,*N*′)iridium(III) ion, electron adduct**							
12.3.1	**Dibromine radical ion**							
	$Ir(bpy)_2(C^3,N'\text{-bpy})^{+} + Br_2^{\bullet-} \rightarrow Ir(bpy)_2(C^3,N'\text{-bpy})^{2+} + 2\ Br^-$	~10^9			20	f.p./rq	Estd. from d.k. in soln. contg. Ir(III) complex, Br^- and 1,4-dimethoxybenzene (RQ); reaction in competition with disproportionation of $Br_2^{\bullet-}$.	89A025
12.3.2	**Oxygen**							
	$Ir(bpy)_2(C^3,N'\text{-bpy})^{+} + O_2 \rightarrow Ir(bpy)_2(C^3,N'\text{-bpy})^{2+} + HO_2/O_2^-$	9.0×10^8	1-6			p.r.	Reaction includes protonated form $Ir(bpy)_2(C^3,N'\text{-Hbpy})^{2+}$.	85A160
12.3.3	**1,4-Dimethoxybenzene radical cation**							
	$Ir(bpy)_2(C^3,N'\text{-bpy})^{+} + [1,4\text{-}C_6H_4(OCH_3)_2]^{\bullet+} \rightarrow Ir(bpy)_2(C^3,N'\text{-bpy})^{2+} + 1,4\text{-}C_6H_4(OCH_3)_2$	2.3×10^9	1.5-6.3	→0	20	f.p./rq	D.k. at 400, 420 and 460 nm in soln. contg. (3-5) × 10^{-5} mol L^{-1} Ir(III) complex and (1-6.4) × 10^{-3} mol L^{-1} 1,4-dimethoxybenzene (RQ).	89A025
12.4	**Bis(2,2′-bipyridine)([2,2′-bipyridin]-3-yl-*C*,*N*′)iridium(IV) ion, conjugate monoacid ‡**							
12.4.1	**1,1′-Dimethyl-4,4′-bipyridinium radical cation**							
	$Ir(bpy)_2(C^3,N'\text{-Hbpy})^{4+} + MV^{\bullet+} \rightarrow Ir(bpy)_2(C^3,N'\text{-Hbpy})^{3+} + MV^{2+}$	3.1×10^9	1.4		20	f.p./oq	D.k. at various wavelengths in soln. contg. 5×10^{-5} mol L^{-1} $[Ir(Hbpy\text{-}C^3,N')(bpy)_2]^{3+}$ and 0.07 mol L^{-1} MV^{2+} (OQ). ‡It is not known whether $[Ir(Hbpy\text{-}C^3,N')(bpy)_2]^{4+}$ has been oxidized at the metal or ligand.	86A057
12.4.2	**Chloride ion**							
	$Ir(bpy)_2(C^3,N'\text{-Hbpy})^{4+} + Cl^- \rightarrow Ir(bpy)_2(C^3,N'\text{-Hbpy})^{3+} + Cl^{\bullet}$	~8×10^8	1.4	0.2	20	f.p./oq	P.b.k. at 350 nm ($Cl^{\bullet} + Cl^- \rightarrow Cl_2^{\bullet-}$) in soln. contg. 5×10^{-5} mol L^{-1} $[Ir(Hbpy\text{-}C^3,N')(bpy)_2]^{3+}$, 0.04 mol L^{-1} $S_2O_8^{2-}$ (OQ) and 6.6×10^{-4} mol L^{-1} chloride ion.	86A057
12.5	**Hexachloroiridate(IV) ion**							
12.5.1	**5-Hydroxyindole**							
	$IrCl_6^{2-} + 5\text{-HOInH} \rightarrow IrCl_6^{3-} + H^+ + 5\text{-}^{\bullet}OInH$	3.8×10^6	3			f.p./pi	P.b.k. in Ar-satd. soln. contg. (2-3) × 10^{-3} mol L^{-1} $IrCl_6^{3-}$, 0.1 mol L^{-1} 2-chloroethanol and (1-10) × 10^{-4} mol L^{-1} 5-hydroxyindole; also used 5-HO-tryptamine, 5-HO-tryptophan or 5-HO-indole-3-acetic acid.	*90C007*

TABLE 13. Rate constants for manganese transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
13.1	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatomanganate(II) radical anion**							
13.1.1	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatomanganate(II) radical anion**							
	$[MnTPPS]^{\bullet 5-} + [MnTPPS]^{\bullet 5-} \rightarrow$	3.9×10^7	6.8			p.r.	D.k. at 770 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} 2-PrOH and $MnTPPS^{4-}$.	84A120
13.2	**5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)porphinatomanganese(II) radical anion**							
13.2.1	**5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)porphinatomanganese(II) radical anion**							
	$[MnTMpyP]^{\bullet 3+} + [MnTMpyP]^{\bullet 3+} \rightarrow$	3.7×10^7	6.8			p.r.	D.k. at 770 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} 2-PrOH and $MnTMpyP^{4+}$.	84A120
13.3	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatomanganate(II) ion**							
13.3.1	**Hydrogen ion**							
	$MnTPPS^{4-} + H^+ \rightarrow MnTPPSH^{3-}$	1.0×10^6	1.2-1.7	0.1		p.r.	D.k. and p.b.k. in N_2O-satd. soln. contg. $MnTPPS^{3-}$, 0.1 mol L^{-1} 2-PrOH and 0.02-0.06 mol L^{-1} H^+; at $[H^+] \leq 0.01$ mol L^{-1}, $k \sim 3.3 \times 10^7$ L^2 mol^{-2} s^{-1}.	84A190
13.3.2	**Oxygen**							
	$MnTPPS^{4-} + O_2 \rightarrow [MnTPPS\text{-}O_2]^{4-}$	1.5×10^5	8.5	0.05	18	s.f.	Soln. contg. $\sim 10^{-6}$-10^{-5} mol L^{-1} $MnTPPS^{4-}$ and (5-200) $\times 10^{-5}$ mol L^{-1} O_2.	80R105
13.4	**5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)porphinatomanganese(II) ion**							
13.4.1	**Hydrogen ion**							
	$MnTMpyP^{4+} + 2\ H^+ \rightarrow Mn^{2+} + H_2TMpyP^{4+}$	4.7×10^4 L^2 mol^{-2} s^{-1}	0-1	1.0		p.r.	D.k. and p.b.k. in N_2O-satd. soln. contg. $MnTMpyP^{5+}$, 0.1 mol L^{-1} 2-PrOH and 0.1-1.0 mol L^{-1} $HClO_4$.	84A190
13.4.2	**Oxygen**							
	$MnTMpyP^{4+} + O_2 \rightarrow [MnTMpyP\text{-}O_2]^{4+}$	1.6×10^5				p.r.		86A313
		1.2×10^5	8.5	0.05	18	s.f.	Soln. contg. $\sim 10^{-6}$-10^{-5} mol L^{-1} $MnTMpyP^{4+}$ and (5-200) $\times 10^{-5}$ mol L^{-1} O_2.	80R105
13.5	**5,10,15,20-Tetrakis(4-pyridyl)porphinatomanganese(II)**							
13.5.1	**Hydrogen ion**							
	$MnTpyP + 2\ H^+ \rightarrow Mn^{2+} + H_2TpyP$	5×10^4 L^2 mol^{-2} s^{-1}	0-1	1.0		p.r.	D.k. and p.b.k. in N_2O-satd. soln. contg. $MnTpyP^+$, 0.1 mol L^{-1} 2-PrOH and 0.1-1.0 mol L^{-1} $HClO_4$.	84A190
13.5.2	**Oxygen**							
	$MnTpyP + O_2 \rightarrow [MnTpyP\text{-}O_2]$	5×10^2	8.5	0.05	18	s.f.	Soln. contg. varied $[O_2]$.	80R105
13.6	**5,10,15,20-Tetrakis[4-(*N*,*N*,*N*-trimethylammonio)phenyl]porphinatomanganese(II) ion**							
13.6.1	**Oxygen**							
	$MnTAPP^{4+} + O_2 \rightarrow [MnTAPP\text{-}O_2]^{4+}$	1.6×10^5				p.r.		86A313
13.7	**α,α,α,β-Tetrakis[2-(*N*-methylisonicotinamido)phenyl]porphinatomanganese(II) ion**							
13.7.1	**Oxygen**							
	$MnPFP^{4+} + O_2 \rightarrow [MnPFP\text{-}O_2]^{4+}$	1.6×10^5				p.r.		86A313
13.8	**5,10,15,20-Tetrakis(4-carboxyphenyl)porphinatomanganate(II) ion**							
13.8.1	**Oxygen**							
	$MnTCPP^{4-} + O_2 \rightarrow [MnTCPP\text{-}O_2]^{4-}$	2.2×10^5	8.5	0.05	18	s.f.	Soln. contg. varied $[O_2]$.	80R105

TABLE 13. Rate constants for manganese transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
13.9	**Nitrilotriacetatomanganate(II) ion, H-abstraction product**							
13.9.1	**First-order reaction**							
	$Mn[NTA\text{-}H]^- \rightarrow$	3.0×10^3 s^{-1}	4-9			p.r.	D.k. in N_2O-satd. soln. contg. $MnNTA^-$; followed by second-order reaction, $k = 2.9 \times 10^7$ L mol^{-1} s^{-1} at pH 4.5-5.5.	78A436
13.10	**Ethylenediaminetetraacetatomanganate(II) ion, H-abstraction product**							
13.10.1	**First-order reaction**							
	$Mn[EDTA\text{-}H]^{2-} \rightarrow$	2.5×10^3 s^{-1}	4-9			p.r.	D.k. in N_2O-satd. soln. contg. $MnEDTA^{2-}$; followed by pH-dependent (pH 3-10) second-order reaction.	78A436
13.11	**Manganese(III) ion**							
13.11.1	***Thionine semiquinone, conjugate monoacid***							
	$Mn^{3+} + [ThH]^{\cdot+} \rightarrow Mn^{2+} + Th^+ + H^+$	3.5×10^9	2.5	0.2		f.p./oq	D.k. of semithionine in soln. contg. Mn^{2+} and thionine (OQ).	777315
13.12	**Hydroxymanganese(III) ion**							
13.12.1	**Zinc(I) ion**							
	$MnOH^{2+} + Zn^+ \rightarrow Mn^{2+} + Zn^{2+} + OH^-$	2.4×10^9	~6		23	p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $MnSO_4$ and 0.03 mol L^{-1} $ZnSO_4$. Value obtained from computer fit.	78A041
13.13	**Peroxidomanganese(III) ion**							
13.13.1	**First-order reaction**							
	$MnO_2^+ \rightarrow Mn^{2+} + O_2^{\cdot-}$	2.7×10^3 s^{-1} 6.1×10^3 s^{-1}	6.7 6.7	0.01 0.5	24 24	p.r.	Calcd. from equilibration obs. at 254 and 275 nm in O_2-satd. soln. contg. 4.0×10^{-5} mol L^{-1} Mn^{2+} and 0.01 mol L^{-1} formate; $k_r = 1.1 \times 10^8$ L mol L^{-1} s^{-1}. In the presence of 0.5 mol L^{-1} formate, $k = 2.2 \times 10^3$ s^{-1}; species present as MnO_2^+-formate. Measurements reported in [84A384] indicate that MnO_2^+-formate disappeared by a first-order process with $k = 5$ s^{-1}.	761109
13.14	**Peroxidomanganese(III) formate**							
13.14.1	**Ascorbate ion**							
	MnO_2^+-formate + $AH^- \rightarrow$ MnO_2-formate + $^{\cdot}A^- + H^+$	3.5×10^5	7.4		23.5	s.f.	P.b.k. in N_2O-satd. soln. contg. ascorbate, formate, O_2 and Mn^{2+}.	85Z381
13.15	**Hydroperoxidomanganese(III) formate complex**							
13.15.1	**First-order reaction**							
	MnO_2H^{2+}-formate $\rightarrow$ Mn(III)-formate + HO_2^-	79 s^{-1}			25	p.r.	P.b.k. in O_2-satd. soln. contg. 0.5 mol L^{-1} formate and varied $[Mn^{2+}]$.	84A189
13.15.2	***tert*-Butylhydroquinone**							
	MnO_2H^{2+}-formate + $(CH_3)_3CC_6H_3$-1,4-$(OH)_2 \rightarrow$	2.2×10^4	0.9		23	phot., s.f.	D.k. in soln. contg. 0.1-0.2 mol L^{-1} $Mn(ClO_4)_2$, 0.25 mol L^{-1} formate, $HClO_4$ and $(1.4\text{-}5.8) \times 10^{-4}$ mol L^{-1} *tert*-butylhydroquinone.	83A382
13.15.3	**1,2-Benzenediol**							
	MnO_2H^{2+}-formate + 1,2-$C_6H_4(OH)_2 \rightarrow$	2.6×10^4	0.9		23	phot., s.f.	D.k. in soln. contg. 0.1-0.2 mol L^{-1} $Mn(ClO_4)_2$, 0.25 mol L^{-1} formate, $HClO_4$ and $(1\text{-}4) \times 10^{-4}$ mol L^{-1} 1,2-benzenediol (most likely complexed with Mn^{2+}).	83A382

TABLE 13. Rate constants for manganese transients — Continued

No. Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
13.15 Hydroperoxidomanganese(III) formate complex — Continued							
13.15.4 1,3-Benzenediol							
MnO_2H^{2+}-formate + 1,3-$C_6H_4(OH)_2$ →	5.2×10^4	0.9		23	phot., s.f.	D.k. in soln. contg. 0.1-0.2 mol L^{-1} $Mn(ClO_4)_2$, 0.25 mol L^{-1} formate, $HClO_4$ and (0.5-2.0) × 10^{-3} mol L^{-1} 1,3-benzenediol.	83A382
13.16 Peroxidomanganese(III)-manganese(II) formate complex							
13.16.1 First-order reaction							
($MnOOHMn^{4+}$)-formate →	2.8×10^3 s^{-1}	1-1.3		25	p.r.	P.b.k. in O_2-satd. soln. contg. 0.5 mol L^{-1} formate and varied [Mn^{2+}].	84A189
13.17 Manganese(III) phosphate complex							
13.17.1 Ascorbate ion							
Mn(III)-phosphate + AH^- → Mn(II)-phosphate + $^{\bullet}A^-$ + H^+	1.4×10^6	4.7		23.5	p.r.	N_2O-satd. soln. Reactant includes ~20% ascorbic acid (pK_a = 4.1).	85Z381
13.17.2 6-Hydroxy-2,5,7,8-tetramethylchroman-2-carboxylate ion							
Mn(III)-phosphate + $TxOH^-$ → Mn(II)-phosphate + $HTxO^{\bullet}$	8.2×10^4	4.6			p.r.	D.k. and p.b.k. in N_2O-satd. soln. contg. 0.2 mol L^{-1} phosphate, 0.1 mol L^{-1} $MnSO_4$ and (0.35-1.75) × 10^{-4} mol L^{-1} $TxOH^-$.	86A492
13.18 Peroxidomanganese(III) phosphate complex							
13.18.1 First-order reaction							
MnO_2^+-phosphate →	2×10^3 s^{-1}	3.5-5.3			p.r.	P.b.k. in O_2-satd. soln. contg. 0.5 mol L^{-1} phosphate, 0.005 mol L^{-1} formate and 0.005 mol L^{-1} $MnSO_4$. Reaction suggested to generate Mn(III)-phosphate and H_2O_2; k invariant in the pH range 3.5-5.3.	84A384
13.18.2 *tert*-Butylhydroquinone							
MnO_2^+-phosphate + $(CH_3)_3CC_6H_3$-1,4-$(OH)_2$ →	8.7×10^3	5-7		23	phot., s.f.	D.k. in soln. contg. 5 × 10^{-4} mol L^{-1} $MnSO_4$ and 0.5 mol L^{-1} phosphate.	83A382
13.18.3 1,2-Benzenediol							
MnO_2^+-phosphate + 1,2-$C_6H_4(OH)_2$ →	6.7×10^5	5-7		23	phot., s.f.	D.k. in soln. contg. 5 × 10^{-4} mol L^{-1} $MnSO_4$ and 0.5 mol L^{-1} phosphate.	83A382
13.18.4 6-Hydroxy-2,5,7,8-tetramethylchroman-2-carboxylate ion							
MnO_2^+-phosphate + $TxOH^-$ → MnO_2-phosphate + $HTxO^{\bullet}$	1.1×10^5	5.0-5.6			p.r.	D.k. and p.b.k. in O_2-satd. soln. contg. 0.2 mol L^{-1} phosphate, 0.05 mol L^{-1} formate, 5 × 10^{-6} mol L^{-1} $MnSO_4$ and (0.68-2.65) × 10^{-4} mol L^{-1} $TxOH^-$.	86A492
13.18.5 Nicotinamide adenine dinucleotide, reduced							
MnO_2^+-phosphate + NADH →	~1 × 10^2	5-7		23	phot., s.f.	D.k. in soln. contg. 5 × 10^{-4} mol L^{-1} $MnSO_4$ and 0.5 mol L^{-1} phosphate.	83A382
13.18.6 Nicotinamide-adenine dinucleotide phosphate, reduced							
MnO_2^+-phosphate + NADPH →	~1 × 10^2	5-7		23	phot., s.f.	D.k. in soln. contg. 5 × 10^{-4} mol L^{-1} $MnSO_4$ and 0.5 mol L^{-1} phosphate.	83A382
13.18.7 1,3-Benzenediol							
MnO_2^+-phosphate + 1,3-$C_6H_4(OH)_2$ →	67	5-7		23	phot., s.f.	D.k. in soln. contg. 5 × 10^{-4} mol L^{-1} $MnSO_4$ and 0.5 mol L^{-1} phosphate.	83A382
13.19 Manganese(III) pyrophosphate complex							
13.19.1 Ascorbate ion							
Mn(III)-pyrophosphate + AH^- → Mn(II)-pyrophosphate + $^{\bullet}A^-$ + H^+	1.4×10^4	7.0		23.5	p.r.	N_2O-satd. soln.	85Z381

TABLE 13. Rate constants for manganese transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
13.20	**Manganese(III) sulfate complex**							
13.20.1	**Ascorbate ion**							
	Mn(III)-sulfate + AH^- → Mn(II)-sulfate + $^{\bullet}A^-$ + H^+	1.8×10^6	5.6		23.5	p.r.	N_2O-satd. soln.	85Z381
13.20.2	**Nicotinamide-adenine dinucleotide phosphate, reduced**							
	Mn(III)-sulfate + NADPH → Mn(II)-sulfate + NADP + H^+	3.1×10^6	5.4		23.5	p.r.	N_2O-satd. soln.	85Z381
13.21	**Peroxidomanganese(III) sulfate complex**							
13.21.1	**Superoxide radical anion**							
	MnO_2^+-sulfate + $O_2^{\bullet-}$ + 2 H^+ → Mn(II)-sulfate + O_2 + H_2O_2	3.3×10^7	6			p.r.	Calcd. from d.k. in O_2-satd. soln. contg. $(0.1\text{-}2) \times 10^{-3}$ mol L^{-1} Mn^{2+}, 0.5 mol L^{-1} Na_2SO_4 and 0.005 mol L^{-1} formate.	84A384
13.22	**Hydroperoxidomanganese(III) sulfate complex**							
13.22.1	**First-order reaction**							
	MnO_2H^{2+}-sulfate → Mn(III)-sulfate + HO_2^-	13 s^{-1}			25	p.r.	P.b.k. in O_2-satd. soln. contg. 0.5 mol L^{-1} sulfate, and varied [formate] and [Mn^{2+}].	84A189
13.23	**Peroxidomanganese(III)-manganese(II) sulfate complex**							
13.23.1	**First-order reaction**							
	($MnOOHMn^{4+}$)-sulfate →	3.1×10^3 s^{-1}	1-1.3		25	p.r.	P.b.k. in O_2-satd. soln. contg. 0.5 mol L^{-1} sulfate, and varied [formate] and [Mn^{2+}].	84A189
13.24	**Dibromomanganese(III) ion**							
13.24.1	**First-order reaction**							
	$MnBr_2^+ \rightarrow Mn^{3+} + 2\ Br^-$	2.3×10^5 s^{-1}	1	0.25	25	f.p.	D.k. of $Br_2^{\bullet-}$ in soln. contg. 0.1 mol L^{-1} Br^- and $(1\text{-}20) \times 10^{-3}$ mol L^{-1} Mn^{2+}; value of k obtained from the intercept of plot of $(k_{obs})^{-1}$ vs $[Mn^{2+}]^{-1}$.	737317
13.25	**Chloromanganese(III) ion**							
13.25.1	**2,3,9,10-Tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraenecobalt(II) ion**							
	$MnCl^{2+}$ + $Co(Me_4tetraeneN_4)^{2+}$ → Mn^{2+} + $Co(Me_4tetraeneN_4)Cl^{2+}$	2.4×10^7	0		25	f.p.	D.k. at 540 nm in soln. contg. ~10^{-2} mol L^{-1} Mn^{2+} and 1 mol L^{-1} HCl.	79A016
13.25.2	***N-rac*-5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecobalt(II) ion**							
	$MnCl^{2+}$ + *N-rac*-$Co(4,11\text{-dieneN}_4)^{2+}$ → Mn^{2+} + $Co(4,11\text{-dieneN}_4)Cl^{2+}$	5.3×10^6	0		25	f.p.	D.k. at 340 nm in soln. contg. ~10^{-2} mol L^{-1} Mn^{2+} and 1 mol L^{-1} HCl.	79A016
13.26	**Dichloromanganese(III) ion**							
13.26.1	**First-order reaction**							
	$MnCl_2^+ \rightarrow Mn^{3+} + 2\ Cl^-$	2.1×10^5 s^{-1}	1	0.2	25	f.p.	D.k. of $Cl_2^{\bullet-}$ in soln. contg. 0.1 mol L^{-1} Cl^- and $(1\text{-}20) \times 10^{-3}$ mol L^{-1} Mn^{2+}; value of k obtained from the intercept of plot of $(k_{obs})^{-1}$ vs $[Mn^{2+}]$.	737317
13.27	**Peroxido(ethylenediaminediacetato)manganate(III) ion**							
13.27.1	**Water**							
	$MnEDDA(O_2)^-$ + 2 H_2O → $MnEDDA(OH)_2^-$ + H_2O_2	220 s^{-1} *50* s^{-1}	6.3 7.1	0.1		p.r.	D.k. in O_2-satd. soln. contg. MnEDDA and *0.01 mol L^{-1} formate; product reacts with* $O_2^{\bullet-}$ to give $MnEDDA(OH)_2(O_2)^-$ which decays by first-order reaction, $k = 55$ s^{-1}.	90A116

TABLE 13. Rate constants for manganese transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
13.28	**Aqua(methyl)nitrilotriacetatomanganate(III) ion**							
13.28.1	**First-order reaction**							
	$CH_3MnNTA(H_2O)^- \rightarrow MnNTA(H_2O)^- + {}^{\bullet}CH_3$	1.2×10^5 s^{-1}	6			p.r.	D.k. in N_2O-satd. soln. contg. 0.002-0.006 mol L^{-1} NTA, (0.5-5.0) $\times 10^{-3}$ mol L^{-1} $MnSO_4$ and 0.1-0.5 mol L^{-1} DMSO; $k_r = 1.5 \times 10^8$ L mol^{-1} s^{-1}.	88A426
13.28.2	**Methyl**							
	$CH_3MnNTA(H_2O)^- + {}^{\bullet}CH_3 \rightarrow MnNTA(H_2O)^- + C_2H_6$	1.6×10^9	6			p.r.	Calcd. from concn. dependence of d.k. in N_2O-satd. soln. contg. 0.002-0.006 mol L^{-1} NTA, (0.5-5.0) $\times 10^{-3}$ mol L^{-1} $MnSO_4$ and 0.1-0.5 mol L^{-1} DMSO.	88A426
13.29	**Bromo[5,10,15,20-tetrakis(4-sulfonatophenyl)porphinatomanganate(III) ion**							
13.29.1	**Water**							
	$[BrMnTPPS]^{4-} + H_2O \rightarrow (H_2O)MnTPPS^{3-} + Br^-$	4×10^3 s^{-1} 9×10^3 s^{-1}	6.8 12.9			p.r.	D.k. in N_2O-satd. soln. contg. 0.1 mol L^{-1} KBr and $MnTPPS^{4-}$.	84A120
13.30	**2-Hydroxy-2,2-dimethylethyltetrakis(4-sulfonatophenyl)porphinatomanganate(III) ion**							
13.30.1	**Water**							
	$HOC(CH_3)_2CH_2MnTPPS^{4-} + H_2O \rightarrow MnTPPS^{3-} + tert\text{-}BuOH + OH^-$	$\sim 4 \times 10^2$ s^{-1}	6.8			p.r.	D.k. in N_2O-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH and $MnTPPS^{4-}$.	84A120
13.31	**Bromo[5,10,15,20-tetrakis(1-methylpyridinium-4-yl)porphinatomanganate(III) ion**							
13.31.1	**Water**							
	$[BrMnTMpyP]^{4+} + H_2O \rightarrow (H_2O)MnTMpyP^{5+} + Br^-$	6×10^4 s^{-1} 1.5×10^5 s^{-1}	6.8 12.9			p.r.	D.k. in N_2O-satd. soln. contg. 0.1 mol L^{-1} KBr and $MnTMpyP^{4+}$.	84A120
13.32	**2-Hydroxy-2,2-dimethylethyl[5,10,15,20-tetrakis(1-methylpyridinium-4-yl)porphinatomanganate(III) ion**							
13.32.1	**Water**							
	$HOC(CH_3)_2CH_2MnTMpyP^{4+} + H_2O \rightarrow MnTMpyP^{5+} + tert\text{-}BuOH + OH^-$	$\sim 7 \times 10^3$ s^{-1}	6.8			p.r.	D.k. in N_2O-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH and $MnTMpyP^{4+}$.	84A120
13.33	**Dichlorohydroxy(1,4,7,11-tetraazacyclotetradecane)manganese(IV) ion**							
13.33.1	**First-order reaction**							
	$[HOMn(cyclam)Cl_2]^+ \rightarrow$	1.3×10^5 s^{-1}				p.r.	D.k. in N_2O-satd. soln. contg. $Mn(cyclam)Cl_2^+$; reaction suggested to represent loss of ligand.	87A488
13.34	**Dichloro-*meso*-5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradecane(hydroxy)manganese(IV) ion**							
13.34.1	**First-order reaction**							
	[HO-*meso*-$Mn(aneN_4)Cl_2]^+ \rightarrow$	5.0×10^3 s^{-1}				p.r.	D.k. in N_2O-satd. soln. contg. *meso*-$Mn(aneN_4)Cl_2^+$; reaction suggested to represent loss of ligand.	87A488
13.35	**Dichloro-*rac*-5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradecane(hydroxy)manganese(IV) ion**							
13.35.1	**First-order reaction**							
	[HO-*rac*-$Mn(aneN_4)Cl_2]^+ \rightarrow$	9.0×10^3 s^{-1}				p.r.	D.k. in N_2O-satd. soln. contg. *rac*-$Mn(aneN_4)Cl_2^+$; reaction suggested to represent loss of ligand.	87A488
13.36	**Manganese(V)**							
13.36.1	**Manganate(VI) ion**							
	$Mn(V) + MnO_4^{2-} \rightarrow Mn(IV) + MnO_4^-$	$<4 \times 10^4$	13	0.1	22	p.r.	Estd. from abs. changes in Ar-satd. soln. contg. MnO_4^{2-} and 0.1 mol L^{-1} OH^-.	81A057

TABLE 14. Rate constants for molybdenum transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
14.1	**18-Molybdodiphosphate ion(7-), conjugate acid**							
14.1.1	**18-Molybdodiphosphate ion(7-), conjugate acid**							
	$HP_2Mo_{18}O_{62}^{6-} + HP_2Mo_{18}O_{62}^{6-} \rightarrow P_2Mo_{18}O_{62}^{6-} + H_2P_2Mo_{18}O_{62}^{6-}$	1.0×10^4	2		22	p.r.	P.b.k. at 750 nm in N_2O-satd. soln. contg. $\sim 10^{-4}$ mol L^{-1} $P_2Mo_{18}O_{62}^{6-}$ and 0.5 mol L^{-1} alcohol.	82A107
14.2	**Bis(μ-oxo)(ethylenediaminetetraacetato)bis[oxomolybdate(IV)(V)] ion**							
14.2.1	**Oxygen**							
	$[Mo_2O_4(EDTA)]^{3-} + O_2 \rightarrow$	$\sim 2 \times 10^8$			25	p.r.	D.k. in soln. contg. $(0.2\text{-}2.0) \times 10^{-4}$ mol L^{-1} $Mo_2O_4(EDTA)^{2-}$, 0.1 mol L^{-1} 1-BuOH and $(1\text{-}5) \times 10^{-6}$ mol L^{-1} O_2; concn. of transient $\sim 1 \times 10^{-5}$ mol L^{-1}.	85A363
14.3	**Bis(μ-oxo)bis[aqua(oxalato)oxomolybdate(IV)(V) ion**							
14.3.1	**Oxygen**							
	$[Mo_2O_4(ox)_2(H_2O)_2]^{3-} + O_2 \rightarrow$	$\sim 1 \times 10^8$			25	p.r.	D.k. in soln. contg. $(0.2\text{-}2.0) \times 10^{-4}$ mol L^{-1} $Mo_2O_4(ox)(H_2O)_2^{2-}$, 0.1 mol L^{-1} 1-BuOH and $(1\text{-}5) \times 10^{-6}$ mol L^{-1} O_2; concn. of transient $\sim 1 \times 10^{-5}$ mol L^{-1}.	85A363
14.4	**Octacyanomolybdate(V) ion**							
14.4.1	**10-Methylphenothiazine**							
	$Mo(CN)_8^{3-} + MPTH \rightarrow Mo(CN)_8^{4-} + [MPTH]^{\bullet+}$	9.6×10^7	1		22	p.r.	D.k. at 520 nm in N_2O-satd. soln. contg. 0.17 mol L^{-1} EtOH, 2×10^{-4} mol L^{-1} $Mo(CN)_8^{4-}$, 1×10^{-5} mol L^{-1} MPTH, 0.10 mol L^{-1} $HClO_4$ and 0.2 mol L^{-1} NaBr; $k_r = 3.3 \times 10^7$ L mol^{-1} s^{-1}	83N00
14.5	***cis*-Octaaqua-μ-oxo-bis(oxo)dimolybdenum(IV) ion**							
14.5.1	**First-order reaction**							
	cis-$Mo_2O_3(H_2O)_8^{2+} \rightarrow$ *trans*-$Mo_2O_3(H_2O)_8^{2+}$	2.4×10^4 s^{-1}	0.7	0.5		f.p.	D.k. in deaerated soln. (satd. with ethylene) contg. 0.2 mol L^{-1} $HClO_4$ and 7.5×10^{-5} mol L^{-1} $Mo_2O_4(H_2O)_6^{2+}$.	89A42
14.6	**Hexaaquadi-μ-oxodioxodimolybdenum(V,VI) ion**							
14.6.1	**First-order reaction**							
	$Mo_2O_4(OH_2)_6^{3+} \rightarrow$	2.9×10^3 s^{-1}	2	0.5		p.r.	D.k. at 290 nm in N_2O-satd. soln. contg. 0.01 mol L^{-1} $HClO_4$ and 7.5×10^{-5} mol L^{-1} $Mo_2O_4(H_2O)_6^{2+}$.	89A42

TABLE 15. Rate constants for nickel transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
15.1	**Nickel(I) ion**							
15.1.1	**Hydroxyl**							
	$Ni^+ + {}^{\bullet}OH \rightarrow Ni^{2+} + OH^-$	2×10^{10}				p.r.	D.k. at 300 nm in Ar-satd. soln. contg. 10^{-4} mol L^{-1} $NiSO_4$; value obtained by computer fit assuming $2k({}^{\bullet}OH + {}^{\bullet}OH) = 1 \times 10^{10}$ L mol^{-1} s^{-1}.	741037
15.1.2	**Hydroxymethyl**							
	$Ni^+ + {}^{\bullet}CH_2OH \rightarrow NiCH_2OH^+$	4.2×10^9				p.r.	D.k. at 300 nm, p.b.k. at 250 nm and condy. change in Ar-satd. soln. contg. 10^{-4} mol L^{-1} $NiSO_4$ and 0.1 mol L^{-1} MeOH; value obtained by computer fit.	741037
15.1.3	**Carbon dioxide radical anion**							
	$Ni^+ + {}^{\bullet}CO_2^- \rightarrow NiCO_2$	6.6×10^9				p.r.	D.k. at 300 nm, p.b.k. at 250 nm and condy. change in Ar-satd. soln. contg. 5×10^{-5} mol L^{-1} $NiSO_4$ and 5×10^{-5} mol L^{-1} formate ion; value obtained by computer fit; product suggested to undergo protonation.	741037
15.1.4	**1-Hydroxyethyl**							
	$Ni^+ + CH_3\dot{C}HOH \rightarrow NiCHOHCH_3^+$	2.3×10^9				p.r.	D.k. at 300 nm, p.b.k. at 250 nm and condy. change in Ar-satd. soln. contg. 10^{-4} mol L^{-1} $NiSO_4$ and EtOH; value obtained by computer fit.	741037
15.1.5	**1-Hydroxy-1-methylethyl**							
	$Ni^+ + (CH_3)_2\dot{C}OH \rightarrow NiCOH(CH_3)_2^+$	1.4×10^9				p.r.	D.k. at 300 nm, p.b.k. at 250 nm and condy. change in Ar-satd. soln. contg. 10^{-4} mol L^{-1} $NiSO_4$ and 2-PrOH; value obtained by computer fit.	741037
15.1.6	**2-Hydroxy-2,2-dimethylethyl**							
	$Ni^+ + {}^{\bullet}CH_2C(CH_3)_2OH \rightarrow Ni^{2+} + OH^- + CH_2{=}C(CH_3)_2$	3×10^9				p.r.	D.k. at 300 nm, p.b.k. at 250 nm and condy. change in Ar-satd. soln. contg. 10^{-4} mol L^{-1} $NiSO_4$ and 0.5 mol L^{-1} *tert*-BuOH; value obtained by computer fit.	741037
15.1.7	**Cyclopentyl**							
	$Ni^+ + c\text{-}\dot{C}_5H_9 \rightarrow c\text{-}C_5H_9Ni^+$	2.8×10^9				p.r.	D.k. at 300 nm, p.b.k. at 250 nm and condy. change in Ar-satd. soln. contg. 10^{-4} mol L^{-1} $NiSO_4$ and cyclopentane; value obtained by computer fit.	741037
15.1.8	**Bromate ion**							
	$Ni^+ + BrO_3^- \rightarrow$	$\leq 8.4 \times 10^6$		0.08		p.r.	D.k. at 313 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$, 0.001 mol L^{-1} MeOH and $(2.5\text{-}5) \times 10^{-3}$ mol L^{-1} BrO_3^-.	68G855
15.1.9	**Tris(ethylenediamine)cobalt(III) ion**							
	$Ni^+ + Co(en)_3^{3+} \rightarrow$	$\leq 5 \times 10^6$	5-6	0.08		p.r.	D.k. at 310 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	690428
15.1.10	***cis*-Dichlorobis(ethylenediamine)cobalt(III) ion**							
	$Ni^+ + cis\text{-}Co(en)_2Cl_2^+ \rightarrow$	5.9×10^8	5-6	0.08		p.r.	D.k. at 350 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	690428
15.1.11	***trans*-Dichlorobis(ethylenediamine)cobalt(III) ion**							
	$Ni^+ + trans\text{-}Co(en)_2Cl_2^+ \rightarrow$	8.3×10^8	5-6	0.08		p.r.	D.k. at 350 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	690428

TABLE 15. Rate constants for nickel transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
15.1	**Nickel(I) ion** — Continued							
15.1.12	**Carbonatobis(ethylenediamine)cobalt(III) ion**							
	$Ni^+ + Co(en)_2CO_3^+ \rightarrow$	$\leq 5 \times 10^6$	5-6	0.08		p.r.	D.k. at 310 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	690428
15.1.13	***cis*-Bis(ethylenediamine)difluorocobalt(III) ion**							
	$Ni^+ + cis\text{-}Co(en)_2F_2^+ \rightarrow$	$\leq 5 \times 10^6$	5-6	0.08		p.r.	D.k. at 310 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	690428
15.1.14	**Aquabis(ethylenediamine)fluorocobalt(III) ion**							
	$Ni^+ + Co(en)_2(H_2O)F^{2+} \rightarrow$	$\leq 5 \times 10^6$	5-6	0.08		p.r.	D.k. at 310 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	690428
15.1.15	***cis*-Amminechlorobis(ethylenediamine)cobalt(III) ion**							
	$Ni^+ + cis\text{-}Co(en)_2(NH_3)Cl^{2+} \rightarrow$	4.7×10^8	5-6	0.08		p.r.	D.k. at 310 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	690428
15.1.16	***cis*-Nitroamminebis(ethylenediamine)cobalt(III) ion**							
	$Ni^+ + cis\text{-}Co(en)_2(NH_3)NO_2^{2+} \rightarrow$	3.3×10^8	5-6	0.08		p.r.	D.k. at 350 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	690428
15.1.17	**Hexaamminecobalt(III) ion**							
	$Ni^+ + Co(NH_3)_6^{3+} \rightarrow$	$\leq 5 \times 10^6$	5-6	0.08		p.r.	D.k. at 310 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	690428
15.1.18	**Pentaammine(bromo)cobalt(III) ion**							
	$Ni^+ + Co(NH_3)_5Br^{2+} \rightarrow$	1.1×10^9	4.0	0.08		p.r.	D.k. at 310 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	690428
15.1.19	**Pentaammine(chloro)cobalt(III) ion**							
	$Ni^+ + Co(NH_3)_5Cl^{2+} \rightarrow$	6.5×10^8	5-6	0.08		p.r.	D.k. at 310 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	690428
15.1.20	**Pentaammine(cyano)cobalt(III) ion**							
	$Ni^+ + Co(NH_3)_5(CN)^{2+} \rightarrow$	3.3×10^8	5-6	0.08		p.r.	D.k. at 310 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	690428
15.1.21	**Pentaammine(fluoro)cobalt(III) ion**							
	$Ni^+ + Co(NH_3)_5F^{2+} \rightarrow$	$\leq 5 \times 10^6$	5-6	0.08		p.r.	D.k. at 310 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	690428
15.1.22	**Pentaammine(aqua)cobalt(III) ion**							
	$Ni^+ + Co(NH_3)_5(H_2O)^{3+} \rightarrow$	$\leq 5 \times 10^6$	4.0	0.08		p.r.	D.k. at 310 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	690428
15.1.23	**Pentaammine(hydroxy)cobalt(III) ion**							
	$Ni^+ + Co(NH_3)_5OH^{2+} \rightarrow$	1.3×10^7	7.6	0.08		p.r.	D.k. at 310 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	690428
15.1.24	**Pentaammine(azido)cobalt(III) ion**							
	$Ni^+ + Co(NH_3)_5(N_3)^{2+} \rightarrow$	5.8×10^8	5-6	0.08		p.r.	D.k. at 350 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	690428

TABLE 15. Rate constants for nickel transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
15.1	**Nickel(I) ion** — Continued							
15.1.25	**Pentaammine(thiocyanato-*N*)cobalt(III) ion**							
	$Ni^+ + Co(NH_3)_5(NCS)^{2+} \rightarrow$	4.1×10^8	5-6	0.08		p.r.	D.k. at 350 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	690428
15.1.26	**(Acetato)pentaamminecobalt(III) ion**							
	$Ni^+ + Co(NH_3)_5(OAc)^{2+} \rightarrow$	$\leq 5 \times 10^6$	5-6	0.08		p.r.	D.k. at 310 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	690428
15.1.27	**μ-5-Pyrimidinecarboxylatobis[hydroxotris(ammine)cobalt(III)] ion**							
	$Ni^+ + 5\text{-}pmCO_2[Co(NH_3)_3]_2(OH)_2^{3+} \rightarrow$	$\leq 1 \times 10^7$	4.0		22	p.r.	D.k. in Ar-satd. soln. contg. 0.01 mol L^{-1} $NiSO_4$ and 0.1 mol L^{-1} *tert*-BuOH.	82A146
15.1.28	**μ-4-Pyrimidinecarboxylatobis[hydroxotris(ammine)cobalt(III)] ion**							
	$Ni^+ + 4\text{-}pmCO_2[Co(NH_3)_3]_2(OH)_2^{3+} \rightarrow$	2.7×10^8	4.0		22	p.r.	D.k. in Ar-satd. soln. contg. 0.01 mol L^{-1} $NiSO_4$ and 0.1 mol L^{-1} *tert*-BuOH.	82A146
15.1.29	**Copper(II) ion**							
	$Ni^+ + Cu^{2+} \rightarrow$	$\leq 2.4 \times 10^7$		0.08		p.r.	D.k. at 313 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	68G855
15.1.30	**Hydrogen peroxide**							
	$Ni^+ + H_2O_2 \rightarrow Ni^{2+} + {}^{\bullet}OH + OH^-$	3.2×10^7			25	p.r.		761072
		5×10^7				p.r.	D.k. at 300 nm and condy. change in Ar-satd. soln. contg. 1×10^{-4} mol L^{-1} $NiSO_4$; value obtained from computer fit assuming $2k(^{\bullet}OH + {}^{\bullet}OH) = 1 \times 10^{10}$ L mol^{-1} s^{-1}.	741037
		4.3×10^7		0.08		p.r.	D.k. at 313 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	68G855
15.1.31	**Hydrogen ion**							
	$Ni^+ + H^+ \rightarrow$	$\leq 10^6$		0.08		p.r.	D.k. at 313 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	68G855
15.1.32	**Iodate ion**							
	$Ni^+ + IO_3^- \rightarrow$	2.2×10^8		0.08		p.r.	D.k. at 313 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	68G855
15.1.33	**Permanganate ion**							
	$Ni^+ + MnO_4^- \rightarrow$	7.2×10^9			20	p.r.	D.k. at 545 nm in Ar-satd. or deaerated soln. contg. 10^{-5} mol L^{-1} MnO_4^- and (0.2, 0.75 or 1.45) $\times 10^{-3}$ mol L^{-1} Ni^{2+}.	650385
15.1.34	**Nitrite ion**							
	$Ni^+ + NO_2^- \rightarrow$	1.5×10^8		0.08		p.r.	D.k. at 313 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	68G855
15.1.35	**Nitrate ion**							
	$Ni^+ + NO_3^- \rightarrow$	$\leq 1.4 \times 10^6$		0.08		p.r.	D.k. at 313 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	68G855
15.1.36	**Nitrous oxide**							
	$Ni^+ + N_2O \rightarrow NiO^+ + N_2$	9.1×10^6			25	p.r.	D.k. in N_2O-satd. soln. contg. 0.5 mol L^{-1} $NiSO_4$; studied at 1-30 °C, E_a = 40.6 kJ mol^{-1}.	761072

TABLE 15. Rate constants for nickel transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
15.1	**Nickel(I) ion** — Continued							
15.1.36	**Nitrous oxide** — Continued							
		$\leq 6.3 \times 10^6$				p.r.	D.k. at 313 nm in N_2O-satd. soln. contg. 1.0 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	68G855
15.1.37	**Oxygen**							
	$Ni^+ + O_2 \rightarrow NiO_2^+$	1.4×10^9		0.08		p.r.	D.k. at 313 nm in soln. contg. 0.02 mol L^{-1} $NiSO_4$ and 0.001 mol L^{-1} MeOH.	68G855
		2.2×10^9			18	p.r.	D.k. in soln. contg. Ni^{2+}.	66A001
15.1.38	**Hexaammineruthenium(III) ion**							
	$Ni^+ + Ru(NH_3)_6^{3+} \rightarrow$	4.0×10^8		0.08		p.r.	D.k. in soln. contg. 0.02 mol L^{-1} $NiSO_4$ and varied $[Ru(NH_3)_6^{3+}]$.	701229
15.1.39	**Peroxodisulfate ion**							
	$Ni^+ + S_2O_8^{2-} \rightarrow Ni^{2+} + SO_4^{\bullet -} + SO_4^{2-}$	1.5×10^8		0.049	25	p.r.	D.k. in deaerated soln. contg. 0.05 mol L^{-1} Ni^{2+} and (0.5-10) $\times 10^{-4}$ mol L^{-1} $S_2O_8^{2-}$.	761072
15.1.40	**Allyl alcohol**							
	$Ni^+ + H_2C{=}CHCH_2OH \rightarrow [Ni(CH_2CHCH_2OH)]^+$	$\sim 10^8$			25	p.r.	D.k. in deaerated soln. contg. 0.01 mol L^{-1} $NiSO_4$, 1.2×10^{-3} mol L^{-1} allyl alcohol and 1.24 mol L^{-1} MeOH.	761072
15.1.41	**1,4-Benzoquinone**							
	$Ni^+ + Q \rightarrow Ni^{2+} + Q^{\bullet -}$	2.3×10^8	6.0		25	p.r.	P.b.k. at 430 nm in deaerated soln. contg. 0.01 mol L^{-1} Ni^{2+}, 1 mol L^{-1} *tert*-BuOH and (2-4) $\times 10^{-5}$ mol L^{-1} Q.	761134
15.1.42	**2-Methyl-1,4-naphthoquinone**							
	$Ni^+ + 2\text{-}CH_3NQ \rightarrow Ni^{2+} + [2\text{-}CH_3NQ]^{\bullet -}$	2.4×10^9	7.0		~25	p.r.	P.b.k. at 395 nm in soln. contg. 0.005 mol L^{-1} $NiSO_4$, 1 mol L^{-1} *tert*-BuOH, (2.5-5.0) $\times 10^{-5}$ mol L^{-1} 2-CH_3-NQ and 0.001 mol L^{-1} phosphate.	751032 731047
15.1.43	**4-Pyrimidinecarboxylate ion**							
	$Ni^+ + 4\text{-}pmCO_2^- \rightarrow Ni^{2+} + [4\text{-}pmCO_2]^{\bullet 2-}$	4×10^8				p.r.	D.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH, 0.01 mol L^{-1} $NiSO_4$ and 8×10^{-4} mol L^{-1} 4-$pmCO_2^-$.	82A146
15.1.44	**Tetranitromethane**							
	$Ni^+ + C(NO_2)_4 \rightarrow Ni^{2+} + C(NO_2)_3^- + {}^{\bullet}NO_2$	1.4×10^9	5.9		25	p.r.	P.b.k. in deaerated soln. contg. 1 mol L^{-1} *tert*-BuOH, 0.01 mol L^{-1} Ni^{2+} and (32-136) $\times 10^{-6}$ mol L^{-1} tetranitromethane.	761134
15.2	**Tetracyanonickelate(I) ion**							
15.2.1	**First-order reaction**							
	$Ni(CN)_4^{3-} \rightarrow Ni(CN)_3^{2-} + CN^-$	8.1×10^3 s^{-1}			20	p.r.	P.b.k. at 350 nm and d.k. at 240 nm in N_2O-satd. soln. contg. 0.53 or 4.4 $\times 10^{-4}$ mol L^{-1} $Ni(CN)_4^{2-}$ and 0.1 mol L^{-1} formate ion; $k_r = 8 \times 10^7$ L mol^{-1} s^{-1} [78Z002].	741072
15.3	**Tris(cyano)nickelate(I) ion**							
15.3.1	**Tris(cyano)nickelate(I) ion**							
	$Ni(CN)_3^{2-} + Ni(CN)_3^{2-} \rightarrow Ni_2(CN)_6^{4-}$	7.4×10^7			20	p.r.	P.b.k. at 313 nm in N_2O-satd. soln. contg. 0.06 or 2×10^{-4} mol L^{-1} $Ni(CN)_4^{2-}$ and 0.1 mol L^{-1} formate ion.	74107

TABLE 15. Rate constants for nickel transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
15.4	**1,4,7,10-Tetraazacyclotridecanenickel(I) ion**							
15.4.1	**First-order reaction**							
	$Ni([13]aneN_4)^+ \rightarrow$	8.8×10^3 s^{-1}	5.5			p.r.	D.k. in Ar-satd. soln. contg. 2×10^{-4} mol L^{-1} $Ni([13]aneN_4)^{2+}$ and 0.1 mol L^{-1} formate ion; ligand loss reaction suggested.	85A145
15.4.2	**Nitrous oxide**							
	$Ni([13]aneN_4)^+ + N_2O + 2\ H_3O^+ \rightarrow Ni([13]aneN_4)^{2+} + N_2 + 3\ H_2O$	8.4×10^7	6.0			p.r.	D.k. at 370 nm and p.b.k. at 525 nm in Ar-satd. soln. contg. 2×10^{-4} $Ni([13]aneN_4)^{2+}$, 0.1 mol L^{-1} formate ion and 0.002-0.02 mol L^{-1} N_2O.	85A145
15.5	**9-Methyl-9-nitro-1,4,7,11-tetraazacyclotridecanenickel(II) ion, electron adduct**							
15.5.1	**First-order reaction**							
	$Ni(MeNO_2[13]aneN_4)^+ \rightarrow$	3.5×10^3 s^{-1}			22	p.r.	D.k. at 290 nm in soln. contg. 0.001 mol L^{-1} $Ni(MeNO_2[13]aneN_4)^{2+}$ and 0.1 mol L^{-1} *tert*-BuOH.	88A391
15.6	**1,4,8,11-Tetraazacyclotetradecanenickel(I) ion**							
15.6.1	**Hexaamminecobalt(III) ion**							
	$Ni(cyclam)^+ + Co(NH_3)_6^{3+} \rightarrow Ni(cyclam)^{2+} + Co(NH_3)_6^{2+}$	6.2×10^6				p.r.		85A032
15.6.2	**Nitrous oxide**							
	$Ni(cyclam)^+ + N_2O + 2\ H_3O^+ \rightarrow Ni(cyclam)^{2+} + N_2 + 3\ H_2O$	3.2×10^7				p.r.		85A032
15.6.3	**Oxygen**							
	$Ni(cyclam)^+ + O_2 \rightarrow Ni(cyclam)^{2+} + O_2^{\cdot-}$	2.5×10^9				p.r.		85A032
15.6.4	**Hexaammineruthenium(III) ion**							
	$Ni(cyclam)^+ + Ru(NH_3)_6^{3+} \rightarrow Ni(cyclam)^{2+} + Ru(NH_3)_6^{2+}$	6.4×10^8				p.r.		85A032
15.7	**1,4,8,11-Tetramethyl-1,4,8,11-tetraazacyclotetradecanenickel(I) ion**							
15.7.1	**Hexaamminecobalt(III) ion**							
	$Ni(Me_4[14]aneN_4)^+ + Co(NH_3)_6^{3+} \rightarrow Ni(Me_4[14]aneN_4)^{2+} + Co(NH_3)_6^{2+}$	8.0×10^5				p.r.		85A032
15.7.2	**Nitrous oxide**							
	$Ni(Me_4[14]aneN_4)^+ + N_2O + 2\ H_3O^+ \rightarrow Ni(Me_4[14]aneN_4)^{2+} + N_2 + 3\ H_2O$	8.3×10^2				p.r.		85A032
15.7.3	**Oxygen**							
	$Ni(Me_4[14]aneN_4)^+ + O_2 \rightarrow Ni(Me_4[14]aneN_4)^{2+} + O_2^{\cdot-}$	1.6×10^9				p.r.		85A032
15.7.4	**Hexaammineruthenium(III) ion**							
	$Ni(Me_4[14]aneN_4)^+ + Ru(NH_3)_6^{3+} \rightarrow Ni(Me_4[14]aneN_4)^{2+} + Ru(NH_3)_6^{2+}$	4.9×10^7				p.r.		85A032
15.8	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanenickel(I) ion**							
15.8.1	**Hexaamminecobalt(III) ion**							
	$Ni(aneN_4)^+ + Co(NH_3)_6^{3+} \rightarrow Ni(aneN_4)^{2+} + Co(NH_3)_6^{2+}$	1.9×10^5	7.0	0.016-0.028		p.r.	D.k. at 380 nm in Ar-satd. soln. contg. $(2.5\text{-}5.0) \times 10^{-3}$ mol L^{-1} $Ni(aneN_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and $(2.5\text{-}10) \times 10^{-4}$ mol L^{-1} $Co(NH_3)_6^{3+}$.	761039

TABLE 15. Rate constants for nickel transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
15.8	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanenickel(I) ion — Continued**							
15.8.2	**Tris(ethylenediamine)cobalt(III) ion**							
	$Ni(aneN_4)^+ + Co(en)_3^{3+} \rightarrow Ni(aneN_4)^{2+} + Co(en)_3^{2+}$	1.1×10^5	7.0	0.016-0.028		p.r.	D.k. at 380 nm in Ar-satd. soln. contg. $(2.5\text{-}5.0) \times 10^{-3}$ mol L^{-1} $Ni(aneN_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and $(2.5\text{-}10) \times 10^{-4}$ mol L^{-1} $Co(en)_3^{3+}$.	761039
15.8.3	**Aqua(5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)hydroxycobalt(III) ion**							
	$Ni(aneN_4)^+ + Co(4,11\text{-}dieneN_4)(H_2O)OH^{2+} \rightarrow Ni(aneN_4)^{2+} + Co(4,11\text{-}dieneN_4)(H_2O)OH^+$	1.1×10^6	7.0	0.016-0.028		p.r.	D.k. at 380 nm in Ar-satd. soln. contg. $(2.5\text{-}5.0) \times 10^{-3}$ mol L^{-1} $Ni(aneN_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and $(2.5\text{-}10) \times 10^{-4}$ mol L^{-1} $Co(4,11\text{-}dieneN_4)(H_2O)OH^{2+}$.	761039
15.8.4	**Dihydroxy(2,3,9,10-tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraene)cobalt(III) ion**							
	$Ni(aneN_4)^+ + Co(Me_4tetraeneN_4)(OH)_2^+ \rightarrow Ni(aneN_4)^{2+} + Co(Me_4tetraeneN_4)(OH)_2$	1.7×10^7	7.0	0.016-0.028		p.r.	D.k. at 380 nm in Ar-satd. soln. contg. $(2.5\text{-}5.0) \times 10^{-3}$ mol L^{-1} $Ni(aneN_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and $(2.5\text{-}10) \times 10^{-4}$ mol L^{-1} $Co(Me_4tetraeneN_4)(OH)_2^+$.	761039
15.8.5	**Tris(2,2′-bipyridine)cobalt(III) ion**							
	$Ni(aneN_4)^+ + Co(bpy)_3^{3+} \rightarrow Ni(aneN_4)^{2+} + Co(bpy)_3^{2+}$	1.3×10^9	7.0	0.016-0.028		p.r.	D.k. at 380 nm in Ar-satd. soln. contg. $(2.5\text{-}5.0) \times 10^{-3}$ mol L^{-1} $Ni(aneN_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and $(2.5\text{-}10) \times 10^{-4}$ mol L^{-1} $Co(bpy)_3^{3+}$.	761039
15.8.6	**Tris(2,2′-bipyridine)chromium(III) ion**							
	$Ni(aneN_4)^+ + Cr(bpy)_3^{3+} \rightarrow Ni(aneN_4)^{2+} + Cr(bpy)_3^{2+}$	7.7×10^8	7.0	0.016-0.028		p.r.	D.k. at 380 nm in Ar-satd. soln. contg. $(2.5\text{-}5.0) \times 10^{-3}$ mol L^{-1} $Ni(aneN_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and $(2.5\text{-}10) \times 10^{-4}$ mol L^{-1} $Cr(bpy)_3^{3+}$.	761039
15.8.7	**Tris(2,2′-bipyridine)iron(III) ion**							
	$Ni(aneN_4)^+ + Fe(bpy)_3^{3+} \rightarrow Ni(aneN_4)^{2+} + Fe(bpy)_3^{2+}$	6.4×10^7	7.0	0.016-0.028		p.r.	D.k. at 380 nm in Ar-satd. soln. contg. $(2.5\text{-}5.0) \times 10^{-3}$ mol L^{-1} $Ni(aneN_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and $(2.5\text{-}10) \times 10^{-4}$ mol L^{-1} $Fe(bpy)_3^{3+}$.	761039
15.8.8	**Hydrogen ion**							
	$Ni(aneN_4)^+ + H^+ \rightarrow$	1.1×10^5	0.5-1.25	0.06-0.3		p.r.	D.k. at 380 nm in Ar-satd. soln. contg. 0.003 mol L^{-1} $Ni(aneN_4)^{2+}$ and 1 mol L^{-1} *tert*-BuOH.	761039
15.8.9	**Dihydrogen phosphate ion**							
	$Ni(aneN_4)^+ + H_2PO_4^- \rightarrow$	$<10^4$	5.50	0.01-0.1		p.r.	D.k. at 380 nm in Ar-satd. soln. contg. 0.003 mol L^{-1} $Ni(aneN_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH and 0.01-0.1 mol L^{-1} $H_2PO_4^{2-}$.	761039
15.8.10	**Nitrous oxide**							
	$Ni(aneN_4)^+ + N_2O \rightarrow$	3.9×10^7	7.0	0.01		p.r.	D.k. at 380 nm in soln. contg. 0.003 mol L^{-1} $Ni(aneN_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH, $(7.5\text{-}25) \times 10^{-4}$ mol L^{-1} N_2O and 0.001 mol L^{-1} phosphate buffer.	761039
15.8.11	**Oxygen**							
	$Ni(aneN_4)^+ + O_2 \rightarrow Ni(aneN_4)^{2+} + O_2^{\cdot -}$	1.5×10^9	4.0			p.r.	D.k. at 300 nm in He-satd. soln. contg. 0.1 mol L^{-1} formate ion, 1×10^{-4} mol L^{-1} $Ni(aneN_4)^{2+}$ and varied $[O_2]$.	92A165

TABLE 15. Rate constants for nickel transients — Continued

Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
15.8 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanenickel(I) ion — Continued							
15.8.11 Oxygen — Continued							
	1.6×10^9	7.0			p.r.	D.k. at 380 nm in soln. contg. 0.003 mol L^{-1} Ni(aneN$_4$)$^{2+}$, 1 mol L^{-1} *tert*-BuOH, (7-25) $\times$ 10^{-5} mol L^{-1} O_2 and 0.001 mol L^{-1} phosphate buffer.	761039
15.8.12 Hexaammineruthenium(III) ion							
Ni(aneN$_4$)$^+$ + Ru(NH$_3$)$_6^{3+}$ → Ni(aneN$_4$)$^{2+}$ + Ru(NH$_3$)$_6^{2+}$	6.9×10^8	4	0.01		p.r.	N_2-satd. soln. contg. alcohol.	88A334
	3.8×10^8	7.0	0.016-0.028		p.r.	D.k. at 380 nm in Ar-satd. soln. contg. (2.5-5.0) $\times$ 10^{-3} mol L^{-1} Ni(aneN$_4$)$^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and (2.5-10) $\times$ 10^{-4} mol L^{-1} Ru(NH$_3$)$_6^{3+}$.	761039
15.8.13 Pentaammine(nitroso)ruthenium(III) ion							
Ni(aneN$_4$)$^+$ + Ru(NH$_3$)$_5$NO^{3+} → Ni(aneN$_4$)$^{2+}$ + Ru(NH$_3$)$_5$NO^{2+}	7.4×10^7	7.0	0.016-0.028		p.r.	D.k. at 380 nm in Ar-satd. soln. contg. (2.5-5.0) $\times$ 10^{-3} mol L^{-1} Ni(aneN$_4$)$^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and (2.5-10) $\times$ 10^{-4} mol L^{-1} Ru(NH$_3$)$_5$NO^{3+}.	761039
15.8.14 Acetic acid							
Ni(aneN$_4$)$^+$ + CH$_3$CO$_2$H →	1.2×10^4	4.85	0.015-0.06		p.r.	D.k. at 380 nm in Ar-satd. soln. contg. 0.003 mol L^{-1} Ni(aneN$_4$)$^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and 0.005-0.05 mol L^{-1} acetate buffer.	761039
15.8.15 9,10-Anthraquinone-2,6-disulfonate ion							
Ni(aneN$_4$)$^+$ + 2,6-diSO$_3$AQ^{2-} → Ni(aneN$_4$)$^{2+}$ + [2,6-diSO$_3$AQ]$^{\bullet 3-}$	4.8×10^9	7.0	0.004		p.r.	D.k. or p.b.k. in Ar-satd. soln. contg. 0.001 mol L^{-1} Ni(aneN$_4$)$^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and (2.5-5.0) $\times$ 10^{-5} mol L^{-1} 2,6-diSO$_3$AQ^{2-}.	761039
15.8.16 1,4-Benzoquinone							
Ni(aneN$_4$)$^+$ + Q → Ni(aneN$_4$)$^{2+}$ + Q$^{\bullet -}$	4.8×10^9	7.0	0.004		p.r.	D.k. or p.b.k. in Ar-satd. soln. contg. 0.001 mol L^{-1} Ni(aneN$_4$)$^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and (2.5-5.0) $\times$ 10^{-5} mol L^{-1} Q.	761039
15.8.17 3-Benzoylpyridine							
Ni(aneN$_4$)$^+$ + 3-C$_6$H$_5$COpy →	2.5×10^8	7.0	0.004		p.r.	D.k. or p.b.k. in Ar-satd. soln. contg. 0.001 mol L^{-1} Ni(aneN$_4$)$^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and (2.5-5.0) $\times$ 10^{-5} mol L^{-1} 3-C$_6$H$_5$COpy.	761039
15.8.18 Fluorescein dianion							
Ni(aneN$_4$)$^+$ + Fl^{2-} →	3.2×10^9	7.0	0.004		p.r.	D.k. or p.b.k. in Ar-satd. soln. contg. 0.001 mol L^{-1} Ni(aneN$_4$)$^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and (2.5-5.0) $\times$ 10^{-5} mol L^{-1} Fl^{2-}.	761039
15.8.19 Iodomethane							
Ni(aneN$_4$)$^+$ + CH$_3$I →	4.6×10^8	9.2	0.01		p.r.	D.k. at 380 nm in Ar-satd. soln. contg. 0.003 mol L^{-1} Ni(aneN$_4$)$^{2+}$, 1 mol L^{-1} *tert*-BuOH, (2.5-5.0) $\times$ 10^{-4} mol L^{-1} CH$_3$I and 0.001 mol L^{-1} tetraborate buffer.	761039

TABLE 15. Rate constants for nickel transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
15.9	**1,4,5,7,7,8,11,12,14,14-Decamethyl-1,4,8,11-tetraazacyclotetradecanenickel(I) ion**							
15.9.1	**Hexaamminecobalt(III) ion**							
	$Ni(Me_{10}cyclam)^+ + Co(NH_3)_6^{3+} \rightarrow Ni(Me_{10}cyclam)^{2+} + Co(NH_3)_6^{2+}$	1.7×10^4				p.r.		85A032
15.9.2	**Hexaamminebis(μ-hydroxy)-μ-(trifluoroacetato)dicobalt(III) ion**							
	$Ni(Me_{10}cyclam)^+ + CF_3CO_2[Co(NH_3)_3]_2(OH)_2^{3+} \rightarrow$	3.0×10^5			22	p.r.	D.k. at 335 nm in Ar-satd. soln.	83A140
15.9.3	**Hexaammine-μ-(difluoroacetato)bis(μ-hydroxy)dicobalt(III) ion**							
	$Ni(Me_{10}cyclam)^+ + CHF_2CO_2[Co(NH_3)_3]_2(OH)_2^{3+} \rightarrow$	1.8×10^5			22	p.r.	D.k. at 335 nm in Ar-satd. soln.	83A140
15.9.4	**Hexaammine-μ-(fluoroacetato)bis(μ-hydroxy)dicobalt(III) ion**							
	$Ni(Me_{10}cyclam)^+ + CH_2FCO_2[Co(NH_3)_3]_2(OH)_2^{3+} \rightarrow$	1.4×10^5			22	p.r.	D.k. at 335 nm in Ar-satd. soln.	83A140
15.9.5	**μ-Acetatohexaamminebis(μ-hydroxy)dicobalt(III) ion**							
	$Ni(Me_{10}cyclam)^+ + CH_3CO_2[Co(NH_3)_3]_2(OH)_2^{3+} \rightarrow$	8.8×10^4			22	p.r.	D.k. at 335 nm in Ar-satd. soln.	83A140
15.9.6	**Nitrous oxide**							
	$Ni(Me_{10}cyclam)^+ + N_2O \rightarrow$	<0.1				p.r.		85A032
15.9.7	**Oxygen**							
	$Ni(Me_{10}cyclam)^+ + O_2 \rightarrow Ni(Me_{10}cyclam)^{2+} + O_2^{\bullet-}$	4×10^7				p.r.		85A032
15.9.8	**Hexaammineruthenium(III) ion**							
	$Ni(Me_{10}cyclam)^+ + Ru(NH_3)_6^{3+} \rightarrow Ni(Me_{10}cyclam)^{2+} + Ru(NH_3)_6^{2+}$	3.0×10^7				p.r.		85A032
15.10	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienenickel(I) ion**							
15.10.1	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanesilver(II) ion**							
	$Ni(4,11\text{-}dieneN_4)^+ + Ag(aneN_4)^{2+} \rightarrow Ni(4,11\text{-}dieneN_4)^{2+} + Ag(aneN_4)^+$	5.7×10^8	4	0.03		p.r.	D.k. or p.b.k. in N_2-satd. soln. contg. alcohol.	88A33
15.10.2	**Hexaamminecobalt(III) ion**							
	$Ni(4,11\text{-}dieneN_4)^+ + Co(NH_3)_6^{3+} \rightarrow Ni(4,11\text{-}dieneN_4)^{2+} + Co(NH_3)_6^{2+}$	1.9×10^6	7.0	0.016-0.028		p.r.	D.k. at 460 nm in Ar-satd. soln. contg. $(2.5\text{-}5.0) \times 10^{-3}$ mol L^{-1} Ni(4,11-dieneN$_4$)$^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and $(2.5\text{-}10) \times 10^{-4}$ mol L^{-1} $Co(NH_3)_6^{3+}$.	76103
15.10.3	**Tris(ethylenediamine)cobalt(III) ion**							
	$Ni(4,11\text{-}dieneN_4)^+ + Co(en)_3^{3+} \rightarrow Ni(4,11\text{-}dieneN_4)^{2+} + Co(en)_3^{2+}$	1.1×10^6	4	0.01		p.r.	D.k. or p.b.k. in N_2-satd. soln. contg. alcohol.	88A33
		1.1×10^6	7.0	0.016-0.028		p.r.	D.k. at 460 nm in Ar-satd. soln. contg. $(2.5\text{-}5.0) \times 10^{-3}$ mol L^{-1} Ni(4,11-dieneN$_4$)$^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and $(2.5\text{-}10) \times 10^{-4}$ mol L^{-1} $Co(en)_3^{3+}$.	76103
15.10.4	**Tris(2,2′-bipyridine)cobalt(III) ion**							
	$Ni(4,11\text{-}dieneN_4)^+ + Co(bpy)_3^{3+} \rightarrow Ni(4,11\text{-}dieneN_4)^{2+} + Co(bpy)_3^{2+}$	1.3×10^9	7.0	0.016-0.028		p.r.	D.k. at 460 nm in Ar-satd. soln. contg. $(2.5\text{-}5.0) \times 10^{-3}$ mol L^{-1} Ni(4,11-dieneN$_4$)$^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and $(2.5\text{-}10) \times 10^{-4}$ mol L^{-1} $Co(bpy)_3^{3+}$.	76103

TABLE 15. Rate constants for nickel transients — Continued

Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
15.10 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienenickel(I) ion — Continued							
15.10.5 Aqua(5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)hydroxycobalt(III) ion							
$Ni(4,11\text{-}dieneN_4)^+ + Co(4,11\text{-}dieneN_4)(H_2O)OH^{2+} \rightarrow Ni(4,11\text{-}dieneN_4)^{2+} + Co(4,11\text{-}dieneN_4)(H_2O)OH^+$	2.6×10^6	7.0	0.016-0.028		p.r.	D.k. at 460 nm in Ar-satd. soln. contg. $(2.5\text{-}5.0) \times 10^{-3}$ mol L^{-1} $Ni(4,11\text{-}dieneN_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and $(2.5\text{-}10) \times 10^{-4}$ mol L^{-1} $Co(4,11\text{-}dieneN_4)(H_2O)OH^{2+}$.	761039
15.10.6 2,3,9,10-Tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraenecobalt(III) ion							
$Ni(4,11\text{-}dieneN_4)^+ + Co(Me_4tetraeneN_4)^{3+} \rightarrow Ni(4,11\text{-}dieneN_4)^{2+} + Co(Me_4tetraeneN_4)(H_2O)_2^{2+}$	4.0×10^7	4	0.01		p.r.	D.k. or p.b.k. in N_2-satd. soln. contg. alcohol.	88A334
15.10.7 Dihydroxy(2,3,9,10-tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraene)cobalt(III) ion							
$Ni(4,11\text{-}dieneN_4)^+ + Co(Me_4tetraeneN_4)(OH)_2^+ \rightarrow Ni(4,11\text{-}dieneN_4)^{2+} + Co(Me_4tetraeneN_4)(OH)_2$	3.6×10^7	7.0	0.016-0.028		p.r.	D.k. at 460 nm in Ar-satd. soln. contg. $(2.5\text{-}5.0) \times 10^{-3}$ mol L^{-1} $Ni(4,11\text{-}dieneN_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and $(2.5\text{-}10) \times 10^{-4}$ mol L^{-1} $Co(Me_4tetraeneN_4)(OH)_2^+$.	761039
15.10.8 Tris(2,2′-bipyridine)chromium(III) ion							
$Ni(4,11\text{-}dieneN_4)^+ + Cr(bpy)_3^{3+} \rightarrow Ni(4,11\text{-}dieneN_4)^{2+} + Cr(bpy)_3^{2+}$	3.1×10^8	4	0.01		p.r.	D.k. or p.b.k. in N_2-satd. soln. contg. alcohol.	88A334
	1.1×10^8	7.0	0.016-0.028		p.r.	D.k. at 460 nm in Ar-satd. soln. contg. $(2.5\text{-}5.0) \times 10^{-3}$ mol L^{-1} $Ni(4,11\text{-}dieneN_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and $(2.5\text{-}10) \times 10^{-4}$ mol L^{-1} $Cr(bpy)_3^{3+}$.	761039
15.10.9 α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,11,13,15-pentaenecopper(II) ion							
$Ni(4,11\text{-}dieneN_4)^+ + Cu(Me_2pyo[14]trieneN_4)^{2+} \rightarrow Ni(4,11\text{-}dieneN_4)^{2+} + Cu(Me_2pyo[14]trieneN_4)^+$	1.0×10^8	4	0.01		p.r.	D.k. or p.b.k. in N_2-satd. soln. contg. alcohol.	88A334
15.10.10 Tris(2,2′-bipyridine)iron(III) ion							
$Ni(4,11\text{-}dieneN_4)^+ + Fe(bpy)_3^{3+} \rightarrow Ni(4,11\text{-}dieneN_4)^{2+} + Fe(bpy)_3^{2+}$	2.2×10^6	7.0	0.016-0.028		p.r.	D.k. at 460 nm in Ar-satd. soln. contg. $(2.5\text{-}5.0) \times 10^{-3}$ mol L^{-1} $Ni(4,11\text{-}dieneN_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and $(2.5\text{-}10) \times 10^{-4}$ mol L^{-1} $Fe(bpy)_3^{3+}$	761039
15.10.11 Hydrogen ion							
$Ni(4,11\text{-}dieneN_4)^+ + H^+ \rightarrow$	1.3×10^6	<1.25	0.06-0.3		p.r.	D.k. at 460 nm in Ar-satd. soln. contg. 0.003 mol L^{-1} $Ni(4,11\text{-}dieneN_4)^{2+}$ and 1 mol L^{-1} *tert*-BuOH. Reaction may involve proton transfer to the metal center to give a hydrido complex.	761039
15.10.12 Nitrous oxide							
$Ni(4,11\text{-}dieneN_4)^+ + N_2O \rightarrow$	1.8×10^7	7.0			p.r.	D.k. at 460 nm in soln. contg. 0.003 mol L^{-1} $Ni(4,11\text{-}dieneN_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH, $(7.5\text{-}25) \times 10^{-4}$ mol L^{-1} N_2O and and 0.001 mol L^{-1} phosphate buffer.	761039
15.10.13 α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,11,13,15-pentaenenickel(II) ion							
$Ni(4,11\text{-}dieneN_4)^+ + Ni(Me_2pyo[14]trieneN_4)^{2+} \rightarrow Ni(4,11\text{-}dieneN_4)^{2+} + Ni(Me_2pyo[14]trieneN_4)^+$	2.1×10^7	4	0.01		p.r.	D.k. or p.b.k. in N_2-satd. soln. contg. alcohol.	88A334

TABLE 15. Rate constants for nickel transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
15.10	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienenickel(I) ion** — Continued							
15.10.14	**Oxygen**							
	$Ni(4,11\text{-dieneN}_4)^+ + O_2 \rightarrow Ni(4,11\text{-dieneN}_4)^{2+} + O_2^{\cdot -}$	1.7×10^9	7.0			p.r.	D.k. at 460 nm in soln. contg. 0.003 mol L^{-1} $Ni(4,11\text{-dieneN}_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH, (7-25) $\times 10^{-5}$ mol L^{-1} O_2 and 0.001 mol L^{-1} phosphate buffer.	761039
15.10.15	**Dihydrogen phosphate ion**							
	$Ni(4,11\text{-dieneN}_4)^+ + H_2PO_4^- \rightarrow$	2.4×10^5	5.5	0.01-0.1		p.r.	D.k. at 460 nm in Ar-satd. soln. contg. 0.003 mol L^{-1} $Ni(4,11\text{-dieneN}_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH and 0.01-0.1 mol L^{-1} $H_2PO_4^{2-}$.	761039
15.10.16	**Hexaammineruthenium(III) ion**							
	$Ni(4,11\text{-dieneN}_4)^+ + Ru(NH_3)_6^{3+} \rightarrow Ni(4,11\text{-dieneN}_4)^{2+} + Ru(NH_3)_6^{2+}$	4.5×10^8	4	0.01		p.r.	D.k. or p.b.k. in N_2-satd. soln. contg. alcohol.	88A334
		4.5×10^8	7.0	0.016-0.028		p.r.	D.k. at 460 nm in Ar-satd. soln. contg. (2.5-5.0) $\times 10^{-3}$ mol L^{-1} $Ni(4,11\text{-dieneN}_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and (2.5-10) $\times 10^{-4}$ mol L^{-1} $Ru(NH_3)_6^{3+}$.	761039
15.10.17	**Pentaammine(nitroso)ruthenium(III) ion**							
	$Ni(4,11\text{-dieneN}_4)^+ + Ru(NH_3)_5NO^{3+} \rightarrow Ni(4,11\text{-dieneN}_4)^{2+} + Ru(NH_3)_5NO^{2+}$	3.5×10^7	7.0	0.016-0.028		p.r.	D.k. at 460 nm in Ar-satd. soln. contg. (2.5-5.0) $\times 10^{-3}$ mol L^{-1} $Ni(4,11\text{-dieneN}_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and (2.5-10) $\times 10^{-4}$ mol L^{-1} $Ru(NH_3)_5NO^{3+}$.	761039
15.10.18	**Acetic acid**							
	$Ni(4,11\text{-dieneN}_4)^+ + CH_3CO_2H \rightarrow$	1.9×10^5	4.85	0.015-0.06		p.r.	D.k. at 460 nm in Ar-satd. soln. contg. 0.003 mol L^{-1} $Ni(4,11\text{-dieneN}_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH and 0.005-0.05 mol L^{-1} acetate buffer.	761039
15.10.19	**9,10-Anthraquinone-2,6-disulfonate ion**							
	$Ni(4,11\text{-dieneN}_4)^+ + 2,6\text{-di}SO_3AQ^{2-} \rightarrow Ni(4,11\text{-dieneN}_4)^{2+} + [2,6\text{-di}SO_3AQ]^{\cdot 3-}$	5.0×10^9	7.0	0.004		p.r.	D.k. at 460 nm in Ar-satd. soln. contg. 0.001 mol L^{-1} $Ni(4,11\text{-dieneN}_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and (2.5-5) $\times 10^{-5}$ mol L^{-1} 2,6-diSO_3AQ^{2-}.	761039
15.10.20	**1,4-Benzoquinone**							
	$Ni(4,11\text{-dieneN}_4)^+ + Q \rightarrow Ni(4,11\text{-dieneN}_4)^{2+} + Q^{\cdot -}$	3.8×10^9	7.0	0.004		p.r.	D.k. at 460 nm in Ar-satd. soln. contg. 0.001 mol L^{-1} $Ni(4,11\text{-dieneN}_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and (2.5-5) $\times 10^{-5}$ mol L^{-1} Q.	761039
15.10.21	**3-Benzoylpyridine**							
	$Ni(4,11\text{-dieneN}_4)^+ + 3\text{-}C_6H_5COpy \rightarrow$	7.5×10^8	7.0	0.004		p.r.	D.k. at 460 nm in Ar-satd. soln. contg. 0.001 mol L^{-1} $Ni(4,11\text{-dieneN}_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and (2.5-5) $\times 10^{-5}$ mol L^{-1} 3-C_6H_5COpy.	761039
15.10.22	**Eosin dianion**							
	$Ni(4,11\text{-dieneN}_4)^+ + Eos \rightarrow$	2.7×10^9	7.0	0.004		p.r.	D.k. at 460 nm in Ar-satd. soln. contg. 0.001 mol L^{-1} $Ni(4,11\text{-dieneN}_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and (2.5-5) $\times 10^{-5}$ mol L^{-1} Eos.	761039

TABLE 15. Rate constants for nickel transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
15.10	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienenickel(I) ion** — Continued							
15.10.23	**Fluorescein dianion**							
	$Ni(4,11\text{-}dieneN_4)^+ + Fl^{2-} \rightarrow$	3.3×10^9	7.0	0.004		p.r.	D.k. at 460 nm in Ar-satd. soln. contg. 0.001 mol L^{-1} $Ni(4,11\text{-}dieneN_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH, 0.001 mol L^{-1} phosphate buffer and (2.5-5) $\times 10^{-5}$ mol L^{-1} Fl^{2-}.	761039
15.10.24	**Iodomethane**							
	$Ni(4,11\text{-}dieneN_4)^+ + CH_3I \rightarrow$	1.3×10^8	9.2	0.01		p.r.	D.k. at 460 nm in Ar-satd. soln. contg. 0.003 mol L^{-1} $Ni(4,11\text{-}dieneN_4)^{2+}$, 1 mol L^{-1} *tert*-BuOH, (2.5-5) $\times 10^{-5}$ mol L^{-1} CH_3I and 0.001 mol L^{-1} tetraborate buffer.	761039
15.11	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-1,4,8,11-tetraenenickel(I) ion**							
15.11.1	**Tris(2,2′-bipyridine)chromium(III) ion**							
	$Ni(tetraeneN_4)^+ + Cr(bpy)_3^{3+} \rightarrow Ni(tetraeneN_4)^{2+} + Cr(bpy)_3^{2+}$	8.0×10^8	4	0.01		p.r.	D.k. or p.b.k. in N_2-satd. soln. contg. alcohol.	88A334
15.11.2	**Hexaammineruthenium(III) ion**							
	$Ni(tetraeneN_4)^+ + Ru(NH_3)_6^{3+} \rightarrow Ni(tetraeneN_4)^{2+} + Ru(NH_3)_6^{2+}$	3.0×10^8	4	0.01		p.r.	D.k. or p.b.k. in N_2-satd. soln. contg. alcohol.	88A334
15.12	**α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),13,15-trienenickel(I) ion**							
15.12.1	**α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),13,15-trienenickel(I) ion**							
	$Ni(Me_2pyo[14]aneN_4)^+ + Ni(Me_2pyo[14]aneN_4)^+ \rightarrow$	2.5×10^8				p.r.	D.k. at 290 and 320 nm in N_2-satd. soln. contg. 10^{-4} mol L^{-1} $Ni(Me_2pyo[14]aneN_4)^{2+}$ and 0.01 mol L^{-1} Br^-. Reaction in competition with Ni(I) + Ni(III), $k \sim 10^8$-10^9 L mol^{-1} s^{-1}.	81A144
15.13	**α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,11,13,15-pentaenenickel(I) ion**							
15.13.1	**Tris(2,2′-bipyridine)chromium(III) ion**							
	$Ni(Me_2pyo[14]trieneN_4)^+ + Cr(bpy)_3^{3+} \rightarrow Ni(Me_2pyo[14]trieneN_4)^{2+} + Cr(bpy)_3^{2+}$	5.1×10^8	4	0.01		p.r.	D.k. or p.b.k. in N_2-satd. soln. contg. alcohol.	88A334
15.13.2	**Hexaammineruthenium(III) ion**							
	$Ni(Me_2pyo[14]trieneN_4)^+ + Ru(NH_3)_6^{3+} \rightarrow Ni(Me_2pyo[14]trieneN_4)^{2+} + Ru(NH_3)_6^{2+}$	2.3×10^8	4	0.01		p.r.	D.k. or p.b.k. in N_2-satd. soln. contg. alcohol.	88A334
15.14	**8-Methyl-8-nitro-1,3,6,10,13,15-hexaazatricyclo[13.1.1.1^{13,15}]octadecanenickel(II) ion, electron adduct**							
15.14.1	**First-order reaction**							
	$Ni(MeNO_2[18]aneN_6)^+ \rightarrow$	1.8×10^3 s^{-1}			22	p.r.	D.k. at 290 nm in soln. contg. 0.001 mol L^{-1} $Ni(MeNO_2[18]aneN_6)^{2+}$ and 0.1 mol L^{-1} *tert*-BuOH.	88A391
15.15	**8-Amino-8-methyl-1,3,6,10,13,15-hexaazatricyclo[13.1.1.1^{13,15}]octadecanenickel(I) ion**							
15.15.1	**First-order reaction**							
	$Ni(MeNH_2[18]aneN_6)^+ \rightarrow$	3.5×10^3 s^{-1}			22	p.r.	D.k. at 360 nm in soln. contg. 0.001 mol L^{-1} $Ni(MeNH_2[18]aneN_6)^{2+}$ and 0.1 mol L^{-1} *tert*-BuOH.	88A391

TABLE 15. Rate constants for nickel transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
15.16	**3,7-Bis(2-aminoethyl)-1,3,5,7-tetraazabicyclo[3.3.1]nonanenickel(I) ion**							
15.16.1	**First-order reaction**							
	$NiL^+ \rightarrow$	2.2×10^4 s^{-1}			22	p.r.	D.k. at 360 nm in soln. contg. 0.001 mol L^{-1} NiL^{2+} and 0.1 mol L^{-1} *tert*-BuOH.	88A391
15.17	**Nitrilotriacetatonickelate(I) ion**							
15.17.1	**Nitrilotriacetatonickelate(I) ion**							
	$NiNTA^{2-} + NiNTA^{2-} \rightarrow (NiNTA)_2^{4-}$	7.5×10^8	5-9			p.r.	D.k. in soln. contg. $NiNTA^-$ and 0.1 mol L^{-1} *tert*-BuOH.	80A194
15.18	***N*-Methyl-5,10,15,20-tetrakis(4-sulfonatophenyl)porphinatonickelate(II), radical anion**							
15.18.1	**First-order reaction**							
	$[Ni(N\text{-Me})TPPS]^{\cdot 4-} \rightarrow CH_3NiTPPS^{4-}$	2.0×10^2 s^{-1}				p.r.	D.k. in Ar-satd. soln. contg. (1-10) $\times$ 10^{-5} mol L^{-1} Ni(*N*-Me)$TPPS^{3-}$ and 1% 2-PrOH.	92G183
15.19	**Hydroxymethylnickel(II) ion**							
15.19.1	**Water**							
	$NiCH_2OH^+ + H_2O \rightarrow Ni^{2+} + MeOH + OH^-$	7 s^{-1}				p.r.	D.k. at 250 nm and condy. change in Ar-satd. soln. contg. 10^{-4} mol L^{-1} $NiSO_4$ and 0.1 mol L^{-1} MeOH.	741037
15.19.2	**Hydrogen peroxide**							
	$NiCH_2OH^+ + H_2O_2 \rightarrow$	7.3×10^3				p.r.	Condy. change in Ar-satd. soln. contg. $NiSO_4$ and MeOH.	741037
15.20	**Carboxylatonickel(II)**							
15.20.1	**Water**							
	$NiCO_2 + H_2O \rightarrow$	< 1 s^{-1}				p.r.	D.k. at 250 nm and condy. change in Ar-satd. soln. contg. $NiSO_4$ and formate ion; $NiCO_2$ is probably protonated.	741037
15.21	**1-Hydroxyethylnickel(II) ion**							
15.21.1	**Water**							
	$NiCHOHCH_3^+ + H_2O \rightarrow Ni^{2+} + EtOH + OH^-$	5 s^{-1}				p.r.	D.k. at 250 nm and condy. change in Ar-satd. soln. contg. $NiSO_4$ and EtOH.	741037
15.21.2	**Hydrogen peroxide**							
	$NiCHOHCH_3^+ + H_2O_2 \rightarrow$	2.3×10^4				p.r.	Condy. change in Ar-satd. soln. contg. $NiSO_4$ and EtOH.	741037
15.22	**1-Hydroxy-1-methylethylnickel(II) ion**							
15.22.1	**Water**							
	$NiCOH(CH_3)_2^+ + H_2O \rightarrow$	< 1 s^{-1}				p.r.	D.k. at 250 nm and condy. change in Ar-satd. soln. contg. $NiSO_4$ and 2-PrOH.	741037
15.22.2	**Hydrogen peroxide**							
	$NiCOH(CH_3)_2^+ + H_2O_2 \rightarrow$	1.1×10^6				p.r.	Condy. change in Ar-satd. soln. contg. 5×10^{-4} mol L^{-1} $NiSO_4$ and 0.005 mol L^{-1} 2-PrOH.	741037
15.23	**1-Ethoxyethylnickel(II) ion**							
15.23.1	**Water**							
	$NiCH(CH_3)OC_2H_5^+ + H_2O \rightarrow$	< 1 s^{-1}				p.r.	D.k. at 250 nm and condy. change in Ar-satd. soln. contg. $NiSO_4$ and diethyl ether.	74103

TABLE 15. Rate constants for nickel transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
15.23	**1-Ethoxyethylnickel(II) ion** — Continued							
15.23.2	**Hydrogen peroxide**							
	$NiCH(CH_3)OC_2H_5^+ + H_2O_2 \rightarrow$	1.3×10^3				p.r.	Condy. change in Ar-satd. soln. contg. $NiSO_4$ and diethyl ether.	741037
15.24	**Cyclopentylnickel(II) ion**							
15.24.1	**Water**							
	$c\text{-}C_5H_9Ni^+ + H_2O \rightarrow Ni^{2+} + c\text{-}C_5H_{10} + OH^-$	49 s^{-1}				p.r.	D.k. at 250 nm and condy. change in Ar-satd. soln. contg. $NiSO_4$ and cyclopentane.	741037
15.24.2	**Hydrogen peroxide**							
	$c\text{-}C_5H_9Ni^+ + H_2O_2 \rightarrow$	$<5 \times 10^5$				p.r.	Condy. change in Ar-satd. soln. contg. $NiSO_4$ and cyclopentane.	741037
15.25	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanenickel(II) ion, OH reaction product**							
15.25.1	**Hydrogen peroxide**							
	$Ni(ancN_4\text{-}H)^{2+} + H_2O_2 \rightarrow$	2×10^4	5		22	p.r./f.p.	D.k.	79A038
15.26	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienenickel(II) ion, OH reaction product**							
15.26.1	**First-order reaction**							
	$Ni(4,11\text{-}dieneN_4\text{-}H)^{2+} \rightarrow$	1×10^6 s^{-1}			22	p.r./f.p.	Value obtained by computer simulation; $k_r = 1 \times 10^3$ s^{-1}.	79A038
15.26.2	**Hydrogen ion**							
	$Ni(4,11\text{-}dieneN_4\text{-}H)^{2+} + H^+ \rightarrow Ni(4,11\text{-}dieneN_4)^{3+}$	6×10^7			22	p.r./f.p.	Value obtained by computer simulation; $k_r = 1 \times 10^3$ s^{-1}.	79A038
15.26.3	**Hydrogen peroxide**							
	$Ni(4,11\text{-}dieneN_4\text{-}H)^{2+} + H_2O_2 \rightarrow$	5×10^2	5		22	p.r./f.p.		79A038
15.27	**Iminodiacetatonickelate(II), H-abstraction product**							
15.27.1	**First-order reaction**							
	$Ni(IDA\text{-}H) \rightarrow$	2.6×10^5 s^{-1}	7			p.r.	D.k. in N_2O-satd. soln. contg. 0.01 mol L^{-1} Ni(IDA).	81A023
15.27.2	**Oxygen**							
	$Ni(IDA\text{-}H) + O_2 \rightarrow$	3×10^4	7			p.r.	D.k. in soln. satd. with various mixtures of N_2O and O_2 contg. Ni(IDA).	81A023
15.28	**Bis(iminodiacetato)nickelate(II), H-abstraction product**							
15.28.1	**Oxygen**							
	$Ni(IDA)(IDA\text{-}H)^{2-} + O_2 \rightarrow$	5×10^3	7			p.r.	D.k. in soln. satd. with various mixtures of N_2O and O_2 contg. $Ni(IDA)_2^{2-}$.	81A023
15.28.2	**Ferricyanide ion**							
	$Ni(IDA)(IDA\text{-}H)^{2-} + Fe(CN)_6^{3-} \rightarrow$	7×10^4	7			p.r.	D.k. at 420 nm in N_2O-satd. soln. contg. $Ni(IDA)_2^{2-}$ and $Fe(CN)_6^{3-}$.	81A023
15.29	**Nitrilotriacetatonickelate(II), H-abstraction product**							
15.29.1	**Bromide ion**							
	$Ni(NTA\text{-}H)^- + Br^- \rightarrow$	2×10^3				p.r.	D.k. in N_2O-satd. soln. contg. 4×10^{-4} mol L^{-1} NiNTA and Br^-.	78A436
15.29.2	**Copper(II) ion**							
	$Ni(NTA\text{-}H)^- + Cu^{2+} \rightarrow$	7.8×10^7				p.r.	D.k. at 290 nm in N_2O-satd. soln. contg. $NiNTA^-$ and Cu^{2+}.	80A194

TABLE 15. Rate constants for nickel transients — Continued

No. Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
15.29 Nitrilotriacetatonickelate(II), H-abstraction product — Continued							
15.29.3 Iodide ion							
$Ni(NTA\text{-}H)^- + I^- \rightarrow$	4×10^2				p.r.	D.k. in N_2O-satd. soln. contg. 4×10^{-4} mol L^{-1} NiNTA, I^- and $HClO_4$.	78A436
15.29.4 Hexachloroiridate(IV) ion							
$Ni(NTA\text{-}H)^- + IrCl_6^{2-} \rightarrow$	3.6×10^7	7			p.r.	D.k. at 490 nm ($IrCl_6^{2-}$) and d.k. at 290 nm (radical) in N_2O-satd. soln. contg. $NiNTA^-$ and $IrCl_6^{2-}$.	80A194
15.29.5 Nickel(II) ion							
$Ni(NTA\text{-}H)^- + Ni^{2+} \rightarrow$	3.6×10^3				p.r.	D.k. at 290 nm in N_2O-satd. soln. contg. $NiNTA^-$ and Ni^{2+}.	80A194
15.29.6 Oxygen							
$Ni(NTA\text{-}H)^- + O_2 \rightarrow$	3.9×10^3				p.r.	D.k. at 290 nm in soln. contg. $NiNTA^-$ and N_2O-O_2 (1:1).	80A194
	4.0×10^3				p.r.	D.k. in N_2O-satd. soln. contg. 4×10^{-4} mol L^{-1} NiNTA and O_2.	78A436
15.30 Ethylenediaminetetraacetatonickelate(II), H-abstraction product							
15.30.1 Ethylenediaminetetraacetatonickelate(II) ion							
$Ni(EDTA\text{-}H)^{2-} + NiEDTA^{2-} \rightarrow$	9.3×10^4				f.p./pi	D.k.; reaction suggested to produce $Ni(I)EDTA^{3-}$.	91A292
15.31 Amminenickel(III) ions							
15.31.1 Hydrazine							
$Ni(III)(NH_3)_n + H_2NNH_2 \rightarrow$	4×10^6	11.3			p.r.	D.k. at 300 nm in N_2O-satd. soln. contg. $(1\text{-}2) \times 10^{-3}$ mol L^{-1} $NiSO_4$, $(1\text{-}5) \times 10^{-4}$ mol L^{-1} hydrazine and 0.67 mol L^{-1} NH_3.	720460
15.31.2 Amminenickel(III) ions							
$Ni(III)(NH_3)_n + Ni(III)(NH_3)_n \rightarrow$	$<1.8 \times 10^7$	11.3			p.r.	D.k. at 300 nm in N_2O-satd. soln. contg. 0.67 mol L^{-1} NH_3 and $(5\text{-}200) \times 10^{-5}$ mol L^{-1} $NiSO_4$.	720460
15.32 Ethylenediaminenickel(III) ions							
15.32.1 Ethylenediaminenickel(III) ions							
$Ni(en)_n^{3+} + Ni(en)_n^{3+} \rightarrow$	3.9×10^4 to 1.3×10^7	8.5-10			p.r.	D.k. at 300 nm in N_2O-satd. soln. contg. $(2\text{-}100) \times 10^{-5}$ mol L^{-1} $NiSO_4$ and $(6\text{-}400) \times 10^{-5}$ mol L^{-1} ethyenediamine; k is a function of pH, [$NiSO_4$] and [ethylenediamine].	720461
15.33 Glycinatonickel(III) ion							
15.33.1 Glycinatonickel(III) ion							
$Ni(Gly)_n^{(3-n)+} + Ni(Gly)_n^{(3-n)+} \rightarrow$	$\sim 8 \times 10^8$	8.9, 10			p.r.	D.k. at 350 nm in N_2O-satd. soln. contg. $(1\text{-}20) \times 10^{-4}$ mol L^{-1} $NiSO_4$ and $(3\text{-}60) \times 10^{-4}$ mol L^{-1} glycine; k is a function of pH, [$NiSO_4$] and [glycine].	720461
15.34 Bis(1,4,7-triazacyclononane)nickel(III) ion							
15.34.1 Tryptophan							
$Ni(tacn)_2^{3+} + TrpH \rightarrow Ni(tacn)_2^{2+} + Trp^{\bullet} + H^+$	5×10^4	7			p.r.	D.k. at 520 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} KBr, 0.011 mol L^{-1} tryptophan, $(0\text{-}10) \times 10^{-3}$ mol L^{-1} $Ni(tacn)_2(ClO_4)_2$, and 0.01 mol L^{-1} phosphate buffer; $k_r = 4.8 \times 10^5$ L mol^{-1} s^{-1}.	91A015

TABLE 15. Rate constants for nickel transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
15.35	**1,4,7,10-Tetraazacyclotridecanenickel(III) ion**							
15.35.1	**First-order reaction**							
	$Ni([13]aneN_4)^{3+}$ →	2.5×10^2 s^{-1}	3.3			p.r.	D.k. at ~550 nm and p.b.k. at ~300 nm in N_2O-satd. soln. contg. (1-10) × 10^{-4} mol L^{-1} $Ni([13]aneN_4)^{2+}$ and perchlorate ion; process suggested to represent configurational isomerization; followed by first-order reaction, k = 0.017 s^{-1}. In the presence of 0.1 mol L^{-1} Na_2SO_4, $k = 1 \times 10^4$ s^{-1}; product suggested to be stabilized by axial sulfate ligands.	86A470
15.36	**9-Methyl-9-nitro-1,4,7,11-tetraazacyclotridecanenickel(III) ion**							
15.36.1	**First-order reaction**							
	$Ni(MeNO_2[13]aneN_4)^{3+}$ →	3.6×10^3 s^{-1}			22	p.r.	D.k. at 520 nm in N_2O-satd. soln.	88A391
15.37	**11,13-Dimethyl-1,4,7,10-tetraazacyclotrideca-10,13-dienenickel(III) ion**							
15.37.1	**First-order reaction**							
	$Ni(10,13\text{-}dieneN_4)^{3+}$ →	(1.0 to 7.0) × 10^2 s^{-1}	3.6		22	p.r.	D.k. in N_2O-satd. soln. contg. $Ni(10,13\text{-}dieneN_4)^{2+}$ and 0.1 mol L^{-1} NaBr; pK_a = 8.8.	82A060
15.38	**11,13-Dimethyl-1,4,7,10-tetraazacyclotrideca-10,13-dienenickel(III) ion, conjugate base**							
15.38.1	**11,13-Dimethyl-1,4,7,10-tetraazacyclotrideca-10,13-dienenickel(III) ion, conjugate base**							
	$Ni(10,13\text{-}dieneN_4\text{-}H)^{2+}$ + $Ni(10,13\text{-}dieneN_4\text{-}H)^{2+}$ →	3.5×10^8	10.6		22	p.r.	D.k. in N_2O-satd. soln. contg. $Ni(10,13\text{-}dieneN_4\text{-}H)^{2+}$ and 0.1 mol L^{-1} NaBr; $k = 3.9 \times 10^8$ L mol^{-1} s^{-1} at pH 8.2. Product suggested to be dimer.	82A060
15.39	**Aquabromo-11-methyl-13-(trifluoromethyl)-1,4,7,10-tetraazacyclotrideca-10,13-dienenickel(III) ion**							
15.39.1	**First-order reaction**							
	$Ni(trifluoro\text{-}10,13\text{-}dieneN_4)(H_2O)Br^{2+}$ →	1×10^3 s^{-1} 7.6×10^4 s^{-1}	4.8 8.4			p.r.	D.k. in soln. contg. 0.001 mol L^{-1} acetate or phosphate buffer. Reaction suggested to represent deprotonation of ligand and loss of Br^-.	84A277
15.40	**Diaqua-11-methyl-13-(trifluoromethyl)-1,4,7,10-tetraazacyclotrideca-10,13-dienenickel(III) ion, conjugate base**							
15.40.1	**Diaqua-11-methyl-13-(trifluoromethyl)-1,4,7,10-tetraazacyclotrideca-10,13-dienenickel(III) ion, conjugate base**							
	$Ni(trifluoro\text{-}10,13\text{-}dieneN_4\text{-}H)(H_2O)_2^{2+}$ + $Ni(trifluoro\text{-}10,13\text{-}dieneN_4\text{-}H)(H_2O)_2^{2+}$ →	7.5×10^7				p.r.	D.k. in N_2O-satd. soln. contg. Br^- and $Ni(L\text{-}H)(H_2O)^{2+}$; pK_a = 5.1 for $NiL(H_2O)_2^{3+}$.	84A277
15.41	**Aquamethyl(1,4,8,11-tetraazacyclotetradecane)nickel(III) ion**							
15.41.1	**First-order reaction**							
	$CH_3Ni(cyclam)(H_2O)^{2+}$ → $Ni(cyclam)^{2+} + {}^{\bullet}CH_3 + H_2O$	57 s^{-1}	3.0			p.r.	Derived from p.b.k. at 300 nm for formation of $CH_3OONi(cyclam)(H_2O)^{2+}$ in N_2O-satd. soln. contg. $Ni(cyclam)^{2+}$, O_2 and 0.1 mol L^{-1} DMSO; $k_r = 6.5 \times 10^8$ L mol^{-1} s^{-1}; $\Delta V‡ = 24.4 \times 10^{-3}$ L mol^{-1} [90A321].	88A444
15.41.2	**Hexaaquachromium(II) ion**							
	$CH_3Ni(cyclam)(H_2O)^{2+} + Cr(H_2O)_6^{2+}$ → $Ni(cyclam)^{2+} + (H_2O)_5CrCH_3^{2+}$ + 2 H_2O	1.1×10^5	3.0			p.r.	D.k. at 300 nm soln. contg. 0.001 mol L^{-1} $Ni(cyclam)^{2+}$, 1×10^{-4} mol L^{-1} Cr^{2+} and 0.1 mol L^{-1} DMSO.	88A444

TABLE 15. Rate constants for nickel transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
15.42	**1,4,8,11-Tetraazacyclotetradecanenickel(III) ion**							
15.42.1	**First-order reaction**							
	$Ni(cyclam)^{3+} \rightarrow$	7.5×10^1 s^{-1} 1.3×10^4 s^{-1}	3.1 6			p.r.	D.k. in N_2O-satd. soln. contg. 0.3 mol L^{-1} ClO_4^- or 0.1 mol L^{-1} SO_4^{2-} and $Ni(cyclam)^{2+}$; followed by further d.k., k = 0.36 and 3.5 s^{-1} at pH 3 and 6, respectively. Transient stabilized by the presence of sulfate ions, $K \sim 10^5$ L^2 mol^{-2} [81A285].	80A350
15.42.2	**Hydroxide ion**							
	$Ni(cyclam)^{3+} + OH^- \rightarrow Ni(cyclam\text{-}H)^{2+} + H_2O$	1.5×10^5	9-11	0.3		p.r.	D.k. in N_2O-satd. soln. contg. $Ni(aneN_4)(ClO_4)_2$.	81A285
15.43	**β-*rac*-(5,7,7,12,12,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecane)nickel(III) ion**							
15.43.1	**First-order reaction**							
	$\beta\text{-}Ni(aneN_4)^{3+} \rightarrow$	2.6×10^3 s^{-1}	3.2			p.r.	D.k. in N_2O-satd. soln. contg. 1×10^{-4} mol L^{-1} β-$Ni(aneN_4)(ClO_4)_2$ and 0.3 mol L^{-1} $NaClO_4$; reaction attributed to isomerization; a subsequent first-order process has $k \sim 0.04$ s^{-1} at pH 3.0-6.0 and is attributed to oxidation of the ligand by the tervalent nickel.	81A285
15.43.2	**Hydroxide ion**							
	$\beta\text{-}Ni(aneN_4)^{3+} + OH^- \rightarrow \beta\text{-}Ni(aneN_4\text{-}H)^{2+} + H_2O$	2.7×10^4	9-11	0.3		p.r.	D.k. in N_2O-satd. soln. contg. $Ni(aneN_4)(ClO_4)_2$.	81A285
15.44	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanenickel(III) ion**							
15.44.1	**Perhydroxyl**							
	$Ni(aneN_4)^{3+} + HO_2^{\cdot} \rightarrow O_2 + Ni(aneN_4)^{2+} + H^+$	1.0×10^5	2.0		22	p.r./f.p.	D.k.	79A038
15.44.2	**Superoxide radical anion**							
	$Ni(aneN_4)^{3+} + O_2^{\cdot -} \rightarrow O_2 + Ni(aneN_4)^{2+}$	2.1×10^9	6.2		22	p.r./f.p.	D.k.	79A038
15.44.3	**Iron(II) ion**							
	$Ni(aneN_4)^{3+} + Fe^{2+} \rightarrow Ni(aneN_4)^{2+} + Fe^{3+}$	4.2×10^4	1		22	p.r./f.p.	D.k.	79A038
15.44.4	**Hydroxide ion**							
	$Ni(aneN_4)^{3+} + OH^- \rightarrow Ni(aneN_4\text{-}H)^{2+} + H_2O$	2.2×10^4	9-11	0.3		p.r.	D.k. in N_2O-satd. soln. contg. $Ni(aneN_4)(ClO_4)_2$.	81A285
15.44.5	**Sulfate ion**							
	$Ni(aneN_4)^{3+} + SO_4^{2-} \rightarrow Ni(aneN_4)SO_4^+$	1.0×10^6	3.2-5.2	0.03	22	p.r.	P.b.k. at 320 nm in N_2O-satd. soln. contg. 3×10^{-5} to 0.01 mol L^{-1} SO_4^{2-} and $Ni(aneN_4)^{2+}$.	79A249
15.45	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanedi(phosphato)nickel(III) ion**							
15.45.1	**Ascorbate ion**							
	$Ni(aneN_4)(HPO_4)_2^- + AH^- \rightarrow$	2×10^5	7.0			p.r.	D.k. in air-satd. soln. contg. $Ni(aneN_4)^{2+}$, 0.005 mol L^{-1} formate ion and 0.02 mol L^{-1} HPO_4^{2-}.	90A422
15.46	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienenickel(III) ion**							
15.46.1	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienenickel(I) ion**							
	$Ni(4,11\text{-}dieneN_4)^{3+} + Ni(4,11\text{-}dieneN_4)^+ \rightarrow$	8×10^7	5	→0		p.r.	D.k. at 450 nm and 535 nm in soln. contg. 2×10^{-4} mol L^{-1} $Ni(4,11\text{-}dieneN_4)^{2+}$.	78A299

TABLE 15. Rate constants for nickel transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
15.46	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienenickel(III) ion** — Continued							
15.46.2	**Perhydroxyl**							
	$Ni(4,11\text{-dieneN}_4)^{3+} + HO_2^{\bullet} \rightarrow Ni(4,11\text{-dieneN}_4)^{2+} + O_2 + H^+$	1.6×10^5	2.0		22	p.r./f.p.	D.k.	79A038
15.46.3	**Superoxide radical anion**							
	$Ni(4,11\text{-dieneN}_4)^{3+} + O_2^{\bullet -} \rightarrow Ni(4,11\text{-dieneN}_4)^{2+} + O_2$	1.6×10^9	6.2		22	p.r./f.p.	D.k.	79A038
15.46.4	**Iron(II) ion**							
	$Ni(4,11\text{-dieneN}_4)^{3+} + Fe^{2+} \rightarrow Ni(4,11\text{-dieneN}_4)^{2+} + Fe^{3+}$	2.1×10^4	1		22	p.r./f.p.	D.k.	79A038
		2×10^5				p.r.		78A299
15.46.5	**Hydrogen peroxide**							
	$Ni(4,11\text{-dieneN}_4)^{3+} + H_2O_2 \rightarrow$	2.3×10^3	1		22	p.r./f.p.		79A038
15.46.6	**Iodide ion**							
	$Ni(4,11\text{-dieneN}_4)^{3+} + I^- \rightarrow$	3×10^4				p.r.		78A299
15.46.7	**Hydroxide ion**							
	$Ni(4,11\text{-dieneN}_4)^{3+} + OH^- \rightarrow Ni(4,11\text{-dieneN}_4\text{-H})^{2+} + H_2O$	1.2×10^3	9-11	0.3		p.r.	D.k. in N_2O-satd. soln. contg. $Ni(4,11\text{-dieneN}_4)(ClO_4)_2$.	81A285
15.47	**5,7,7,12,14,14-Hexamethyl-1,4,7,11-tetraazacyclotetradeca-4,11-diene(hydroxo)nickel(III) ion**							
15.47.1	**First-order reaction**							
	$Ni(4,11\text{-dieneN}_4)OH^+ \rightarrow$	~0.02 s^{-1} ~0.01 s^{-1}	3.5 4.9			p.r.	D.k. in N_2O-satd. soln. contg. (1-10) × 10^{-5} mol L^{-1} $Ni(4,11\text{-dieneN}_4)^{2+}$; uncertain whether first- or second-order.	79A002
15.48	**Bromo(5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)nickel(III) ion**							
15.48.1	**Water**							
	$Ni(4,11\text{-dieneN}_4)Br^{2+} + H_2O \rightarrow Ni(4,11\text{-dieneN}_4)(H_2O)^{3+} + Br^-$	120 s^{-1}	3.0			p.r.	D.k. in N_2O-satd. soln. contg. (1-10) × 10^{-5} mol L^{-1} $Ni(4,11\text{-dieneN}_4)^{2+}$ and 0.01-0.1 mol L^{-1} Br^-; k_r = 1300 L mol^{-1} s^{-1}; at pH 8.2, $k = 2.5 \times 10^5$ s^{-1}; pK_a of $Ni(4,11\text{-dieneN}_4)(H_2O)^{3+}$ = 3.45.	79A002
15.48.2	**Bromide ion**							
	$Ni(4,11\text{-dieneN}_4)Br^{2+} + Br^- \rightarrow Ni(4,11\text{-dieneN}_4)^{2+} + Br_2^{\bullet -}$	~40	3.0			p.r.	D.k. in N_2O-satd. soln. contg. (1-10) × 10^{-5} mol L^{-1} $Ni(4,11\text{-dieneN}_4)^{2+}$ and 0.01-0.1 mol L^{-1} Br^-; $k_r = 9 \times 10^9$ L mol^{-1} s^{-1}.	79A002
15.49	**Dichloro(5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)nickel(III) ion**							
15.49.1	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanesilver(II) ion**							
	$Ni(4,11\text{-dieneN}_4)Cl_2^+ + Ag(aneN_4)^{2+} \rightarrow Ni(4,11\text{-dieneN}_4)Cl_2 + Ag(aneN_4)^{3+}$	4.8×10^8	4	0.1		p.r.	D.k. or p.h.k. in N_2O-satd. soln.	88A334
15.50	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-1,4,8,11-tetraenenickel(III) ion**							
15.50.1	**Perhydroxyl**							
	$Ni(tetraeneN_4)^{3+} + HO_2^{\bullet} \rightarrow Ni(tetraeneN_4)^{2+} + O_2 + H^+$	8.5×10^5	2.0			p.r./f.p.	D.k.	79A038
15.50.2	**Superoxide radical anion**							
	$Ni(tetraeneN_4)^{3+} + O_2^{\bullet -} \rightarrow Ni(tetraeneN_4)^{2+} + O_2$	1.0×10^9	6.2			p.r./f.p.	D.k.	79A038
15.50.3	**Iron(II) ion**							
	$Ni(tetraeneN_4)^{3+} + Fe^{2+} \rightarrow Ni(tetraeneN_4)^{2+} + Fe^{3+}$	3.6×10^4	1		22	p.r./f.p.	D.k.	79A038

TABLE 15. Rate constants for nickel transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
15.50	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-1,4,8,11-tetraenenickel(III) ion** — Continued							
15.50.4	**Hydrogen peroxide**							
	$Ni(tetraeneN_4)^{3+} + H_2O_2 \rightarrow$	3.3×10^3	1		22	p.r./f.p.	D.k.	79A038
15.50.5	**Manganese(II) ion**							
	$Ni(tetraeneN_4)^{3+} + Mn^{2+} \rightarrow Ni(tetraeneN_4)^{2+} + Mn^{3+}$	1.5×10^2	1		22	p.r./f.p.	D.k.	79A038
15.51	**1,4,8,12-Tetraazacyclopentadecanenickel(III) ion**							
15.51.1	**First-order reaction**							
	$Ni([15]aneN_4)^{3+} \rightarrow$	5.0×10^4 s^{-1}	3.3			p.r.	D.k. at 550 nm and p.b.k. at ~300 nm in N_2O-satd. soln. contg. $(1\text{-}10) \times 10^{-4}$ mol L^{-1} $Ni([15]aneN_4)^{2+}$ and perchlorate or sulfate ion; process suggested to represent configurational isomerization; followed by first-order reaction, $k = 0.33$ and 0.14 s^{-1} in the presence of perchlorate or sulfate ions, respectively.	86A470
15.52	**1,4,7,10,13-Pentaazacyclohexadecanenickel(III) ion**							
15.52.1	**1,4,7,10,13-Pentaazacyclohexadecanenickel(III) ion**							
	$Ni([16]aneN_5)^{3+} + Ni([16]aneN_5)^{3+} \rightarrow$	5.1×10^4	3.0-11.5			p.r.	D.k.; unclear whether k or $2k$. Reaction preceded by first-order decay, $k = 6 \times 10^3$ s^{-1}, suggested to represent intramolecular rearrangement.	83A32
15.52.2	**Iron(II) ion**							
	$Ni([16]aneN_5)^{3+} + Fe^{2+} \rightarrow$	$\leq 1 \times 10^3$	3.3			p.r.	No effect on d.k. by addn. of 1×10^{-4} mol L^{-1} $FeSO_4$.	83A32
15.52.3	**Oxygen**							
	$Ni([16]aneN_5)^{3+} + O_2 \rightarrow$	2×10^3	3.5			p.r.		83A32
15.53	**8-Methyl-8-nitro-1,3,6,10,13,15-hexaazatricyclo[13.1.1.1^{13,15}]octadecanenickel(III) ion**							
15.53.1	**First-order reaction**							
	$Ni(MeNO_2[18]aneN_6)^{3+} \rightarrow$	8.1×10^3 s^{-1}			22	p.r.	D.k. at 545 nm in N_2O-satd. soln.	88A3
15.54	**8-Amino-8-methyl-1,3,6,10,13,15-hexaazatricyclo[13.1.1.1^{13,15}]octadecanenickel(III) ion**							
15.54.1	**First-order reaction**							
	$Ni(MeNH_2[18]aneN_6)^{3+} \rightarrow$	1.5×10^3 s^{-1}			22	p.r.	D.k. at 545 nm in N_2O-satd. soln.	88A3
15.55	**3,7-Bis(2-aminoethyl)-1,3,5,7-tetraazabicyclo[3.3.1]nonanenickel(III) ion**							
15.55.1	**First-order reaction**							
	$NiL^{3+} \rightarrow$	3.5×10^3 s^{-1}			22	p.r.	D.k. at 530 nm in N_2O-satd. soln.	88A3
15.56	**Diaqua-α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),13,15-trienenickel(III) ion**							
15.56.1	**First-order reaction**							
	$Ni(Me_2pyo[14]aneN_4)(H_2O)_2^{3+} \rightarrow Ni(Me_2pyo[14]aneN_4)(H_2O)(OH)^{2+} + H^+$	~220 s^{-1}	4.5, 4.8			p.r.	Estd. from d.k. in N_2O-satd. soln. contg. $Ni(Me_2pyo[14]aneN_4)^{2+}$ and low $[Br^-]$; $pK_a = 4$. The product eliminates water to produce $Ni(Me_2pyo[14]aneN_4)(OH)^{2+}$.	81A

TABLE 15. Rate constants for nickel transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
15.57	**Hydroxy-α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),13,15-trienenickel(III) ion**							
15.57.1	**Hydroxide ion**							
	$Ni(Me_2pyo[14]aneN_4)(OH)^{2+} + OH^- \rightarrow Ni(Me_2pyo[14]aneN_4\text{-}H)(OH)^+ + H_2O$	1.4×10^7	8.5-10.5			p.r.	D.k. at 550 nm in N_2O-satd. soln. contg. 10^{-4} mol L^{-1} $Ni(Me_2pyo[14]aneN_4)^{2+}$ and 0.01 mol L^{-1} Br$^-$. Rate constant for deprotonation of ligand estimated to be 70 s^{-1} at pH ≤ 8; $k = 1.5 \times 10^7$ L mol^{-1} s^{-1} in N_2O-satd. soln. contg. SCN$^-$ [82A106].	81A144
15.58	**Aquabromo-α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),13,15-trienenickel(III) ion**							
15.58.1	**Hydroxide ion**							
	$Ni(Me_2pyo[14]aneN_4)(H_2O)Br^{2+} + OH^- \rightarrow Ni(Me_2pyo[14]aneN_4)(OH)^{2+} + Br^- + H_2O$	$\sim 6.1 \times 10^9$ $\sim 5.2 \times 10^9$	5.5 8.7			p.r.	D.k. in unbuffered N_2O-satd. soln. contg. 10^{-4} mol L^{-1} $Ni(Me_2pyo[14]aneN_4)^{2+}$ and (5-25) × 10^{-3} mol L^{-1} Br$^-$. Reaction is faster in solution buffered at pH 5-9 with phosphate or tetraborate. Dependence on pH and [buffer] is complex.	81A144
15.58.2	**Water**							
	$Ni(Me_2pyo[14]aneN_4)(H_2O)Br^{2+} + H_2O \rightarrow Ni(Me_2pyo[14]aneN_4)(H_2O)_2^{3+} + Br^-$	7.2×10^2 s^{-1}	<4.0			p.r.	D.k. at 320 nm in N_2O-satd. soln. contg. $Ni(Me_2pyo[14]aneN_4)^{2+}$ and Br$^-$; $k_r = 2.6 \times 10^5$ L mol^{-1} s^{-1}.	81A144
15.59	**Aqua-α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),13,15-triene(thiocyanato)nickel(III) ion**							
15.59.1	**Aqua-α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),13,15-triene(thiocyanato)nickel(III) ion**							
	$Ni(Me_2pyo[14]aneN_4)(H_2O)SCN^{2+} + Ni(Me_2pyo[14]aneN_4)(H_2O)SCN^{2+} \rightarrow$	6.5×10^5	3.2			p.r.	D.k. in N_2O-satd. soln. contg. $Ni(Me_2pyo[14]aneN_4)^{2+}$ and SCN$^-$.	82A106
15.60	**α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,11,13,15-pentaene(hydroxo)nickel(III) ion**							
15.60.1	**Hydroxide ion**							
	$Ni(Me_2pyo[14]trieneN_4)(OH)^{2+} + OH^- \rightarrow Ni(Me_2pyo[14]trieneN_4\text{-}H)(OH)^+ + H_2O$	2.5×10^6	alk.			p.r.	D.k. in N_2O-satd. soln. contg. $Ni(Me_2pyo[14]trieneN_4)^{2+}$ and SCN$^-$.	82A106
15.61	**α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,11,13,15-pentaenebis(hydroxo)nickel(III) ion**							
15.61.1	**Hydroxide ion**							
	$Ni(Me_2pyo[14]trieneN_4)(OH)_2^+ + OH^- \rightarrow Ni(Me_2pyo[14]trieneN_4\text{-}H)(OH)_2 + H_2O$	1.0×10^5	alk.			p.r.	D.k. in N_2O-satd. soln. contg. $Ni(Me_2pyo[14]trieneN_4)^{2+}$ and SCN$^-$.	82A106
15.62	**Aquabromo-α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,11,13,15-pentaenenickel(III) ion**							
15.62.1	**Aquabromo-α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,11,13,15-pentaenenickel(III) ion**							
	$Ni(Me_2pyo[14]trieneN_4)Br^{2+} + Ni(Me_2pyo[14]trieneN_4)Br^{2+} \rightarrow$	1.1×10^7	3.2			p.r.	D.k. in N_2O-satd. soln. contg. $Ni(Me_2pyo[14]trieneN_4)^{2+}$ and Br$^-$.	82A106
15.63	**Aqua-α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,11,13,15-pentaene(thiocyanato)nickel(III) ion**							
15.63.1	**Aqua-α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,11,13,15-pentaene(thiocyanato)nickel(III) ion**							
	$Ni(Me_2pyo[14]trieneN_4)(H_2O)SCN^{2+} + Ni(Me_2pyo[14]trieneN_4)(H_2O)SCN^{2+} \rightarrow$	5.0×10^7	3.2			p.r.	D.k. in N_2O-satd. soln. contg. $Ni(Me_2pyo[14]trieneN_4)^{2+}$ and SCN$^-$.	82A106
15.63.2	**Thiocyanate ion**							
	$Ni(Me_2pyo[14]trieneN_4)(H_2O)SCN^{2+} + SCN^- \rightarrow H_2O + Ni(Me_2pyo[14]trieneN_4)(SCN)_2^+$	1.0×10^6	3.2			p.r.	D.k. in N_2O-satd. soln. contg. $Ni(Me_2pyo[14]trieneN_4)^{2+}$ and SCN$^-$; $k_r = 3 \times 10^3$ s^{-1}.	82A106

TABLE 15. Rate constants for nickel transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
15.64	**α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,11,13,15-pentaenebis(thiocyanato)nickel(III) ion**							
15.64.1	**α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,11,13,15-pentaenebis(thiocyanato)nickel(III) ion**							
	$Ni(Me_2pyo[14]trieneN_4)(SCN)_2^+ + Ni(Me_2pyo[14]trieneN_4)(SCN)_2^+ \rightarrow$	1.6×10^8	3.2			p.r.	D.k. in N_2O-satd. soln. contg. $Ni(Me_2pyo[14]trieneN_4)^{2+}$ and SCN^-.	82A106
15.65	**Aquabromo-α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,6,11,13,15-hexaenenickel(III) ion**							
15.65.1	**Aquabromo-α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,6,11,13,15-hexaenenickel(III) ion**							
	$Ni(Me_2pyo[14]hexaeneN_4)(H_2O)Br^{2+} + Ni(Me_2pyo[14]hexaeneN_4)(H_2O)Br^{2+} \rightarrow$	6.9×10^7	3.2			p.r.	D.k. in N_2O-satd. soln. contg. $Ni(Me_2pyo[14]hexaeneN_4)^{2+}$ and Br^-.	82A106
15.65.2	**Hydroxide ion**							
	$Ni(Me_2pyo[14]hexaeneN_4)(H_2O)Br^{2+} + OH^- \rightarrow Br^- + Ni(Me_2pyo[14]hexaeneN_4)(H_2O)OH^{2+}$	$\sim 4.7 \times 10^9$				p.r.	D.k. in N_2O-satd. soln. contg. $Ni(Me_2pyo[14]hexaeneN_4)^{2+}$ and Br^-; $k_r = \sim 6.9 \times 10^5$ L mol^{-1} s^{-1}.	82A106
15.65.3	**Bromide ion**							
	$Ni(Me_2pyo[14]hexaeneN_4)(H_2O)Br^{2+} + Br^- \rightarrow H_2O + Ni(Me_2pyo[14]hexaeneN_4)Br_2^+$	$\sim 8.0 \times 10^5$				p.r.	D.k. in N_2O-satd. soln. contg. $Ni(Me_2pyo[14]hexaeneN_4)^{2+}$ and Br^-; $k_r = \sim 6 \times 10^3$ s^{-1}.	82A106
15.66	**Dibromo-α,2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,6,11,13,15-hexaenenickel(III) ion**							
15.66.1	**Dibromo-α,2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,6,11,13,15-hexaenenickel(III) ion**							
	$Ni(Me_2pyo[14]hexaeneN_4)Br_2^+ + Ni(Me_2pyo[14]hexaeneN_4)Br_2^+ \rightarrow$	2.8×10^8	3.2			p.r.	D.k. in N_2O-satd. soln. contg. $Ni(Me_2pyo[14]hexaeneN_4)^{2+}$ and Br^-.	82A106
15.67	**Aqua-α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,6,11,13,15-hexaene(thiocyanato)nickel(III) ion**							
15.67.1	**Thiocyanate ion**							
	$Ni(Me_2pyo[14]hexaeneN_4)(H_2O)SCN^{2+} + SCN^- \rightarrow H_2O + Ni(Me_2pyo[14]hexaeneN_4)(SCN)_2^+$	6.0×10^6	3.2,7			p.r.	D.k. in N_2O-satd. soln. contg. $Ni(Me_2pyo[14]hexaeneN_4)^{2+}$ and SCN^-.	82A106
15.68	**α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,6,11,13,15-hexaenebis(thiocyanato)nickel(III) ion**							
15.68.1	**α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,6,11,13,15-hexaenebis(thiocyanato)nickel(III) ion**							
	$Ni(Me_2pyo[14]hexaeneN_4)(SCN)_2^+ + Ni(Me_2pyo[14]hexaeneN_4)(SCN)_2^+ \rightarrow$	3.7×10^8	3.2			p.r.	D.k. in N_2O-satd. soln. contg. $Ni(Me_2pyo[14]hexaeneN_4)^{2+}$ and SCN^-.	82A106
15.69	**Bromo-α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,6,11,13,15-hexaenenickel(III) ion**							
15.69.1	**Dibromine radical ion**							
	$Ni(Me_2pyo[14]hexaeneN_4)Br^{2+} + Br_2^{\bullet -} \rightarrow Ni(Me_2pyo[14]hexaeneN_4)^{2+} + Br_2 + Br^-$	1.0×10^{10}	3.2			p.r.	Calcd. from d.k. at 360 nm in soln. contg. 4.6×10^{-6} mol L^{-1} $Ni(Me_2pyo[14]hexaeneN_4)^{2+}$ and 0.001 mol L^{-1} Br^- assuming $2k(Br_2^{\bullet -} + Br_2^{\bullet -}) = 4.5 \times 10^9$, $k(Br_2^{\bullet -} + Ni(Me_2pyo[14]hexaeneN_4)^{2+}) = 1.1 \times 10^{10}$ L mol^{-1} s^{-1}.	82A087
15.70	**Ethylenediaminetetraacetatonickelate(III) ion**							
15.70.1	**Water**							
	$NiEDTA^- + H_2O \rightarrow NiEDTA(H_2O)^-$	1.1×10^3 s^{-1}	11.4	0.2		f.p./pi	D.k. at 300 nm in N_2O-satd. soln. contg. $NiEDTA^{2-}$ and Na_2CO_3; $k = 2 \times 10^3$ s^{-1} associated with similar spectral changes observed for the product of reaction of $NiEDTA^{2-}$ with OH [751135].	91A292

TABLE 15. Rate constants for nickel transients — Continued

No.	Reaction		k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
15.70	**Ethylenediaminetetraacetatonickelate(III) ion** — Continued								
15.70.2	**Carbonate ion**								
	$NiEDTA^- + CO_3^{2-} \rightarrow NiEDTA^{2-} + CO_3^{\cdot -}$		8.8×10^4	11.4	0.2		f.p./pi	D.k. at 600 nm in N_2O-satd. soln. contg. $NiEDTA^{2-}$ and Na_2CO_3; $k_r = 4.5 \times 10^7$ L mol^{-1} s^{-1}.	91A292
15.71	**Hydroxy(ethylenediaminetetraacetato)nickelate(III) ion**								
15.71.1	**First-order reaction**								
	$NiEDTA(OH)^{2-} \rightarrow Ni(EDTA\text{-}H)^{2-} + H_2O$		1.4×10^2 s^{-1}	11.4-13			f.p./pi		91A292
15.72	**Aqua(ethylenediaminetetraacetato)nickelate(III) ion**								
15.72.1	**Iodide ion**								
	$NiEDTA(H_2O)^- + I^- \rightarrow$	*	5.5×10^5	11.4	0.2		f.p./pi	D.k. at 300 nm in N_2O-satd. soln. contg. $NiEDTA^{2-}$ and Na_2CO_3.	91A292
		*	1.3×10^3	4-9			p.r.	D.k. at 300 nm in N_2O-satd. soln. contg. $NiEDTA^{2-}$ and I^-.	751135
								* Unexplained discrepancy in these data.	
15.72.2	**Oxygen**								
	$NiEDTA(H_2O)^- + O_2 \rightarrow$		6.5×10^2				p.r.	D.k. at 300 nm in N_2O-satd. soln. contg. $NiEDTA^{2-}$ and O_2.	751135
15.73	**Dioxonickel(IV) ion**								
15.73.1	**First-order reaction**								
	$NiO_2^+ \rightarrow Ni^{2+} + O_2^{\cdot -}$		780 s^{-1}	5.7		25	p.r.	Estd. from p.b.k. (nitroform anion) in soln. contg. $(5\text{-}100) \times 10^{-3}$ mol L^{-1} Ni^{2+}, $(31.8\text{-}106.4) \times 10^{-6}$ mol L^{-1} tetranitromethane, 1 mol L^{-1} *tert*-BuOH and $(2.6 \text{ or } 13) \times 10^{-4}$ mol L^{-1} O_2.	761134
15.74	**Dioxonickel(IV) ion, protonated**								
15.74.1	**First-order reaction**								
	$NiO_2H^{2+} \rightarrow Ni^{2+} + HO_2^{\cdot}$		≥ 2800 s^{-1}	3.0		25	p.r.	Estd. from p.b.k. (nitroform anion) in soln. contg. $(5\text{-}100) \times 10^{-3}$ mol L^{-1} Ni^{2+}, $(31.8\text{-}106.4) \times 10^{-6}$ mol L^{-1} tetranitromethane, 1 mol L^{-1} *tert*-BuOH and $(2.6 \text{ or } 13) \times 10^{-4}$ mol L^{-1} O_2; $pK_a = 3.2$.	761134

TABLE 16. Rate constants for osmium transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
16.1	**Tris(2,2'-bipyridine)osmium(III) ion**							
16.1.1	**Iron(II) ion**							
	$Os(bpy)_3^{3+} + Fe^{2+} \rightarrow Os(bpy)_3^{2+} + Fe^{3+}$	1.4×10^4	~0		20	f.p./oq	Calcd. from current-time curve; soln. contg. 0.5 mol L^{-1} H_2SO_4, 3×10^{-4} mol L^{-1} $Os(bpy)_3^{2+}$ and $[Fe^{2+}] = [Fe^{3+}]$ (OQ).	80E224
16.2	**Tris(5,5'-dimethyl-2,2'-bipyridine)osmium(III) ion**							
16.2.1	**Iron(II) ion**							
	$Os(5,5'\text{-}Me_2bpy)_3^{3+} + Fe^{2+} \rightarrow Os(5,5'\text{-}Me_2bpy)_3^{2+} + Fe^{3+}$	1.0×10^3	~0		20	f.p./oq	Calcd. from current-time curve; soln. contg. 0.5 mol L^{-1} H_2SO_4, 3×10^{-4} mol L^{-1} $Os(5,5'\text{-}Me_2bpy)_3^{2+}$ and $[Fe^{2+}] = [Fe^{3+}]$ (OQ).	80E224
16.3	**Tris(1,10-phenanthroline)osmium(III) ion**							
16.3.1	**Iron(II) ion**							
	$Os(phen)_3^{3+} + Fe^{2+} \rightarrow Os(phen)_3^{2+} + Fe^{3+}$	1.1×10^4	~0		20	f.p./oq	Calcd. from current-time curve; soln. contg. 0.5 mol L^{-1} H_2SO_4, 1.5×10^{-4} mol L^{-1} $Os(phen)_3^{2+}$ and $[Fe^{2+}] = [Fe^{3+}]$ (OQ).	80E224
16.4	**Tris(5-chloro-1,10-phenanthroline)osmium(III) ion**							
16.4.1	**Iron(II) ion**							
	$Os(5\text{-}Clphen)_3^{3+} + Fe^{2+} \rightarrow Os(5\text{-}Clphen)_3^{2+} + Fe^{3+}$	7.0×10^4	~0		20	f.p./oq	Calcd. from current-time curve; soln. contg. 0.5 mol L^{-1} H_2SO_4, 2×10^{-4} mol L^{-1} $Os(5\text{-}Clphen)_3^{2+}$ and $[Fe^{2+}] = [Fe^{3+}]$ (OQ).	80E224

TABLE 17. Rate constants for lead transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
17.1	**Lead atom**							
17.1.1	**Lead atom**							
	$Pb^0 + Pb^0 \rightarrow Pb_2$	7.5×10^8	5.4			p.r.	D.k. at 300 nm and 660 nm in Ar-satd. soln. contg. 2×10^{-4} mol L^{-1} $Pb(ClO_4)_2$ and 2×10^{-3} mol L^{-1} formate. Species could be Pb_2^{2+}.	92A206
17.1.2	**Silver(I) ion**							
	$Pb^0 + Ag^+ \rightarrow PbAg^+$	8.2×10^8	4			p.r.	D.k. at 660 nm in soln. contg. 1×10^{-4} mol L^{-1} Pb^{2+}, 0.01 mol L^{-1} formate and varied $[Ag^+]$. Value obtained from computer fit.	92A348
17.2	**Lead(I) ion**							
17.2.1	**Lead(I) ion**							
	$Pb^+ + Pb^+ \rightarrow Pb^0 + Pb^{2+}$	4.1×10^9	5.4			p.r.	P.b.k. at 660 nm in Ar-satd. soln. contg. 1×10^{-4} to 0.5 mol L^{-1} $Pb(ClO_4)_2$ and 2×10^{-3} mol L^{-1} formate; p.b.k. at 300 nm gave $k = 2.8 \times 10^9$ L mol^{-1} s^{-1}.	92A206
17.2.2	**Oxygen**							
	$Pb^+ + O_2 \rightarrow Pb^{2+} + O_2^{\cdot -}$	3.9×10^9				p.r.	D.k. in soln. contg. Pb^{2+}.	66A001
17.2.3	**1,4-Benzoquinone**							
	$Pb^+ + Q \rightarrow Pb^{2+} + Q^{\cdot -}$	4.1×10^9	6.3		25	p.r.	P.b.k. at 430 nm in soln. contg. Pb(II) acetate and 1 mol L^{-1} *tert*-BuOH. Pb^+ may be complexed to acetate.	761134
17.2.4	**2-Methyl-1,4-naphthoquinone**							
	$Pb^+ + 2\text{-}CH_3NQ \rightarrow Pb^{2+} + [2\text{-}CH_3NQ]^{\cdot -}$	3.7×10^9	7			p.r.	P.b.k. in soln. contg. 5×10^{-3} mol L^{-1} $Pb(ClO_4)_2$, 5×10^{-5} mol L^{-1} 2-CH_3-NQ and 1 mol L^{-1} *tert*-BuOH.	751032 731047
17.3	**Lead(I)**							
17.3.1	**Hexaamminecobalt(III) ion**							
	$Pb(I) + Co(NH_3)_6^{3+} \rightarrow Pb(II) + Co(NH_3)_6^{2+}$	5.6×10^7		0.06	29	p.r.	D.k. at 315 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $PbCl_2$, 0.001 mol L^{-1} MeOH and 1.5×10^{-4} mol L^{-1} $Co(NH_3)_6^{3+}$.	78A206
17.3.2	**Pentaammine(aqua)cobalt(III) ion**							
	$Pb(I) + Co(NH_3)_5(H_2O)^{3+} \rightarrow Pb(II) + Co(NH_3)_5(H_2O)^{2+}$	2.3×10^8		0.06	29	p.r.	D.k. at 315 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $PbCl_2$, 0.001 mol L^{-1} MeOH and 1.5×10^{-4} mol L^{-1} $Co(NH_3)_5(H_2O)^{3+}$.	78A206
17.3.3	**Pentaammine(chloro)cobalt(III) ion**							
	$Pb(I) + Co(NH_3)_5Cl^{2+} \rightarrow Pb(II) + Co(NH_3)_5Cl^+$	2.6×10^8		0.06	29	p.r.	D.k. at 315 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $PbCl_2$, 0.001 mol L^{-1} MeOH and 1.5×10^{-4} mol L^{-1} $Co(NH_3)_5Cl^{2+}$.	78A206
17.3.4	**Pentaammine(bromo)cobalt(III) ion**							
	$Pb(I) + Co(NH_3)_5Br^{2+} \rightarrow Pb(II) + Co(NH_3)_5Br^+$	4.8×10^8		0.06	29	p.r.	D.k. at 315 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $PbCl_2$, 0.001 mol L^{-1} MeOH and 1.5×10^{-4} mol L^{-1} $Co(NH_3)_5Br^{2+}$.	78A206
17.3.5	**Tetraamminediaquacobalt(III) ion**							
	$Pb(I) + Co(NH_3)_4(H_2O)_2^{3+} \rightarrow Pb(II) + Co(NH_3)_4(H_2O)_2^{2+}$	3.0×10^8		0.06	29	p.r.	D.k. at 315 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $PbCl_2$, 0.001 mol L^{-1} MeOH and 1.5×10^{-4} mol L^{-1} $Co(NH_3)_4(H_2O)_2^{3+}$.	78A206

TABLE 17. Rate constants for lead transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
17.3	**Lead(I)** — Continued							
17.3.6	**Trinitrotrisamminecobalt(III)**							
	$Pb(I) + Co(NH_3)_3(NO_2)_3 \rightarrow Pb(II) + Co(NH_3)_3(NO_2)_3^-$	2.0×10^9		0.06	29	p.r.	D.k. at 315 and 275 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $PbCl_2$, 0.001 mol L^{-1} MeOH and 1.5×10^{-4} mol L^{-1} $Co(NH_3)_3(NO_3)_3$.	78A206
17.3.7	**Tris(ethylenediamine)cobalt(III) ion**							
	$Pb(I) + Co(en)_3^{3+} \rightarrow Pb(II) + Co(en)_3^{2+}$	7.9×10^7		0.06	29	p.r.	D.k. at 315 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $PbCl_2$, 0.001 mol L^{-1} MeOH and 1.5×10^{-4} mol L^{-1} $Co(en)_3^{3+}$.	78A206
17.3.8	**Trioxalatocobaltate(III) ion**							
	$Pb(I) + Co(C_2O_4)_3^{3-} \rightarrow Pb(II) + Co(C_2O_4)_3^{4-}$	6.0×10^8		0.06	29	p.r.	D.k. at 315 nm in Ar-satd. soln. contg. 0.02 mol L^{-1} $PbCl_2$, 0.001 mol L^{-1} MeOH and 1.5×10^{-4} mol L^{-1} $Co(C_2O_4)_3^{3-}$.	78A206
17.4	**Tetrakis(1-methylpyridinium-4-yl)porphinatolead(II) radical cation**							
17.4.1	**Tetrakis(1-methylpyridinium-4-yl)porphinatolead(II) radical cation**							
	$[PbTMpyP]^{\bullet 5+} + [PbTMpyP]^{\bullet 5+} \rightarrow PbTMpyP^{4+} + PbTMpyP^{6+}$	5.4×10^7	9			p.r.	D.k. at 750 nm and p.b.k. at 425 nm in N_2O-satd. soln. contg. $PbTMpyP^{4+}$ and 0.01 mol L^{-1} KBr; unclear whether k or $2k$. $PbTMpyP^{6+}$ represents a Pb(IV) species; subsequent decay of the Pb(IV) species occurs with $k = 0.93$ and 2 s^{-1} at pH 9 and 12, respectively.	86A241
17.5	**Tetrakis(1-methylpyridinium-3-yl)porphinatolead(II) radical cation**							
17.5.1	**Tetrakis(1-methylpyridinium-3-yl)porphinatolead(II) radical cation**							
	$[Pb(3\text{-}TMpyP)]^{\bullet 5+} + [Pb(3\text{-}TMpyP)]^{\bullet 5+} \rightarrow Pb(3\text{-}TMpyP)^{4+} + Pb(3\text{-}TMpyP)^{6+}$	7.4×10^7	9			p.r.	D.k. at 750 nm and p.b.k. at 425 nm in N_2O-satd. soln. contg. $Pb(3\text{-}TMpyP)^{4+}$ and 0.01 mol L^{-1} KBr; unclear whether k or $2k$. $Pb(3\text{-}TMpyP)^{6+}$ represents a Pb(IV) species; subsequent decay of the Pb(IV) species occurs with $k = 0.93$ and 2 s^{-1} at pH 9 and 12, respectively.	86A241
17.6	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatoplumbate(II) radical cation**							
17.6.1	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatoplumbate(II) radical cation**							
	$[PbTPPS]^{\bullet 3-} + [PbTPPS]^{\bullet 3-} \rightarrow$	1.6×10^7	7			p.r.	D.k. at 700 nm in N_2O-satd. soln. contg. 0.01 mol L^{-1} KBr.	86S115
17.7	**Lead(III)**							
17.7.1	**Lead(III)**							
	$Pb(III) + Pb(III) \rightarrow Pb(II) + Pb(IV)$	4.8×10^8	<0			p.r.	D.k. in soln. contg. 11 mol L^{-1} HCl and Pb(II) and Pb(IV).	84A446
17.8	**Dihydroxylead(III) ion**							
17.8.1	**Dihydroxylead(III) ion**							
	$Pb(OH)_2^+ + Pb(OH)_2^+ \rightarrow Pb(OH)^+ + Pb(OH)_3^+$	3.5×10^9	5-7			p.r.	D.k. in N_2O-satd. soln. contg. $Pb(ClO_4)_2$.	90A095
17.9	**Tetrahydroxyplumbate(III) ion**							
17.9.1	**Tetrahydroxyplumbate(III) ion**							
	$Pb(OH)_4^- + Pb(OH)_4^- \rightarrow Pb(OH)_3^- + PbO(OH)^+ + H_2O + 2\ OH^-$	2.1×10^9	11.4			p.r.	D.k. at 280 nm and condy. change in N_2O-satd. soln. contg. $Pb(OH)_3^-$.	90A095

TABLE 17. Rate constants for lead transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
17.9	**Tetrahydroxyplumbate(III) ion** — Continued							
17.9.2	**2-Methyl-2-propanol**							
	$Pb(OH)_4^-$ + *tert*-BuOH →	5.0×10^5	13			p.r.	D.k. at 280 nm in Ar-satd. soln. contg. $Pb(OH)_6^{2-}$ and 0.02-0.1 mol L^{-1} *tert*-BuOH.	90A095
17.9.3	**2-Propanol**							
	$Pb(OH)_4^-$ + 2-PrOH + OH^- → $Pb(OH)_3^-$ + $(CH_3)_2\dot{C}O^-$ + 2 H_2O	1.2×10^4	13			γ-r.	Estd. from yield of $Pb(OH)_3^-$ formed by a chain reaction in soln. contg. 2.2×10^{-4} mol L^{-1} $Pb(OH)_6^{2-}$ and 0.1 mol L^{-1} 2-PrOH.	90A095
17.10	**Hydroxy(oxo)lead(IV) ion**							
17.10.1	**Hydroxide ion**							
	$PbO(OH)^+$ + OH^- → $PbO(OH)_2$	6×10^5	11.4			p.r.	Condy. change in N_2O-satd. soln. contg. 5×10^{-4} mol L^{-1} $Pb(OH)_3^-$; $k = 5 \times 10^6$ L mol^{-1} s^{-1} was derived for subsequent dimerization of the product.	90A095

TABLE 18. Rate constants for palladium transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
18.1	**Palladium(I) ion**							
18.1.1	**Palladium(III) ion**							
	$Pd^{+} + Pd^{3+} \rightarrow 2\ Pd^{2+}$	1×10^{9}	0			p.r.	D.k. at 250 nm and 290 nm in Ar-satd. soln. contg. 1 mol L^{-1} $HClO_4$ and (5-10) $\times 10^{-5}$ mol L^{-1} $Pd(ClO_4)_2$. In N_2O-satd. soln. a slower reaction was also observed, $k \sim 4 \times 10^{7}$ L mol^{-1} s^{-1}, suggested to represent $Pd^{3+} + Pd^{3+}$ and/or $Pd^{3+} + H_2O_2$.	94A210
18.2	**Bis(hydroxyprolinato)palladate(I) ion**							
18.2.1	**Bis(hydroxyprolinato)palladate(I) ion**							
	$Pd(HypO)_2^{-} + Pd(HypO)_2^{-} \rightarrow$	1.4×10^{8}	6.0			p.r.	D.k. at 260 nm in N_2-satd. soln. contg. 0.5 mol L^{-1} *tert*-BuOH and $Pd(HypO)_2$. Unclear whether k or $2k$.	93A224
18.3	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatopalladate(II) radical anion**							
18.3.1	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatopalladate(II) radical anion**							
	$[PdTPPS]^{\bullet 5-} + [PdTPPS]^{\bullet 5-} \rightarrow$	2.4×10^{7} 1.3×10^{8}	6.8 12			p.r.	D.k. in N_2-satd. soln. contg. 0.1 mol L^{-1} 2-PrOH and $PdTPPS^{4-}$. Reaction suggested to be disproportionation, ΔG = 31 kJ mol^{-1}.	83C026

TABLE 19. Rate constants for platinum transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
19.1	**Triammineaquaplatinum(I) ion**							
19.1.1	**Water**							
	$Pt(NH_3)_3(H_2O)^+ + H_2O \rightarrow Pt(NH_3)_2(H_2O)_2^+ + NH_3$	4.2×10^4 s^{-1}	4.1-7		~23	p.r.	D.k. in soln. contg. $Pt(NH_3)_4^{2+}$ and alcohol; average of two values obtained from optical and conductivity measurements. Reaction preceded by rapid release of NH_3.	81A353
		1.2×10^4 s^{-1}	11.4		~23	p.r.	D.k. in soln. contg. $Pt(NH_3)_4^{2+}$ and 2.0 mol L^{-1} 2-PrOH; condy. decrease gave $k = 1.2 \times 10^4$ s^{-1}; implies pK_a of product ~11.	81A353
19.2	***cis*-Diamminedichloroplatinate(I) ion**							
19.2.1	**Water**							
	cis-$Pt(NH_3)_2Cl_2^- + H_2O \rightarrow$ *cis*-$Pt(NH_3)_2Cl(H_2O) + Cl^-$	1.3×10^6 s^{-1}	6-8			p.r.	*P.b.k. at 390 nm in deaerated soln. contg.* (0.25-1) $\times 10^{-3}$ mol L^{-1} *cis*-$Pt(NH_3)_2Cl_2$, 0.1 mol L^{-1} NaCl and 1.0 mol L^{-1} *tert*-BuOH; for loss of second Cl^-, $k = 380$ s^{-1}; subsequent second-order decay ($k = 5.5 \times 10^7$ L mol^{-1} s^{-1}) may represent disproportionation of product.	85A090
19.3	***trans*-Diamminedichloroplatinate(I) ion**							
19.3.1	**Water**							
	trans-$Pt(NH_3)_2Cl_2^- + H_2O \rightarrow$ *trans*-$Pt(NH_3)_2Cl(H_2O) + Cl^-$	3.1×10^4 s^{-1}				p.r.	P.b.k. at 390 nm in deaerated soln. contg. *trans*-$Pt(NH_3)_2Cl_2$, 0.1 mol L^{-1} NaCl and 1.0 mol L^{-1} *tert*-BuOH; for loss of second Cl^-, $k = 870$ s^{-1}.	85A090
19.4	**Tetrabromoplatinate(I) ion**							
19.4.1	**First-order reaction**							
	$PtBr_4^{3-} \rightarrow$	3.2×10^3 s^{-1}	2			p.r.	D.k. at 320 nm in Ar-satd. soln. contg. 0.01 mol L^{-1} $HClO_4$, *tert*-BuOH and $PtBr_4^{2-}$.	92A259
19.5	**Tetrachloroplatinate(I) ion**							
19.5.1	**Tetrachloroplatinate(I) ion**							
	$PtCl_4^{3-} + PtCl_4^{3-} \rightarrow$	2.1×10^9				p.r.	D.k. at 310 nm in deaerated soln. contg. (0.25-1.0) $\times 10^{-4}$ mol L^{-1} $PtCl_4^{2-}$ and 0.002 mol L^{-1} MeOH; $k = 1.6 \times 10^9$ L mol^{-1} s^{-1} in the presence of 0.1 mol L^{-1} KCl and 0.002 mol L^{-1} MeOH; $k = \sim 1.3 \times 10^9$ L mol^{-1} s^{-1} in the presence of 0.005 mol L^{-1} H_2SO_4 and 0.001 mol L^{-1} MeOH.	690144
19.6	**Tetracyanoplatinate(I) ion**							
19.6.1	**Nitrous oxide**							
	$Pt(CN)_4^{3-} + N_2O \rightarrow$	1.8×10^7				p.r.	D.k. at 360 nm in soln. contg. 5×10^{-4} mol L^{-1} $Pt(CN)_4^{2-}$, 0.001 mol L^{-1} NaOH, 0.01 mol L^{-1} MeOH and (1.2-2.4) $\times 10^{-4}$ mol L^{-1} N_2O.	690144
19.6.2	**Oxygen**							
	$Pt(CN)_4^{3-} + O_2 \rightarrow$	3.5×10^9				p.r.	D.k. at 360 nm in soln. contg. 5×10^{-4} mol L^{-1} $Pt(CN)_4^{2-}$, 0.001 mol L^{-1} NaOH, 0.01 mol L^{-1} MeOH and (9-18) $\times 10^{-6}$ mol L^{-1} O_2.	690144

TABLE 19. Rate constants for platinum transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
19.7	**Bis(ethylenediamine)platinum(I) ion**							
19.7.1	**Bis(ethylenediamine)platinum(I) ion**							
	$Pt(en)_2^+ + Pt(en)_2^+ \rightarrow$	4.5×10^8			~25	p.r.	D.k. at 300 nm in soln. contg. ~1.1×10^{-4} mol L^{-1} $Pt(en)_2^{2+}$ and 0.1-0.5 mol L^{-1} 2-PrOH or 1.24 mol L^{-1} MeOH; unclear whether k or $2k$.	751188
19.8	**Chloro(diethylenetriamine)platinum(I)**							
19.8.1	**First-order reaction**							
	$Pt(dien)Cl \rightarrow$	2.3×10^5 s^{-1}			~25	p.r.	D.k. at 260-400 nm in soln. contg. ~1.6 or ~2.3×10^{-4} mol L^{-1} $Pt(dien)Cl^+$ and 0.1-0.5 mol L^{-1} 2-PrOH or 1.24 mol L^{-1} MeOH; reaction may represent substitution of Cl^- by H_2O. Product disappears by second-order kinetics, k = 2.3×10^7 L mol^{-1} s^{-1}; unclear whether k or $2k$.	751188
19.9	***cis*-Bis(glycinato)platinate(I) ion**							
19.9.1	***cis*-Bis(glycinato)platinate(I) ion**							
	cis-$Pt(Gly)_2^- + cis$-$Pt(Gly)_2^- \rightarrow$	4.2×10^9			~25	p.r.	D.k. at 250-310 nm in deaerated soln. contg. 4.5×10^{-5} mol L^{-1} *cis*-$Pt(Gly)_2$ and 1.0 mol L^{-1} 2-PrOH; unclear whether k or $2k$.	771053
19.10	***trans*-Bis(glycinato)platinate(I) ion**							
19.10.1	***trans*-Bis(glycinato)platinate(I) ion**							
	trans-$Pt(Gly)_2^- + trans$-$Pt(Gly)_2^- \rightarrow$	4.2×10^9			~25	p.r.	D.k. at 250-270 nm in deaerated soln. contg. 3.0 or 4.5×10^{-5} mol L^{-1} *trans*-$Pt(Gly)_2$ and 1.0 mol L^{-1} 2-PrOH; unclear whether k or $2k$.	771053
19.11	**Bis(ethylenediamine)platinum(II), H reaction product**							
19.11.1	***Bis(ethylenediamine)platinum(II), H reaction product***							
	$Pt(en)_2^{2+}/H + Pt(en)_2^{2+}/H \rightarrow$	1.4×10^8	2-3		~25	p.r.	D.k. at 420 nm in soln. contg. 4.1×10^{-4} mol L^{-1} $Pt(en)_2^{2+}$, 0.1-1 mol L^{-1} *tert*-BuOH and 0.001-0.01 mol L^{-1} $HClO_4$; unclear whether k or $2k$.	751188
19.12	**Chloro(diethylenetriamine)platinum(II), H reaction product**							
19.12.1	**Chloro(diethylenetriamine)platinum(II), H reaction product**							
	$Pt(dien)Cl^+/H + Pt(dien)Cl^+/H \rightarrow$	3.4×10^9	2-3		~25	p.r.	D.k. at 410 nm in soln. contg. 3.1 or 4.2×10^{-4} mol L^{-1} $Pt(dien)Cl^+$, 0.1-1 mol L^{-1} *tert*-BuOH and 0.001-0.01 mol L^{-1} $HClO_4$; unclear whether k or $2k$.	751188
19.13	**Chloro(tetraethyldiethylenetriamine)platinum(II), H reaction product**							
19.13.1	**Chloro(tetraethyldiethylenetriamine)platinum(II), H reaction product**							
	$Pt(Et_4dien)Cl^+/H + Pt(Et_4dien)Cl^+/H \rightarrow$	6.6×10^{10}	2-3			p.r.	D.k. at 290 nm in soln. contg. 1.0 and 1.9 $\times 10^{-4}$ mol L^{-1} $Pt(Et_4dien)Cl^+$, 0.1-1 mol L^{-1} *tert*-BuOH and 0.001-0.01 mol L^{-1} $HClO_4$; unclear whether k or $2k$.	751188

TABLE 19. Rate constants for platinum transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
19.14	***cis*-Bis(glycinato)platinum(II), H reaction product**							
19.14.1	**First-order reaction**							
	cis-Pt(Gly)$_2$/H →	7.3×10^3 s^{-1}	2		~25	p.r.	D.k. at 250-310 nm in deaerated soln. contg. ~1×10^{-4} mol L^{-1} *cis*-Pt(Gly)$_2$, 0.01 mol L^{-1} $HClO_4$ and 0.5 mol L^{-1} *tert*-BuOH.	771053
19.15	***trans*-Bis(glycinato)platinum(II), H reaction product**							
19.15.1	**First-order reaction**							
	trans-Pt(Gly)$_2$/H →	2.5×10^5 s^{-1}	2		~25	p.r.	P.b.k. at 320-370 nm in deaerated soln. contg. (1.5-10) $\times 10^{-5}$ mol L^{-1} *trans*-Pt(Gly)$_2$, 0.01 mol L^{-1} $HClO_4$ and 0.5 mol L^{-1} *tert*-BuOH. A subsequent first-order decay observed at 250-360 nm, k = 6.4×10^3 s^{-1}.	771053
19.16	**Octahydrogen tetrakis(μ-diphosphito)diplatinate(I)(II) ion**							
19.16.1	**First-order reaction**							
	$[Pt_2(P_2O_5H_2^{2-})_4]^{5-}$ →	2.9×10^4 s^{-1}	6.8			p.r.	D.k. at 420 nm in N_2-satd. soln. contg. 5×10^{-5} mol L^{-1} $Pt_2(P_2O_5H_2^{2-})_4^{4-}$, 1% *tert*-BuOH and 2×10^{-3} mol L^{-1} phosphate buffer.	84A241
19.17	**Tetraamminehydridoplatinum(III) ion**							
19.17.1	**First-order reaction**							
	$Pt(NH_3)_4(H)^{2+}$ →	2.2×10^4 s^{-1}	1.1-2.9		~23	p.r.	D.k. in soln. contg. (0.15-2.45) $\times 10^{-4}$ mol L^{-1} $Pt(NH_3)_4^{2+}$ and 0.1-2.0 mol L^{-1} *tert*-BuOH; no condy. change observed on the same time frame suggests reaction may represent rearrangement of the hydride.	81A353
		2.0×10^3 s^{-1}	1.1-2.9		~23	p.r.	Rearranged hydride; p.b.k. below 400 nm in soln. contg. *tert*-BuOH; average of two values obtained from optical and condy. measurements; reaction may represent loss of NH_3.	81A353
19.18	**Tetraammine(aqua)hydroxyplatinum(III) ion**							
19.18.1	**First-order reaction**							
	$Pt(NH_3)_4(H_2O)(OH)^{2+}$ →	1.3×10^5 s^{-1}	3.3-10.2		~23	p.r.	D.k. or p.b.k. at different wavelengths in N_2O-satd. soln. contg. $Pt(NH_3)_4^{2+}$. Average of two values obtained as intercepts from pH studies. Reaction may represent H_2O elimination to give $Pt(NH_3)_3(NH_2)^{2+}$ in competition with protonation or deprotonation of $Pt(NH_3)_4(H_2O)(OH)^{2+}$ to give $Pt(NH_3)_4(H_2O)_2^{3+}$ or $Pt(NH_3)_4(OH)_2^{+}$, respectively.	82A074
19.18.2	**Hydrogen ion**							
	$Pt(NH_3)_4(H_2O)(OH)^{2+} + H^+$ → $Pt(NH_3)_4(H_2O)_2^{3+}$	7.0×10^9	<5.6		~23	p.r.	P.b.k. at 340, 350 and 510-540 nm in N_2O-satd. soln. contg. ~6×10^{-4} mol L^{-1} $Pt(NH_3)_4^{2+}$ and varied [H^+]; reaction in competition with H_2O elimination to give $Pt(NH_3)_3(NH_2)^{2+}$; $k_r = 3 \times 10^3$ s^{-1}; pK_a of $Pt(NH_3)_4(H_2O)_2^{3+}$ = ~6.4, ~9.8.	82A074

TABLE 19. Rate constants for platinum transients — Continued

No.	Reaction	k,(L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
19.18	**Tetraammine(aqua)hydroxyplatinum(III) ion — Continued**							
19.18.3	**Hydroxide ion**							
	$Pt(NH_3)_4(H_2O)(OH)^{2+} + OH^- \rightarrow Pt(NH_3)_4(OH)_2^+ + H_2O$	8.3×10^9	7-9.6		~23	p.r.	D.k. at 270-290 nm, p.b.k. at 340-530 nm and decrease in condy. in N_2O-satd. soln. contg. 1.1 or 5.0×10^{-4} mol L^{-1} $Pt(NH_3)_4^{2+}$; effect of [OH^-]; reaction in competition with H_2O elimination to give $Pt(NH_3)_3(NH_2)^{2+}$; $k_r = 5 \times 10^5$ s^{-1}; pK_a of $Pt(NH_3)_4(H_2O)(OH)^{2+}$ = ~9.8.	82A074
19.19	**Tetraamminebis(hydroxy)platinum(III) ion**							
19.19.1	**First-order reaction**							
	$Pt(NH_3)_4(OH)_2^+ \rightarrow$	1.8×10^6 s^{-1}	8.7		~23	p.r.	Absorption and condy. change in soln. contg. *tert*-BuOH and *trans*-$Pt(NH_3)_4(OH)_2^{2+}$. Reaction may represent competition between NH_3 elimination and proton transfer from water to give $Pt(NH_3)_4(H_2O)_2^{3+}$.	82A074
19.20	**Tetraamminebis(aqua)platinum(III) ion**							
19.20.1	**Tetraamminebis(aqua)platinum(III) ion**							
	$Pt(NH_3)_4(H_2O)_2^{3+} + Pt(NH_3)_4(H_2O)_2^{3+} \rightarrow$	1.4×10^6	3.3		~23	p.r.	D.k. at 260 nm and increase in condy. in N_2O-satd. soln. contg. $Pt(NH_3)_4^{2+}$; pK_a of $Pt(NH_3)_4(H_2O)_2^{3+}$ = ~6.4, ~9.8.	82A074
19.20.2	**Chloride ion**							
	$Pt(NH_3)_4(H_2O)_2^{3+} + Cl^- \rightarrow Pt(NH_3)_4(H_2O)Cl^{2+} + H_2O$	1.9×10^9	3.35, 3.7		~23	p.r.	P.b.k. at 270 nm in N_2O-satd. soln. contg. $Pt(NH_3)_4^{2+}$ and 1 or 4×10^{-5} mol L^{-1} Cl^-; product decays by second-order kinetics with $k = 7.5 \times 10^6$ L mol^{-1} s^{-1}.	86A017
19.21	**Tetraammineplatinum(II), $Cl_2^{\cdot-}$ reaction product**							
19.21.1	**First-order reaction**							
	$Pt(NH_3)_4^{2+}/Cl_2^{\cdot-} \rightarrow$	7.6×10^3 s^{-1}	0.3			p.r.	D.k. at 270 nm in He-satd. soln. contg. 2×10^{-4} mol L^{-1} $Pt(NH_3)_4^{2+}$ and 0.5 mol L^{-1} HCl. Reaction may represent equilibration between $Pt(NH_3)_4Cl_2^+$ and $Pt(NH_3)_4(H_2O)Cl^{2+}$; a subsequent complex decay has been approximated to a second-order decay, $k \sim 1 \times 10^7$ L mol^{-1} s^{-1} at 270 nm.	86A017
19.22	***cis*-Diamminedichloroplatinum(II), OH reaction product**							
19.22.1	**First-order reaction**							
	cis-$Pt(NH_3)_2Cl_2/OH \rightarrow$	3.4×10^4 s^{-1}				p.r.	D.k. in N_2O-satd. soln. contg. *cis*-$Pt(NH_3)_2Cl_2$; reaction may represent loss of one Cl^-; for loss of second Cl^-, $k = 370$ s^{-1}. Product decays by second-order kinetics, probably disproportionation, $k = 1.8 \times 10^7$ L mol^{-1} s^{-1}.	85A090
19.23	***trans*-Diamminedichloroplatinum(II), OH reaction product**							
19.23.1	**First-order reaction**							
	trans-$Pt(NH_3)_2Cl_2/OH \rightarrow$	6.3×10^4 s^{-1}				p.r.	D.k. in N_2O-satd. soln. contg. *trans*-$Pt(NH_3)_2Cl_2$; reaction may represent loss of one Cl^-; for loss of second Cl^-, $k = 810$ s^{-1}. Product decays by second-order kinetics, probably disproportionation, $k = 8 \times 10^7$ L mol^{-1} s^{-1}.	85A090

TABLE 19. Rate constants for platinum transients — Continued

No.	Reaction		k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
19.24	***cis*-Dichlorobis(isopropylamine)-*trans*-dihydroxyplatinate(III) ion**								
19.24.1	**First-order reaction**								
	cis-$PtCl_2(OH)_2(2\text{-}PrNH_2)_2^-$ →		6.0×10^6 s^{-1}				p.r.	P.b.k. at 390 nm in deaerated soln. contg. *cis*-$PtCl_2(OH)_2(2\text{-}PrNH_2)$ and 1.0 mol L^{-1} *tert*-BuOH; reaction may represent loss of one Cl^-; for loss of second Cl^-, $k = 1200$ s^{-1}. Product decays by second-order kinetics, probably disproportionation, $k = 6.5 \times 10^6$ L mol^{-1} s^{-1}.	85A090
19.25	**Tetrachloroplatinate(II), $Cl_2^{\bullet-}$ reaction product**								
19.25.1	**First-order reaction**								
	$PtCl_4^{2-}/Cl_2^{\bullet-}$ →		3×10^5 s^{-1}	0.3		~25	p.r.	D.k. in soln. contg. $PtCl_4^{2-}$ and 0.5 mol L^{-1} HCl; reaction probably associated with change in number of chloride ligands and/or substitution of Cl^- by H_2O; followed by second-order reaction, $k = \sim 1 \times 10^9$ L mol^{-1} s^{-1}.	751188
19.25.2	**Copper(II) ions**								
	$PtCl_4^{2-}/Cl_2^{\bullet-}$ + Cu(II) →		1.5×10^8	0.3	0.5	~25	p.r.	D.k. in soln. contg. $(1\text{-}2) \times 10^{-4}$ mol L^{-1} $PtCl_4^{2-}$, 0.5 mol L^{-1} HCl and $(0.5\text{-}1.2) \times 10^{-4}$ mol L^{-1} $CuCl_2$.	751188
19.26	**Hexachloroplatinate(III) ion**								
19.26.1	**Water**								
	$PtCl_6^{3-} + 2\ H_2O \rightarrow PtCl_4(H_2O)(OH)^{2-} + H^+ + 2\ Cl^-$	*	4.8×10^5 s^{-1}	4.4, 5.1		20-28	p.r.	D.k. at 279-309 nm and p.b.k. at 435-450 nm in Ar-satd. soln. contg. 0.11 or 0.51 mol L^{-1} *tert*-BuOH and 1 or 3.8×10^{-4} mol L^{-1} $PtCl_6^{2-}$; condy. increase gave $k = 4.2 \times 10^5$ s^{-1}; pK_a of $PtCl_4(H_2O)_2^-$ = 3.5 [87A472].	89A203
		*	1.1×10^5 s^{-1}	5-9		~20	p.r.	P.b.k. at 410 nm, d.k. at 440 nm, condy. increase (in acidic soln.) and decrease (in alkaline soln.) in Ar-satd. soln. contg. $\sim 1 \times 10^{-4}$ mol L^{-1} $PtCl_6^{2-}$ and 0.01 mol L^{-1} *tert*-BuOH.	89A250
								* Unexplained discrepancy in these data.	
19.27	**Pentachloroplatinate(III) ion**								
19.27.1	**First-order reaction**								
	$PtCl_5^{2-}$ →		4.8×10^9 s^{-1}	2			f.p.	D.k. at 450-460 and 635-644 nm in aerated soln. contg. 5×10^{-3} mol L^{-1} $PtCl_6^{2-}$ and 1×10^{-2} mol L^{-1} $HClO_4$. Reaction suggested to represent solvation or aquation.	87A088
19.28	**Aquapentachloroplatinate(III) ion**								
19.28.1	**Water**								
	$PtCl_5(H_2O)^{2-} + H_2O \rightarrow PtCl_4(H_2O)_2^- + Cl^-$		5×10^5 s^{-1}	2.6		20-28	p.r.	P.b.k. at 450 nm in Ar-satd. soln. contg. 0.11 mol L^{-1} *tert*-BuOH and 0.98 or 2.0×10^{-4} mol L^{-1} $PtCl_6^{2-}$. Reaction suggested to be preceded by Cl–abstraction by H-atom.	89A203
			4.8×10^5 s^{-1}	3.0-4.4			f.p.	P.b.k. at 435 nm in soln. contg. 4.0×10^{-5} mol L^{-1} $PtCl_6^{2-}$. Reaction suggested to be preceded by rapid hydration of $PtCl_5^{2-}$.	89A203

TABLE 19. Rate constants for platinum transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
19.29	**Aquatetrachlorohydroxyplatinate(III) ion**							
19.29.1	**First-order reaction**							
	* $PtCl_4(H_2O)(OH)^{2-} \rightarrow PtCl_2(OH)_2^- + H^+ + 2\ Cl^-$	1.5×10^5 s^{-1}	2.2-2.6		20-28	p.r.	P.b.k. at 410-470 nm in Ar-satd. soln. contg. 0.11 mol L^{-1} *tert*-BuOH and (1-2) $\times 10^{-4}$ mol L^{-1} $PtCl_6^{2-}$; condy. increase gave $k = 1.3 \times 10^5$ s^{-1}.	89A203
		1.4×10^5 s^{-1}	2.0-4.5		20-28	f.p.	P.b.k. at 400-480 nm in Ar-satd. soln. contg. (1-8) $\times 10^{-5}$ mol L^{-1} $PtCl_6^{2-}$; condy. increase gave $k = 1.7 \times 10^5$ s^{-1}.	89A203
		1.4×10^5 s^{-1}	3.4-4.6		20-28	p.r.	P.b.k. at 259-470 nm in N_2O-satd. soln. contg. (8.5-51) $\times 10^{-5}$ mol L^{-1} $PtCl_4^{2-}$; condy. increase gave $k = 1.4 \times 10^5$ s^{-1}; $k = 1.2 \times 10^5$ s^{-1} at pH 9 (1×10^5 s^{-1} by condy.); $k = 4 \times 10^4$ s^{-1} at pH 10; $k = 1.2 \times 10^4$ s^{-1} at pH 11.1; in alkaline soln. transient could be $PtCl_4(OH)_2^{3-}$.	89A203
		1.1×10^5 s^{-1}	4.0-5.1		20-28	p.r.	P.b.k. at 369-480 nm in Ar-satd. soln. contg. 0.11 mol L^{-1} *tert*-BuOH and (1-4) $\times 10^{-4}$ mol L^{-1} $PtCl_6^{2-}$; condy. increase gave $k = 1.1 \times 10^5$ s^{-1}. * For a different interpretation of this process and structure of the reactant see the following entry.	89A203
19.30	**Tetrachlorohydroxyplatinate(III)**							
19.30.1	**Water**							
	* $PtCl_4(OH)^{2-} + H_2O \rightarrow PtCl_4(OH)_2^{3-} + H^+$	1.6×10^5 s^{-1}	5-9			p.r.	P.b.k. at 410 nm, d.k. at 450 nm and condy. increase (in acidic soln.) and decrease (in alkaline soln.) in N_2O-satd. soln. contg. ~1×10^4 mol L^{-1} $PtCl_4^{2-}$. * For a different interpretation of this process and structure of the reactant see the previous entry.	89A250
19.31	**Dichlorobis(hydroxy)platinate(III) ion**							
19.31.1	**Ferrocyanide ion**							
	$PtCl_2(OH)_2^- + Fe(CN)_6^{4-} \rightarrow$	8.2×10^5	5.8-6.0	$\rightarrow 0$	20-28	p.r.	D.k. at 410 nm in N_2O-satd. soln. contg. 5×10^{-4} mol L^{-1} $PtCl_4^{2-}$ and (2.5-5.0) $\times 10^{-5}$ mol L^{-1} $Fe(CN)_6^{4-}$.	89A203
19.32	**Tetrabromo(hydroxy)platinate(III) ion**							
19.32.1	**Water**							
	$PtBr_4(OH)^{2-} + H_2O \rightarrow PtBr_4(OH)_2^{3-} + H^+$	1.0×10^5 s^{-1}				p.r.	D.k. at 530 nm, p.b.k. at 420 nm and condy. change at pH 3.7 and 8.5 and 21 °C, in N_2O-satd. soln. contg. 1×10^{-4} mol L^{-1} $PtBr_4^{2-}$.	92A259
19.33	**Hexabromoplatinate(III) ion**							
19.33.1	**Water**							
	$PtBr_6^{3-} + H_2O \rightarrow PtBr_5(OH)^{3-} + H^+ + Br^-$	3.7×10^4 s^{-1}				p.r.	D.k. at 540 nm and p.b.k. at 440 nm in Ar-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH and 0.001 mol L^{-1} $PtBr_6^{2-}$ and condy. change in Ar-satd. soln. contg. 1×10^{-4} mol L^{-1} $PtBr_6^{2-}$ at pH 4.0 and 9.25.	92A259

TABLE 19. Rate constants for platinum transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
19.34	**Bis(ethylenediamine)platinum(II), $Cl_2^{\cdot-}$ reaction product**							
19.34.1	**First-order reaction**							
	$Pt(en)_2^{2+}/Cl_2^{\cdot-} \rightarrow$	1.3×10^3 s^{-1}	0.3		~25	p.r.	D.k. in deaerated soln. contg. $Pt(en)_2^{2+}$ and 0.5 mol L^{-1} HCl; followed by another first-order reaction, $k = 7.7$ s^{-1}.	751188
19.34.2	**Copper(II) ion**							
	$Pt(en)_2^{2+}/Cl_2^{\cdot-} + Cu(II) \rightarrow$	2×10^8	0.3	0.5	~25	p.r.	D.k. in deaerated soln. contg. (1-2) × 10^{-4} mol L^{-1} $Pt(en)_2^{2+}$, 0.5 mol L^{-1} HCl and (5-12) × 10^{-5} mol L^{-1} $CuCl_2$.	751188
19.34.3	**Iron(II) ions**							
	$Pt(en)_2^{2+}/Cl_2^{\cdot-} + Fe(II) \rightarrow$	2.5×10^5	0.3	0.5	~25	p.r.	D.k. in deaerated soln. contg. (1-2) × 10^{-4} mol L^{-1} $Pt(en)_2^{2+}$, 0.5 mol L^{-1} HCl and 6.1×10^{-4} mol L^{-1} $FeCl_2$.	751188
19.35	**Chlorobis(ethylenediamine)platinum(III) ion**							
19.35.1	**Chlorobis(ethylenediamine)platinum(III) ion**							
	$Pt(en)_2Cl^{2+} + Pt(en)_2Cl^{2+} \rightarrow$	1.8×10^7	3.3		23	p.r.	D.k. at 260 nm and condy. increase in N_2O-satd. soln. contg. 1×10^{-4} mol L^{-1} $Pt(en)_2^{2+}$ and (1-2) × 10^{-5} mol L^{-1} Cl^-.	80A286
		2.5×10^7	3.4			p.r.	D.k. in N_2O-satd. soln. contg. $Pt(en)_2^{2+}$ and 10^{-5} mol L^{-1} Cl^-.	80A286
		2.1×10^7	2.0			f.p.	D.k. in soln. contg. $Pt(en)_2Cl_2^{2+}$, (0-1) × 10^{-5} mol L^{-1} Cl^- and 0-0.5 mol L^{-1} *tert*-BuOH.	80A286
		2.2×10^7	2		~25	p.r.	D.k. at 260-300 nm in soln. contg. (8-20) × 10^{-4} mol L^{-1} *trans*-$Pt(en)_2Cl_2^{2+}$, 0.01 mol L^{-1} $HClO_4$ and 0.11-2 mol L^{-1} *tert*-BuOH.	751188
19.35.2	**Copper(II) ion**							
	$Pt(en)_2Cl^{2+} + Cu(II) \rightarrow$	2.7×10^5	2.1			p.r.	D.k. at 260 and 280 nm in N_2O-satd. soln. contg. (1.83-9.86) × 10^{-4} mol L^{-1} $Pt(en)_2^{2+}$, 5 × 10^{-6} mol L^{-1} Cl^- and 1.3 or 2.25 × 10^{-4} mol L^{-1} Cu^{2+}. Mechanism of reaction may be complex as the rate constants were appreciably higher (25-50%) at the lower [Cu(II)] employed.	761093
		3.2×10^5	2.0			f.p.	D.k. at 260-280 nm in N_2O-satd. soln. contg. (0.85-1.28) × 10^{-4} mol L^{-1} $Pt(en)_2Cl_2^{2+}$, 1 or 2 × 10^{-4} mol L^{-1} Cu^{2+} and 0.5 mol L^{-1} *tert*-BuOH. Mechanism of reaction may be complex as the rate constants were appreciably higher (25-50%) at the lower [Cu(II)] employed.	761093
19.36	**quabis(ethylenediamine)hydroxyplatinum(III) ion**							
19.36.	**First-order reaction**							
	$Pt(en)_2(H_2O)(OH)^{2+} \rightarrow Pt(en)(en\text{-}H)^{2+} + 2\,H_2O$	3×10^5 s^{-1}	<4.5		~23	p.r.	D.k. at 260 nm, p.b.k. at 340 nm and condy. change in N_2O-satd. soln. contg. $Pt(en)_2^{2+}$.	80A286
		2.5×10^5 s^{-1}	4.0-9.6			p.r.	D.k. in N_2O-satd. soln. contg. (2.5-5.1) × 10^{-4} mol L^{-1} $Pt(en)_2^{2+}$; average of two values obtained as intercepts from plots of k_{obs} vs $[H^+]$ and $[OH^-]$, respectively.	761093
19.36.2	**Hydroxide ion**							
	$Pt(en)_2(H_2O)(OH)^{2+} + OH^- \rightarrow Pt(en)(en\text{-}H)^{2+} + 2\,H_2O + OH^-$	3.1×10^{10}	7.0-9.6			p.r.	Effect of $[OH^-]$ on d.k. in N_2O-satd. soln. contg. (2.5-5.1) × 10^{-4} mol L^{-1} $Pt(en)_2^{2+}$.	80A286 761093

TABLE 19. Rate constants for platinum transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
19.36	**Aquabis(ethylenediamine)hydroxyplatinum(III) ion** — Continued							
19.36.3	**Hydrogen ion**							
	$Pt(en)_2(H_2O)(OH)^{2+} + H^+ \rightarrow Pt(en)_2(H_2O)_2^{3+}$	4.2×10^9	4.0-7.0			p.r.	D.k. in N_2O-satd. soln. contg. (2.5-5.0) × 10^{-4} mol L^{-1} $Pt(en)_2^{2+}$; $k_r = 6.6 \times 10^2$ s^{-1}.	80A286 761093
		5.4×10^9	<4.5		~23	p.r.	D.k. at 260 nm, p.b.k. at 340 nm and condy change in N_2O-satd. soln. contg. $Pt(en)_2^{2+}$.	80A286
19.37	**Bis(ethylenediamine)platinum(III) ion, deprotonated**							
19.37.1	**Bis(ethylenediamine)platinum(III) ion, deprotonated**							
	$Pt(en)(en\text{-}H)^{2+} + Pt(en)(en\text{-}H)^{2+} \rightarrow$	8.0×10^5	4.4-10.5		~23	p.r.	D.k. or condy. change (pH 8.9-10.5) in N_2O-satd. soln. contg. $Pt(en)_2^{2+}$.	80A286
		7.5×10^5	2.9-8.5			p.r.	D.k. at 330-480 nm in N_2O-satd. soln. contg. (1.83-9.86) × 10^{-4} mol L^{-1} $Pt(en)_2^{2+}$ and (0-2) × 10^{-3} mol L^{-1} Cl^-.	761093
19.37.2	**Copper(II) ion**							
	$Pt(en)(en\text{-}H)^{2+} + Cu(II) \rightarrow$	$<10^4$	6.3-6.6			p.r.	D.k. at 480 nm in N_2O-satd. soln. contg. (1.83-9.86) × 10^{-4} mol L^{-1} $Pt(en)_2^{2+}$ and 1.6×10^{-4} mol L^{-1} Cu^{2+}.	761093
19.37.3	**Ferrocyanide ion**							
	$Pt(en)(en\text{-}H)^{2+} + Fe(CN)_6^{4-} \rightarrow$	2.3×10^8	6.3-6.6			p.r.	D.k. at 480 nm in N_2O-satd. soln. contg. (1.83-9.86) × 10^{-4} mol L^{-1} $Pt(en)_2^{2+}$ and 2.4×10^{-5} mol L^{-1} $Fe(CN)_6^{4-}$; formation of $Fe(CN)_6^{3-}$ observed.	761093
19.37.4	**Oxygen**							
	$Pt(en)(en\text{-}H)^{2+} + O_2 \rightarrow$	$<10^5$	6.3-6.6			p.r.	D.k. at 340 and 480 nm in N_2O-satd. soln. contg. (1.83-9.86) × 10^{-4} mol L^{-1} $Pt(en)_2^{2+}$ and 1.8×10^{-4} mol L^{-1} O_2.	761093
19.37.5	**1-Hydroxy-1-methylethyl**							
	$Pt(en)(en\text{-}H)^{2+} + (CH_3)_2\dot{C}OH \rightarrow$	6.5×10^9	4.5,8.5		~23	p.r.	D.k. at 340 and 480 nm in deaerated soln. contg. $Pt(en)_2(OH)_2^{2+}$ and 2-PrOH. Value obtained from computer fit. Rate constants independent of concentrations of complex and alcohol.	80A286
19.37.6	**2-Hydroxy-2,2-dimethylethyl**							
	$Pt(en)(en\text{-}H)^{2+} + {}^{\cdot}CH_2C(CH_3)_2OH \rightarrow$	4×10^9	4.5,8.5		~23	p.r.	D.k. at 340 and 480 nm in deaerated soln. contg. $Pt(en)_2(OH)_2^{2+}$ and *tert*-BuOH. Value obtained from computer fit. Rate constants independent of concentrations of complex and alcohol.	80A286
19.38	**Diaquabis(ethylenediamine)platinum(III) ion**							
19.38.1	**Chloride ion**							
	$Pt(en)_2(H_2O)_2^{3+} + Cl^- \rightarrow Pt(en)_2(H_2O)Cl^{2+} + H_2O$	$\sim 3 \times 10^8$	3.3			p.r.	P.b.k. at 260 nm and condy. change in N_2O-satd. soln. contg. 1×10^{-4} mol L^{-1} $Pt(en)_2^{2+}$ and 1 or 2×10^{-5} mol L^{-1} Cl^-; $k_r \sim 10^3$ s^{-1}.	80A286
19.39	**Chloro(diethylenetriamine)platinum(II), $Cl_2^{\cdot-}$ reaction product**							
19.39.1	**Copper(II) ions**							
	$Pt(dien)Cl^+/Cl_2^{\cdot-} + Cu(II) \rightarrow$	3.2×10^8	0.3		~25	p.r.	D.k. in deaerated soln. contg. $Pt(dien)Cl^+$, 0.5 mol L^{-1} HCl and (0.5-1.2) × 10^{-4} mol L^{-1} $CuCl_2$.	751188

TABLE 19. Rate constants for platinum transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
19.39	**Chloro(diethylenetriamine)platinum(II), $Cl_2^{\bullet-}$ reaction product — Continued**							
19.39.2	**Chloro(diethylenetriamine)platinum(II), $Cl_2^{\bullet-}$ reaction product**							
	$Pt(dien)Cl^+/Cl_2^{\bullet-} + Pt(dien)Cl^+/Cl_2^{\bullet-}$	3.4×10^8	0.3		~25	p.r.	D.k. in deaerated soln. contg. $Pt(dien)Cl^+$, 0.5 mol L^{-1} HCl and 0.1-0.2 mol L^{-1} 2-PrOH; unclear whether k or $2k$.	751188
19.40	**Chloro(diethylenetriamine)platinum(II), OH reaction product**							
19.40.1	**First-order reaction**							
	$^{Pt}(dien)Cl^+/OH \rightarrow$	4.8×10^3 s^{-1}				p.r.	D.k. at 270 nm in N_2O-satd. soln. contg. 1.1×10^{-4} mol L^{-1} $Pt(dien)Cl^+$; followed by an intermediate complex decay and by a second-order decay with $k = 3.8 \times 10^4$ L mol^{-1} s^{-1}.	761093
19.41	**Diethylenetriamine(pyridine)platinum(II) ion OH-adduct**							
19.41.1	**First-order reaction**							
	$[Pt(dien)pyOH]^{\bullet 2+} \rightarrow$	1.5×10^5 s^{-1}	3.5-9.7			p.r.	D.k. at 280 nm in N_2O-satd. soln. contg. $(2\text{-}25) \times 10^{-5}$ mol L^{-1} $Pt(dien)py^{2+}$	78A363
19.41.2	**Diethylenetriamine(pyridine)platinum(II) ion**							
	$[Pt(dien)pyOH]^{\bullet 2+} + Pt(dien)py^{2+} \rightarrow$	$\sim 3 \times 10^9$	3.5-9.7			p.r.	D.k. at 280 nm in N_2O-satd. soln. contg. $(2\text{-}25) \times 10^{-5}$ mol L^{-1} $Pt(dien)py^{2+}$.	78A363
19.42	**Chloro(tetraethyldiethylenetriamine)platinum(II), $Cl_2^{\bullet-}$ reaction product**							
19.42.1	**Copper(II) ions**							
	$Pt(Et_4dien)Cl^+/Cl_2^{\bullet-} + Cu(II) \rightarrow$	1.5×10^7	0.3		~25	p.r.	D.k. in soln. contg. $(1\text{-}2) \times 10^{-4}$ mol L^{-1} $Pt(Et_4dien)Cl^+$, $(0.5\text{-}1.2) \times 10^{-4}$ mol L^{-1} $CuCl_2$ and 0.5 mol L^{-1} HCl.	751188
19.42.2	**Chloro(tetraethyldiethylenetriamine)platinum(II), $Cl_2^{\bullet-}$ reaction product**							
	$Pt(Et_4dien)Cl^+/Cl_2^{\bullet-} + Pt(Et_4dien)Cl^+/Cl_2^{\bullet-} \rightarrow$	$\sim 4 \times 10^5$	0.3		~25	p.r.	D.k. in soln. contg. $Pt(Et_4dien)Cl^+$, 0.1-0.2 mol L^{-1} 2-PrOH and 0.5 mol L^{-1} HCl; unclear whether k or $2k$.	751188
19.43	**Chloro(tetraethyldiethylenetriamine)platinum(II), OH reaction product**							
19.43.1	**First-order reaction**							
	$Pt(Et_4dien)Cl^+/OH \rightarrow$	1.8 s^{-1}			~25	p.r.	D.k. at 280 and 360 nm and p.b.k. at 520 nm in N_2O-satd. soln. contg. 1.87 or 3.74 $\times 10^{-4}$ mol L^{-1} $Pt(Et_4dien)Cl^+$; preceded by other undefined processes.	761093
19.44	**1,8-Diamino-3,6,10,13,16.19-hexaazabicyclo[6.6.6]eicosaneplatinum(III) ion**							
19.44.1	**First-order reaction**							
	$Pt(diamsar)^{3+} \rightarrow$	6×10^3 s^{-1}	6.8,10			p.r.	D.k. at 390 nm in He-satd. soln. contg. $Pt(diamsar)^{4+}$ and 0.1 mol L^{-1} *tert*-BuOH.	83A148
19.45	***cis*-Bis(glycinato)platinum(II), OH reaction product**							
19.45.1	**First-order reaction**							
	cis-$Pt(Gly)_2/OH \rightarrow$	1.1×10^3 s^{-1}	2.9		~25	p.r.	Absorbance changes at 250-260 and 340-390 nm in N_2O-satd. soln. contg. 2.5×10^{-4} mol L^{-1} *cis*-$Pt(Gly)_2$; subsequent changes at 290-330 and 400-420 nm gave $k = 4.2 \times 10^2$ s^{-1}.	771053

TABLE 19. Rate constants for platinum transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
19.45	***cis*-Bis(glycinato)platinum(II), OH reaction product** — Continued							
19.45.1	**First-order reaction** — Continued							
		2.2×10^6 s^{-1}	5.7-10		~25	p.r.	P.b.k. at 305-520 nm in N_2O-satd soln. contg. (2.4-4.35) $\times 10^{-4}$ mol L^{-1} *cis*-Pt(Gly)$_2$. At pH 10, $k = 7.2 \times 10^4$ s^{-1} from d.k. at 270-300 nm in soln. contg. 1.9×10^{-4} mol L^{-1} *cis*-Pt(gly)$_2$. At pH 4.8-10, $k = 2.0 \times 10^4$ L mol^{-1} s^{-1} from d.k. at 310-540 nm in soln. contg. (0.8-9.4) $\times 10^{-4}$ mol L^{-1} *cis*-Pt(gly)$_2$.	771053
19.45.2	**Copper(II) ion**							
	cis-Pt(Gly)$_2$/OH + Cu(II) →	1.7×10^7	3.0		~25	p.r.	P.b.k. at 360 and 520 nm in N_2O-satd. soln. contg. (1.09-3.08) $\times 10^{-4}$ mol L^{-1} *cis*-Pt(Gly)$_2$ and 1.2 or 3.4×10^{-4} mol L^{-1} Cu(ClO$_4$)$_2$.	771053
19.45.3	**Ferrocyanide ion**							
	cis-Pt(Gly)$_2$/OH + Fe(CN)$_6^{4-}$ →	3.7×10^9	2.9		~25	p.r.	D.k. at 260 and 270 nm and p.b.k. at 340-430 nm in N_2O-satd. soln. contg. (1.09-3.08) $\times 10^{-4}$ mol L^{-1} *cis*-Pt(Gly)$_2$ and 1.2 or 1.7×10^{-5} mol L^{-1} K$_4$Fe(CN)$_6$; variation of k with wavelength indicates some complexity.	771053
		3.0×10^8			~25	p.r.	P.b.k. at 340-520 nm in N_2O-satd. soln. contg. (1.09-3.08) $\times 10^{-4}$ mol L^{-1} *cis*-Pt(Gly)$_2$ and 3.2 or 9.1×10^{-5} mol L^{-1} K$_4$Fe(CN)$_6$; kinetics could be fitted to two consecutive reactions, the second with $k = 3.7 \times 10^7$ L mol^{-1} s^{-1}.	771053
19.46	***trans*-Bis(glycinato)platinum(II), OH reaction product**							
19.46.1	**First-order reaction**							
	trans-Pt(Gly)$_2$/OH →	1.9×10^3 s^{-1}	2.9,3.0		~25	p.r.	Absorbance changes at 250-280 and 300-630 nm in N_2O-satd. soln. contg. (0.88 or 1.29) $\times 10^{-4}$ mol L^{-1} *trans*-Pt(Gly)$_2$. At pH 3.6, $k = 3.2 \times 10^3$ s^{-1} for 1.46×10^{-4} mol L^{-1} *trans*-Pt(Gly)$_2$; at pH 4.1, $k = 4.1 \times 10^3$ s^{-1} for 2.5×10^{-4} mol L^{-1} *trans*-Pt(Gly)$_2$. At pH 3-4.1 subsequent changes at 260-310 nm gave $k = 2.4 \times 10^2$ s^{-1} for (0.88-2.5) $\times 10^{-4}$ mol L^{-1} *trans*-Pt(Gly)$_2$. At pH 2.9-4.3, $k = 3.5 \times 10^5$ L mol^{-1} s^{-1} in soln. contg. (0.57-2.5) $\times 10^{-4}$ mol L^{-1} *trans*-Pt(Gly)$_2$. At pH ~5.7 and 6.3, $k = 1.6 \times 10^9$ L mol^{-1} s^{-1} in soln. contg. (0.97-2.16) $\times 10^{-4}$ mol L^{-1} *trans*-Pt(Gly)$_2$. At pH 10, $k = \sim 9 \times 10^5$ s^{-1} from changes at 320-480 nm and $k = \sim 1 \times 10^5$ s^{-1} from changes at 250-480 nm in soln. contg. (0.46-1.02) $\times 10^{-4}$ mol L^{-1} *trans*-Pt(Gly)$_2$. At pH 9 and ~10, $k = 6.5 \times 10^8$ L mol^{-1} s^{-1} from changes at 300-520 nm in soln. contg. (0.46-1.97) $\times 10^{-4}$ mol L^{-1} *trans*-Pt(Gly)$_2$.	771053
19.46.2	**Copper(II) ion**							
	trans-Pt(Gly)$_2$/OH + Cu(II) →	4.2×10^3	2.9		~25	p.r.	D.k. at 260 nm in N_2O-satd. soln. contg. (1.09-3.08) $\times 10^{-4}$ mol L^{-1} *trans*-Pt(Gly)$_2$ and 0.82 or 1.47×10^{-4} mol L^{-1} Cu(ClO$_4$)$_2$; species involved represents second transient.	771053

TABLE 19. Rate constants for platinum transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
19.46	***trans*-Bis(glycinato)platinum(II), OH reaction product** — Continued							
19.46.3	**Copper(II) ions**							
	trans-Pt(Gly)$_2$/OH + Cu(II) →	9.9×10^6	10.0		~25	p.r.	P.b.k. at 370 nm in N_2O-satd. soln. contg. (1.09-3.08) × 10^{-4} mol L^{-1} *trans*-Pt(Gly)$_2$ and 0.58 or 2.42 × 10^{-4} mol L^{-1} $Cu(ClO_4)_2$.	771053
19.46.4	**Ferrocyanide ion**							
	trans-Pt(Gly)$_2$/OH + $Fe(CN)_6^{4-}$ →	2.5×10^9	3.3		~25	p.r.	D.k. at 270-300 nm and p.b.k. at 320-440 nm in N_2O-satd. soln. contg. (1.09-3.08) × 10^{-4} mol L^{-1} *trans*-Pt(Gly)$_2$ and 1.0 or 3.3 × 10^{-5} mol L^{-1} $K_4Fe(CN)_6$.	771053
		3.8×10^9	8.4		~25	p.r.	D.k. at 260-280 nm in N_2O-satd. soln. contg. (1.09-3.08) × 10^{-4} mol L^{-1} *trans*-Pt(Gly)$_2$ and 2.2 × 10^{-5} mol L^{-1} $K_4Fe(CN)_6$.	771053
19.47	**Octahydrogen tetrakis(μ-diphosphito)diplatinate(II)(III) ic**							
19.47.1	**Octahydrogen tetrakis(μ-diphosphito)diplatinate(II)(III) ion**							
	$[Pt_2(P_2O_5H_2^{2-})_4]^{3-}$ + $[Pt_2(P_2O_5H_2^{2-})_4]^{3-}$ →	6.7×10^8				p.r.	D.k. at 310 nm in N_2O-satd. soln. contg. $[Pt_2(P_2O_5^{2-})_4]^{4-}$; unclear whether k or $2k$.	86A578
19.47.2	**1,1'-Bis(2-sulfonatoethyl)-4,4'-bipyridinium radical anion**							
	$[Pt_2(P_2O_5H_2^{2-})_4]^{3-}$ + $[SEV]^{\cdot-}$ → $[Pt_2(P_2O_5H_2)_4]^{4-}$ + SEV	1×10^9			25	f.p./oq	D.k. in soln. contg. ~1 × 10^{-4} mol L^{-1} $[Pt_2(P_2O_5^{2-})_4]^{4-}$ and SEV (OQ).	81A344
19.47.3	**1,1'-Bis(3-sulfonatopropyl)-4,4'-bipyridinium radical anion**							
	$[Pt_2(P_2O_5H_2^{2-})_4]^{3-}$ + $[SPV]^{\cdot-}$ → $[Pt_2(P_2O_5H_2)_4]^{4-}$ + SPV	1.6×10^9				f.p./oq	D.k. at 600 nm in soln. contg. 2.7 × 10^{-5} mol L^{-1} $[Pt_2(P_2O_5^{2-})_4]^{4-}$ and 5 × 10^{-4} mol L^{-1} SPV (OQ).	85A161
19.48	***cis*-[Dichlorobis(1-(2-hydroxyethyl)-2-methyl-5-nitroimidazole-N^3)]platinum(III) ion**							
19.48.1	**Water**							
	$A_2Pt^{III}Cl_2^+ + H_2O \rightarrow A_2Pt^{III}(H_2O)Cl^{2+} + Cl^-$	7.1×10^4 s^{-1}				p.r.	D.k. in N_2O-satd. soln. contg. $A_2Pt^{II}Cl_2$; for loss of second Cl^-, k = 820 s^{-1}. Subsequent second-order decay (k = 5 × 10^7 L mol^{-1} s^{-1}) may represent disproportionation of product.	85A090
19.49	***cis*-Dichlorobis(isopropylamine)-*trans*-dihydroxyplatinum(IV), OH reaction product**							
19.49.1	**Water**							
	$PtCl_2(OH)_2(2\text{-}PrNH_2)_2/OH + H_2O \rightarrow Pt(H_2O)Cl(OH)_2(2\text{-}PrNH_2)_2^{2+} + Cl^-$	1.1×10^3 s^{-1}				p.r.	D.k. in N_2O-satd. soln. contg. 2.5 × 10^{-4} mol L^{-1} complex; for loss of second Cl^-, k = 20 s^{-1}. Subsequent slower decay (k < 10^5 L mol^{-1} s^{-1}) may represent disproportionation of product.	85A090

TABLE 20. Rate constants for rhenium transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
20.1	**Rhenate(VI) ion**							
20.1.1	**Rhenate(VI) ion**							
	$ReO_4^{2-} + ReO_4^{2-} \rightarrow$	1.7×10^9	7			p.r.	D.k. at 290 nm in N_2-satd. soln. contg. 0.1 mol L^{-1} *tert*-BuOH and ReO_4^-.	85A234

TABLE 21. Rate constants for rhodium transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
21.1	**Chlorotris[3-(diphenylphosphino)benzenesulfonato]rhodate(0) ion**							
21.1.1	**Hydrogen ion**							
	$RhCl(dpm)_3^{4-} + H^+ \rightarrow RhCl(H)(dpm)_3^{3-}$	6.0×10^9	5			p.r.	Ar-satd. soln. contg. 0.12 mol L^{-1} $RhCl(dpm)_3^{3-}$, 0.2 mol L^{-1} *tert*-BuOH and 0.02 mol L^{-1} phosphate.	87F040
21.2	**η^5-Pentamethylcyclopentadienyl(2,2'-bipyridine)rhodium(I) ion**							
21.2.1	**Hydrogen ion**							
	$(C_5Me_5)Rh^{I}(bpy) + H^+ \rightarrow (C_5Me_5)Rh^{III}H(bpy)^+$	1.6×10^6	acid			p.r.	Soln. contg. 5% 2-PrOH and $(C_5Me_5)Rh^{III}(bpy)L^+$ (L = I^- or OH^-).	87N149
21.3	**Tris(2,2'-bipyridine)rhodium(I) ion**							
21.3.1	**First-order reaction**							
	$Rh(bpy)_3^+ \rightarrow Rh(bpy)_2^+ + bpy$	5.0×10^4 s^{-1}				p.r.	*P.b.k. at 500 nm in soln. contg. 10^{-3} mol* L^{-1} $Rh(bpy)_3^{3+}$ and 0.1 mol L^{-1} 2-PrOH.	*83A046*
21.4	**Tetrakis[μ-(1,3-diisocyanopropane)]dirhodium(I)(II) ion**							
21.4.1	**Tetrakis[μ-(1,3-diisocyanopropane)]dirhodium(I)(II) ion**							
	$Rh_2(1,3\text{-diisocyanopropane})_4^{3+} + Rh_2(1,3\text{-diisocyanopropane})_4^{3+} \rightarrow [Rh_2(1,3\text{-diisocyanopropane})_4]_2^{6+}$	1.7×10^7 4×10^5	0.3	→0	25	f.p.	D.k. in soln. contg. (1-10) × 10^{-6} mol L^{-1} $[Rh_2(1,3\text{-diisocyanopropane})_4]_2^{6+}$ and 1 *N* H_2SO_4.	79A167
21.4.2	**Sulfatoiron(III) ion**							
	$Rh_2(1,3\text{-diisocyanopropane})_4^{3+} + FeSO_4^+ \rightarrow$	6.9×10^4	0.3		25	f.p.	D.k. at 440 and 700 nm in soln. contg. $[Rh_2(1,3\text{-diisocyanopropane})_4]_2^{6+}$, (0-7) × 10^{-4} mol L^{-1} $FeSO_4^+$ and 1 *N* H_2SO_4.	79A167
21.5	**η^5-Pentamethylcyclopentadienyl(2,2'-bipyridine)(hydroxy)rhodium(II) ion**							
21.5.1	**η^5-Pentamethylcyclopentadienyl(2,2'-bipyridine)(hydroxy)rhodium(II) ion**							
	$(C_5Me_5)Rh^{II}(bpy)(OH) + (C_5Me_5)Rh^{II}(bpy)(OH) \rightarrow (C_5Me_5)Rh^{I}(bpy) + (C_5Me_5)Rh^{III}(bpy)(OH)^+ + OH^-$	1.6×10^4 s^{-1}				p.r.	Soln. contg. 5% 2-PrOH and $(C_5Me_5)Rh^{III}(bpy)(OH)^+$; reaction between first- and second-order; *k* may represent ligand loss followed by rapid disproportionation.	87N149
21.6	**η^5-Pentamethylcyclopentadienyl(2,2'-bipyridine)(iodo)rhodium(II) ion**							
21.6.1	**η^5-Pentamethylcyclopentadienyl(2,2'-bipyridine)(iodo)rhodium(II) ion**							
	$(C_5Me_5)Rh^{II}(bpy)(I) + (C_5Me_5)Rh^{II}(bpy)(I) \rightarrow (C_5Me_5)Rh^{I}(bpy) + (C_5Me_5)Rh^{III}(bpy)(I)^+ + I^-$	1.6×10^3 s^{-1}				p.r.	Soln. contg. 5% 2-PrOH and $(C_5Me_5)Rh^{III}(bpy)(I)^+$; reaction between first- and second-order; *k* may represent ligand loss followed by rapid disproportionation.	87N149
21.7	**Aquatriamminerhodium(II) ion**							
21.7.1	**Water**							
	$Rh(NH_3)_3H_2O^{2+} + H_2O \rightarrow Rh(NH_3)_2(H_2O)_2^{2+} + NH_3$	40 s^{-1}	4			p.r.	Condy. change from $NH_3 + H^+ \rightarrow NH_4^+$ in Ar-satd. soln. contg. 0.5 mol L^{-1} *tert*-BuOH and 10^{-3} mol L^{-1} $Rh(NH_3)_5Cl^{2+}$ or $Rh(NH_3)_5H_2O^{3+}$.	751128
21.8	**Tetraamminerhodium(II) ion**							
21.8.1	**Water**							
	$Rh(NH_3)_4^{2+} + H_2O \rightarrow Rh(NH_3)_3H_2O^{2+} + NH_3$	3.5×10^2 s^{-1}	4			p.r.	Condy. change from $NH_3 + H^+ \rightarrow NH_4^+$ in Ar-satd. soln. contg. 0.5 mol L^{-1} *tert*-BuOH and 10^{-3} mol L^{-1} $Rh(NH_3)_5Cl^{2+}$ or $Rh(NH_3)_5H_2O^{3+}$.	751128

TABLE 21. Rate constants for rhodium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
21.8	**Tetraamminerhodium(II) ion** — Continued							
21.8.2	**Oxygen**							
	$Rh(NH_3)_4^{2+} + O_2 \rightarrow Rh(NH_3)_4O_2^{2+}$	3.1×10^8	4			p.r.	P.b.k. at 260 nm in soln. contg. 0.5 mol L^{-1} *tert*-BuOH, 10^{-3} mol L^{-1} $Rh(NH_3)_5H_2O^{3+}$ and various [O_2].	751128
21.8.3	**Tetraamminedibromorhodium(III) ion**							
	$Rh(NH_3)_4^{2+} + Rh(NH_3)_4Br_2^{+} \rightarrow Rh(NH_3)_4^{3+} + Rh(NH_3)_4Br_2$	$\sim 1.4 \times 10^6$	4			p.r.	Estd. from condy. increase in Ar-satd. soln. contg. 0.5 mol L^{-1} *tert*-BuOH and 10^{-3} mol L^{-1} $Rh(NH_3)_4Br_2^{+}$.	751128
21.8.4	**Tetraamminenodium(II) ion**							
	$Rh(NH_3)_4^{2+} + Rh(NH_3)_4^{2+} \rightarrow Rh(NH_3)_4^{+} + Rh(NH_3)_4^{3+}$	$\sim 6 \times 10^6$	4			p.r.	Estd. from dependence of chain length in the $Rh(NH_3)_4^{2+} + Rh(NH_3)_4Br_2^{+}$ reaction on dose rate in Ar-satd. soln.	751128
21.9	**1,3,6,8,10,13,16,19-Octaazabicyclo[6.6.6]eicosanerhodium(II) ion**							
21.9.1	**First-order reaction**							
	$Rh(sep)^{2+} \rightarrow Rh(sep)^{3+}$	0.5 s^{-1}	6.9		25	p.r.	D.k. at 340 nm in He-satd. soln. contg. (1-10) $\times 10^{-4}$ mol L^{-1} $Rh(sep)^{3+}$ and 0.02 mol L^{-1} phosphate buffer; reaction could involve reduction of water.	83A298
21.10	**Bis(2,2'-bipyridine)rhodium(II) ion**							
21.10.1	**Bis(2,2'-bipyridine)rhodium(II) ion**							
	$Rh(bpy)_2^{2+} + Rh(bpy)_2^{2+} \rightarrow [Rh(bpy)_2]_2^{4+}$	1.7×10^8	8.9		25	p.r.	Soln. contg. $Rh(bpy)_2(OH)_2^{+}$ and 2-PrOH. Reaction is pH dependent due to different aquated forms involved. The dimer dissociates to $Rh(bpy)_2(OH)_2^{+} + Rh(bpy)_2^{+}$ with $k = 9 \times 10^{-3}$ s^{-1} at 25 °C and $k = 8 \times 10^{-2}$ s^{-1} at 60 °C.	83A046
21.11	**Tris(2,2'-bipyridine)rhodium(II) ion**							
21.11.1	**First-order reaction**							
	$Rh(bpy)_3^{2+} \rightarrow Rh(bpy)_2^{2+} + bpy$	0.3 s^{-1}	5, 8.1			f.p./oq	D.k. in soln. contg. $Ru(bpy)_3^{2+}$, $Rh(bpy)_3^{3+}$(OQ) and EDTA.	87A460
		0.6 s^{-1}	8.8		25	p.r.	Soln. contg. $Rh(bpy)_3^{3+}$, 0.1 mol L^{-1} 2-PrOH and negligible [bpy]; $k = 4.3$ s^{-1} at 50 °C; $k_r = 3 \times 10^8$ L mol^{-1} s^{-1}.	83A046
		0.45 s^{-1}	3-10			p.r.	D.k. and p.b.k. in Ar-purged soln. contg. (2.5-50) $\times 10^{-5}$ mol L^{-1} $Rh(bpy)_3^{3+}$ and 0.1 mol L^{-1} formate ion or 0.1 mol L^{-1} 2-PrOH.	81A134
21.11.2	**Bis(2,2'-bipyridine)rhodium(II) ion**							
	$Rh(bpy)_3^{2+} + Rh(bpy)_2^{2+} \rightarrow Rh(bpy)_3^{3+} + Rh(bpy)_2^{+}$	3×10^8	8.9		25	p.r.	P.b.k. at 510 nm in soln. contg. $Rh(bpy)_3^{3+}$ and $Rh(bpy)_2(OH)_2^{+}$.	83A046
21.11.3	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanesilver(II) ion**							
	$Rh(bpy)_3^{2+} + Ag(aneN_4)^{2+} \rightarrow Rh(bpy)_3^{3+} + Ag(aneN_4)^{+}$	1.3×10^8	4	0.04		p.r		88A334
21.11.4	**Oxygen**							
	$Rh(bpy)_3^{2+} + O_2 \rightarrow Rh(bpy)_3^{3+} + O_2^{\cdot -}$	4.9×10^8	7.3			p.r.	D.k. at 250 nm in N_2O-satd. soln. contg. 2% air, $Rh(bpy)_3^{3+}$ and formate ion.	81A134
21.11.5	**1,1'-Dimethyl-4,4'-bipyridinium**							
	$Rh(bpy)_3^{2+} + MV^{2+} \rightarrow Rh(bpy)_3^{3+} + MV^{\cdot +}$	4×10^8	8.1			f.p./oq	P.b.k. in soln. contg. 3×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 5×10^{-3} mol L^{-1} $Rh(bpy)_3^{3+}$ (OQ), 0.1 mol L^{-1} TEOA and (0.3-3) $\times 10^{-4}$ mol L^{-1} MV^{2+}.	81N003 79A317

TABLE 21. Rate constants for rhodium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
21.12	**η^5-Pentamethylcyclopentadienyl(2,2'-bipyridine)hydridorhodium(III) ion**							
21.12.1	**Hydrogen ion**							
	$(C_5Me_5)Rh^{III}H(bpy)^+ + H^+ \rightarrow H_2 + (C_5Me_5)Rh^{III}(bpy)^{2+}$	1.8×10^3	<2			p.r.	Soln. contg. 5% 2-PrOH and $(C_5Me_5)Rh^{III}(bpy)L^+$ (L = I^- or OH^-). Reaction accompanied by ligand addition to reform $(C_5Me_5)Rh^{III}(bpy)L^+$.	87N149
21.13	**Tetraammine(superoxido)rhodium(III) ion**							
21.13.1	**Tetraammine(hydrido)rhodium(III) ion**							
	$Rh(NH_3)_4O_2^{2+} + Rh(NH_3)_4H^{2+} \rightarrow Rh(NH_3)_4O_2H^{2+} + Rh(NH_3)_4^{2+}$	$<4 \times 10^7$	1			f.p.	P.b.k. at 240 nm in soln. contg. 0.1 mol L^{-1} $HClO_4$ and $Rh(NH_3)_4H^{2+}$; estd. assuming chain reaction involving $k(Rh(NH_4)_4^{2+} + O_2) = 3.1 \times 10^8$ L mol^{-1} s^{-1}.	79A004

TABLE 22. Rate constants for ruthenium transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.1	**Pentaammine(dinitrogen)ruthenium(I) ion**							
22.1.1	**Pentaammine(dinitrogen)ruthenium(I) ion**							
	$Ru(NH_3)_5N_2^+ + Ru(NH_3)_5N_2^+ \rightarrow Ru(NH_3)_5N_2^{2+} + Ru(NH_3)_5N_2$	1.4×10^9			20	p.r.	D.k. in soln. contg. MeOH or *tert*-BuOH and $Ru(NH_3)_5N_2^{2+}$.	710234
22.2	**Bis(2,2′-bipyridine)bis(cyano)ruthenate(II) ion, electron adduct**							
22.2.1	**Bis(2,2′-bipyridine)bis(cyano)ruthenium(III) ion**							
	$Ru(bpy)_2(CN)_2^- + Ru(bpy)_2(CN)_2^+ \rightarrow$	2.0×10^{10}				f.p./pi	D.k. at 540 nm in deaerated soln. contg. 10^{-4} mol L^{-1} $Ru(bpy)_2(CN)_2$.	84A177
22.3	**Tris(2,2′-bipyridine)ruthenium(II) ion, electron adduct**							
22.3.1	**First-order reaction**							
	$Ru(bpy)_3^+ \rightarrow$	0.2 s^{-1}	11-13			p.r.	D.k. in soln. contg. $Ru(bpy)_3^{2+}$; independent of [OH^-], [$Ru(bpy)_3^{2+}$], or nature of the alcohol used to generate the reducing radicals ($^{\cdot}CH_2O^-$, $CH_3\dot{C}HO^-$, or $(CH_3)_2\dot{C}O^-$); radiation dose <2.5 Gy.	78A068
22.3.2	**Cobalt(II) ion**							
	$Ru(bpy)_3^+ + Co^{2+} \rightarrow Ru(bpy)_3^{2+} + Co^+$	$<1 \times 10^4$			25	f.p./rq	Soln. contg. $Ru(bpy)_3^{2+}$, 0.5 mol L^{-1} ascorbate ion (RQ) and 0.5 mol L^{-1} ascorbic acid.	82A278
22.3.3	**Hexaamminecobalt(III) ion**							
	$Ru(bpy)_3^+ + Co(NH_3)_6^{3+} \rightarrow Ru(bpy)_3^{2+} + Co(NH_3)_6^{2+}$	2.7×10^9	0.6	1.0	23	f.p./rq	D.k. at 510 nm in Ar-satd. soln. contg. 0.1 mol L^{-1} Eu^{2+} (RQ), (3-4) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 0.25 mol L^{-1} HCl and (0.36-2.92) × 10^{-4} mol L^{-1} $Co(NH_3)_6^{3+}$.	86A161
		3.5×10^8	11	~10^{-3}		p.r.		84A255
22.3.4	**Tris(ethylenediamine)cobalt(III) ion**							
	$Ru(bpy)_3^+ + Co(en)_3^{3+} \rightarrow Ru(bpy)_3^{2+} + Co(en)_3^{2+}$	2.3×10^9	0.6	1.0	23	f.p./rq	D.k. at 510 nm in Ar-satd. soln. contg. 0.1 mol L^{-1} Eu^{2+} (RQ), (3-4) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 0.25 mol L^{-1} HCl and (0.77-3.54) × 10^{-4} mol L^{-1} $Co(en)_3^{3+}$.	86A161
		3.2×10^8	11	~10^{-3}		p.r.		84A255
22.3.5	**2,2′-Bipyridinecobalt(II) ion**							
	$Ru(bpy)_3^+ + Co(bpy)^{2+} \rightarrow Ru(bpy)_3^{2+} + Co(bpy)^+$	7×10^8	7.3		25	f.p./rq	Soln. contg. $Ru(bpy)_3^{2+}$, 0.1 mol L^{-1} ascorbate ion (RQ) and 0.01 mol L^{-1} phosphate.	82A278
22.3.6	**4,4′-Dimethyl-2,2′-bipyridinecobalt(II) ion**							
	$Ru(bpy)_3^+ + Co(4,4'\text{-}Me_2bpy)^{2+} \rightarrow Ru(bpy)_3^{2+} + Co(4,4'\text{-}Me_2bpy)^+$	3×10^8	7.3		25	f.p./rq	Soln. contg. $Ru(bpy)_3^{2+}$, 0.1 mol L^{-1} ascorbate ion (RQ) and 0.01 mol L^{-1} phosphate.	82A278
22.3.7	**Tris(4,4′-dimethyl-2,2′-bipyridine)cobalt(II) ion**							
	$Ru(bpy)_3^+ + Co(4,4'\text{-}Me_2bpy)_3^{2+} \rightarrow Ru(bpy)_3^{2+} + Co(4,4'\text{-}Me_2bpy)_3^+$	3×10^9	7.3		25	f.p./rq	Soln. contg. $Ru(bpy)_3^{2+}$, 0.1 mol L^{-1} ascorbate ion (RQ) and 0.01 mol L^{-1} phosphate.	82A278
22.3.8	**5,7,7,12,12,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,14-dienecobalt(II) ion**							
	$Ru(bpy)_3^+ + Co(4,14\text{-dieneN}_4)^{2+} \rightarrow Ru(bpy)_3^{2+} + Co(4,14\text{-dieneN}_4)^{3+}$	1.8×10^8			25	f.p./rq	D.k. in soln. contg. $Ru(bpy)_3^{2+}$ and Eu^{2+} (RQ).	79F046

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.3	**Tris(2,2′-bipyridine)ruthenium(II) ion, electron adduct** — Continued							
22.3.9	**1,3,6,8,10,13,16,19-Octaazabicyclo[6.6.6]eicosanecobalt(III) ion**							
	$Ru(bpy)_3^+ + Co(sep)^{3+} \rightarrow Ru(bpy)_3^{2+} + Co(sep)^{2+}$	$>2 \times 10^9$	0.6	1.0	23	f.p./rq	D.k. at 510 nm in Ar-satd. soln. contg. 0.1 mol L^{-1} Eu^{2+} (RQ), (3-4) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 0.25 mol L^{-1} HCl and (0.86-2.85) × 10^{-4} mol L^{-1} $Co(sep)^{3+}$. Lower limit due to reaction of Eu^{2+} with $Co(sep)^{3+}$.	86A161
22.3.10	**Tris(2,2′-bipyridine)cobalt(III) ion**							
	$Ru(bpy)_3^+ + Co(bpy)_3^{3+} \rightarrow Ru(bpy)_3^{2+} + Co(bpy)_3^{2+}$	1.6×10^9	11	~10^{-3}		p.r.	D.k. in soln. contg. $Ru(bpy)_3^{2+}$ and 0.1 mol L^{-1} CH_3OH.	78A068
22.3.11	**Bis(dimethylglyoximato)methylcobalt(III) difluoroborate**							
	$Ru(bpy)_3^+ + CH_3Co((dmg)BF_2)_2 \rightarrow Ru(bpy)_3^{2+} + CH_3Co((dmg)BF_2)_2^-$	3.2×10^9	0.6	1.0	23	f.p./rq	D.k. at 510 nm in Ar-satd. soln. contg. 0.12 mol L^{-1} ascorbate (RQ), (3-4) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 0.25 mol L^{-1} HCl and (0.14-0.97) × 10^{-4} mol L^{-1} $CH_3Co((dmg)BF_2)_2$.	86A161
22.3.12	**Chromium(III) ion**							
	$Ru(bpy)_3^+ + Cr^{3+} \rightarrow Ru(bpy)_3^{2+} + Cr^{2+}$	4.6×10^6	0.6	1.0	23	f.p./rq	D.k. at 510 nm in Ar-satd. soln. contg. 0.1 mol L^{-1} Eu^{2+} (RQ), (3-4) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 0.25 mol L^{-1} HCl and (2.8-45) × 10^{-4} mol L^{-1} $CrCl_3$.	86A161
22.3.13	**Pentaaqua(trifluoromethyl)chromium(III) ion**							
	$Ru(bpy)_3^+ + (H_2O)_5CrCF_3^{2+} \rightarrow$	$<5 \times 10^5$	0.6	1.0	23	f.p./rq	D.k. at 510 nm in Ar-satd. soln. contg. 0.1 mol L^{-1} Eu^{2+} (RQ), (3-4) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 0.25 mol L^{-1} HCl and (2.2-11.3) × 10^{-4} mol L^{-1} $(H_2O)_5CrCF_3^{2+}$.	86A161
22.3.14	**Pentaaqua(methoxymethyl)chromium(III) ion**							
	$Ru(bpy)_3^+ + (H_2O)_5CrCH_2OCH_3^{2+} \rightarrow Ru(bpy)_3^{2+} + (H_2O)_5CrCH_2OCH_3^+$	2.2×10^6	0.6	1.0	23	f.p./rq	D.k. at 510 nm in Ar-satd. soln. contg. 0.1 mol L^{-1} Eu^{2+} (RQ), (3-4) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 0.25 mol L^{-1} HCl and (1.56-7.80) × 10^{-4} mol L^{-1} $(H_2O)_5CrCH_2OCH_3^{2+}$.	86A161
22.3.15	**Pentaaqua(dichloromethyl)chromium(III) ion**							
	$Ru(bpy)_3^+ + (H_2O)_5CrCHCl_2^{2+} \rightarrow Ru(bpy)_3^{2+} + (H_2O)_5CrCHCl_2^+$	2.1×10^7	0.6	1.0	23	f.p./rq	D.k. at 510 nm in Ar-satd. soln. contg. 0.1 mol L^{-1} Eu^{2+} (RQ), (3-4) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 0.25 mol L^{-1} HCl and (0.90-3.89) × 10^{-4} mol L^{-1} $(H_2O)_5CrCHCl_2^{2+}$.	86A161
22.3.16	**Pentaaqua(benzyl)chromium(III) ion**							
	$Ru(bpy)_3^+ + (H_2O)_5CrCH_2C_6H_5^{2+} \rightarrow Ru(bpy)_3^{2+} + (H_2O)_5CrCH_2C_6H_5^+$	3.2×10^7	0.6	1.0	23	f.p./rq	D.k. at 510 nm in Ar-satd. soln. contg. 0.1 mol L^{-1} Eu^{2+} (RQ), (3-4) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 0.25 mol L^{-1} HCl and (0.18-2.14) × 10^{-4} mol L^{-1} $(H_2O)_5CrCH_2C_6H_5^{2+}$.	86A161
22.3.17	**Pentaaqua(4-pyridiniomethyl)chromium(III) ion**							
	$Ru(bpy)_3^+ + 4\text{-}[(H_2O)_5CrCH_2]C_5H_4NH^{3+} \rightarrow Ru(bpy)_3^{2+} + 4\text{-}[(H_2O)_5CrCH_2]C_5H_4NH^{2+}$	1.4×10^9	0.6	1.0	23	f.p./rq	D.k. at 510 nm in Ar-satd. soln. contg. 0.1 mol L^{-1} Eu^{2+} (RQ), (3-4) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 0.25 mol L^{-1} HCl and (7.6-39.8) × 10^{-4} mol L^{-1} $4\text{-}[(H_2O)_5CrCH_2]C_5H_4NH^{3+}$.	86A161

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.3	**Tris(2,2′-bipyridine)ruthenium(II) ion, electron adduct** — Continued							
22.3.18	**Pentaaqua(4-methylpyridine)chromium(III) ion**							
	$Ru(bpy)_3^+ + (H_2O)_5CrNC_5H_4\text{-}4\text{-}CH_3^{3+} \rightarrow Ru(bpy)_3^{2+} + (H_2O)_5CrNC_5H_4\text{-}4\text{-}CH_3^{2+}$	4.2×10^8	0.6	1.0	23	f.p./rq	D.k. at 510 nm in Ar-satd. soln. contg. 0.1 mol L^{-1} Eu^{2+} (RQ), (3-4) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 0.25 mol L^{-1} HCl and (0.97-3.69) × 10^{-4} mol L^{-1} $(H_2O)_5CrNC_5H_4\text{-}4\text{-}CH_3^{3+}$.	86A161
22.3.19	**Pentaaqua(pyridine)chromium(III) ion**							
	$Ru(bpy)_3^+ + (H_2O)_5Cr(NC_5H_5)^{3+} \rightarrow Ru(bpy)_3^{2+} + (H_2O)_5Cr(NC_5H_5)^{2+}$	5.5×10^8	0.6	1.0	23	f.p./rq	D.k. at 510 nm in Ar-satd. soln. contg. 0.1 mol L^{-1} Eu^{2+} (RQ), (3-4) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 0.25 mol L^{-1} HCl and (1.22-6.12) × 10^{-4} mol L^{-1} $(H_2O)_5CrNC_5H_5^{3+}$.	86A161
22.3.20	**Pentaaqua(3-chloropyridine)chromium(III) ion**							
	$Ru(bpy)_3^+ + (H_2O)_5Cr(NC_5H_4\text{-}3\text{-}Cl)^{3+} \rightarrow Ru(bpy)_3^{2+} + (H_2O)_5Cr(NC_5H_4\text{-}3\text{-}Cl)^{2+}$	1.3×10^9	0.6	1.0	23	f.p./rq	D.k. at 510 nm in Ar-satd. soln. contg. 0.1 mol L^{-1} Eu^{2+} (RQ), (3-4) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 0.25 mol L^{-1} HCl and (1.02-4.5) × 10^{-4} mol L^{-1} $(H_2O)_5CrNC_5H_4\text{-}3\text{-}Cl^{3+}$.	86A161
22.3.21	**Pentaaqua(3-cyanopyridine)chromium(III) ion**							
	$Ru(bpy)_3^+ + (H_2O)_5Cr(NC_5H_4\text{-}3\text{-}CN)^{3+} \rightarrow Ru(bpy)_3^{2+} + (H_2O)_5Cr(NC_5H_4\text{-}3\text{-}CN)^{2+}$	2.6×10^9	0.6	1.0	23	f.p./rq	D.k. at 510 nm in Ar-satd. soln. contg. 0.1 mol L^{-1} Eu^{2+} (RQ), (3-4) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 0.25 mol L^{-1} HCl and (0.73-2.70) × 10^{-4} mol L^{-1} $(H_2O)_5CrNC_5H_4\text{-}3\text{-}CN^{3+}$.	86A161
22.3.22	**Tetraaquabis(pyridine)chromium(III) ion**							
	$Ru(bpy)_3^+ + cis\text{-}(H_2O)_4Cr(py)_2^{3+} \rightarrow Ru(bpy)_3^{2+} + cis\text{-}(H_2O)_4Cr(py)_2^{2+}$	1.5×10^9	0.6	1.0	23	f.p./rq	D.k. at 510 nm in Ar-satd. soln. contg. 0.1 mol L^{-1} Eu^{2+} (RQ), (3-4) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 0.25 mol L^{-1} HCl and (0.40-4.48) × 10^{-4} mol L^{-1} $cis\text{-}(H_2O)_4Cr(py)_2^{3+}$.	86A161
22.3.23	**Tetraaqua(2,2′-bipyridine)chromium(III) ion**							
	$Ru(bpy)_3^+ + (H_2O)_4Cr(bpy)^{3+} \rightarrow Ru(bpy)_3^{2+} + (H_2O)_4Cr(bpy)^{2+}$	1.8×10^9	0.6	1.0	23	f.p./rq	D.k. at 510 nm in Ar-satd. soln. contg. 0.1 mol L^{-1} Eu^{2+} (RQ), (3-4) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 0.25 mol L^{-1} HCl and (1.12-4.49) × 10^{-4} mol L^{-1} $(H_2O)_4Cr(bpy)^{3+}$.	86A161
22.3.24	**Copper(II) ion**							
	$Ru(bpy)_3^+ + Cu^{2+} \rightarrow Ru(bpy)_3^{2+} + Cu^+$	3.9×10^8 5.2×10^8	6.6 6.6	0.04 0.5	25	p.r.	D.k. at 510 nm in soln. contg. $Ru(bpy)_3^{2+}$, 0.5 mol L^{-1} *tert*-BuOH and cacodylate buffer.	78A090
		3.4×10^8	6-7	<0.0002	24	f.p./pi	D.k. at 510 nm in soln. contg. 2 × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$ and (2.6-39) × 10^{-6} mol L^{-1} Cu^{2+}.	771093
22.3.25	**Europium(III) ion**							
	$Ru(bpy)_3^+ + Eu^{3+} \rightarrow Ru(bpy)_3^{2+} + Eu^{2+}$	2.7×10^7	1.3	0.5	25	f.p./rq	D.k. at 490-510 nm in soln. contg. (0.3-3.0) × 10^{-4} mol L^{-1} $Ru(bpy)_3^{2+}$. ~0.1 mol L^{-1} Eu^{2+} (RQ) and 0.05 mol L^{-1} H^+.	78A087 767412
22.3.26	**4,7,13,16,21-Pentaoxa-1,10-diazabicyclo[8.8.5]tricosaneeuropium(III) ion**							
	$Ru(bpy)_3^+ + [Eu\ 2.2.1]^{3+} \rightarrow Ru(bpy)_3^{2+} + [Eu\ 2.2.1]^{2+}$	7.0×10^8		1	22	f.p./rq	D.k. at 500 nm and p.b.k. at 454 nm in deaerated soln. contg. $Ru(bpy)_3^{2+}$, excess $[Eu\ 2.2.1]^{2+}$ (RQ) and 1 mol L^{-1} KCl.	86E195

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.3	**Tris(2,2′-bipyridine)ruthenium(II) ion, electron adduct** — Continued							
22.3.27	**Nitrite ion**							
	$Ru(bpy)_3^+ + NO_2^- \rightarrow$	2.5×10^7	~7			p.r.	D.k. at 510 nm in soln. contg. $Ru(bpy)_3^{2+}$ and 0.5 mol L^{-1} *tert*-BuOH.	720381
22.3.28	**1,4,8,11-Tetramethyl-1,4,8,11-tetraazacyclotetradecanenickel(II) ion**							
	$Ru(bpy)_3^+ + Ni(Me_4[14]aneN_4)^{2+} \rightarrow Ru(bpy)_3^{2+} + Ni(Me_4[14]aneN_4)^+$	5.1×10^8	0.6	1.0	23	f.p./rq	D.k. at 510 nm in Ar-satd. soln. contg. 0.12 mol L^{-1} ascorbate (RQ), $(3\text{-}4) \times 10^{-5}$ mol L^{-1} $Ru(bpy)_3^{2+}$, 0.25 mol L^{-1} HCl, and $(1.05\text{-}4.04) \times 10^{-4}$ mol L^{-1} $Ni(Me_4[14]aneN_4)^{2+}$.	86A161
22.3.29	**Tetracyanonickelate(II) ion**							
	$Ru(bpy)_3^+ + Ni(CN)_4^{2-} \rightarrow Ru(bpy)_3^{2+} + Ni(CN)_4^{3-}$	4.1×10^7	11			p.r.	D.k. in soln. contg. $Ru(bpy)_3^{2+}$ and 0.1 mol L^{-1} CH_3OH.	78A068
22.3.30	**Oxygen**							
	$Ru(bpy)_3^+ + O_2 \rightarrow Ru(bpy)_3^{2+} + O_2^{\cdot-}$	5.5×10^9	6.9	0.04		f.p./rq	D.k. in soln. contg. 10^{-4} mol L^{-1} $Ru(bpy)_3^{2+}$, hydroquinone (RQ) and 2.4×10^{-4} mol L^{-1} O_2.	81A042
		4×10^9		0.5	25	f.p./rq	D.k. at 500 nm in soln. contg. $Ru(bpy)_3^{2+}$ and $Fe(CN)_6^{4-}$ (RQ).	78A087
		7.4×10^9	11			p.r.	D.k. in soln. contg. $Ru(bpy)_3^{2+}$ and 0.1 mol L^{-1} CH_3OH.	78A068
		7.2×10^9	6-7		24	f.p./pi	D.k. at 510 nm in soln. contg. 2×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$ and $(0.5\text{-}2.5) \times 10^{-6}$ mol L^{-1} O_2.	771093
22.3.31	**Pentaammine(chloro)osmium(III) ion**							
	$Ru(bpy)_3^+ + Os(NH_3)_5Cl^{2+} \rightarrow Ru(bpy)_3^{2+} + Os(NH_3)_5Cl^+$	1.0×10^9	1.3	0.5	25	f.p./rq	D.k. at 490 nm in soln. contg. 10^{-4} mol L^{-1} $Ru(bpy)_3^{2+}$, $(0.5\text{-}2.0) \times 10^{-3}$ mol L^{-1} $Os(NH_3)_5Cl^{2+}$, 0.03 mol L^{-1} Eu^{2+} (RQ), 0.45 mol L^{-1} NaCl and 0.05 mol L^{-1} HCl.	82A145
22.3.32	**Ethylenediaminetetraacetatoosmate(III) ion**							
	$Ru(bpy)_3^+ + OsEDTA^- \rightarrow Ru(bpy)_3^{2+} + OsEDTA^{2-}$	1.1×10^9	4-5	0.5	25	f.p./rq	D.k. at 490 nm in soln. contg. $Ru(bpy)_3^{2+}$, 1.0 mol L^{-1} ascorbate ion (RQ) and $OsEDTA^-$.	82A145
22.3.33	**Chlorotris[3-(diphenylphosphino)benzenesulfonato]rhodate(I) ion**							
	$Ru(bpy)_3^+ + RhCl(dpm)_3^{3-} \rightarrow Ru(bpy)_3^{2+} + RhCl(dpm)_3^{4-}$	1.9×10^8	5.0			f.p./rq	D.k. at 500 nm in soln. contg. $Ru(bpy)_3^{2+}$, 0.1 mol L^{-1} ascorbate ion (RQ) and $RhCl(dpm)_3^{3-}$	87F040
22.3.34	**Tris(4,4′-dimethyl-2,2′-bipyridinerhodium(III) ion**							
	$Ru(bpy)_3^+ + Rh(4,4'\text{-}Me_2bpy)_3^{3+} \rightarrow Ru(bpy)_3^{2+} + Rh(4,4'\text{-}Me_2bpy)_3^{2+}$	3.7×10^9	4-5	0.5	25	f.p./rq	D.k. at 490 nm in soln. contg. $Ru(bpy)_3^{2+}$, 1.0 mol L^{-1} ascorbate ion (RQ) and $Rh(4,4'\text{-}Me_2bpy)_3^{3+}$.	82A145
22.3.35	**Hexaammineruthenium(III) ion**							
	$Ru(bpy)_3^+ + Ru(NH_3)_6^{3+} \rightarrow Ru(bpy)_3^{2+} + Ru(NH_3)_6^{2+}$	4.7×10^9		0.5	25	f.p./rq	D.k. at 500 nm in soln. contg. $Ru(bpy)_3^{2+}$ and $Ru(NH_3)_6^{2+}$ (RQ).	78A087
22.3.36	**Tris(2,2′-bipyridine)ruthenium(III) ion**							
	$Ru(bpy)_3^+ + Ru(bpy)_3^{3+} \rightarrow 2\ Ru(bpy)_3^{2+}$	3.4×10^9	4.6		24	p.r.	D.k. at 510 in Ar-satd. soln. contg. 0.5 mol L^{-1} *tert*-BuOH, 2×10^{-3} mol L^{-1} $Ru(bpy)_3^{2+}$ and 10^{-4} mol L^{-1} $Ru(bpy)_3^{3+}$.	78A070
22.3.37	**Sulfite radical ion**							
	$Ru(bpy)_3^+ + SO_3^{\cdot-} \rightarrow$	$\leq 10^6$			25	f.p./rq	P.b.k. in soln. contg. 5×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$ and 0.1-1.0 mol L^{-1} Na_2SO_3 (RQ).	79F045

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.3	**Tris(2,2′-bipyridine)ruthenium(II) ion, electron adduct** — Continued							
22.3.38	**Samarium(III) ion**							
	$Ru(bpy)_3^+ + Sm^{3+} \rightarrow Ru(bpy)_3^{2+} + Sm^{2+}$	$<2 \times 10^4$	0.6	1.0-1.58	23	f.p./rq	D.k. at 510 nm in Ar-satd. soln. contg. 0.1 mol L^{-1} Eu^{2+} (RQ), (3-4) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 0.25 mol L^{-1} HCl and (0.07-0.14) × 10^{-4} mol L^{-1} Sm(III) perchlorate.	86A161
22.3.39	**Ytterbium(III) ions**							
	$Ru(bpy)_3^+ + Yb^{3+} \rightarrow Ru(bpy)_3^{2+} + Yb^{2+}$	1.2×10^5	0.6	1.0	23	f.p./rq	D.k. at 510 nm in Ar-satd. soln. contg. 0.1 mol L^{-1} Eu^{2+} (RQ), (3-4) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 0.25 mol L^{-1} HCl and (0.01-0.05) × 10^{-4} mol L^{-1} $Yb(ClO_4)_3$.	86A161
22.3.40	**Ascorbate radical anion**							
	$Ru(bpy)_3^+ + A^{\bullet -} + H^+ \rightarrow Ru(bpy)_3^{2+} + AH^-$	1×10^9	4			f.p./rq	D.k. at 500 nm in soln. contg. 0.5 mol L^{-1} ascorbic acid, 0.5 mol L^{-1} ascorbate ion (RQ) and 5 × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$.	79F045
22.3.41	**1,4-Benzoquinone**							
	$Ru(bpy)_3^+ + Q \rightarrow Ru(bpy)_3^{2+} + Q^{\bullet -}$	$>2 \times 10^9$	6.9	0.04		f.p./rq	D.k. in soln. contg. 10^{-4} mol L^{-1} $Ru(bpy)_3^{2+}$, hydroquinone (RQ) a 10^{-4} mol L^{-1} benzoquinone.	81A042
22.3.42	**2,2′-Bipyridine, conjugate acid**							
	$Ru(bpy)_3^+ + bpyH^+ \rightarrow Ru(bpy)_3^{2+} + bpyH^{\bullet}$	2×10^9			25	f.p./rq	Soln. contg. $Ru(bpy)_3^{2+}$, 0.1 mol L^{-1} ascorbate ion (RQ), 0.01 mol L^{-1} phosphate and bipyridine.	82A278
22.3.43	**1,1′-Bis(4-sulfonatobenzyl)-4,4′-bipyridinium zwitterion**							
	$Ru(bpy)_3^+ + BSV \rightarrow Ru(bpy)_3^{2+} + BSV^{\bullet -}$	5.7×10^9	10		24	p.r.	P.b.k. at 590 nm in soln. contg. 0.01 mol L^{-1} *tert*-BuOH, 2 × 10^{-5} mol L^{-1} BSV and 6.6 × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$.	85A064
22.3.44	**4-Bromophenoxyl**							
	$Ru(bpy)_3^+ + 4\text{-}BrC_6H_4O^{\bullet} \rightarrow Ru(bpy)_3^{2+} + 4\text{-}BrC_6H_4O^-$	1.0×10^{10}	12.7	0.05	23	f.p./rq	D.k. at 510 nm in soln. contg. (1-2) × 10^{-4} mol L^{-1} $Ru(bpy)_3^{2+}$ and (0.1-40) × 10^{-3} mol L^{-1} 4-bromophenoxide ion (RQ).	82A365
22.3.45	**Carbon dioxide radical anion**							
	$Ru(bpy)_3^+ + CO_2^{\bullet -} \rightarrow Ru(bpy)_2(bpyCO_2)$	1.9×10^9	~7-12			p.r.	P.b.k. at 390 nm in Ar-satd. soln. contg. (5-10) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$ and 0.5 mol L^{-1} formate ion; value obtained from computer fit. Product undergoes protonation by H_2O and $H_2PO_4^{2-}$, k = 290 s^{-1} and 3.2 × 10^5 L mol^{-1} s^{-1}, respectively.	91A218
22.3.46	**4-Carboxyphenoxyl, conjugate base**							
	$Ru(bpy)_3^+ + 4\text{-}^-O_2CC_6H_4O^{\bullet} \rightarrow {}^{2+} + 4\text{-}^-O_2CC_6H_4O^-$	9.8×10^9	12.7	0.05	23	f.p./rq	D.k. at 510 nm in soln. contg. (1-2) × 10^{-4} mol L^{-1} $Ru(bpy)_3^{2+}$ and (0.1-40) × 10^{-3} mol L^{-1} 4-hydroxybenzoate dianion (RQ).	82A365
22.3.47	**4-Chlorophenoxyl**							
	$Ru(bpy)_3^+ + 4\text{-}ClC_6H_4O^{\bullet} \rightarrow Ru(bpy)_3^{2+} + 4\text{-}ClC_6H_4O^-$	1.0×10^{10}	12.7	0.05	23	f.p./rq	D.k. at 510 nm in soln. contg. (1-2) × 10^{-4} mol L^{-1} $Ru(bpy)_3^{2+}$ and (0.1-40) × 10^{-3} mol L^{-1} 4-chlorophenoxide ion (RQ).	82A365

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.3	**Tris(2,2′-bipyridine)ruthenium(II) ion, electron adduct** — Continued							
22.3.48	**1,1′-Dimethyl-4,4′-bipyridinium**							
	$Ru(bpy)_3^+ + MV^{2+} \rightarrow Ru(bpy)_3^{2+} + MV^{\cdot+}$	3.5×10^9	13	0.1		p.r.	P.b.k. at 602 nm in N_2O-satd. soln. contg. 0.13 mol L^{-1} 2-PrOH, $Ru(bpy)_3^{2+}$ and MV^{2+}; $k_r = 2.1 \times 10^{-4}$ L mol^{-1} s^{-1} calculated from K_{eq} and k_f.	91A081 91A198
		1.6×10^9	4-5	0.5	25	f.p./rq	D.k. at 490 nm in soln. contg. $Ru(bpy)_3^{2+}$, 1.0 mol L^{-1} ascorbate ion (RQ) and MV^{2+}.	82A145
22.3.49	**Duroquinone**							
	$Ru(bpy)_3^+ + DQ \rightarrow Ru(bpy)_3^{2+} + [DQ]^{\cdot-}$	4.0×10^9	6-7		24	f.p./pi	D.k. at 510 nm in soln. contg. 2×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$ and (0.61-3.0) $\times 10^{-6}$ mol L^{-1} DQ.	771093
22.3.50	**4-Ethoxyphenoxyl**							
	$Ru(bpy)_3^+ + 4\text{-}EtOC_6H_4O^{\cdot} \rightarrow Ru(bpy)_3^{2+} + 4\text{-}EtOC_6H_4O^-$	1.2×10^{10}	12.7	0.05	23	f.p./rq	D.k. at 510 nm in soln. contg. (1-2) $\times 10^{-4}$ mol L^{-1} $Ru(bpy)_3^{2+}$ and (0.1-40) $\times 10^{-3}$ mol L^{-1} 4-ethoxyphenoxide n (RQ).	82A365
22.3.51	**4-Ethylphenoxyl**							
	$Ru(bpy)_3^+ + 4\text{-}EtC_6H_4O^{\cdot} \rightarrow Ru(bpy)_3^{2+} + 4\text{-}EtC_6H_4O^-$	7.2×10^9	12.7	0.05	23	f.p./rq	D.k. at 510 nm in soln. contg. (1-2) $\times 10^{-4}$ mol L^{-1} $Ru(bpy)_3^{2+}$ and (0.1-40) $\times 10^{-3}$ mol L^{-1} 4-ethylphenoxide ion (RQ).	82A365
22.3.52	**2-Hydroxy-2,2-dimethylethyl**							
	$Ru(bpy)_3^+ + {}^{\cdot}CH_2C(CH_3)_2OH \rightarrow Ru(bpy)_2[bpyCH_2C(CH_3)_2OH]^+$	1.9×10^9	~7-12			p.r.	P.b.k. at 390 nm in Ar-satd. soln. contg. (5-10) $\times 10^{-5}$ mol L^{-1} $Ru(bpy)_3^{2+}$ and 0.5 mol L^{-1} *tert*-BuOH; value obtained from computer fit. Product undergoes protonation by H_2O and $H_2PO_4^{2-}$, k = 530 s^{-1} and 1.3×10^5 L mol^{-1} s^{-1}, *respectively*.	91A218
22.3.53	**1-Hydroxyethyl**							
	$Ru(bpy)_3^+ + CH_3\dot{C}HOH \rightarrow Ru(bpy)_2(bpyCHOHCH_3)^+$	1.9×10^9				p.r.	P.b.k. at 390 nm in Ar-satd. soln. contg. (5-10) $\times 10^{-5}$ mol L^{-1} $Ru(bpy)_3^{2+}$ and 0.5 mol L^{-1} EtOH; value obtained from computer fit. Product undergoes protonation by H_2O and $H_2PO_4^{2-}$, k = 140 s^{-1} and 1.1×10^5 L mol^{-1} s^{-1}, respectively.	91A218
22.3.54	**Hydroxymethyl**							
	$Ru(bpy)_3^+ + {}^{\cdot}CH_2OH \rightarrow Ru(bpy)_2(bpyCH_2OH)^{\cdot}$	1.9×10^9				p.r.	P.b.k. at 390 nm in Ar-satd. soln. contg. (5-10) $\times 10^{-5}$ mol L^{-1} $Ru(bpy)_3^{2+}$ and 0.5 mol L^{-1} MeOH; value obtained from computer fit. Product undergoes protonation by H_2O and $H_2PO_4^{2-}$, k = 410 s^{-1} and 1.3×10^5 L mol^{-1} s^{-1}, respectively.	91A218
22.3.55	**1-Hydroxy-1-methylethyl**							
	$Ru(bpy)_3^+ + (CH_3)_2\dot{C}OH \rightarrow Ru(bpy)_2[bpyCOH(CH_3)_2]^+$	1.9×10^9				p.r.	P.b.k. at 390 nm in Ar-satd. soln. contg. (5-10) $\times 10^{-5}$ mol L^{-1} $Ru(bpy)_3^{2+}$ and 0.5 mol L^{-1} 2-PrOH; value obtained from computer fit. Product undergoes protonation by H_2O and $H_2PO_4^{2-}$, k = 85 s^{-1} and 3.4×10^4 L mol^{-1} s^{-1}, respectively.	91A218

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.3	**Tris(2,2′-bipyridine)ruthenium(II) ion, electron adduct** — Continued							
22.3.56	**4-Iodophenoxyl**							
	$Ru(bpy)_3^+ + 4\text{-}IC_6H_4O^\bullet \rightarrow Ru(bpy)_3^{2+} + 4\text{-}IC_6H_4O^-$	1.1×10^{10}	12.7	0.05	23	f.p./rq	D.k. at 510 nm in soln. contg. (1-2) × 10^{-4} mol L^{-1} $Ru(bpy)_3^{2+}$ and (0.1-40) × 10^{-3} mol L^{-1} 4-iodophenoxide ion (RQ).	82A365
22.3.57	**4-Isopropylphenoxyl**							
	$Ru(bpy)_3^+ + 4\text{-}(CH_3)_2CC_6H_4O^\bullet \rightarrow Ru(bpy)_3^{2+} + 4\text{-}(CH_3)_2CC_6H_4O^-$	1.2×10^{10}	12.7	0.05	23	f.p./rq	D.k. at 510 nm in soln. contg. (1-2) × 10^{-4} mol L^{-1} $Ru(bpy)_3^{2+}$ and (0.1-40) × 10^{-3} mol L^{-1} 4-isopropylphenoxide ion (RQ).	82A365
22.3.58	**4-Methoxy-*N,N*-dimethylaniline radical cation**							
	$Ru(bpy)_3^+ + [4\text{-}CH_3OC_6H_4N(CH_3)_2]^{\bullet+} \rightarrow Ru(bpy)_3^{2+} + 4\text{-}CH_3OC_6H_4N(CH_3)_2$	9.6×10^9	7	0.05	23	f.p./rq	D.k. at 510 nm in soln. contg. (1-2) × 10^{-4} mol L^{-1} $Ru(bpy)_3^{2+}$ and (0.1-40) × 10^{-3} mol L^{-1} 4-methoxy-*N,N*-dimethylaniline (RQ).	82A365
22.3.59	**3-Methoxyphenoxyl**							
	$Ru(bpy)_3^+ + 3\text{-}CH_3OC_6H_4O^\bullet \rightarrow Ru(bpy)_3^{2+} + 3\text{-}CH_3OC_6H_4O^-$	7.2×10^9	12.7	0.05	23	f.p./rq	D.k. at 510 nm in soln. contg. (1-2) × 10^{-4} mol L^{-1} $Ru(bpy)_3^{2+}$ and (0.1-40) × 10^{-3} mol L^{-1} 3-methoxyphenoxide ion (RQ).	82A365
22.3.60	**4-Methoxyphenoxyl**							
	$Ru(bpy)_3^+ + 4\text{-}CH_3OC_6H_4O^\bullet \rightarrow Ru(bpy)_3^{2+} + 4\text{-}CH_3OC_6H_4O^-$	1.2×10^{10}	12.7	0.05	23	f.p./rq	D.k. at 510 nm in soln. contg. (1-2) × 10^{-4} mol L^{-1} $Ru(bpy)_3^{2+}$ and (0.1-40) × 10^{-3} mol L^{-1} 4-methoxyphenoxide ion (RQ).	82A365
22.3.61	**3-Methylphenoxyl**							
	$Ru(bpy)_3^+ + 3\text{-}CH_3C_6H_4O^\bullet \rightarrow Ru(bpy)_3^{2+} + 3\text{-}CH_3C_6H_4O^-$	8.1×10^9	12.7	0.05	23	f.p./rq	D.k. at 510 nm in soln. contg. (1-2) × 10^{-4} mol L^{-1} $Ru(bpy)_3^{2+}$ and (0.1-40) × 10^{-3} mol L^{-1} 3-methylphenoxide ion (RQ).	82A365
22.3.62	**4-Methylphenoxyl**							
	$Ru(bpy)_3^+ + 4\text{-}CH_3C_6H_4O^\bullet \rightarrow Ru(bpy)_3^{2+} + 4\text{-}CH_3C_6H_4O^-$	1.1×10^{10}	12.7	0.05	23	f.p./rq	D.k. at 510 nm in soln. contg. (1-2) × 10^{-4} mol L^{-1} $Ru(bpy)_3^{2+}$ and (0.1-40) × 10^{-3} mol L^{-1} 4-methylphenoxide ion (RQ).	82A365
22.3.63	**Phenoxyl**							
	$Ru(bpy)_3^+ + C_6H_5O^\bullet \rightarrow Ru(bpy)_3^{2+} + C_6H_5O^-$	5.3×10^9	12.7	0.05	23	f.p./rq	D.k. at 510 nm in soln. contg. (1-2) × 10^{-4} mol L^{-1} $Ru(bpy)_3^{2+}$ and (0.1-40) × 10^{-3} mol L^{-1} phenoxide ion (RQ).	82A365
22.3.64	**4-Phenylphenoxyl**							
	$Ru(bpy)_3^+ + 4\text{-}PhC_6H_4O^\bullet \rightarrow Ru(bpy)_3^{2+} + 4\text{-}PhC_6H_4O^-$	7.6×10^9	12.7	0.05	23	f.p./rq	D.k. at 510 nm in soln. contg. (1-2) × 10^{-4} mol L^{-1} $Ru(bpy)_3^{2+}$ and (0.1-40) × 10^{-3} mol L^{-1} 4-phenylphenoxide ion (RQ).	82A365
22.3.65	**2,4,6-Trimethylphenoxyl**							
	$Ru(bpy)_3^+ + 2,4,6\text{-}Me_3C_6H_2O^\bullet \rightarrow Ru(bpy)_3^{2+} + 2,4,6\text{-}Me_3C_6H_2O^-$	1.2×10^{10}	12.7	0.05	23	f.p./rq	D.k. at 510 nm in soln. contg. (1-2) × 10^{-4} mol L^{-1} $Ru(bpy)_3^{2+}$ and (0.1-40) × 10^{-3} mol L^{-1} 2,4,6-trimethylphenoxide ion (RQ).	82A365

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.4	**Bis(2,2′-bipyridine)(4-carboxy-4′-methyl-2,2′-bipyridine)ruthenium(II) ion, electron adduct**							
22.4.1	**Pentaammine(1-L-prolyl-L-prolinato)cobalt(III) ion**							
	$[Ru(bpy)_2(4\text{-}CO_2\text{-}4'\text{-}CH_3bpy)]^{\bullet} + Co(NH_3)_5(Pro)_2^{2+} \rightarrow [Ru(bpy)_2(4\text{-}CO_2\text{-}4'\text{-}CH_3bpy)]^{+} + Co(NH_3)_5(Pro)_2^{+}$	7.2×10^8	6.3		25	p.r.	D.k. at 350 and 500 nm in soln. contg. 6.6×10^{-5} mol L^{-1} $[Ru(bpy)_2(4\text{-}CO_2\text{-}4'\text{-}CH_3bpy)]^{+}$, $(1.3\text{-}7.7) \times 10^{-5}$ mol L^{-1} $Co(NH_3)_5(Pro)_2^{2+}$, 0.13 mol L^{-1} *tert*-BuOH and 0.005 mol L^{-1} sodium acetate buffer; studied between 5 and 50 °C., $\Delta H‡ = 15$ kJ mol^{-1}, $\Delta S‡ = -24.2$ J mol^{-1} K^{-1}.	93A434
22.5	**Bis(2,2′-bipyridine)ruthenium(II)(4-carboxy-4′-methyl-2,2′-bipyridine)(prolylprolinato)pentaamminecobalt(III), electron adduct**							
22.5.1	**Bis(2,2′-bipyridine)(4-carboxy-4′-methyl-2,2′-bipyridine)ruthenium(II) ion**							
	$[Ru(bpy)_2(4\text{-}CO\text{-}4'\text{-}CH_3bpy)(Pro)_2\text{-}Co(NH_3)_5]^{*3+} + [Ru(bpy)_2(4\text{-}CO_2\text{-}4'\text{-}CH_3bpy)]^{+} \rightarrow [Ru(bpy)_2(4\text{-}CO\text{-}4'\text{-}CH_3bpy)(Pro)_2\text{-}Co(NH_3)_5]^{4+} + [Ru(bpy)_2(4\text{-}CO_2\text{-}4'\text{-}CH_3bpy)]^{\bullet}$	6.6×10^8	6.3			p.r.	P.b.k. in soln. contg. $[Ru(bpy)_2(4\text{-}CO_2\text{-}4'\text{-}CH_3bpy)(Pro)_2\text{-}Co(NH_3)_5]^{4+}$, 0.13 mol L^{-1} *tert*-BuOH and 0.005 mol L^{-1} sodium acetate buffer.	93A434
22.6	**Bis(2,2′-bipyridine)(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct**							
22.6.1	**1,1′-Dimethyl-4,4′-bipyridinium**							
	$Ru(bpy)_2(bpm)^{+} + MV^{2+} \rightarrow Ru(bpy)_2(bpm)^{2+} + MV^{\bullet+}$	1.5×10^9	10-13	0.15		p.r.	P.b.k. at 602 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} formate ion, $Ru(bpy)_2(bpm)^{2+}$ and MV^{2+}; $k_r = 3.7 \times 10^2$ L mol^{-1} s^{-1} calculated from K_{eq} and k_f.	91A081 91A198
22.7	**Bis(2,2′-bipyridine)(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct, protonated**							
22.7.1	**1,1′-Dimethyl-4,4′-bipyridinium**							
	$Ru(bpy)_2(bpmH)^{2+} + MV^{2+} \rightarrow Ru(bpy)_2(bpm)^{2+} + MV^{\bullet+} + H^{+}$	1.8×10^6	3.0	0.14		p.r.	P.b.k. at 602 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} formate ion, $Ru(bpy)_2(bpm)^{2+}$ and MV^{2+}; $k_r = 4.5 \times 10^4$ L mol^{-1} s^{-1}.	91A081 91A198
22.8	**(2,2′-Bipyrazine)bis(2,2′-bipyridine)ruthenium(II) ion, electron adduct**							
22.8.1	**1,1′-Dimethyl-4,4′-bipyridinium**							
	$Ru(bpy)_2(bpz)^{+} + MV^{2+} \rightarrow Ru(bpy)_2(bpz)^{2+} + MV^{\bullet+}$	1.2×10^9	10-13	0.15		p.r.	P.b.k. at 602 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} formate ion, $Ru(bpy)_2(bpz)^{2+}$ and MV^{2+}; $k_r = 3.1 \times 10^3$ L mol^{-1} s^{-1} calculated from K_{eq} and k_f.	91A081 91A198
22.9	**(2,2′-Bipyrazine)bis(2,2′-bipyridine)ruthenium(II) ion, electron adduct, protonated**							
22.9.1	**1,1′-Dimethyl-4,4′-bipyridinium**							
	$Ru(bpy)_2(bpzH)^{2+} + MV^{2+} \rightarrow Ru(bpy)_2(bpz)^{2+} + MV^{\bullet+} + H^{+}$	1.9×10^5	3.0	0.14		p.r.	P.b.k. at 602 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} formate ion, $Ru(bpy)_2(bpz)^{2+}$ and MV^{2+}; $k_r = 9.3 \times 10^5$ L mol^{-1} s^{-1}.	91A081 91A198
22.10	**(2,2′-Bipyrazine)(2,2′-bipyridine)(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct**							
22.10.1	**1,1′-Dimethyl-4,4′-bipyridinium**							
	$Ru(bpy)(bpm)(bpz)^{+} + MV^{2+} \rightarrow Ru(bpy)(bpm)(bpz)^{2+} + MV^{\bullet+}$	1.0×10^9	10-13	0.15		p.r.	P.b.k. at 602 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} formate ion, $Ru(bpy)(bpm)(bpz)^{2+}$ and MV^{2+}; $k_r = 1.3 \times 10^5$ L mol^{-1} s^{-1} calculated from K_{eq} and k_f.	91A081 91A198

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.11	**(2,2′-Bipyrazine)(2,2′-bipyridine)(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct, protonated**							
22.11.1	**1,1′-Dimethyl-4,4′-bipyridinium**							
	$Ru(bpy)(bpm)(bpzH)^{2+} + MV^{2+} \rightarrow Ru(bpy)(bpm)(bpz)^{2+} + MV^{\cdot+} + H^+$	1.1×10^4	3.0	0.14		p.r.	P.b.k. at 602 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} formate ion, $Ru(bpy)(bpm)(bpz)^{2+}$ and MV^{2+}; $k_r = 7.8 \times 10^5$ L mol^{-1} s^{-1}.	91A081 91A198
22.12	**Tris(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct**							
22.12.1	**Tris(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct**							
	$Ru(bpm)_3^+ + Ru(bpm)_3^+ \rightarrow$	2.8×10^7	7.0			p.r.	D.k. at 350 and 450 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} formate ion and $Ru(bpm)_3^{2+}$. Reaction suggested to involve the protonated electron adduct; $k \sim 1.5 \times 10^7$ and $\sim 5 \times 10^7$ L mol^{-1} s^{-1}, at pH 5 and pH 6-7, respectively, and $k = 18$ s^{-1} at pH 13.0.	89A280
22	**1,1′-Dimethyl-4,4′-bipyridinium**							
	$Ru(bpm)_3^+ + MV^{2+} \rightarrow Ru(bpm)_3^{2+} + MV^{\cdot+}$	1.0×10^9	13.0			p.r.	P.b.k. at 602 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} formate ion, $(1.3) \times 10^{-5}$ mol L^{-1} MV^{2+} and 1.0×10^{-4} mol L^{-1} $Ru(bpm)_3^{2+}$; $k_r = 1.2 \times 10^4$ L mol^{-1} s^{-1} calculated from K_{eq} and k_f [91A081].	89A280
22.12.3	**Ascorbate radical anion**							
	$Ru(bpm)_3^+ + A^{\cdot-} + H^+ \rightarrow Ru(bpm)_3^{2+} + AH^-$	2.1×10^9	10	1.0		f.p./rq	D.k. at 490 nm in soln. contg. $Ru(bpm)_3^{2+}$ and ascorbate ion (RQ).	89A280
22.13	**Tris(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct, protonated**							
22.13.1	**1,1′-Dimethyl-4,4′-bipyridinium**							
	$Ru(bpm)_2(bpmH)^{2+} + MV^{2+} \rightarrow Ru(bpm)_3^{2+} + MV^{\cdot+} + H^+$	1.0×10^6	3.0			p.r.	P.b.k. at 602 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} formate ion, $(1.5\text{-}4.5) \times 10^{-5}$ mol L^{-1} MV^{2+} and 1.0×10^{-4} mol L^{-1} $Ru(bpm)_3^{2+}$; $pK_a = 6.3$; $k_r = 6.3 \times 10^4$ L mol^{-1} s^{-1}.	89A280
22.14	**(2,2′-Bipyridine)bis(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct**							
22.14.1	**1,1′-Dimethyl-4,4′-bipyridinium**							
	$Ru(bpm)_2(bpy)^+ + MV^{2+} \rightarrow Ru(bpm)_2(bpy)^{2+} + MV^{\cdot+}$	1.3×10^9	10-13	0.15		p.r.	P.b.k. at 602 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} formate ion, $Ru(bpm)_2(bpy)^{2+}$ and MV^{2+}; $k_r = 3.3 \times 10^3$ L mol^{-1} s^{-1} calculated from K_{eq} and k_f.	91A081 91A198
22.15	**(2,2′-Bipyridine)bis(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct, protonated**							
22.15.1	**1,1′-Dimethyl-4,4′-bipyridinium**							
	$Ru(bpm)(bpmH)(bpy)^{2+} + MV^{2+} \rightarrow Ru(bpm)_2(bpy)^{2+} + MV^{\cdot+} + H^+$	4.7×10^5	3.0	0.14		p.r.	P.b.k. at 602 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} formate ion, $Ru(bpm)_2(bpy)^{2+}$ and MV^{2+}; $k_r = 7.2 \times 10^4$ L mol^{-1} s^{-1}.	91A081 91A198

TABLE 22. Rate constants for ruthenium transients — Continued

Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.16 (2,2′-Bipyrazine)bis(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct							
22.16.1 1,1′-Dimethyl-4,4′-bipyridinium							
$Ru(bpm)_2(bpz)^+ + MV^{2+} \rightarrow Ru(bpm)_2(bpz)^{2+} + MV^{\cdot+}$	6.0×10^8	10-13	0.15		p.r.	P.b.k. at 602 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} formate ion, $Ru(bpm)_2(bpz)^{2+}$ and MV^{2+}; $k_r = 7.9 \times 10^5$ L mol^{-1} s^{-1} calculated from K_{eq} and k_f.	91A081 91A198
22.17 (2,2′-Bipyrazine)bis(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct, protonated							
22.17.1 1,1′-Dimethyl-4,4′-bipyridinium							
$Ru(bpm)_2(bpzH)^{2+} + MV^{2+} \rightarrow Ru(bpm)_2(bpz)^{2+} + MV^{\cdot+} + H^+$	8.7×10^3	3.0	0.14		p.r.	P.b.k. at 602 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} formate ion, $Ru(bpm)_2(bpz)^{2+}$ and MV^{2+}; $k_r = 1.7 \times 10^6$ L mol^{-1} s^{-1}.	91A081 91A198
22.18 Tris(2,2′-bipyrazine)ruthenium(II) ion, electron adduct							
22.18.1 1,3,6,8,10,13,16,19-Octaazabicyclo[6.6.6]eicosanecobalt(III) ion							
$Ru(bpz)_3^+ + Co(sep)^{3+} \rightarrow Ru(bpz)_3^{2+} + Co(sep)^{2+}$	3.3×10^5	10.3			p.r.	D.k. at 490 nm in N_2O-satd. soln. contg. 0.13 mol L^{-1} 2-PrOH, 1×10^{-4} mol L^{-1} $Ru(bpz)_3^{2+}$ and $<3 \times 10^{-5}$ mol L^{-1} $Co(sep)^{3+}$.	88A091
22.18.2 Oxygen							
$Ru(bpz)_3^+ + O_2 \rightarrow Ru(bpz)_3^{2+} + O_2^{\cdot-}$	5.8×10^8	11.0			f.p./rq	Soln. contg. $Ru(bpz)_3^{2+}$, EDTA (RQ) and 1.3×10^{-3} mol L^{-1} O_2.	86A120
22.18.3 Ascorbate radical anion							
$Ru(bpz)_3^+ + A^{\cdot-} + H^+ \rightarrow Ru(bpz)_3^{2+} + AH^-$	1.5×10^9	4.5-9.5	1	22	f.p./rq	D.k. in soln. contg. 5×10^{-5} mol L^{-1} $Ru(bpz)_3^{2+}$ and 3×10^{-3} mol L^{-1} ascorbate ion (RQ).	89E105
22.18.4 1,1′-Dimethyl-4,4′-bipyridinium							
$Ru(bpz)_3^+ + MV^{2+} \rightarrow Ru(bpz)_3^{2+} + MV^{\cdot+}$	1.3×10^8	10-13	0.15		p.r.	P.b.k. at 602 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} formate ion, $Ru(bpz)_3^{2+}$ and MV^{2+}; $k_r = 1.7 \times 10^7$ L mol^{-1} s^{-1}.	91A081 91A198
	3.8×10^8	12	1.0	22	f.p./rq	D.k. at 490 nm and p.b.k. at 440 and 605 nm in soln. contg. $Ru(bpz)_3^{2+}$, 0.05 mol L^{-1} triethanolamine (RQ) and 2 and 5×10^{-4} mol L^{-1} MV^{2+}; $k = 5 \times 10^8$ L mol^{-1} s^{-1} was obtained using 2×10^{-4} mol L^{-1} MV^{2+} and $(CH_3)_2NCH_2CH_2S^-$ as RQ.	89E105
22.19 Tris(2,2′-bipyrazine)ruthenium(II) ion, electron adduct, protonated							
22.19.1 1,1′-Dimethyl-4,4′-bipyridinium							
$Ru(bpz)_2(bpzH)^{2+} + MV^{2+} \rightarrow Ru(bpz)_3^{2+} + MV^{\cdot+} + H^+$	4.4×10^4	3.0	0.14		p.r.	P.b.k. at 602 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} formate ion, $Ru(bpz)_3^{2+}$ and MV^{2+}; $k_r = 3.3 \times 10^7$ L mol^{-1} s^{-1}.	91A081 91A198
22.19.2 1,3,6,8,10,13,16,19-Octaazabicyclo[6.6.6]eicosanecobalt(III) ion							
$Ru(bpz)_2(bpzH)^{2+} + Co(sep)^{3+} \rightarrow Ru(bpz)_3^{2+} + Co(sep)^{2+} + H^+$	$<10^3$	4.0			p.r.	No reaction obs. in the presence of 0.1 mol L^{-1} $Co(sep)^{3+}$ in N_2O-satd. soln. contg. 0.13 mol L^{-1} 2-PrOH and 1×10^{-4} mol L^{-1} $Ru(bpz)_3^{2+}$; pK_a of protonated electron adduct = 7.1.	88A091

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.20	**Bis(2,2′-bipyrazine)(2,2′-bipyridine)ruthenium(II) ion, electron adduct**							
22.20.1	**1,1′-Dimethyl-4,4′-bipyridinium**							
	$Ru(bpz)_2(bpy)^+ + MV^{2+} \rightarrow Ru(bpz)_2(bpy)^{2+} + MV^{\bullet+}$	8.0×10^8	10-13	0.15		p.r.	P.b.k. at 602 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} formate ion, $Ru(bpz)_2(bpy)^{2+}$ and MV^{2+}; $k_r = 4.8 \times 10^5$ L mol^{-1} s^{-1} calculated from K_{eq} and k_f.	91A081 91A198
22.21	**Bis(2,2′-bipyrazine)(2,2′-bipyridine)ruthenium(II) ion, electron adduct, protonated**							
22.21.1	**1,1′-Dimethyl-4,4′-bipyridinium**							
	$Ru(bpz)(bpzH)(bpy)^{2+} + MV^{2+} \rightarrow Ru(bpz)_2(bpy)^{2+} + MV^{\bullet+} + H^+$	9.0×10^4	3.0	0.14		p.r.	P.b.k. at 602 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} formate ion, $Ru(bpz)_2(bpy)^{2+}$ and MV^{2+}; $k_r = 4.5 \times 10^6$ L mol^{-1} s^{-1}.	91A081 91A198
22.22	**Bis(2,2′-bipyrazine)(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct**							
22.22.1	**1,1′-Dimethyl-4,4′-bipyridinium**							
	$Ru(bpz)_2(bpm)^+ + MV^{2+} \rightarrow Ru(bpz)_2(bpm)^{2+} + MV^{\bullet+}$	5.3×10^8	10-13	0.15		p.r.	P.b.k. at 602 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} formate ion, $Ru(bpz)_2(bpm)^{2+}$ and MV^{2+}; $k_r = 7.2 \times 10^6$ L mol^{-1} s^{-1} calculated from K_{eq} and k_f.	91A081 91A198
22.23	**Bis(2,2′-bipyrazine)(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct, protonated**							
22.23.1	**1,1′-Dimethyl-4,4′-bipyridinium**							
	$Ru(bpz)(bpzH)(bpm)^{2+} + MV^{2+} \rightarrow Ru(bpz)_2(bpm)^{2+} + MV^{\bullet+} + H^+$	3.0×10^4	3.0	0.14		p.r.	P.b.k. at 602 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} formate ion, $Ru(bpz)_2(bpm)^{2+}$ and MV^{2+}; $k_r = 8.1 \times 10^6$ L mol^{-1} s^{-1}.	91A081 91A198
22.24	**Tris(2,2′-bipyridine)ruthenium(II) ion, OH-adduct**							
22.24.1	**Tris(2,2′-bipyridine)ruthenium(II) ion, OH-adduct**							
	$Ru(bpy)_3\text{-}OH^{2+} + Ru(bpy)_3\text{-}OH^{2+} \rightarrow$	6×10^6	~7		21	p.r.	D.k. at 750 nm in N_2O-satd. soln. contg. $Ru(bpy)_3^{2+}$; mixt. of adducts; unclear whether k or $2k$.	86A034
		$(5\text{-}10) \times 10^6$	5-11	1.0	25	p.r.	D.k. at 750 nm in N_2O-satd. soln. contg. $Ru(bpy)_3^{2+}$.	757415
22.24.2	**Ferricyanide ion**							
	$Ru(bpy)_3\text{-}OH^{2+} + Fe(CN)_6^{3-} \rightarrow$	4.1×10^5	9.7			p.r.	D.k. at 800 nm and p.b.k. at 479 nm in N_2O-satd. soln. contg. $(1\text{-}6) \times 10^{-4}$ mol L^{-1} $Ru(bpy)_3^{2+}$ and $(1.32\text{-}5.97) \times 10^{-4}$ mol L^{-1} $Fe(CN)_6^{3-}$; $k = 3.4 \times 10^5$ L mol^{-1} s^{-1} by condy. measurement.	90A015
22.25	**Tris(2,2′-bipyrazine)ruthenium(II) ion, OH-adduct**							
22.25.1	**Tris(2,2′-bipyrazine)ruthenium(II) ion, OH-adduct**							
	$Ru(bpz)_3\text{-}OH^{2+} + Ru(bpz)_3\text{-}OH^{2+} \rightarrow$	$\sim 4 \times 10^8$	4.0			p.r.	D.k. at 450 nm in N_2O-satd. soln. contg. $Ru(bpz)_3^{2+}$; unclear whether k or $2k$.	88A091
22.26	**Bis(2,2′-bipyridine)(dipyrido[3,2-*a*:2′,3′-*c*]phenazine)ruthenium(II) ion, electron adduct, diprotonated**							
22.26.1	**Bis(2,2′-bipyridine)(dipyrido[3,2-*a*:2′,3′-*c*]phenazine)ruthenium(II) ion, electron adduct, diprotonated**							
	$Ru(bpy)_2(dppzH_2)^{3+} + Ru(bpy)_2(dppzH_2)^{3+} \rightarrow Ru(bpy)_2(dppz)^{2+} + Ru(bpy)_2(dppzH_2)^{2+} + 2\ H^+$	1.2×10^8	3			p.r.	D.k. at 390 nm in N_2O-satd. soln. contg. $Ru(bpy)_2(dppz)^{2+}$ and 0.1 mol L^{-1} formate ion; pK_a of reduced species = 4 and 10.	89A312

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.27	**Bis(2,2′-bipyridine)(dipyrido[3,2-*a*:2′,3′-*c*]phenazine)ruthenium(II) ion, electron adduct, protonated**							
22.27.1	**Bis(2,2′-bipyridine)(dipyrido[3,2-*a*:2′,3′-*c*]phenazine)ruthenium(II) ion, electron adduct, protonated**							
	$Ru(bpy)_2(dppzH)^{2+}$ + $Ru(bpy)_2(dppzH)^{2+}$ → $Ru(bpy)_2(dppz)^{2+}$ + $Ru(bpy)_2(dppzH_2)^{2+}$	4.7×10^8	7			p.r.	D.k. at 390 nm in N_2O-satd. soln. contg. $Ru(bpy)_2(dppz)^{2+}$ and 0.1 mol L^{-1} formate ion; pK_a of reduced species = 4 and 10.	89A312
22.28	**Bis(2,2′-bipyridine)(dipyrido[3,2-*a*:2′,3′-*c*]phenazine)ruthenium(II) ion, electron adduct**							
22.28.1	**Bis(2,2′-bipyridine)(dipyrido[3,2-*a*:2′,3′-*c*]phenazine)ruthenium(II) ion, electron adduct**							
	2 $Ru(bpy)_2(dppz)^+$ + 2 H_2O → $Ru(bpy)_2(dppz)^{2+}$ + $Ru(bpy)_2(dppzH_2)^{2+}$ + 2 OH^-	4.3×10^8	12-13			p.r.	D.k. at 390 nm in N_2O-satd. soln. contg. $Ru(bpy)_2(dppz)^{2+}$ and 0.1 mol L^{-1} formate ion; pK_a of reduced species = 4 and 10.	89A312
22.28.2	**1,1′-Dimethyl-4,4′-bipyridinium**							
	$Ru(bpy)_2(dppz)^+$ + MV^{2+} → $Ru(bpy)_2(dppz)^{2+}$ + $MV^{\bullet+}$	1.6×10^9	13			p.r.	P.b.k. in N_2O-satd. soln. contg. $Ru(bpy)_2(dppz)^{2+}$ and 0.1 mol L^{-1} formate ion; at pH 3 and 7 the reduction of $Ru(bpy)_2(dppz)^{2+}$ by $MV^{\bullet+}$ was observed; pK_a of the reduced species = 4 and 10.	89A312
22.29	**Bis(2,2′-bipyridine)(6,7-dihydro-5,8-dimethyldibenzo[*b*,*j*][1,10]phenanthroline)ruthenium(II) ion, electron adduct**							
22.29.1	**4,7,13,16,21-Pentaoxa-1,10-diazabicyclo[8.8.5]tricosaneeuropium(III) ion**							
	$Ru(bpy)_2(DMCH)^+$ + $[Eu\ 2.2.1]^{3+}$ → $Ru(bpy)_2(DMCH)^{2+}$ + $[Eu\ 2.2.1]^{2+}$	5.9×10^7		1	22	f.p./rq	D.k. at 500 nm in soln. contg. $Ru(bpy)_2(DMCH)^{2+}$, excess $[Eu\ 2.2.1]^{2+}$ (RQ) and 1 mol L^{-1} KCl.	86E195
22.30	**Tris(4,4′-dimethyl-2,2′-bipyridine)ruthenium(II) ion, electron adduct**							
22.30.1	**Copper(II) ion**							
	$Ru(4,4'\text{-}Me_2bpy)_3^+$ + Cu^{2+} → $Ru(4,4'\text{-}Me_2bpy)_3^{2+}$ + Cu^+	3.7×10^8	6.6	0.04	25	p.r.	D.k. at 510 nm in soln. contg. $Ru(4,4'\text{-}Me_2bpy)_3^{2+}$, 0.5 mol L^{-1} *tert*-BuOH and cacodylate buffer.	78A090
22.30.2	**Europium(III) ion**							
	$Ru(4,4'\text{-}Me_2bpy)_3^+$ + Eu^{3+} → $Ru(4,4'\text{-}Me_2bpy)_3^{2+}$ + Eu^{2+}	4.5×10^7		0.5	25	f.p./rq	D.k. at 490-510 nm in soln. contg. $(0.3\text{-}3.0) \times 10^{-4}$ mol L^{-1} $Ru(4,4'\text{-}Me_2bpy)_3^{2+}$ and ~0.1 mol L^{-1} Eu^{2+} (RQ).	78A087
22.31	**Tris(1,10-phenanthroline)ruthenium(II) ion, electron adduct**							
22.31.1	**Copper(II) ion**							
	$Ru(phen)_3^+$ + Cu^{2+} → $Ru(phen)_3^{2+}$ + Cu^+	4.7×10^8	6.6	0.04	25	p.r.	D.k. at 510 nm in soln. contg. $Ru(phen)_3^{2+}$, 0.5 mol L^{-1} *tert*-BuOH and cacodylate buffer.	78A090
22.31.2	**Europium(III) ion**							
	$Ru(phen)_3^+$ + Eu^{3+} → $Ru(phen)_3^{2+}$ + Eu^{2+}	5.2×10^7		0.5	25	f.p./rq	D.k. at 490-510 nm in soln. contg. $(0.3\text{-}3.0) \times 10^{-4}$ mol L^{-1} $Ru(phen)_3^{2+}$ and ~0.1 mol L^{-1} Eu^{2+} (RQ).	78A087
22.32	**Tris(4,7-dimethyl-1,10-phenanthroline)ruthenium(II) ion, electron adduct**							
22.32.1	**Europium(III) ion**							
	$Ru(4,7\text{-}Me_2phen)_3^+$ + Eu^{3+} → $Ru(4,7\text{-}Me_2phen)_3^{2+}$ + Eu^{2+}	5.7×10^7		0.5	25	f.p./rq	D.k. at 490-510 nm in soln. contg. $(0.3\text{-}3.0) \times 10^{-4}$ mol L^{-1} $Ru(4,7\text{-}Me_2phen)_3^{2+}$ and ~0.1 mol L^{-1} Eu^{2+} (RQ).	78A087

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.33	**Tris(5-chloro-1,10-phenanthroline)ruthenium(II) ion, electron adduct**							
22.33.1	**Copper(II) ion**							
	$Ru(5\text{-}Clphen)_3^{+} + Cu^{2+} \rightarrow Ru(5\text{-}Clphen)_3^{2+} + Cu^{+}$	2.6×10^8	6.6	0.04	25	p.r.	D.k. at 510 nm in soln. contg. Ru(5-Clphen)$_3^{2+}$, 0.5 mol L^{-1} *tert*-BuOH and cacodylate buffer.	78A090
22.33.2	**Europium(III) ion**							
	$Ru(5\text{-}Clphen)_3^{+} + Eu^{3+} \rightarrow Ru(5\text{-}Clphen)_3^{2+} + Eu^{2+}$	1.6×10^7		0.5	25	f.p./rq	D.k. at 490-510 nm in soln. contg. $(0.3\text{-}3.0) \times 10^{-4}$ mol L^{-1} Ru(5-Clphen)$_3^{2+}$ and ~0.1 mol L^{-1} Eu^{2+} (RQ).	78A087
22.34	**Tris(1,4,5,8-tetraazaphenanthrene)ruthenium(II) ion, electron adduct, protonated**							
22.34.1	**Tris(1,4,5,8-tetraazaphenanthrene)ruthenium(II) ion, electron adduct, protonated**							
	$Ru(TAP)_2(TAPH)^{2+} + Ru(TAP)_2(TAPH)^{2+} \rightarrow$	1.0×10^9	5			f.p./rq	D.k. at 470 nm in Ar- or O_2-satd. soln. contg. 6×10^{-5} mol L^{-1} Ru(TAP)$_3^{2+}$ and 10^{-2} mol L^{-1} guanosine 5′-monophosphate (RQ); $pK_a = 7.6$; unclear whether k or $2k$.	92R075
22.35	**Tris(1,4,5,8-tetraazaphenanthrene)ruthenium(II) ion, electron adduct**							
22.35.1	**Oxygen**							
	$Ru(TAP)_3^{+} + O_2 \rightarrow Ru(TAP)_3^{2+} + O_2^{\cdot-}$	1.9×10^7 4.4×10^7 8.4×10^7 2.2×10^8	7.5 8.0 8.4 8.9			f.p./rq	D.k. at 470 nm in O_2-satd. soln. contg. 6×10^{-5} mol L^{-1} Ru(TAP)$_3^{2+}$ and 10^{-2} mol L^{-1} guanosine 5′-monophosphate (RQ).	92R075
22.35.2	**1,4-Benzosemiquinone, radical ion**							
	$Ru(TAP)_3^{+} + Q^{\cdot-} + 2\,H^{+} \rightarrow Ru(TAP)_3^{2+} + QH_2$	$\sim 5 \times 10^9$				f.p./rq	D.k. at 480 nm in soln. contg. 1.1×10^{-4} mol L^{-1} Ru(TAP)$_3^{2+}$ and 10^{-2} mol L^{-1} hydroquinone (RQ).	87A267
22.35.3	**1,4-Benzoquinone**							
	$Ru(TAP)_3^{+} + Q \rightarrow Ru(TAP)_3^{2+} + Q^{\cdot-}$	4.3×10^8 5.6×10^8	6.5 8.4			f.p./rq	D.k. at 470 nm in Ar-satd. soln. contg. 10^{-4} mol L^{-1} Ru(TAP)$_3^{2+}$, 10^{-2} mol L^{-1} guanosine 5′-monophosphate (RQ) and 8×10^{-5} mol L^{-1} benzoquinone. Change in k with pH attributed to protonation of Ru(TAP)$_3^{+}$; pK_a Ru(TAP)$_2$(TAPH)$^{2+}$ = 7.6.	92R075
22.35.4	**Guanosine 5'-monophosphate radical**							
	$Ru(TAP)_3^{+} + [GMP(-H)]^{\cdot} + H^{+} \rightarrow Ru(TAP)_3^{2+} + GMP$	1.0×10^9 1.5×10^9	6 9			f.p./rq	D.k. at 470 nm in Ar-satd. soln. contg. 10^{-4} mol L^{-1} Ru(TAP)$_3^{2+}$ and 10^{-2} mol L^{-1} GMP (RQ); pK_a (GMP$^{\cdot+}$) = 4, pK_a Ru(TAP)$_2$(TAPH)$^{2+}$ = 7.6.	92R075
22.36	***trans*-Tetraammine(aqua)nitrosylruthenium(II) ion**							
22.36.1	**Pentaammine(nitroso)ruthenium(III) ion**							
	trans-$Ru(NH_3)_4NO(H_2O)^{2+} + Ru(NH_3)_5NO^{3+} \rightarrow$ *trans*-$Ru(NH_3)_4NO(H_2O)^{3+} + Ru(NH_3)_5NO^{2+}$	8	7.5	0.4	26.0	γ-r.	Kinetic anal. of zero-order k_{obs} in N_2O-satd. soln. contg. 2.0×10^{-3} mol^{-1} L^{-1} Ru(NH$_3$)$_5$NO^{3+} and 0.4 mol L^{-1} HCO_2^{-}.	78A110

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.37	**Pentaamminenitrosylruthenium(II) ion**							
22.37.1	**Water**							
	$Ru(NH_3)_5NO^{2+} + H_2O \rightarrow$ *trans*-$Ru(NH_3)_4NO(H_2O)^{2+} + NH_3$	1.8×10^{-2} s^{-1}	7.1	0.4	25.0	γ-r.	Kinetic anal. of abs. increase at 315 nm in N_2O-satd. soln. contg. 1.7×10^{-3} mol^{-1} L^{-1} $Ru(NH_3)_5NO^{3+}$ and 0.4 mol L^{-1} HCO_2^- (or 2-PrOH); $\Delta H‡ = 99.2$ kJ mol^{-1}, $\Delta S‡ = 45.2$ J K^{-1} mol^{-1}.	78A110
22.37.2	**2-Hydroxy-2,2-dimethylethyl**							
	$Ru(NH_3)_5NO^{2+} + {}^{\bullet}CH_2C(CH_3)_2OH \rightarrow Ru(NH_3)_5N(O)CH_2C(CH_3)_2OH^{2+}$	3.7×10^9	6.0-7.5			p.r.	D.k. at 280 nm and p.b.k. in Ar-satd. soln. contg. $Ru(NH_3)_5NO^{3+}$ and 0.3 mol L^{-1} *tert*-BuOH.	79A134
		3.7×10^9	1.0-10.3		23	p.r.	D.k. at 280 nm and p.b.k. in deoxygenated soln. contg. (5-50) $\times 10^{-4}$ mol L^{-1} $Ru(NH_3)_5NO^{3+}$ and 0.1-2 mol L^{-1} *tert*-BuOH.	751077
22.37.3	**2-Amino-2-carboxy-2-methylethyl**							
	$Ru(NH_3)_5NO^{2+} + {}^{\bullet}CH_2C(CH_3)(NH_3^+)CO_2^- \rightarrow Ru(NH_3)_5N(O)CH_2C(CH_3)(NH_3)CO_2^{2+}$	3.1×10^9	6.0-7.5			p.r.	D.k. at 280 nm and p.b.k. in Ar-satd. soln. contg. $Ru(NH_3)_5NO^{3+}$ and 0.3 mol L^{-1} α-aminoisobutyrate ion.	79A134
22.37.4	**(*N*-Acetyl-*N*-methylamino)methyl**							
	$Ru(NH_3)_5NO^{2+} + {}^{\bullet}CH_2N(CH_3)C(O)CH_3 \rightarrow Ru(NH_3)_5N(O)CH_2N(CH_3)C(O)CH_3^{2+}$	2.9×10^9	6.0-7.5			p.r.	D.k. at 280 nm and p.b.k. in Ar-satd. soln. contg. $Ru(NH_3)_5NO^{3+}$ and 0.3 mol L^{-1} *N*,*N*-dimethylacetamide.	79A134
22.37.5	**2-Amino-2-methylpropyl, conjugate acid**							
	$Ru(NH_3)_5NO^{2+} + {}^{\bullet}CH_2C(CH_3)_2NH_3^+ \rightarrow Ru(NH_3)_5N(O)CH_2C(CH_3)_2NH_3^{3+}$	2.0×10^9	7.0			p.r.	D.k. at 280 nm and p.b.k. in Ar-satd. soln. contg. 5×10^{-4} mol L^{-1} $Ru(NH_3)_5NO^{3+}$ and 0.3 mol L^{-1} *tert*-butylamine.	79A134
22.37.6	**2-Carboxy-2-hydroxy-2-methylethyl, anion**							
	$Ru(NH_3)_5NO^{2+} + {}^{\bullet}CH_2C(CH_3)(OH)CO_2^- \rightarrow Ru(NH_3)_5N(O)CH_2C(CH_3)(OH)CO_2^+$	3.0×10^9	7.0			p.r.	D.k. at 280 nm and p.b.k. in Ar-satd. soln. contg. 5×10^{-4} mol L^{-1} $Ru(NH_3)_5NO^{3+}$ and 0.3 mol L^{-1} α-hydroxyisobutyrate ion.	79A134
22.37.7	**2-Carboxy-2,2-dimethylethyl anion**							
	$Ru(NH_3)_5NO^{2+} + {}^{\bullet}CH_2C(CH_3)_2CO_2^- \rightarrow Ru(NH_3)_5N(O)CH_2C(CH_3)_2CO_2^+$	2.9×10^9	6.3			p.r.	P.b.k. at 343 nm and d.k. at 280 nm in Ar-satd. soln. contg. 5×10^{-4} mol L^{-1} $Ru(NH_3)_5NO^{3+}$ and 0.3 mol L^{-1} pivalate ion.	79A134
22.37.8	**Oxygen**							
	$Ru(NH_3)_5NO^{2+} + O_2 \rightarrow$	7.6×10^6				p.r.	D.k. at 280 nm in air-satd. soln. contg. $Ru(NH_3)_5NO^{3+}$.	751049
22.37.9	**2-Hydroxy-2,2-dimethylethylperoxyl**							
	$Ru(NH_3)_5NO^{2+} + (CH_3)_2C(OH)CH_2OO^{\bullet} \rightarrow$	3×10^9				p.r.	D.k. in air-satd. soln. contg. 1×10^{-3} mol L^{-1} $Ru(NH_3)_5NO^{3+}$ and 1 mol L^{-1} *tert*-BuOH. Authors suggested that oxidation to $Ru(NH_3)_5NO^{3+}$ could occur.	751077
22.38	**Decaammine(dinitrogen)diruthenium(I-II) ion**							
22.38.1	**Water**							
	$[(NH_3)_5RuN_2Ru(NH_3)_5]^{3+} + H_2O \rightarrow Ru(NH_3)_5N_2^{2+}$ + other products	8.0×10^4 s^{-1}	7.2		23.5	p.r.	D.k. at 500 nm in N_2-satd. soln. contg. 1×10^{-4} mol L^{-1} $[(NH_3)_5RuN_2Ru(NH_3)_5]^{4+}$ and 0.1 mol L^{-1} *tert*-BuOH; other products include Ru(I)-Ru(0) species.	82A135

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.39	**Decaammine(dinitrogen)diruthenium(II) ion, OH-adduct**							
22.39.1	**First-order reaction**							
	$[(NH_3)_5RuN_2Ru(NH_3)_5]$-$OH^{4+}$ → $[(NH_3)_5RuN_2Ru(NH_3)_5]^{5+} + OH^-$	1.4×10^4 s^{-1}	6.8		23.5	p.r.	D.k. at 435 nm in N_2O-satd. soln. contg. 1×10^{-4} mol L^{-1} $[(NH_3)_5RuN_2Ru(NH_3)_5]^{4+}$.	82A135
22.40	**Decaammine(dinitrogen)diruthenium(II-III) ion**							
22.40.1	**Water**							
	$[(NH_3)_5RuN_2Ru(NH_3)_5]^{5+} + H_2O$ → $Ru(NH_3)_5N_2^{2+} + Ru(NH_3)_5OH^{2+} + H^+$	0.16 s^{-1}	6.8		23.5	p.r.	D.k. at 235 nm in N_2O-satd. soln. contg. (2-5) $\times 10^{-4}$ mol L^{-1} $[(NH_3)_5RuN_2Ru(NH_3)_5]^{4+}$.	82A135
22.41	**Tris(acetylacetonato)ruthenate(II) ion**							
22.41.1	**Hydrogen ion**							
	$Ru(acac)_3^- + H^+ \rightarrow Ru(acac)_2 +$ acacH	$\leq 1 \times 10^2$	3.5-7.0		25	p.r.	Estd. from condy. change in He-satd. soln. contg. 5×10^{-4} mol L^{-1} $Ru(acac)_3$ and 0.1 mol L^{-1} *tert*-BuOH; pK_a of $Ru(acac)_3H$ <3.5.	79A297
22.41.2	**First-order reaction**							
	$Ru(acac)_3^- \rightarrow Ru(acac)_2 + acac^-$	$\leq 3 \times 10^{-2}$ s^{-1}	3.5-7.0		25	p.r.	Estd. from condy. change in He-satd. soln. contg. 5×10^{-4} mol L^{-1} $Ru(acac)_3$ and 0.1 mol L^{-1} *tert*-BuOH.	79A297
22.42	**Pentaammine(chloro)ruthenium(II) ion**							
22.42.1	**Water**							
	$Ru(NH_3)_5Cl^+ + H_2O$ → $Ru(NH_3)_5(H_2O)^{2+} + Cl^-$	4.7 s^{-1}			20	p.r.	D.k. at 280 nm in soln. contg. 0.1 mol L^{-1} MeOH and ~1.5×10^{-4} mol L^{-1} $Ru(NH_3)_5Cl^{2+}$.	700178
22.43	**Pentaammine(aquo)ruthenium(II) ion**							
22.43.1	**Pentaammine(chloro)ruthenium(III) ion**							
	$Ru(NH_3)_5(H_2O)^{2+} + Ru(NH_3)_5Cl^{2+}$ → $Ru(NH_3)_5(H_2O)^{3+} + Ru(NH_3)_5Cl^+$	1.0×10^3		0.0003	20	p.r.	D.k. at 330 nm in soln. contg. 0.1 mol L^{-1} MeOH and ~1.5×10^{-4} mol L^{-1} $Ru(NH_3)_5Cl^{2+}$.	700178
22.44	**Tris(2,2′-bipyridine)ruthenium(II) ion, H-adduct**							
22.44.1	**Tris(2,2′-bipyridine)ruthenium(II) ion, H-adduct**							
	$Ru(bpy)_3$-$H^{2+} + Ru(bpy)_3$-H^{2+} → $Ru(bpy)_3^{2+} + Ru(bpy)_2(bpyH_2)^{2+}$	6.6×10^8	~1			p.r.	D.k. in soln. contg. $Ru(bpy)_3^{2+}$, 0.05 mol L^{-1} $HClO_4$ and 0.5 mol L^{-1} *tert*-BuOH; unclear whether k or $2k$.	720381
22.45	**Pentaammine(dinitrogen)ruthenium(III) ion**							
22.45.1	**Water**							
	$Ru(NH_3)_5N_2^{3+} + H_2O$ → $Ru(NH_3)_5OH^{2+} + H^+ + N_2$	260 s^{-1}			20	p.r.	P.b.k. at 310 nm and d.k. at 430 nm in N_2O-satd. soln. contg. (5.5 or 11) $\times 10^{-4}$ mol L^{-1} $Ru(NH_3)_5N_2^{2+}$; average of two values.	710234
22.46	**Hexacyanoruthenate(III) ion**							
22.46.1	**Ferrocyanide ion**							
	$Ru(CN)_6^{3-} + Fe(CN)_6^{4-}$ → $Ru(CN)_6^{4-} + Fe(CN)_6^{3-}$	2.8×10^6 2.4×10^7 9.6×10^7 1.7×10^8		0.03 0.075 0.24 0.44	25	f.p./pi	P.b.k. at 420 nm and d.k. at 455 nm in soln. contg 4×10^{-3} mol L^{-1} $Ru(CN)_6^{4-}$, $Fe(CN)_6^{4-}$ and KCl.	90A168

TABLE 22. Rate constants for ruthenium transients — Continued

No. Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.46 Hexacyanoruthenate(III) ion — Continued							
22.46.2 Hexacyanoosmate(II) ion							
$Ru(CN)_6^{3-} + Os(CN)_6^{4-} \rightarrow$ $Ru(CN)_6^{4-} + Os(CN)_6^{3-}$	2.1×10^5 2.1×10^6 6.6×10^6 1.2×10^7		0.03 0.075 0.24 0.44	25	f.p./pi	D.k. at 455 nm in soln. contg $Ru(CN)_6^{4-}$ and $Os(CN)_6^{4-}$ and KCl.	90A168
22.47 Bis(2,2′-bipyridine)bis(cyano)ruthenium(III) ion							
22.47.1 Iron(II) sulfate							
$Ru(bpy)_2(CN)_2^+ + FeSO_4 \rightarrow$ $Ru(bpy)_2(CN)_2 + FeSO_4^+$	2.0×10^5	0.3		20	f.p./oq	Calcd. from current-time curve; soln. contg. 0.5 mol L^{-1} H_2SO_4, 3×10^{-4} mol L^{-1} $Ru(bpy)_2(CN)_2$ and $[Fe^{2+}] = [Fe^{3+}]$ (OQ).	80E224
22.47.2 1,1′-Dimethyl-4,4′-bipyridinium radical cation							
$Ru(bpy)_2(CN)_2^+ + MV^{\cdot+} \rightarrow$ $Ru(bpy)_2(CN)_2 + MV^{2+}$	9.4×10^9	5-7			f.p./oq	D.k. at 600 nm in soln. contg. 5.5×10^{-5} mol L^{-1} $Ru(bpy)_2(CN)_2$ and 3×10^{-3} mol L^{-1} MV^{2+} (OQ).	85B030
	1.8×10^{10}				f.p./pi	D.k. at 395 nm in N_2-satd. soln. contg. 10^{-2} mol L^{-1} MV^{2+} and 10^{-4} mol L^{-1} $Ru(bpy)_2(CN)_2$.	84A177
22.48 2-(Aminomethyl)pyridinebis(2,2′-bipyridine)ruthenium(III) ion							
22.48.1 2-(Aminomethyl)pyridinebis(2,2′-bipyridine)ruthenium(III) ion, deprotonated							
$Ru(bpy)_2(pyCH_2NH_2)^{3+} +$ $Ru(bpy)_2(pyCH_2NH)^{2+} \rightarrow$ $Ru(bpy)_2(pyCH_2NH_2)^{2+} +$ $Ru(bpy)_2(pyCH_2NH)^{3+}$	1×10^9	0-2	1.0	24	f.p./oq	D.k. at 436 nm in deaerated soln. contg.1.01×10^{-5} mol L^{-1} $Ru(bpy)_2(pyCH_2NH_2)^{2+}$, 2×10^{-3} mol L^{-1} Fe^{3+} (OQ) and 0.01-1.00 mol L^{-1} $HClO_4$; $k = 9 \times 10^8$ L mol^{-1} s^{-1} in 1.0 mol L^{-1} H_2SO_4; $k_r = 5 \times 10^6$ L mol^{-1} s^{-1}.	81A225
22.49 2-(Aminomethyl)pyridinebis(2,2′-bipyridine)ruthenium(III) ion, deprotonated							
22.49.1 Hydrogen ion							
$Ru(bpy)_2(pyCH_2NH)^{2+} + H^+ \rightarrow$ $Ru(bpy)_2(pyCH_2NH_2)^{3+}$	1×10^9	0-2	1.0	24	f.p./oq	D.k. at 436 nm in deaerated soln. contg.1.01×10^{-5} mol L^{-1} $Ru(bpy)_2(pyCH_2NH_2)^{2+}$, 2×10^{-3} mol L^{-1} Fe^{3+} (OQ) and 0.01-1.00 mol L^{-1} $HClO_4$; $k = 2 \times 10^9$ L mol^{-1} s^{-1} in 1.0 mol L^{-1} H_2SO_4; $k_r = 5 \times 10^6$ L mol^{-1} s^{-1}.	81A225
22.50 Tris(2,2′-bipyridine)ruthenium(III) ion							
22.50.1 Silver(I) ion, complex with Ag(0)							
$Ru(bpy)_3^{3+} + Ag_2^+ \rightarrow Ru(bpy)_3^{2+} + 2$ Ag^+	1.2×10^{10}				f.p./oq	P.b.k. in soln. contg. $Ru(bpy)_3^{2+}$ and Ag^+ (OQ).	80C004
22.50.2 Ethylenediaminetetraacetatocobaltate(II) ion							
$Ru(bpy)_3^{3+} + CoEDTA^{2-} \rightarrow$ $Ru(bpy)_3^{2+} + CoEDTA^-$	9×10^3	4.75		25		In 0.05 mol L^{-1} acetate buffer.	85F089
22.50.3 8-Methyl-1,3,13,16-tetraaza-6,10,19-trithiabicyclo[6.6.6]eicosanecobalt(II) ion							
$Ru(bpy)_3^{3+} + Co(AZAcapten)^{2+} \rightarrow$ $Ru(bpy)_3^{2+} + Co(AZAcapten)^{3+}$	$\sim 5 \times 10^8$				f.p./oq	P.b.k. at 470 nm in soln. contg. $Ru(bpy)_3^{2+}$ and $Co(AZAcapten)^{3+}$ (OQ).	85F222
22.50.4 1,3,6,8,10,13,16,19-Octaazabicyclo[6.6.6]eicosanecobalt(II) ion							
$Ru(bpy)_3^{3+} + Co(sep)^{2+} \rightarrow$ $Ru(bpy)_3^{2+} + Co(sep)^{3+}$	5.5×10^8		0.2	25	f.p./oq	P.b.k. at 450 nm in soln. contg. $(2\text{-}5) \times 10^{-5}$ mol L^{-1} $Ru(bpy)_3^{2+}$ and $(1\text{-}7) \times 10^{-3}$ mol L^{-1} $Co(sep)^{3+}$ (OQ).	84A238

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.50	**Tris(2,2′-bipyridine)ruthenium(III) ion** — Continued							
22.50.5	**1,4,8,11-Tetraazacyclotetradecanecobalt(II) ion**							
	$Ru(bpy)_3^{3+} + Co(cyclam)^{2+} \rightarrow Ru(bpy)_3^{2+} + Co(cyclam)^{3+}$	3.2×10^7		0.1	25	f.p./oq	P.b.k. at 443 nm in soln. contg. $Ru(bpy)_3^{2+}$, $Co(NH_3)_5py^{3+}$ (OQ) and $Co(cyclam)^{2+}$.	90A221
22.50.6	**2,3,9,10-Tetramethyl-1,4,8,11-tetraazacyclotetradecanecobalt(II) ion**							
	$Ru(bpy)_3^{3+} + Co(Me_4[14]aneN_4)^{2+} \rightarrow Ru(bpy)_3^{2+} + Co(Me_4[14]aneN_4)^{3+}$	5.9×10^5		0.1	25	f.p./oq	P.b.k. at 443 nm in soln. contg. $Ru(bpy)_3^{2+}$, $Co(NH_3)_5Br^{3+}$ (OQ), $Co(NH_3)_5Cl^{3+}$ (OQ) or $S_2O_8^{2-}$ (OQ) and $Co(Me_4[14]aneN_4)^{2+}$; average of three values.	90A221
22.50.7	**5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanecobalt(II) ion**							
	$Ru(bpy)_3^{3+} + Co(Me_6[14]aneN_4)^{2+} \rightarrow Ru(bpy)_3^{2+} + Co(Me_6[14]aneN_4)^{3+}$	7.7×10^6		0.1	25	f.p./oq	P.b.k. at 443 nm in soln. contg. $Ru(bpy)_3^{2+}$, $Co(NH_3)_5Br^{2+}$ (OQ) or $Co(NH_3)_5Cl^{2+}$ (OQ) and $Co(Me_6[14]aneN_4)^{2+}$; average of two values.	90A221
22.50.8	**2,3,9,10-Tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraenecobalt(II) ion**							
	$Ru(bpy)_3^{3+} + Co(Me_4tetraeneN_4)^{2+} \rightarrow Ru(bpy)_3^{2+} + Co(Me_4tetraeneN_4)^{3+}$	2.1×10^7		0.1	25	f.p./oq	P.b.k. at 443 nm in soln. contg. $Ru(bpy)_3^{2+}$ and $Co(Me_4tetraeneN_4)^{3+}$ (OQ).	90A221
22.50.9	**1,4,8,12-Tetraazacyclopentadecanecobalt(II) ion**							
	$Ru(bpy)_3^{3+} + Co([15]aneN_4)^{2+} \rightarrow Ru(bpy)_3^{2+} + Co([15]aneN_4)^{3+}$	1.8×10^7		0.1	25	f.p./oq	P.b.k. at 443 nm in soln. contg. $Ru(bpy)_3^{2+}$, $Co(NH_3)_5Br^{2+}$ (OQ) or $Co(NH_3)_5Cl^{2+}$ (OQ) and $Co([15]aneN_4)^{2+}$; average of two values.	90A221
22.50.10	**Tris(2,2′-bipyridine)cobalt(II) ion**							
	$Ru(bpy)_3^{3+} + Co(bpy)_3^{2+} \rightarrow Ru(bpy)_3^{2+} + Co(bpy)_3^{3+}$	1.3×10^8		1.0		f.p./oq	Soln. contg. $Ru(bpy)_3^{2+}$ and $Co(bpy)_3^{3+}$ (OQ).	82F048
		2.4×10^8		1.0	25	f.p./oq	D.k. at 675 nm in soln. contg. 7.5×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$ and 0.5 or 1.0×10^{-3} mol L^{-1} $Co(bpy)_3^{3+}$ (OQ); studied at 5-25 °C, $E_a = -11.8$ kJ mol^{-1}.	80A003
22.50.11	**Tris(1,10-phenanthroline)cobalt(II) ion**							
	$Ru(bpy)_3^{3+} + Co(phen)_3^{2+} \rightarrow Ru(bpy)_3^{2+} + Co(phen)_3^{3+}$	1.4×10^8		1.0	25	f.p./oq	D.k. at 675 nm in soln. contg. 7.5×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$ and 0.25-2.0×10^{-3} mol L^{-1} $Co(phen)_3^{3+}$ (OQ); the same value was obtained under pseudo-first order conditions with addn. of 1.0×10^{-4} mol L^{-1} $Co(phen)_3^{2+}$. Studied at 5-25 °C, $E_a = -4.6 \pm 3.7$ kJ mol^{-1}.	80A003
22.50.12	**3,10,17,24-Tetrasulfophthalocyaninecobaltate(II) ion**							
	$Ru(bpy)_3^{3+} + Co(tspc)^{4-} \rightarrow Ru(bpy)_3^{2+} + Co(tspc)^{3-}$	4.5×10^7				f.p./oq	D.k. at 580 nm; mixed dimer contg. $(5\text{-}10) \times 10^{-3}$ $Ru(bpy)_3^{2+}$ and $(1\text{-}5) \times 10^{-6}$ mol L^{-1} $Co(tspc)^{3-}$ (OQ).	79A090
22.50.13	**3,10,17,24-Tetrasulfophthalocyaninecobaltate(I) ion**							
	$Ru(bpy)_3^{3+} + Co(tspc)^{5-} \rightarrow Ru(bpy)_3^{2+} + Co(tspc)^{4-}$	2.9×10^8	1-3			f.p./oq	D.k. at 520 nm in deaerated soln. contg. 0.001-0.1 mol L^{-1} HCl, 0.001-0.01 mol L^{-1} $Ru(bpy)_3^{2+}$ and $Co(tspc)^{4-}$ (OQ).	79A090
22.50.14	**Decaammine-μ-peroxidodicobalt(III) ion**							
	$Ru(bpy)_3^{3+} + [Co(NH_3)_5]_2(O_2)^{4+} \rightarrow Ru(bpy)_3^{2+} + [Co(NH_3)_5]_2(O_2)^{5+}$	1.3×10^7	0			f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, $[Co(NH_3)_5]_2(O_2)^{5+}$ (OQ) and 1 mol L^{-1} HCl.	81A065

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref
22.50	**Tris(2,2′-bipyridine)ruthenium(III) ion** — Continued							
22.50.15	**μ-Amido-μ-peroxidooctakisamminedicobalt(III) ion**							
	$Ru(bpy)_3^{3+} + NH_2[Co(NH_3)_4]_2(O_2)^{3+} \rightarrow Ru(bpy)_3^{2+} + NH_2[Co(NH_3)_4]_2(O_2)^{4+}$	3.4×10^5	0			f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, $NH_2[Co(NH_3)_4]_2(O_2)^{4+}$ (OQ) and 1 mol L^{-1} HCl.	81A065
22.50.16	**μ-Amido-μ-peroxidotetrakis(ethylenediamine)dicobalt(III) ion**							
	$Ru(bpy)_3^{3+} + NH_2[Co(en)_2]_2(O_2)^{3+} \rightarrow Ru(bpy)_3^{2+} + NH_2[Co(en)_2]_2(O_2)^{4+}$	2.5×10^6	0			f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, $NH_2[Co(en)_2]_2(O_2)^{4+}$ (OQ) and 1 mol L^{-1} HCl; $k = 7.6 \times 10^5$ L mol^{-1} s^{-1} detd. by s.f.	81A065
22.50.17	**μ-Amido-μ-peroxidotetrakis(2,2′-bipyridine)dicobalt(III) ion**							
	$Ru(bpy)_3^{3+} + NH_2[Co(bpy)_2]_2(O_2)^{3+} \rightarrow Ru(bpy)_3^{2+} + NH_2[Co(bpy)_2]_2(O_2)^{4+}$	3.0×10^8	0			f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, $NH_2[Co(bpy)_2]_2(O_2)^{4+}$ (OQ) and 1 mol L^{-1} HCl.	81A065
22.50.18	**μ-Amido-μ-peroxidotetrakis(1,10-phenanthroline)dicobalt(III) ion**							
	$Ru(bpy)_3^{3+} + NH_2[Co(phen)_2]_2(O_2)^{3+} \rightarrow Ru(bpy)_3^{2+} + NH_2[Co(phen)_2]_2(O_2)^{4+}$	3.6×10^8	0			f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$ and $NH_2[Co(phen)_2]_2(O_2)^{4+}$ (OQ) and 1 mol L^{-1} HCl.	81A065
22.50.19	**Chromium(II) ion**							
	$Ru(bpy)_3^{3+} + Cr^{2+} \rightarrow Ru(bpy)_3^{2+} + Cr^{3+}$	7.6×10^7						86A536
22.50.20	**Pentaaquamethylchromium(III) ion**							
	$Ru(bpy)_3^{3+} + (H_2O)_5CrCH_3^{2+} \rightarrow Ru(bpy)_3^{2+} + (H_2O)_5CrCH_3^{3+}$	$<10^3$	1-1.2	0.1	25	f.p./oq	P.b.k. at 450 nm in soln. contg. (1.2-2.6) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, (2-10) × 10^{-3} mol L^{-1} $Co(NH_3)_5Br^{2+}$ (OQ) and (2-210) × 10^{-5} mol L^{-1} $(H_2O)_5CrCH_3^{2+}$; [H$^+$] = 0.07-0.095 mol L^{-1}.	86A536
22.50.21	**Pentaaqua(ethyl)chromium(III) ion**							
	$Ru(bpy)_3^{3+} + (H_2O)_5CrCH_2CH_3^{2+} \rightarrow Ru(bpy)_3^{2+} + (H_2O)_5CrCH_2CH_3^{3+}$	2.0×10^5	1-1.2	0.1	25	f.p./oq	P.b.k. at 450 nm in soln. contg. (1.2-2.6) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, (2-10) × 10^{-3} mol L^{-1} $Co(NH_3)_5Br^{2+}$ (OQ) and (2-210) × 10^{-5} mol L^{-1} $(H_2O)_5CrCH_2CH_3^{2+}$; [H$^+$] = 0.07-0.095 mol L^{-1}.	86A536
22.50.22	**Pentaaqua(isopropyl)chromium(III) ion**							
	$Ru(bpy)_3^{3+} + (H_2O)_5CrCH(CH_3)_2^{2+} \rightarrow Ru(bpy)_3^{2+} + (H_2O)_5CrCH(CH_3)_2^{3+}$	4.3×10^7	1-1.2	0.1	25	f.p./oq	P.b.k. at 450 nm in soln. contg. (1.2-2.6) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, (2-10) × 10^{-3} mol L^{-1} $Co(NH_3)_5Br^{2+}$ (OQ) and (2-210) × 10^{-5} mol L^{-1} $(H_2O)_5CrCH(CH_3)_2^{2+}$; [H$^+$] = 0.07-0.095 mol L^{-1}.	86A536
22.50.23	**Pentaaqua(methoxymethyl)chromium(III) ion**							
	$Ru(bpy)_3^{3+} + (H_2O)_5CrCH_2OCH_3^{2+} \rightarrow Ru(bpy)_3^{2+} + (H_2O)_5CrCH_2OCH_3^{3+}$	1.0×10^7	1-1.2	0.1	25	f.p./oq	P.b.k. at 450 nm in soln. contg. (1.2-2.6) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, (2-10) × 10^{-3} mol L^{-1} $Co(NH_3)_5Br^{2+}$ (OQ) and (2-210) × 10^{-5} mol L^{-1} $(H_2O)_5CrCH_2OCH_3^{2+}$; [H$^+$] = 0.07-0.095 mol L^{-1}.	86A536
22.50.24	**Pentaaqua(4-cyanobenzyl)chromium(III) ion**							
	$Ru(bpy)_3^{3+} + (H_2O)_5Cr(4\text{-}CH_2C_6H_4CN^{2+} \rightarrow Ru(bpy)_3^{2+} + (H_2O)_5Cr(4\text{-}CH_2C_6H_4CN)^{3+}$	9.5×10^6	1-1.2	0.1	25	f.p./oq	P.b.k. at 450 nm in soln. contg. (1.2-2.6) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, (2-10) × 10^{-3} mol L^{-1} $Co(NH_3)_5Br^{2+}$ (OQ) and (2-210) × 10^{-5} mol L^{-1} $(H_2O)_5Cr(4\text{-}CH_2C_6H_4CN)^{2+}$; [H$^+$] = 0.07-0.095 mol L^{-1}.	86A536

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.50	**Tris(2,2′-bipyridine)ruthenium(III) ion** — Continued							
22.50.25	**Pentaaqua[4-(trifluoromethyl)benzyl]chromium(III) ion**							
	$Ru(bpy)_3^{3+}$ + $(H_2O)_5CrCH_2C_6H_4$-4-CF_3^{2+} → $Ru(bpy)_3^{2+}$ + $(H_2O)_5CrCH_2C_6H_4$-4-CF_3^{3+}	1.7×10^7	1-1.2	0.1	25	f.p./oq	P.b.k. at 450 nm in soln. contg. (1.2-2.6) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, (2-10) × 10^{-3} mol L^{-1} $Co(NH_3)_5Br^{2+}$ (OQ) and (2-210) × 10^{-5} mol L^{-1} $(H_2O)_5Cr(4\text{-}CH_2C_6H_4CF_3)^{2+}$; $[H^+]$ = 0.07-0.095 mol L^{-1}.	86A536
22.50.26	**Pentaaqua(benzyl)chromium(III) ion**							
	$Ru(bpy)_3^{3+}$ + $(H_2O)_5CrCH_2C_6H_5^{2+}$ → $Ru(bpy)_3^{2+}$ + $(H_2O)_5CrCH_2C_6H_5^{3+}$	5.3×10^8	1-1.2	0.1	25	f.p./oq	P.b.k. at 450 nm in soln. contg. (1.2-2.6) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, (2-10) × 10^{-3} mol L^{-1} $Co(NH_3)_5Br^{2+}$ (OQ) and (2-210) × 10^{-5} mol L^{-1} $(H_2O)_5CrCH_2C_6H_5^{2+}$; $[H^+]$ = 0.07-0.095 mol L^{-1}.	86A536
22.50.27	**Pentaaqua(4-methylbenzyl)chromium(III) ion**							
	$Ru(bpy)_3^{3+}$ + $(H_2O)_5CrCH_2C_6H_4$-4-CH_3^{2+} → $Ru(bpy)_3^{2+}$ + $(H_2O)_5CrCH_2C_6H_4$-4-CH_3^{3+}	2.9×10^8	1-1.2	0.1	25	f.p./oq	P.b.k. at 450 nm in soln. contg. (1.2-2.6) × 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, (2-10) × 10^{-3} mol L^{-1} $Co(NH_3)_5Br^{2+}$ (OQ) and (2-210) × 10^{-5} mol L^{-1} $(H_2O)_5Cr(4\text{-}CH_2C_6H_4CH_3)^{2+}$; $[H^+]$ = 0.07-0.095 mol L^{-1}.	86A536
22.50.28	**(Methyl)-1,4,8,12-tetraazacyclopentadecanechromium(III) ion**							
	$Ru(bpy)_3^{3+}$ + $CH_3Cr([15]aneN_4)^{2+}$ → $Ru(bpy)_3^{2+}$ + $CH_3Cr([15]aneN_4)^{3+}$	14	2	0.21	25	therm.	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, 0.01 mol L^{-1} H^+, 0.2 mol L^{-1} $NaClO_4$ and $CH_3Cr([15]aneN_4)^{2+}$.	91A511
22.50.29	**(Ethyl)-1,4,8,12-tetraazacyclopentadecanechromium(III) ion**							
	$Ru(bpy)_3^{3+}$ + $CH_3CH_2Cr([15]aneN_4)^{2+}$ → $Ru(bpy)_3^{2+}$ + $CH_3CH_2Cr([15]aneN_4)^{3+}$	2.1×10^4	2	0.21	25	f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, $Co(NH_3)_5Br^{2+}$, or $Co(NH_3)_5py^{3+}$ or $Co(NH_3)_5(H_2O)^{3+}$ (OQ), 0.01 mol L^{-1} H^+, 0.2 mol L^{-1} $NaClO_4$ and $CH_3CH_2Cr([15]aneN_4)^{2+}$.	91A511
22.50.30	**(Propyl)-1,4,8,12-tetraazacyclopentadecanechromium(III) ion**							
	$Ru(bpy)_3^{3+}$ + $CH_3CH_2CH_2Cr([15]aneN_4)^{2+}$ → $Ru(bpy)_3^{2+}$ + $CH_3CH_2CH_2Cr([15]aneN_4)^{3+}$	3.5×10^3	2	0.21	25	f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, $Co(NH_3)_5Br^{2+}$ (OQ), 0.01 mol L^{-1} H^+, 0.2 mol L^{-1} $NaClO_4$ and $CH_3CH_2CH_2Cr([15]aneN_4)^{2+}$.	91A511
22.50.31	**(1-Methylethyl)-1,4,8,12-tetraazacyclopentadecanechromium(III) ion**							
	$Ru(bpy)_3^{3+}$ + $(CH_3)_2CHCr([15]aneN_4)^{2+}$ → $Ru(bpy)_3^{2+}$ + $(CH_3)_2CHCr([15]aneN_4)^{3+}$	4.7×10^6	2	0.21	25	f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, $Co(NH_3)_5Br^{2+}$ (OQ), 0.01 mol L^{-1} H^+, 0.2 mol L^{-1} $NaClO_4$ and $(CH_3)_2CHCr([15]aneN_4)^{2+}$.	91A511
22.50.32	**(Butyl)-1,4,8,12-tetraazacyclopentadecanechromium(III) ion**							
	$Ru(bpy)_3^{3+}$ + $CH_3(CH_2)_3Cr([15]aneN_4)^{2+}$ → $Ru(bpy)_3^{2+}$ + $CH_3(CH_2)_3Cr([15]aneN_4)^{3+}$	3.8×10^3	2	0.21	25	f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, $Co(NH_3)_5Br^{2+}$ (OQ), 0.010 mol L^{-1} H^+, 0.20 mol L^{-1} $NaClO_4$ and $CH_3(CH_2)_3Cr([15]aneN_4)^{2+}$.	91A511
22.50.33	**(2-Butyl)-1,4,8,12-tetraazacyclopentadecanechromium(III) ion**							
	$Ru(bpy)_3^{3+}$ + $CH_3CH_2CH(CH_3)Cr([15]aneN_4)^{2+}$ → $Ru(bpy)_3^{2+}$ + $CH_3CH_2CH(CH_3)Cr([15]aneN_4)^{3+}$	1.4×10^6	2	0.21	25	f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, $Co(NH_3)_5Br^{2+}$ (OQ), 0.01 mol L^{-1} H^+, 0.2 mol L^{-1} $NaClO_4$ and $CH_3CH_2CH(CH_3)Cr([15]aneN_4)^{2+}$.	91A511

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.50	**Tris(2,2′-bipyridine)ruthenium(III) ion** — Continued							
22.50.34	**(Cyclohexyl)-1,4,8,12-tetraazacyclopentadecanechromium(III) ion**							
	$Ru(bpy)_3^{3+}$ + c-$C_6H_{11}Cr([15]aneN_4)^{2+}$ → $Ru(bpy)_3^{2+}$ + c-$C_6H_{11}Cr([15]aneN_4)^{3+}$	1.2×10^7	2	0.21	25	f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, $Co(NH_3)_5Br^{2+}$ (OQ), 0.01 mol L^{-1} H$^+$, 0.2 mol L^{-1} $NaClO_4$ and c-$C_6H_{11}Cr([15]aneN_4)^{2+}$.	91A511
22.50.35	**(Phenylmethyl)-1,4,8,12-tetraazacyclopentadecanechromium(III) ion**							
	$Ru(bpy)_3^{3+}$ + $C_6H_5CH_2Cr([15]aneN_4)^{2+}$ → $Ru(bpy)_3^{2+}$ + $C_6H_5CH_2Cr([15]aneN_4)^{3+}$	5.5×10^8	2	0.21	25	f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, $Co(NH_3)_5Br^{2+}$ (OQ), 0.01 mol L^{-1} H$^+$, 0.2 mol L^{-1} $NaClO_4$ and $C_6H_5CH_2Cr([15]aneN_4)^{2+}$.	91A511
22.50.36	**(4-Bromobenzyl)-1,4,8,12-tetraazacyclopentadecanechromium(III) ion**							
	$Ru(bpy)_3^{3+}$ + 4-$BrC_6H_4CH_2Cr([15]aneN_4)^{2+}$ → $Ru(bpy)_3^{2+}$ + 4-$BrC_6H_4CH_2Cr([15]aneN_4)^{3+}$	4.3×10^8	2	0.21	25	f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, $Co(NH_3)_5Br^{2+}$ (OQ), 0.01 mol L^{-1} H$^+$, 0.2 mol L^{-1} $NaClO_4$ and 4-$BrC_6H_4CH_2Cr([15]aneN_4)^{2+}$.	91A511
22.50.37	**(4-Chlorophenylmethyl)-1,4,8,12-tetraazacyclopentadecanechromium(III) ion**							
	$Ru(bpy)_3^{3+}$ + 4-$ClC_6H_4CH_2Cr([15]aneN_4)^{2+}$ → $Ru(bpy)_3^{2+}$ + 4-$ClC_6H_4CH_2Cr([15]aneN_4)^{3+}$	3.8×10^8	2	0.21	25	f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, $Co(NH_3)_5Br^{2+}$ (OQ), 0.01 mol L^{-1} H$^+$, 0.2 mol L^{-1} $NaClO_4$ and 4-$ClC_6H_4CH_2Cr([15]aneN_4)^{2+}$.	91A511
22.50.38	**(4-Fluorophenylmethyl)-1,4,8,12-tetraazacyclopentadecanechromium(III) ion**							
	$Ru(bpy)_3^{3+}$ + 4-$FC_6H_4CH_2Cr([15]aneN_4)^{2+}$ → $Ru(bpy)_3^{2+}$ + 4-$FC_6H_4CH_2Cr([15]aneN_4)^{3+}$	3.0×10^8	2	0.21	25	f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, $Co(NH_3)_5Br^{2+}$ (OQ), 0.01 mol L^{-1} H$^+$, 0.2 mol L^{-1} $NaClO_4$ and 4-$FC_6H_4CH_2Cr([15]aneN_4)^{2+}$.	91A511
22.50.39	**(4-Methylbenzyl)-1,4,8,12-tetraazacyclopentadecanechromium(III) ion**							
	$Ru(bpy)_3^{3+}$ + 4-$CH_3C_6H_4CH_2Cr([15]aneN_4)^{2+}$ → $Ru(bpy)_3^{2+}$ + 4-$CH_3C_6H_4CH_2Cr([15]aneN_4)^{3+}$	1.1×10^9	2	0.21	25	f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, $Co(NH_3)_5Br^{2+}$ (OQ), 0.01 mol L^{-1} H$^+$, 0.2 mol L^{-1} $NaClO_4$ and 4-$CH_3C_6H_4CH_2Cr([15]aneN_4)^{2+}$.	91A511
22.50.40	**(4-Trifluoromethyl)phenylmethyl-1,4,8,12-tetraazacyclopentadecanechromium(III) ion**							
	$Ru(bpy)_3^{3+}$ + 4-$CF_3C_6H_4CH_2Cr([15]aneN_4)^{2+}$ → $Ru(bpy)_3^{2+}$ + 4-$CF_3C_6H_4CH_2Cr([15]aneN_4)^{3+}$	2.7×10^7	2	0.21	25	f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, $Co(NH_3)_5Br^{2+}$ (OQ), 0.01 mol L^{-1} H$^+$, 0.2 mol L^{-1} $NaClO_4$ and 4-$CF_3C_6H_4CH_2Cr([15]aneN_4)^{2+}$.	91A511
22.50.41	**(4-Methoxyphenylmethyl)-1,4,8,12-tetraazacyclopentadecanechromium(III) ion**							
	$Ru(bpy)_3^{3+}$ + 4-$CH_3OC_6H_4CH_2Cr([15]aneN_4)^{2+}$ → $Ru(bpy)_3^{2+}$ + 4-$CH_3OC_6H_4CH_2Cr([15]aneN_4)^{3+}$	1.2×10^9	2	0.21	25	f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, $Co(NH_3)_5Br^{2+}$ (OQ), 0.01 mol L^{-1} H$^+$, 0.2 mol L^{-1} $NaClO_4$ and 4-$CH_3OC_6H_4CH_2Cr([15]aneN_4)^{2+}$.	91A511
22.50.42	**Copper(I) ion**							
	$Ru(bpy)_3^{3+}$ + Cu^+ → $Ru(bpy)_3^{2+}$ + Cu^{2+}	4.3×10^8 3×10^8	0.3 <0		25	f.p./oq	P.b.k. at 450 nm in soln. contg. 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 0.01-0.06 mol L^{-1} Cu^{2+} (OQ) and in 0.5 and 2.4 mol L^{-1} $HClO_4$, respectively.	78A090
		9.7×10^8	0.3		25	f.p./oq	P.b.k. at 450 nm in soln. contg. 10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 0.01-0.06 mol L^{-1} Cu^{2+} (OQ) and 0.5 mol L^{-1} sulfuric acid.	78A090
		3.4×10^8		1.0	21	f.p./oq	P.b.k. in deoxygenated soln. contg. $Ru(bpy)_3^{2+}$ and Cu^{2+} (OQ).	78F683
		1×10^8	0	1.9	24	f.p./oq	D.k. at 480 nm in soln. contg. $Ru(bpy)_3^{2+}$, Cu^{2+} (OQ) and 1 mol L^{-1} $HClO_4$.	771093

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.50	**Tris(2,2′-bipyridine)ruthenium(III) ion** — Continued							
22.50.43	**Copper(I) chloride**							
	$Ru(bpy)_3^{3+} + CuCl \rightarrow Ru(bpy)_3^{2+} + CuCl^+$	3.5×10^9	1	1.0	21	f.p./oq	P.b.k. in deoxygenated soln. contg. $Ru(bpy)_3^{2+}$, 0.10 mol L^{-1} $HClO_4$, 0.5 mol L^{-1} NaCl and Cu(II) ions (OQ); 75% $CuCl^+$.	78F683
22.50.44	**Tetraformatocuprate(I) ion**							
	$Ru(bpy)_3^{3+} + Cu(HCO_2)_4^{3-} \rightarrow Ru(bpy)_3^{2+} + Cu(HCO_2)_4^{2-}$	2.1×10^9	1	1.0	21	f.p./oq	P.b.k. in deoxygenated soln. contg. $Ru(bpy)_3^{2+}$, 0.10 mol L^{-1} $HClO_4$, 0.5 mol L^{-1} formate ion and Cu(II) ions (OQ); 80% $Cu(HCO_2)_4^{2-}$.	78F683
22.50.45	**Tetraacetatocuprate(I) ion**							
	$Ru(bpy)_3^{3+} + Cu(OAc)_4^{3-} \rightarrow Ru(bpy)_3^{2+} + Cu(OAc)_4^{2-}$	2.3×10^9	1	1.0	21	f.p./oq	P.b.k. in deoxygenated soln. contg. $Ru(bpy)_3^{2+}$, 0.10 mol L^{-1} $HClO_4$, 0.5 mol L^{-1} acetate ion and Cu(II) ions (OQ); 90% $Cu(OAc)_4^{2-}$.	78F683
22.50.46	**4,7,13,16,21-Pentaoxa-1,10-diazabicyclo[8.8.5]tricosaneeuropium(II) ion**							
	$Ru(bpy)_3^{3+} + [Eu\ 2.2.1]^{2+} \rightarrow Ru(bpy)_3^{2+} + [Eu\ 2.2.1]^{3+}$	1.3×10^9		1	22	f.p./oq	P.b.k. at 454 nm in soln. contg. $Ru(bpy)_3^{2+}$, excess $[Eu\ 2.2.1]^{3+}$ (OQ) and 1 mol L^{-1} KCl.	86E195
22.50.47	**Iron(II) ion**							
	$Ru(bpy)_3^{3+} + Fe^{2+} \rightarrow Ru(bpy)_3^{2+} + Fe^{3+}$	1.2×10^6	0.3		22-23	phot.	Step-excitation method, $\lambda_{exc} = 488.8$ nm; soln. contg. 7.6×10^{-6} mol L^{-1} $Ru(bpy)_3^{2+}$, 1.02×10^{-3} mol L^{-1} Fe^{3+} (OQ), 2.8×10^{-6} mol L^{-1} Fe^{2+} and 0.5 mol L^{-1} $HClO_4$; at $\lambda_{exc} = 496.5$ and 514.5 nm, $k = 9.3 \times 10^5$ and 1.5×10^6 L mol^{-1} s^{-1}, respectively.	79F488
		2.6×10^6	≤1	0.1	18	f.p./oq	P.b.k. at 452 nm in soln. contg. $Ru(bpy)_3^{2+}$, Fe^{3+} (OQ) and 0.1, 0.5, 1.0, 2.5 and 5.0 mol L^{-1} $HClO_4$, respectively.	79A218
		7.2×10^5		0.5				
		6.4×10^5		1.0				
		4.3×10^5		2.5				
		1.5×10^5		5.0				
		1.6×10^6	≤1	0.1	18	f.p./oq	P.b.k. at 452 nm in soln. contg. $Ru(bpy)_3^{2+}$, Fe^{3+} (OQ) and 0.1, 0.5 and 1.0 mol L^{-1} CF_3SO_3H, respectively.	79A218
		1.2×10^6		0.5				
		9.8×10^5		1.0				
		1.2×10^6	0	1.0	25	f.p./oq	P.b.k. in soln. contg. 3.0×10^{-6} mol L^{-1} $Ru(bpy)_3^{2+}$, 3.0×10^{-6} mol L^{-1} $Ru(phen)_3^{2+}$, 1.0 or 0.076 mol L^{-1} $HClO_4$, 4.0×10^{-5} mol L^{-1} Fe^{3+} (OQ) and 3.0×10^{-5} mol L^{-1} Fe^{2+}; independent of temperature 5-50 °C.	777164
		1.4×10^6	~1	0.1	25			
		8.5×10^5	0	1.9	24	f.p./oq	D.k. at 480 nm in soln. contg. $Ru(bpy)_3^{2+}$, Fe^{3+} (OQ) and 1 mol L^{-1} $HClO_4$.	771093
		1.0×10^6	0			f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, Fe^{3+} (OQ) and 1.0 mol L^{-1} $HClO_4$.	747159
22.50.48	**Iron(II) acetate**							
	$Ru(bpy)_3^{3+} + Fe(OAc)_n^{2-n+} \rightarrow Ru(bpy)_3^{2+} + Fe(OAc)_n^{3-n+}$	3.4×10^8	5.0			f.p./oq	P.b.k. at 452 nm in deaerated soln. contg. 5×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 4×10^{-4} mol L^{-1} Fe^{3+} (OQ) and 0.1 mol L^{-1} acetate ion.	81N178

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1}.s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.50	**Tris(2,2'-bipyridine)ruthenium(III) ion** — Continued							
22.50.49	**Tetrachloroferrate(II) ion**							
	$Ru(bpy)_3^{3+} + FeCl_4^{2-} \rightarrow Ru(bpy)_3^{2+} + FeCl_4^-$	4.1×10^6 4.7×10^6 5.3×10^6	1 0.3 0	0.1 0.5 1.0	18	f.p./oq	P.b.k. at 452 nm in soln. contg. $Ru(bpy)_3^{2+}$, Fe^{3+} (OQ) (primarily $FeCl_4^-$) and 0.1, 0.5 and 1.0 mol L^{-1} HCl, respectively.	79A218
22.50.50	**Triphosphatoferrate(II) ion**							
	$Ru(bpy)_3^{3+} + Fe(PO_4)_3^{7-} \rightarrow Ru(bpy)_3^{2+} + Fe(PO_4)_3^{6-}$	1.9×10^7 1.5×10^7	<1.2		18	f.p./oq	P.b.k. at 452 nm in soln. contg. $Ru(bpy)_3^{2+}$, Fe^{3+} (OQ) (various species including $Fe(PO_4)_3^{6-}$) and 0.5 and 5.0 mol L^{-1} H_3PO_4, respectively.	79A218
22.50.51	**Iron(II) sulfate**							
	$Ru(bpy)_3^{3+} + FeSO_4 \rightarrow Ru(bpy)_3^{2+} + FeSO_4^+$	1.3×10^7 8×10^6	~2 ~0.8			f.p./oq	P.b.k. at 455 nm in soln. contg. 2×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, Fe(III) (OQ), (0-7) $\times 10^{-4}$ mol L^{-1} Fe(II) and 7×10^{-3} or 0.16 mol L^{-1} H_2SO_4, respectively.	89E329
		4.0×10^6	0.3	1.0		f.p./oq	Soln. contg. $Ru(bpy)_3^{2+}$, Fe(III) (OQ) and 0.5 mol L^{-1} H_2SO_4.	82F048
		4.8×10^6	0.3		20	f.p./oq	Calcd. from current-time curve; soln. contg. 0.5 mol L^{-1} H_2SO_4, 3×10^{-4} mol L^{-1} $Ru(bpy)_3^{2+}$ and $[Fe^{2+}] = [Fe^{3+}]$ (OQ).	80E224
		5.1×10^6 5.2×10^6 4.0×10^6	~0.8 0.3 <0		18	f.p./oq	P.b.k. at 452 nm in soln. contg. $Ru(bpy)_3^{2+}$, Fe^{3+} (OQ) ($FeSO_4^+$ and $Fe(SO_4)_2^-$) and 0.17, 0.5 or 2.5 mol L^{-1} H_2SO_4, respectively.	79A218
		5.2×10^6	0.3		25	f.p./oq	P.b.k. in soln. contg. $Ru(bpy)_3^{2+}$, Fe(III) (OQ) and 0.5 mol L^{-1} H_2SO_4; $k = 4.9 \times 10^6$ L mol^{-1} s^{-1} detd. by s.f.	766404
22.50.52	**Tris(1,10-phenanthroline)iron(II) ion**							
	$Ru(bpy)_3^{3+} + Fe(phen)_3^{2+} \rightarrow Ru(bpy)_3^{2+} + Fe(phen)_3^{3+}$	1.8×10^9 1.3×10^9	0 ~1	1.0 0.1	25	f.p./oq	P.b.k. at 450 nm in soln. contg. 3.0×10^{-6} mol L^{-1} $Ru(bpy)_3^{2+}$, 2.5×10^{-6} mol L^{-1} $Fe(phen)_3^{2+}$, 1.0 or 0.076 mol L^{-1} $HClO_4$, 4.0×10^{-3} mol L^{-1} Fe^{3+} (OQ) and 3.0×10^{-5} mol L^{-1} Fe^{2+}.	777164
22.50.53	**Ferrocyanide ion**							
	$Ru(bpy)_3^{3+} + Fe(CN)_6^{4-} \rightarrow Ru(bpy)_3^{2+} + Fe(CN)_6^{3-}$	9.8×10^9	6.8	0.1	23	f.p./oq	P.b.k. at 450 nm in soln. contg. 4.2×10^{-1} $Ru(bpy)_3^{2+}$, 0.01 mol L^{-1} MV^{2+} (OQ) and 2.0×10^{-4} mol L^{-1} $Fe(CN)_6^{3-}$.	82A130
22.50.54	**Mercury(I) ion**							
	$Ru(bpy)_3^{3+} + Hg^+ \rightarrow Ru(bpy)_3^{2+} + Hg^{2+}$	2.9×10^9	~1	1.0	21	f.p./oq	P.b.k. at 436 nm in deaerated soln. contg. 3.6×10^{-6} mol L^{-1} $Ru(bpy)_3^{2+}$, 1×10^{-2} mol L^{-1} $Hg(NO_3)_2$ (OQ), 0.11 mol L^{-1} HNO_3 and 0.09 mol L^{-1} $NaNO_3$; assumed $k(Hg^+ + Hg^+) = 8 \times 10^9$ L mol^{-1} s^{-1}.	84A148
22.50.55	**Mercury(I) dimer ion**							
	$Ru(bpy)_3^{3+} + Hg_2^{2+} \rightarrow Ru(bpy)_3^{2+} + Hg^{2+} + Hg^+$	4.5	~1	1.0	21	f.p./oq	P.b.k. at 436 nm in deaerated soln. contg. 3.6×10^{-6} mol L^{-1} $Ru(bpy)_3^{2+}$, 1×10^{-2} mol L^{-1} $Hg(NO_3)_2$ (OQ), 0.11 mol L^{-1} HNO_3 and 0.09 mol L^{-1} $NaNO_3$.	84A148

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction		k ($L\,mol^{-1}\,s^{-1}$)	pH	I	t(°C)	Method	Comment	Ref.
22.50	**Tris(2,2′-bipyridine)ruthenium(III) ion** — Continued								
22.50.56	**Dichloromercurate(I) ion**								
	$Ru(bpy)_3^{3+} + HgCl_2^- \rightarrow Ru(bpy)_3^{2+} + HgCl_2$		$>2 \times 10^{10}$		1.0		f.p./oq	Soln. contg. $Ru(bpy)_3^{2+}$ and $HgCl_2$ (OQ).	84A077
22.50.57	**Superoxide radical anion**								
	$Ru(bpy)_3^{3+} + O_2^{\cdot -} \rightarrow Ru(bpy)_3^{2+} + O_2$	*	8.0×10^9		0.2	23	f.p./oq	P.b.k. at 450 nm in O_2 satd. soln. contg. 5.5×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$ and $(5\text{-}50) \times 10^{-3}$ mol L^{-1} MV^{2+} (OQ) in D_2O.	88A105
		*	1.4×10^{10}	>7	0.1	23	f.p./oq	P.b.k. at 452 nm in soln. contg. 5×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, ~0.01 mol L^{-1} MV^{2+} (OQ) and $(0.7\text{-}10) \times 10^{-4}$ mol L^{-1} O_2. Calcd. from pH study; unreactive with HO_2.	85F449
		*	3.5×10^{10}			24	f.p./oq	P.b.k. at 450 in air-satd. soln. contg. $Ru(bpy)_3^{2+}$ and BSV (OQ).	85A064
								* Unexplained discrepancy in these data.	
22.50.58	**Tris(2,2′-bipyridine)rhodium(II) ion**								
	$Ru(bpy)_3^{3+} + Rh(bpy)_3^{2+} \rightarrow Ru(bpy)_3^{2+} + Rh(bpy)_3^{3+}$		1.3×10^9	5	0.056	20	f.p./oq	D.k. at 670 nm and p.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$ and $Rh(bpy)_3^{3+}$ (OQ) in 0.04 mol L^{-1} acetate buffer.	87A460
			3×10^9	0.3		25	f.p./oq	P.b.k. at 450 nm in soln. contg. 5×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 4.0×10^{-3} mol L^{-1} $Rh(bpy)_3^{3+}$ (OQ) and 0.5 mol L^{-1} H_2SO_4.	81N003 79A317
22.50.59	**Hexaammineruthenium(II) ion**								
	$Ru(bpy)_3^{3+} + Ru(NH_3)_6^{2+} \rightarrow Ru(bpy)_3^{2+} + Ru(NH_3)_6^{3+}$		3.7×10^9	0.3			f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, $Ru(NH_3)_6^{3+}$ (OQ) and 1.0 mol L^{-1} CF_3CO_2H.	747159
22.50.60	**Ammine(2,2′-bipyridine)(2,2′:6′,2″-terpyridine)ruthenium(II) ion**								
	$Ru(bpy)_3^{3+} + Ru(terpy)(bpy)(NH_3)^{2+} \rightarrow Ru(bpy)_3^{2+} + Ru(terpy)(bpy)(NH_3)^{3+}$		2.7×10^9	0			f.p./oq	P.b.k. at 450 nm and d.k. at 480 nm in soln. contg. 5.64×10^{-6} mol L^{-1} $Ru(bpy)_3^{2+}$, 3.48×10^{-6} mol L^{-1} $Ru(terpy)(bpy)NH_3^{2+}$, 4.2×10^{-3} mol L^{-1} Fe^{3+} (OQ), 5.25×10^{-5} mol L^{-1} Fe^{2+} and 1.0 mol L^{-1} $HClO_4$; average of two values.	84A302
22.50.61	**Thiocyanate ion**								
	$Ru(bpy)_3^{3+} + 2\,SCN^- \rightarrow Ru(bpy)_3^{2+} + (SCN)_2^{\cdot -}$		2×10^5	7.0		25	p.r.	D.k. at 500 nm in N_2O-satd. soln. contg. 0.01 mol L^{-1} KSCN, 4.5×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$ and 5×10^{-3} mol L^{-1} phosphate ion; $k_r = 7 \times 10^{10}$ L mol^{-1} s^{-1}.	90C005
22.50.62	**Sulfite ion**								
	$Ru(bpy)_3^{3+} + SO_3^{2-} \rightarrow$		2×10^9				f.p./oq	Soln. contg. $Ru(bpy)_3^{2+}$ and $Co(NH_3)_5X^{2+}$ (X = Br, Cl, I) (OQ).	79Z056
22.50.63	**Thallium(II) ion**								
	$Ru(bpy)_3^{3+} + Tl^{2+} \rightarrow Ru(bpy)_3^{2+} + Tl^{3+}$		2.9×10^{10}	<0	3.0		f.p./oq	P.b.k. at 452 nm in soln. contg. $Ru(bpy)_3^{2+}$, 3.0 mol L^{-1} HCl and $Tl(NO_3)_3$ (OQ); Cl^- complexes of Tl are present.	82A111

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.50	**Tris(2,2′-bipyridine)ruthenium(III) ion** — Continued							
22.50.64	**1,4-Benzenediol**							
	$Ru(bpy)_3^{3+} + QH_2 \rightarrow Ru(bpy)_3^{2+} + Q^{\cdot-} + 2\,H^+$	2.1×10^9	6.9	0.04		f.p./oq	P.b.k. at 470 nm in soln. contg. 2×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 10^{-2} mol L^{-1} MV^{2+} (OQ) and (2.5-20) $\times 10^{-4}$ mol L^{-1} QH_2.	81A042
22.50.65	**1,1′-Bis(carboxymethyl)-4,4′-bipyridinium radical cation**							
	$Ru(bpy)_3^{3+} + [CMV]^{\cdot+} \rightarrow Ru(bpy)_3^{2+} + CMV^{2+}$	6.5×10^9		~0.0003		f.p./oq	Soln. contg. $Ru(bpy)_3^{2+}$ and CMV^{2+} (OQ).	82N022
22.50.66	**1,1′-Bis(2-hydroxyethyl)-4,4′-bipyridinium radical cation**							
	$Ru(bpy)_3^{3+} + [BP]^{\cdot+} \rightarrow Ru(bpy)_3^{2+} + BP^{2+}$	1.2×10^9	5			f.p./oq	Soln. contg. $Ru(bpy)_3^{2+}$ and *N,N′*-bis(2-hydroxyethyl)-4,4′-bipyridinium (OQ).	82C019
22.50.67	**1,1′-Bis(4-sulfonatobenzyl)-4,4′-bipyridinium zwitterion, radical anion**							
	$Ru(bpy)_3^{3+} + [BSV]^{\cdot-} \rightarrow Ru(bpy)_3^{2+} + BSV$	2.1×10^{10}				f.p./oq	P.b.k. at 450 nm and d.k. at 590 nm in soln. contg. $Ru(bpy)_3^{2+}$ and BSV (OQ).	82N118
22.50.68	**1,1′-Bis(2-sulfonatoethyl)-4,4′-bipyridinium radical anion**							
	$Ru(bpy)_3^{3+} + [SEV]^{\cdot-} \rightarrow Ru(bpy)_3^{2+} + SEV$	5.8×10^9	6.5	0.066	20	f.p./oq	D.k. at 600 nm. in soln. contg. $Ru(bpy)_3^{2+}$ and SEV (OQ).	86N260
22.50.69	**1,1′-Bis(3-sulfonatopropyl)-4,4′-bipyridinium radical anion**							
	$Ru(bpy)_3^{3+} + [SPV]^{\cdot-} \rightarrow Ru(bpy)_3^{2+} + SPV$	* 1.4×10^{10}	6.2			f.p./oq	D.k. at 602 nm in soln. contg. $Ru(bpy)_3^{2+}$ and SPV (OQ).	91A143
		* 4.0×10^9	8.2				* The large pH effect is not explained.	
		3.5×10^9	7	0.4		p./oq	Soln. contg. $Ru(bpy)_3^{2+}$ and SPV (OQ).	85F435
		5.0×10^9				f.p./oq	D.k. at 603 nm in soln. contg. 2.0×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$ and 5×10^{-4} mol L^{-1} SPV (OQ).	85F007
		7.8×10^9		~0.0003		f.p./oq	Soln. contg. $Ru(bpy)_3^{2+}$ and SPV (OQ).	82N022
		7.9×10^9				f.p./oq	Soln. contg. $Ru(bpy)_3^{2+}$ and SPV (OQ).	81N054
22.50.70	**1,1′-Bis(3-sulfonatopropyl)-3,3′-dimethyl-4,4′-bipyridinium radical anion**							
	$Ru(bpy)_3^{3+} + [3\text{-MSPV}]^{\cdot-} \rightarrow Ru(bpy)_3^{2+} + 3\text{-MSPV}$	3.8×10^9				f.p./oq	Soln. contg. $Ru(bpy)_3^{2+}$ and 3-MPVS (OQ).	90N140
22.50.71	**1,1′-Bis[3-(trimethylammonio)propyl]-4,4′-bipyridinium radical cation**							
	$Ru(bpy)_3^{3+} + [APV]^{\cdot3+} \rightarrow Ru(bpy)_3^{2+} + APV^{4+}$	1.2×10^9	6.5	0.066	20	f.p./oq	D.k. at 600 nm in soln. contg. $Ru(bpy)_3^{2+}$ and APV^{4+} (OQ).	86N260
22.50.72	**Cysteine**							
	$Ru(bpy)_3^{3+} + CysSH \rightarrow Ru(bpy)_3^{2+} + CysS^{\cdot} + H^+$	3.7×10^6				f.p./oq	P.b.k. at 452 nm in soln. contg. 4×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, cysteine and 0.01 mol L^{-1} MV^{2+} (OQ).	78A351
22.50.73	**1,1′-Dibenzyl-4,4′-bipyridinium radical cation**							
	$Ru(bpy)_3^{3+} + BV^{\cdot+} \rightarrow Ru(bpy)_3^{2+} + BV^{2+}$	2.4×10^9	5		22	f.p.	D.k. at ~600 nm in soln. contg. $Ru(bpy)_3^{2+}$ and BV^{2+} (OQ).	82S257
		2.3×10^9	5			f.p./oq	Soln. contg. $Ru(bpy)_3^{2+}$ and BV^{2+} (OQ).	82C019

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.50	**Tris(2,2′-bipyridine)ruthenium(III) ion** — Continued							
22.50.74	**1,1′-Dimethyl-4,4′-bipyridinium radical cation**							
	$Ru(bpy)_3^{3+} + MV^{\bullet+} \rightarrow Ru(bpy)_3^{2+} + MV^{2+}$	2.5×10^9		→0			Deduced from the analysis of data reported in [91A143], [91N125], [90A389], [89E329], [88A025], [85F435], [81A042], [81N003], [78A351]; k depends on I, see Appendix, Table A1 and Fig. 1.	
22.50.75	**Ethylenediaminetetraacetate ions**							
	$Ru(bpy)_3^{3+} + EDTA \rightarrow Ru(bpy)_3^{2+} + [EDTA_{ox}]^{\bullet}$	1.2×10^6 4.6×10^7 5.0×10^7	4.7 8.7 11.0	1.0 0.6 1.0		f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$ and MV^{2+} (OQ). Studied at various concentrations and ionic strength; extrapolation to $I = 0$ at pH 4.7 indicates $k > 4 \times 10^8$ L mol^{-1} s^{-1}.	89A065
22.50.76	**1,1′,2,2′,6,6′-Hexamethyl-4,4′-bipyridinium radical cation**							
	$Ru(bpy)_3^{3+} + [HMV]^{\bullet+} \rightarrow Ru(bpy)_3^{2+} + HMV^{2+}$	2.9×10^9	5		22	f.p./oq	Soln. contg. 6.0×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$ and 1.6×10^{-3} mol L^{-1} HMV^{2+} (OQ).	82F316 82S257
22.50.77	**1-Methyl-4,4′-bipyridinyl**							
	$Ru(bpy)_3^{3+} + [1\text{-Me-}4,4'\text{-bpy}]^{\bullet} \rightarrow Ru(bpy)_3^{2+} + 1\text{-Me-}4,4'\text{-bpy}^{+}$	$\sim 10^9$	5.6		25	f.p./oq	D.k. at 600 nm in soln. contg. $Ru(bpy)_3^{2+}$ and 1-methyl-4,4′-bipyridinium (OQ).	78E293
22.50.78	**1-Methyl-1′-tetradecyl-4,4′-bipyridinium radical cation**							
	$Ru(bpy)_3^{3+} + [C_{14}MV]^{\bullet+} \rightarrow Ru(bpy)_3^{2+} + C_{14}MV^{2+}$	4×10^9		0.0014		f.p/oq	D.k. at 602 nm in soln. contg. $Ru(bpy)_3^{2+}$ and 5×10^{-4} mol L^{-1} $C_{14}MV^{2+}$ (OQ); addn. of 10^{-2} mol L^{-1} NaCl increases k by 30%.	80N025 81N002
22.50.79	**Oxalate ion**							
	$Ru(bpy)_3^{3+} + {}^{-}O_2CCO_2^{-} \rightarrow Ru(bpy)_3^{2+} + {}^{-}O_2CCO_2^{\bullet}$	1.0×10^5 3×10^4		0.30-1.0 2.1-3.0	23	f.p./oq	P.b.k. at 450 nm in soln. contg. $Ru(bpy)_3^{2+}$, $(1.0\text{-}10) \times 10^{-3}$ mol L^{-1} MV^{2+} (OQ) and 0.10 mol L^{-1} oxalate ion.	90A389
22.50.80	**1,1′-Tetramethylene-2,2′-bipyridinium radical cation**							
	$Ru(bpy)_3^{3+} + [BP]^{\bullet+} \rightarrow Ru(bpy)_3^{2+} + BP^{2+}$	1.5×10^9	5			f.p./oq	Soln. contg. $Ru(bpy)_3^{2+}$ and BP^{2+} (OQ).	82C019
22.50.81	**1,1′,2,2′-Tetramethyl-4,4′-bipyridinium radical cation**							
	$Ru(bpy)_3^{3+} + [TMV]^{\bullet+} \rightarrow Ru(bpy)_3^{2+} + TMV^{2+}$	2.6×10^9	5		22	f.p./oq	D.k. at 605 nm in soln. contg. 6.0×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$ and 1.6×10^{-3} mol L^{-1} TMV^{2+} (OQ).	82F316 82S257
22.50.82	**1,1′-Trimethylene-2,2′-bipyridinium radical cation**							
	$Ru(bpy)_3^{3+} + [TQ]^{\bullet+} \rightarrow Ru(bpy)_3^{2+} + TQ^{2+}$	2.8×10^9	5			f.p./oq	Soln. contg. $Ru(bpy)_3^{2+}$ and TQ^{2+} (OQ).	82C019
22.50.83	**Triethanolamine**							
	$Ru(bpy)_3^{3+} + TEOA \rightarrow Ru(bpy)_3^{2+} + [TEOA]^{\bullet+}$	2×10^7	8.1	0.5	25	f.p./oq	P.b.k. in soln. contg. 5×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 4.0×10^{-3} mol L^{-1} $Rh(bpy)_3^{3+}$ (OQ) and 0.01 mol L^{-1} TEOA/$TEOAH^{+}$ ($pK_a = 8.1$).	79A317
		4.7×10^7	9			f.p./oq	P.b.k. at 452 nm in soln. contg. 4×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 0.05-0.125 mol L^{-1} TEOA and 0.01 mol L^{-1} MV^{2+} (OQ); at pH 5 and 7, $k_{obs} = 2.4 \times 10^5$ and 6.5×10^6 L mol^{-1} s^{-1}, respectively, indicating that only the unprotonated amine is reactive.	78A351

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1}) *	pH	I	t(°C)	Method	Comment	Ref.
22.50	**Tris(2,2′-bipyridine)ruthenium(III) ion** — Continued							
22.50.84	**Trimethylhydroquinone**							
	$Ru(bpy)_3^{3+} + 2,3,5\text{-}(CH_3)_3QH_2 \rightarrow Ru(bpy)_3^{2+} + 2\,H^+ + [2,3,5\text{-}(CH_3)_3Q]^{\cdot-}$	3.3×10^9	6.9	0.04		f.p./oq	P.b.k. at 470 nm ($Ru(bpy)_3^{2+}$) in soln. contg. 2×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 10^{-2} mol L^{-1} MV^{2+} (OQ) and (2.5-20) 10^{-4} mol L^{-1} trimethylhydroquinone.	81A042
22.51	**Tris(4,4′-dimethyl-2,2′-bipyridine)ruthenium(III) ion**							
22.51.1	**Copper(I) ion**							
	$Ru(4,4'\text{-}Me_2bpy)_3^{3+} + Cu^+ \rightarrow Ru(4,4'\text{-}Me_2bpy)_3^{2+} + Cu^{2+}$	8.7×10^7	0.3		25	f.p./oq	P.b.k. at ~450 nm in soln. contg. 10^{-5} mol L^{-1} $Ru(4,4'\text{-}Me_2bpy)_3^{2+}$, 0.01-0.06 mol L^{-1} Cu^{2+} (OQ) and 0.5 mol L^{-1} sulfuric acid.	78A090
22.51.2	**Iron(II) sulfate**							
	$Ru(4,4'\text{-}Me_2bpy)_3^{3+} + FeSO_4 \rightarrow Ru(4,4'\text{-}Me_2bpy)_3^{2+} + FeSO_4^+$	1.0×10^5	0.3		20	f.p./oq	Calcd. from current-time curve; soln. contg. 0.5 mol L^{-1} H_2SO_4, 3×10^{-4} mol L^{-1} $Ru(bpy)_3^{2+}$ and $[Fe^{2+}] = [Fe^{3+}]$ (OQ).	80E224
22.51.3	**Dichloromercurate(I) ion**							
	$Ru(4,4'\text{-}Me_2bpy)_3^{3+} + HgCl_2^- \rightarrow Ru(4,4'\text{-}Me_2bpy)_3^{2+} + HgCl_2$	$>2 \times 10^{10}$		1.0		f.p./oq	Soln. contg. $Ru(bpy)_3^{2+}$ and $HgCl_2$ (OQ).	84A077
22.52	**Tris(5,5'-dimethyl-2,2′-bipyridine)ruthenium(III) ion**							
22.52.1	**Iron(II) sulfate**							
	$Ru(5,5'\text{-}Me_2bpy)_3^{3+} + FeSO_4 \rightarrow Ru(5,5'\text{-}Me_2bpy)_3^{2+} + FeSO_4^+$	6.0×10^5	0.3		20	f.p./oq	Calcd. from current-time curve; soln. contg. 0.5 mol L^{-1} H_2SO_4, 3×10^{-4} mol L^{-1} $Ru(bpy)_3^{2+}$ and $[Fe^{2+}] = [Fe^{3+}]$ (OQ).	80E224
22.53	**Ammine(2,2′-bipyridine)(2,2′:6′,2″-terpyridine)ruthenium(III) ion**							
22.53.1	**Iron(II) ion**							
	$Ru(terpy)(bpy)(NH_3)^{3+} + Fe^{2+} \rightarrow Ru(terpy)(bpy)(NH_3)^{2+} + Fe^{3+}$	3.1×10^4	0			f.p./oq	P.b.k. at 450 and 480 nm in soln. contg. 5.64×10^{-6} mol L^{-1} $Ru(bpy)_3^{2+}$, 3.48×10^{-6} mol L^{-1} $Ru(terpy)(bpy)NH_3^{2+}$, 4.2×10^{-3} mol L^{-1} Fe^{3+} (OQ), 5.25×10^{-5} mol L^{-1} Fe^{2+} and 1.0 mol L^{-1} $HClO_4$; same value obtained by s.f.	84A302
22.54	**Tris(4-triethylphosphonio-2,2′-bipyridine)ruthenium(III) ion**							
22.54.1	**Tris(2,2′-bipyridine)cobalt(II) ion**							
	$Ru[4\text{-}(Et_3P)bpy]_3^{6+} + Co(bpy)_3^{2+} \rightarrow Ru[4\text{-}(Et_3P)bpy]_3^{5+} + Co(bpy)_3^{3+}$	2.2×10^8		1.0		f.p.	Soln. contg. $Ru([4\text{-}(Et_3P)bpy]_3^{5+}$ and $Co(bpy)_3^{3+}$ (OQ).	82F048
22.54.2	**Iron(II) sulfate**							
	$Ru[4\text{-}(Et_3P)bpy]_3^{6+} + FeSO_4 \rightarrow Ru[4\text{-}(Et_3P)bpy]_3^{5+} + FeSO_4^+$	1.9×10^8	0.3			f.p./oq	Soln. contg. $Ru([4\text{-}(Et_3P)bpy]_3^{5+}$ and $FeSO_4^+$ (OQ) in 0.5 mol L^{-1} H_2SO_4.	82F048

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.55	**Tris(1,10-phenanthroline)ruthenium(III) ion**							
22.55.1	**Tris(2,2′-bipyridine)cobalt(II) ion**							
	$Ru(phen)_3^{3+} + Co(bpy)_3^{2+} \rightarrow Ru(phen)_3^{2+} + Co(bpy)_3^{3+}$	1.9×10^8		0.25		f.p./oq	P.b.k. at 420-450 nm in soln. contg. 1×10^{-4} mol L^{-1} $Ru(phen)_3^{2+}$, 0.25 mol L^{-1} LiCl and $(2\text{-}6) \times 10^{-4}$ mol L^{-1} $Co(bpy)_3^{3+}$ (OQ); $k = 2.5 \times 10^8$ in presence of 0.166 mol L^{-1} Na_2SO_4 and 4.8×10^7 L mol^{-1} s^{-1} in 50% aqueous acetonitrile contg. 0.25 mol L^{-1} LiCl.	85S022
22.55.2	**2,3,9,10-Tetramethyl-1,4,8,11-tetraazacyclotetradecanecobalt(II) ion**							
	$Ru(phen)_3^{3+} + Co(Me_4[14]aneN_4)^{2+} \rightarrow Ru(phen)_3^{2+} + Co(Me_4[14]aneN_4)^{3+}$	9.7×10^5		0.1	25	f.p./oq	P.b.k. in soln. contg. $Ru(phen)_3^{2+}$ and $Co(NH_3)_5Br^{2+}$ (OQ).	90A221
22.55.3	**1,3,6,8,10,13,16,19-Octaazabicyclo[6.6.6]eicosanecobalt(II) ion**							
	$Ru(phen)_3^{3+} + Co(sep)^{2+} \rightarrow Ru(phen)_3^{2+} + Co(sep)^{3+}$	6.4×10^8		0.2	25	f.p./oq	P.b.k. at 450 nm in soln. contg. $(2\text{-}5) \times 10^{-5}$ mol L^{-1} $Ru(phen)_3^{2+}$ and $(1\text{-}7) \times 10^{-3}$ mol L^{-1} $Co(sep)^{3+}$ (OQ).	84A238
22.55.4	**1,8-Diamino-3,6,10,13,16,19-hexaazabicyclo[6.6.6]eicosanecobalt(II) ion, conjugate diacid**							
	$Ru(phen)_3^{3+} + Co(diamsarH_2)^{4+} \rightarrow Ru(phen)_3^{2+} + Co(diamsarH_2)^{5+}$	7.9×10^6	1	0.2	25	f.p./oq	P.b.k. at 450 nm in soln. contg. $(2\text{-}5) \times 10^{-5}$ mol L^{-1} $Ru(phen)_3^{2+}$, $(1\text{-}7) \times 10^{-3}$ mol L^{-1} $Co(diamsar)^{3+}$ (OQ) and 0.1 mol L^{-1} HCl.	84A238
22.55.5	**1,8-Diamino-3,6,10,13,16,19-hexaazabicyclo[6.6.6]eicosanecobalt(II) ion**							
	$Ru(phen)_3^{3+} + Co(diamsar)^{2+} \rightarrow Ru(phen)_3^{2+} + Co(diamsar)^{3+}$	9.6×10^7	8.3	0.2	25	f.p./oq	P.b.k. at 450 nm in soln. contg. $(2\text{-}5) \times 10^{-5}$ mol L^{-1} $Ru(phen)_3^{2+}$, $(1\text{-}7) \times 10^{-3}$ mol L^{-1} $Co(diamsar)^{3+}$ (OQ), 0.1 mol L^{-1} LiCl and 0.05 mol L^{-1} *N*-ethylmorpholine.	84A238
22.55.6	**Copper(I) ion**							
	$Ru(phen)_3^{3+} + Cu^+ \rightarrow Ru(phen)_3^{2+} + Cu^{2+}$	1.2×10^9	0.3		25	f.p./oq	P.b.k. at 450 nm in soln. contg. 10^{-5} mol L^{-1} $Ru(phen)_3^{2+}$, 0.01-0.06 mol L^{-1} Cu^{2+} (OQ) and 0.5 mol L^{-1} sulfuric acid.	78A090
22.55.7	**Iron(II) ion**							
	$Ru(phen)_3^{3+} + Fe^{2+} \rightarrow Ru(phen)_3^{2+} + Fe^{3+}$	1.2×10^6 1.4×10^6	0 1.1	1.0 0.1	25 25	f.p./oq	P.b.k. in soln. contg. 3.0×10^{-6} mol L^{-1} $Ru(bpy)_3^{2+}$, 3.0×10^{-6} mol L^{-1} $Ru(phen)_3^{2+}$, 1.0 or 0.076 mol L^{-1} $HClO_4$, respectively, 4.0×10^{-5} mol L^{-1} Fe^{3+} (OQ) and 3.0×10^{-5} mol L^{-1} Fe^{2+}; for $I = 0.1$, k is independent of temperature in the range 5-50 °C.	777164
22.55.8	**Mercury(I) ion**							
	$Ru(phen)_3^{3+} + Hg^+ \rightarrow Ru(phen)_3^{2+} + Hg^{2+}$	2.5×10^9	acid			f.p./oq	P.b.k. at 436 nm in deaerated soln. contg. $Ru(phen)_3^{2+}$, excess $Hg(NO_3)_2$ (OQ), HNO_3 and $NaNO_3$; assumed $k(Hg^+ + Hg^+) = 8 \times 10^9$ L mol^{-1} s^{-1}.	84A148
22.55.9	**Mercury(I) dimer ion**							
	$Ru(phen)_3^{3+} + Hg_2^{2+} \rightarrow Ru(phen)_3^{2+} + Hg^{2+} + Hg^+$	10	acid			f.p./oq	P.b.k. at 436 nm in deaerated soln. contg. $Ru(phen)_3^{2+}$, excess $Hg(NO_3)_2$ (OQ), HNO_3 and $NaNO_3$.	84A148

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.55	**Tris(1,10-phenanthroline)ruthenium(III) ion — Continued**							
22.55.10	**Tris(2,2′-bipyridine)ruthenium(II) ion**							
	$Ru(phen)_3^{3+} + Ru(bpy)_3^{2+} \rightarrow$ $Ru(phen)_3^{2+} + Ru(bpy)_3^{3+}$	1.2×10^9 4.2×10^8	0 1.1	1.0 0.1	25 25	f.p./oq	P.b.k. in soln. contg. 3.0×10^{-6} mol L^{-1} $Ru(bpy)_3^{2+}$, 3.0×10^{-6} mol L^{-1} $Ru(phen)_3^{2+}$, 1.0 or 0.076 mol L^{-1} $HClO_4$, respectively, 4.0×10^{-5} mol L^{-1} Fe^{3+} (OQ) and 3.0×10^{-5} mol L^{-1} Fe^{2+}; $\Delta H‡ = 32$ kJ mol^{-1}, $\Delta S‡ = -28$ J K^{-1} mol^{-1}, $\Delta G‡ = 24$ kJ mol^{-1} for I = 1; measured over 5-50 °C,	777164
22.55.11	**1,1′-Bis(3-sulfonatopropyl)-3,3′-dimethyl-4,4′-bipyridinium radical anion**							
	$Ru(phen)_3^{3+} + [3\text{-MSPV}]^{\bullet -} \rightarrow$ $Ru(phen)_3^{2+} + 3\text{-MSPV}$	2.1×10^9				f.p./oq	Soln. contg. $Ru(phen)_3^{2+}$ and 3-MPVS (OQ).	90N140
22.56	**Tris(5-bromo-1,10-phenanthroline)ruthenium(III) ion**							
22.56.1	**Copper(I) ion**							
	$Ru(5\text{-Brphen})_3^{3+} + Cu^+ \rightarrow$ $Ru(5\text{-Brphen})_3^{2+} + Cu^{2+}$	2.3×10^9	0.3		25	f.p./oq	P.b.k. at 450 nm in soln. contg. 10^{-5} mol L^{-1} $Ru(5\text{-Brphen})_3^{2+}$, 0.01-0.06 mol L^{-1} Cu^{2+} (OQ) and 0.5 mol L^{-1} sulfuric acid.	78A090
22.56.2	**Dichloromercurate(I) ion**							
	$Ru(5\text{-Brphen})_3^{3+} + HgCl_2^- \rightarrow$ $Ru(5\text{-Brphen})_3^{2+} + HgCl_2$	$>2 \times 10^{10}$		1.0		f.p./oq	Soln. contg. $Ru(5\text{-Brphen})_3^{2+}$ and $HgCl_2$ (OQ).	84A077
22.57	**Tris(5-chloro-1,10-phenanthroline)ruthenium(III) ion**							
22.57.1	**1,3,6,8,10,13,16,19-Octaazabicyclo[6.6.6]eicosanecobalt(II) ion**							
	$Ru(5\text{-Clphen})_3^{3+} + Co(sep)^{2+} \rightarrow$ $Ru(5\text{-Clphen})_3^{2+} + Co(sep)^{3+}$	8.2×10^8		0.2	25	f.p./oq	P.b.k. at 450 nm in soln. contg. (2-5) $\times 10^{-5}$ mol L^{-1} $Ru(5\text{-Clphen})_3^{2+}$ and (1-7) $\times 10^{-3}$ mol L^{-1} $Co(sep)^{3+}$ (OQ).	84A238
22.57.2	**1,8-Diamino-3,6,10,13,16,19-hexaazabicyclo[6.6.6]eicosanecobalt(II) ion**							
	$Ru(5\text{-Clphen})_3^{3+} + Co(diamsar)^{2+} \rightarrow$ $Ru(5\text{-Clphen})_3^{2+} + Co(diamsar)^{3+}$	1.7×10^8	8.1	0.2	25	f.p./oq	P.b.k. at 450 nm in soln. contg. 0.2 mol L^{-1} LiCl, 0.05 mol L^{-1} *N*-ethylmorpholine, (2-5) $\times 10^{-5}$ mol L^{-1} $Ru(5\text{-Clphen})_3^{2+}$ and (1-7) $\times 10^{-3}$ mol L^{-1} $Co(diamsar)^{3+}$ (OQ).	84A238
22.57.3	**Copper(I) ion**							
	$Ru(5\text{-Clphen})_3^{3+} + Cu^+ \rightarrow$ $Ru(5\text{-Clphen})_3^{2+} + Cu^{2+}$	2.7×10^9	0.3		25	f.p./oq	P.b.k. at 450 nm in soln. contg. 10^{-5} mol L^{-1} $Ru(5\text{-Clphen})_3^{2+}$, 0.01-0.06 mol L^{-1} Cu^{2+} (OQ) and 0.5 mol L^{-1} sulfuric acid.	78A090
22.57.4	**Iron(II) sulfate**							
	$Ru(5\text{-Clphen})_3^{3+} + FeSO_4 \rightarrow$ $Ru(5\text{-Clphen})_3^{2+} + FeSO_4^+$	2.2×10^7	0.3		25	f.p./oq	P.b.k. in soln. contg. $Ru(5\text{-Clphen})_3^{2+}$, Fe(III) (OQ) and 0.5 mol L^{-1} H_2SO_4; $k = 1.8 \times 10^7$ L mol^{-1} s^{-1} detd. by s.f.	766404
22.57.5	**Mercury(I) ion**							
	$Ru(5\text{-Clphen})_3^{3+} + Hg^+ \rightarrow$ $Ru(5\text{-Clphen})_3^{2+} + Hg^{2+}$	3.5×10^9	acid			f.p./oq	P.b.k. at 436 nm in deaerated soln. contg. $Ru(5\text{-Clphen})_3^{2+}$, excess $Hg(NO_3)_2$ (OQ), HNO_3 and $NaNO_3$; assumed $k(Hg^+ + Hg^+) = 8 \times 10^9$ L mol^{-1} s^{-1}	84A148
22.57.6	**Mercury(I) dimer ion**							
	$Ru(5\text{-Clphen})_3^{3+} + Hg_2^{2+} \rightarrow$ $Ru(5\text{-Clphen})_3^{2+} + Hg^{2+} + Hg^+$	79	acid			f.p./oq	P.b.k. at 436 nm in deaerated soln. contg. $Ru(5\text{-Clphen})_3^{2+}$, excess $Hg(NO_3)_2$ (OQ), HNO_3 and $NaNO_3$.	84A148

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.58	**Tris(5,6-dimethyl-1,10-phenanthroline)ruthenium(III) ion**							
22.58.1	**Copper(I) ion**							
	$Ru(5,6\text{-}Me_2phen)_3^{3+} + Cu^+ \rightarrow Ru(5,6\text{-}Me_2phen)_3^{2+} + Cu^{2+}$	5.4×10^8	0.3		25	f.p./oq	P.b.k. at 450 nm in soln. contg. 10^{-5} mol L^{-1} $Ru(5,6\text{-}Me_2phen)_3^{2+}$, 0.01-0.06 mol L^{-1} Cu^{2+} (OQ) and 0.5 mol L^{-1} sulfuric acid.	78A090
22.58.2	**Mercury(I) ion**							
	$Ru(5,6\text{-}Me_2phen)_3^{3+} + Hg^+ \rightarrow Ru(5,6\text{-}Me_2phen)_3^{2+} + Hg^{2+}$	3.2×10^9	acid			f.p./oq	P.b.k. at 436 nm in deaerated soln. contg. $Ru(5,6\text{-}Me_2phen)_3^{2+}$, excess $Hg(NO_3)_2$ (OQ), HNO_3 and $NaNO_3$; assumed $k(Hg^+ + Hg^+) = 8 \times 10^9$ L mol^{-1} s^{-1}.	84A148
22.58.3	**Mercury(I) dimer ion**							
	$Ru(5,6\text{-}Me_2phen)_3^{3+} + Hg_2^{2+} \rightarrow Ru(5,6\text{-}Me_2phen)_3^{2+} + Hg^{2+} + Hg^+$	3.0	acid			f.p./oq	P.b.k. at 436 nm in deaerated soln. contg. $Ru(5,6\text{-}Me_2phen)_3^{2+}$, excess $Hg(NO_3)_2$ (OQ), HNO_3 and $NaNO_3$.	84A148
22.59	**Tris(4,7-dimethyl-1,10-phenanthroline)ruthenium(III) ion**							
22.59.1	**Tris(2,2′-bipyridine)cobalt(II) ion**							
	$Ru(4,7\text{-}Me_2phen)_3^{3+} + Co(bpy)_3^{2+} \rightarrow Ru(4,7\text{-}Me_2phen)_3^{2+} + Co(bpy)_3^{3+}$	3.1×10^8		0.25		f.p./oq	P.b.k. at 420-450 nm in soln. contg. 1×10^{-4} mol L^{-1} $Ru(4,7\text{-}Me_2phen)_3^{2+}$, 0.25 mol L^{-1} LiCl and $2\text{-}6 \times 10^{-4}$ mol L^{-1} $Co(bpy)_3^{3+}$ (OQ); $k = 5.1 \times 10^8$ in presence of 0.166 mol L^{-1} Na_2SO_4 and 2.2×10^7 L mol^{-1} s^{-1} in 50% aqueous acetonitrile contg. 0.25 mol L^{-1} LiCl.	85S022
22.59.2	**2,3,9,10-Tetramethyl-1,4,8,11-tetraazacyclotetradecanecobalt(II) ion**							
	$Ru(4,7\text{-}Me_2phen)_3^{3+} + Co(Me_4[14]aneN_4)^{2+} \rightarrow Ru(4,7\text{-}Me_2phen)_3^{2+} + Co(Me_4[14]aneN_4)^{3+}$	9.7×10^5		0.10	25	f.p./oq	P.b.k. in soln. contg. $Ru(4,7\text{-}Me_2phen)_3^{2+}$ and $Co(NH_3)_5Br^{2+}$ (OQ).	90A221
22.59.3	**1,3,6,8,10,13,16,19-Octaazabicyclo[6.6.6]eicosanecobalt(II) ion**							
	$Ru(4,7\text{-}Me_2phen)_3^{3+} + Co(sep)^{2+} \rightarrow Ru(4,7\text{-}Me_2phen)_3^{2+} + Co(sep)^{3+}$	5.4×10^8		0.2	25	f.p./oq	P.b.k. at 450 nm in soln. contg. $(2\text{-}5) \times 10^{-5}$ mol L^{-1} $Ru(5\text{-}Clphen)_3^{2+}$ and $(1\text{-}7) \times 10^{-3}$ mol L^{-1} $Co(sep)^{3+}$ (OQ).	84A238
22.59.4	**1,8-Diamino-3,6,10,13,16,19-hexaazabicyclo[6.6.6]eicosanecobalt(II) ion**							
	$Ru(4,7\text{-}Me_2phen)_3^{3+} + Co(diamsar)^{2+} \rightarrow Ru(4,7\text{-}Me_2phen)_3^{2+} + Co(diamsar)^{3+}$	3.1×10^7	8.3	0.2	25	f.p./oq	P.b.k. at 450 nm in soln. contg. 0.2 mol L^{-1} LiCl, 0.05 mol L^{-1} *N*-ethylmorpholine, $(2\text{-}5) \times 10^{-5}$ mol L^{-1} $Ru(5\text{-}Clphen)_3^{2+}$ and $(1\text{-}7) \times 10^{-3}$ mol L^{-1} $Co(diamsar)^{3+}$ (OQ).	84A238
22.59.5	**Copper(I) ion**							
	$Ru(4,7\text{-}Me_2phen)_3^{3+} + Cu^+ \rightarrow Ru(4,7\text{-}Me_2phen)_3^{2+} + Cu^{2+}$	1.4×10^8	0.3		25	f.p./oq	P.b.k. at 450 nm in soln. contg. 10^{-5} mol L^{-1} $Ru(4,7\text{-}Me_2phen)_3^{2+}$, 0.01-0.06 mol L^{-1} Cu^{2+} (OQ) and 0.5 mol L^{-1} sulfuric acid.	78A090
22.59.6	**Europium(II) ion**							
	$Ru(4,7\text{-}Me_2phen)_3^{3+} + Eu^{2+} \rightarrow Ru(4,7\text{-}Me_2phen)_3^{2+} + Eu^{3+}$	4×10^8			25	f.p./oq	Soln. contg. $Ru(4,7\text{-}Me_2phen)_3^{2+}$ and Eu^{3+} (OQ).	766404
22.59.7	**Mercury(I) ion**							
	$Ru(4,7\text{-}Me_2phen)_3^{3+} + Hg^+ \rightarrow Ru(4,7\text{-}Me_2phen)_3^{2+} + Hg^{2+}$	3.0×10^9	acid			f.p./oq	P.b.k. at 436 nm in deaerated soln. contg. $Ru(4,7\text{-}Me_2phen)_3^{2+}$, excess $Hg(NO_3)_2$ (OQ), HNO_3 and $NaNO_3$; assumed $k(Hg^+ + Hg^+) = 8 \times 10^9$ L mol^{-1} s^{-1}.	84A148

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.59	**Tris(4,7-dimethyl-1,10-phenanthroline)ruthenium(III) ion — Continued**							
22.59.8	**Mercury(I) dimer ion**							
	$Ru(4,7\text{-}Me_2phen)_3^{3+} + Hg_2^{2+} \rightarrow Ru(4,7\text{-}Me_2phen)_3^{2+} + Hg^{2+} + Hg^+$	0.20	acid			f.p./oq	P.b.k. at 436 nm in deaerated soln. contg. $Ru(4,7\text{-}Me_2phen)_3^{2+}$, excess $Hg(NO_3)_2$ (OQ), HNO_3 and $NaNO_3$.	84A148
22.59.9	**Triethanolamine**							
	$Ru(4,7\text{-}Me_2phen)_3^{3+} + TEOA \rightarrow Ru(4,7\text{-}Me_2phen)_3^{2+} + [TEOA]^{\cdot+}$	5.2×10^6		0.25	25	f.p./oq	P.b.k. at 420-450 nm in 50% aqueous acetonitrile soln. contg. 1×10^{-4} mol L^{-1} $Ru(4,7\text{-}Me_2phen)_3^{2+}$, 0.25 mol L^{-1} LiCl, $2\text{-}6 \times 10^{-4}$ mol L^{-1} TEOA and 1×10^{-4} mol L^{-1} $Co(bpy)_3^{3+}$ (OQ).	85S022
22.60	**Tris(5-methyl-1,10-phenanthroline)ruthenium(III) ion**							
22.60.1	**Copper(I) ion**							
	$Ru(5\text{-}Mephen)_3^{3+} + Cu^+ \rightarrow Ru(5\text{-}Mephen)_3^{2+} + Cu^{2+}$	1.0×10^9	0.3		25	f.p./oq	P.b.k. at 450 nm in soln. contg. 10^{-5} mol L^{-1} $Ru(5\text{-}Mephen)_3^{2+}$, 0.01-0.06 mol L^{-1} Cu^{2+} (OQ) and 0.5 mol L^{-1} sulfuric acid.	78A090
22.60.2	**Mercury(I) ion**							
	$Ru(5\text{-}Mephen)_3^{3+} + Hg^+ \rightarrow Ru(5\text{-}Mephen)_3^{2+} + Hg^{2+}$	3.1×10^9	acid			f.p./oq	P.b.k. at 436 nm in deaerated soln. contg. $Ru(5\text{-}Mephen)_3^{2+}$, excess $Hg(NO_3)_2$ (OQ), HNO_3 and $NaNO_3$ assumed $k(Hg^+ + Hg^+) = 8 \times 10^9$ L mol^{-1} s^{-1}.	84A148
22.60.3	**Mercury(I) dimer ion**							
	$Ru(5\text{-}Mephen)_3^{3+} + Hg_2^{2+} \rightarrow Ru(5\text{-}Mephen)_3^{2+} + Hg^{2+} + Hg^+$	5.7	acid			f.p./oq	P.b.k. at 436 nm in deaerated soln. contg. $Ru(5\text{-}Mephen)_3^{2+}$, excess $Hg(NO_3)_2$ (OQ), HNO_3 and $NaNO_3$.	84A148
22.61	**Tris(5-phenyl-1,10-phenanthroline)ruthenium(III) ion**							
22.61.1	**Copper(I) ion**							
	$Ru(5\text{-}Phphen)_3^{3+} + Cu^+ \rightarrow Ru(5\text{-}Phphen)_3^{2+} + Cu^{2+}$	1.1×10^9	0.3		25	f.p./oq	P.b.k. at 450 nm in soln. contg. 10^{-5} mol L^{-1} $Ru(5\text{-}Phphen)_3^{2+}$, 0.01-0.06 mol L^{-1} Cu^{2+} (OQ) and 0.5 mol L^{-1} sulfuric acid.	78A090
22.62	**Tris(3,4,7,8-tetramethyl-1,10-phenanthroline)ruthenium(III) ion**							
22.62.1	**Tris(2,2′-bipyridine)cobalt(II) ion**							
	$Ru(3,4,7,8\text{-}Me_4phen)_3^{3+} + Co(bpy)_3^{2+} \rightarrow Ru(3,4,7,8\text{-}Me_4phen)_3^{2+} + Co(bpy)_3^{3+}$	2.0×10^7		0.25		f.p./oq	P.b.k. at 420-450 nm in 50% aqueous acetonitrile soln. contg. 1×10^{-4} mol L^{-1} $Ru(3,4,7,8\text{-}Me_4phen)_3^{2+}$, 0.25 mol L^{-1} LiCl and $2\text{-}6 \times 10^{-4}$ mol L^{-1} $Co(bpy)_3^{3+}$ (OQ).	85S022
22.62.2	**Copper(I) ion**							
	$Ru(3,4,7,8\text{-}Me_4phen)_3^{3+} + Cu^+ \rightarrow Ru(3,4,7,8\text{-}Me_4phen)_3^{2+} + Cu^{2+}$	6.0×10^7	0.3		25	f.p./oq	P.b.k. at 450 nm in soln. contg. 10^{-5} mol L^{-1} $Ru(3,4,7,8\text{-}Me_4phen)_3^{2+}$, 0.01-0.06 mol L^{-1} Cu^{2+} (OQ) and 0.5 mol L^{-1} sulfuric acid.	78A090
22.62.3	**Dichloromercurate(I) ion**							
	$Ru(3,4,7,8\text{-}Me_4phen)_3^{3+} + HgCl_2^- \rightarrow Ru(3,4,7,8\text{-}Me_4phen)_3^{2+} + HgCl_2$	$>2 \times 10^{10}$		1.0		f.p./oq	Soln. contg. $Ru(3,4,7,8\text{-}Me_4phen)_3^{2+}$ and $HgCl_2$ (OQ).	84A077
22.63	**Bis(2,2′-bipyridine)[2-(2-thiazolyl]pyridine]ruthenium(III) ion**							
22.63.1	**Ethylenediaminetetraacetate ions**							
	$Ru(bpy)_2(pyth)^{3+} + EDTA \rightarrow Ru(bpy)_2(pyth)^{2+} + [EDTA_{ox}]^{\cdot}$	2×10^6				f.p./oq	Soln. contg. $Ru(bpy)_2(pyth)^{2+}$ and MV^{2+} (OQ).	83N214

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
22.63	**Bis(2,2′-bipyridine)[2-(2-thiazolyl]pyridine]ruthenium(III) ion — Continued**							
22.63.2	**1,1′-Dimethyl-4,4′-bipyridinium radical cation**							
	$Ru(bpy)_2(pyth)^{3+} + MV^{\bullet+} \rightarrow Ru(bpy)_2(pyth)^{2+} + MV^{2+}$	2.7×10^9				f.p./oq	Soln. contg. $Ru(bpy)_2(pyth)^{2+}$ and MV^{2+} (OQ).	83N214
22.64	**2,2′-Bipyridinebis[2-(2-thiazolyl)pyridine]ruthenium(III) ion**							
22.64.1	**1,1′-Dimethyl-4,4′-bipyridinium radical cation**							
	$Ru(bpy)(pyth)_2^{3+} + MV^{\bullet+} \rightarrow Ru(bpy)(pyth)_2^{2+} + MV^{2+}$	2.7×10^9				f.p./oq	Soln. contg. $Ru(bpy)(pyth)_2^{2+}$ and MV^{2+} (OQ).	83N214
22.65	**Tris[2-(2-thiazolyl)pyridine]ruthenium(III) ion**							
22.65.1	**1,1′-Dimethyl-4,4′-bipyridinium radical cation**							
	$Ru(pyth)_3^{3+} + MV^{\bullet+} \rightarrow Ru(pyth)_3^{2+} + MV^{2+}$	* 1.6×10^{10}	5.0			f.p./oq	D.k. at 602 nm in Ar-satd. buffered soln. contg. 2.0×10^{-5} mol L^{-1} $Ru(pyth)_3^{2+}$ and 5.0×10^{-2} mol L^{-1} MV^{2+} (OQ).	87E949
		* 2.7×10^9				f.p./oq	Soln. contg. $Ru(pyth)_3^{2+}$ and MV^{2+} (OQ). * Unexplained discrepancy in these data.	83N214
22.65.2	**Ethylenediaminetetraacetate ions**							
	$Ru(pyth)_3^{3+} + EDTA \rightarrow Ru(pyth)_3^{2+} + [EDTA_{ox}]^{\bullet}$	4.0×10^8	5.0			f.p./oq	P.b.k. in Ar-satd. buffered soln. contg. 2.0×10^{-5} mol L^{-1} $Ru(pyth)_3^{2+}$, 5.0×10^{-2} mol L^{-1} MV^{2+} (OQ) and 5.0×10^{-2} mol L^{-1} EDTA.	87E949
22.66	**Tris(2,2′-bithiazole)ruthenium(III) ion**							
22.66.1	**Ethylenediaminetetraacetate ions**							
	$Ru(bth)_3^{3+} + EDTA \rightarrow Ru(bth)_3^{2+} + [EDTA_{ox}]^{\bullet}$	8.2×10^8	5.0			f.p./oq	P.b.k. in Ar-satd. buffered soln. contg. 2.0×10^{-5} mol L^{-1} $Ru(bth)_3^{2+}$, 5.0×10^{-2} mol L^{-1} MV^{2+} (OQ) and 5.0×10^{-2} mol L^{-1} EDTA.	87E949
22.67	**Tris[2-(1,2,4-thiadiazol-5-yl)pyridine]ruthenium(III) ion**							
22.67.1	**Ethylenediaminetetraacetate ions**							
	$Ru(pytda)_3^{3+} + EDTA \rightarrow Ru(pytda)_3^{2+} + [EDTA_{ox}]^{\bullet}$	3.9×10^8	5.0			f.p./oq	P.b.k. in Ar-satd. buffered soln. contg. 2.0×10^{-5} mol L^{-1} $Ru(pytda)_3^{2+}$, 5.0×10^{-2} mol L^{-1} MV^{2+} (OQ) and 5.0×10^{-2} mol L^{-1} EDTA.	87E949
22.68	**Hexaammineruthenium(III) ion, OH reaction product**							
22.68.1	**Hexaammineruthenium(III) ion, OH reaction product**							
	$[Ru(NH_3)_6^{3+}/OH] + [Ru(NH_3)_6^{3+}/OH] \rightarrow$	4.5×10^9		$\sim 3 \times 10^{-3}$	20	p.r.	D.k. at 400 nm in N_2O-satd. soln. contg. 5×10^{-4} mol L^{-1} $Ru(NH_3)_6^{3+}$; unclear whether k or $2k$.	700178
22.69	**Pentaammine(chloro)ruthenium(III) ion, OH reaction product**							
22.69.1	**First-order reaction**							
	$[Ru(NH_3)_5Cl^{2+}/OH] \rightarrow$	2.5×10^5 s^{-1}		$\sim 3 \times 10^{-3}$	20	p.r.	P.b.k. at 360 nm in N_2O-satd. soln. contg. 5×10^{-4} mol L^{-1} $Ru(NH_3)_5Cl^{2+}$.	700178

TABLE 22. Rate constants for ruthenium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})*	pH	I	t(°C)	Method	Comment	Ref.
22.70	**Pentaammine(acetylenedicarboxylato)ruthenium(III), OH-adduct**							
22.70.1	**Pentaammine(acetylenedicarboxylato)ruthenium(III), OH-adduct**							
	$(NH_3)_5Ru(C_4O_4\text{-}OH) + (NH_3)_5Ru(C_4O_4\text{-}OH) \rightarrow$	$\sim 2 \times 10^7$	3.5			p.r.	D.k. in N_2O-satd. soln. contg. $(NH_3)_5RuC_4O_4$; unclear whether k or $2k$.	88A030

TABLE 23. Rate constants for antimony transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
23.1	**3,8,13,18-Tetrakis(carboxymethyl)porphine-2,7,12,17-tetrapropanoato(chloro)oxoantimony(V) radical anion**							
23.1.1	**1,1'-Dimethyl-4,4'-bipyridinium**							
	$[SbO(Cl)(uroporphyrin\ I)]^{\cdot+} + MV^{2+} \rightarrow SbO(Cl)(uroporphyrin\ I)^{2+} + MV^{\cdot+}$	4.6×10^8	9.0			f.p./rq	P.b.k. at 578 nm in deaerated soln. contg. 10^{-5} mol L^{-1} SbO(Cl)(uroporphyrin I)$^{2+}$, 0.02 mol L^{-1} EDTA (RQ) and $<10^{-3}$ mol L^{-1} MV^{2+}.	88N184

TABLE 24. Rate constants for tin transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
24.1	**Tin(III)**							
24.1.1	**Tin(III)**							
	$Sn(III) + Sn(III) \rightarrow Sn(II) + Sn(IV)$	1.9×10^{9}	0			f.p.	D.k. at 280 nm in soln. contg. 1 mol L^{-1} HCl and Sn(II) and Sn(IV). In soln. contg. only Sn(II) or Sn(IV), $k = 2.5 \times 10^{9}$ and 1.2×10^{9} L mol^{-1} s^{-1}, respectively.	86A208
24.1.2	**Oxygen**							
	$Sn(III) + O_2 + H^+ \rightarrow Sn(IV) + HO_2^{\bullet}$	1.7×10^{8}	0			f.p.	D.k. at 280 nm in soln. contg. 1 mol L^{-1} HCl, 5.0×10^{-4} mol L^{-1} Sn(IV) and 8.83×10^{-5}, 1.6×10^{-4}, 2.84×10^{-4} or 1.38×10^{-3} mol L^{-1} oxygen.	86A208 89B054
24.2	**Dichloro[5,10,15,20-tetrakis(4-sulfonatophenyl)porphinatostannate(IV) radical anion**							
24.2.1	**First-order reaction**							
	$[SnTPPSCl_2]^{\bullet 5-} \rightarrow$	6.2×10^{4} s^{-1}	7			f.p./rq	D.k. in N_2-satd. soln. contg. $SnTPPSCl_2^{4-}$ and 4-$HOC_6H_4NH_2$ (RQ). Reaction suggested to represent protonation followed by disproportionation to form a Sn(IV) chlorin.	90A022
24.2.2	**Oxygen**							
	$[SnTPPSCl_2]^{\bullet 5-} + O_2 \rightarrow SnTPPSCl_2^{4-} + O_2^{\bullet -}$	2.6×10^{8}	7			f.p./rq	D.k. in N_2-satd. soln. contg. $SnTPPSCl_2^{4-}$ and 4-$HOC_6H_4NH_2$ (RQ) and varied [O_2].	90A022
24.3	**5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)porphinatotin(IV) radical anion**							
24.3.1	**5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)porphinatotin(IV) radical anion**							
	$[SnTMpyP]^{\bullet 5+} + [SnTMpyP]^{\bullet 5+} + H^+ \rightarrow SnTMpyP^{6+} + SnTMpyPH^{5+}$	1.5×10^{5}	2.9			p.r.	D.k.	84A121

TABLE 25. Rate constants for thallium transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
25.1	**Thallium(0)**							
25.1.1	**Silver(I) ion**							
	$Tl^0 + Ag^+ \rightarrow AgTl^+$	1.7×10^9				p.r.	D.k. at 400 nm in soln. contg. 0.1 mol L^{-1} 2-PrOH and 8×10^{-5} mol L^{-1} Tl^+.	80A123
25.1.2	**Carbon dioxide**							
	$Tl^0 + CO_2 \rightarrow Tl^+ + CO_2^{\bullet-}$	3×10^7	3.7		25	p.r.	Calcd. from rate of approach to equilibrium in soln. contg. 0.01-0.04 mol L^{-1} Tl^+; $k_r = 3 \times 10^6$ L mol^{-1} s^{-1}.	89C001
25.1.3	**Cadmium(II) ion**							
	$Tl^0 + Cd^{2+} \rightarrow$	3.6×10^8				p.r.	D.k. at 400 nm in soln. contg. 0.1 mol L^{-1} 2-PrOH and 8×10^{-5} mol L^{-1} Tl^+.	80A123
25.1.4	**Chromium(III) ion**							
	$Tl^0 + Cr^{3+} \rightarrow$	6.0×10^8				p.r.	D.k. at 400 nm in soln. contg. 0.1 mol L^{-1} 2-PrOH and 8×10^{-5} mol L^{-1} Tl^+.	80A123
25.1.5	**Copper(II) ion**							
	$Tl^0 + Cu^{2+} \rightarrow$	3.5×10^9				p.r.	D.k. at 400 nm in soln. contg. 0.1 mol L^{-1} 2-PrOH and 8×10^{-5} mol L^{-1} Tl^+.	80A123
25.1.6	**Ferricyanide ion**							
	$Tl^0 + Fe(CN)_6^{3-} \rightarrow$	3.7×10^9				p.r.	D.k. at 400 nm in soln. contg. 0.1 mol L^{-1} 2-PrOH and 8×10^{-5} mol L^{-1} Tl^+.	80A123
25.1.7	**Nitrous oxide**							
	$Tl^0 + N_2O \rightarrow$	5×10^6			25	p.r.	D.k. in N_2O-satd. soln.; reaction suggested to produce $^{\bullet}OH$.	84C015
25.1.8	**Nickel(II) ion**							
	$Tl^0 + Ni^{2+} \rightarrow$	$<1 \times 10^7$				p.r.	D.k. at 400 nm in soln. contg. 0.1 mol L^{-1} 2-PrOH and 8×10^{-5} mol L^{-1} Tl^+.	80A123
25.1.9	**Hydrogen peroxide**							
	$Tl^0 + H_2O_2 \rightarrow Tl^+ + {}^{\bullet}OH + OH^-$	3.7×10^9				p.r.	D.k. at 400 nm in soln. contg. 0.1 mol L^{-1} 2-PrOH and 8×10^{-5} mol L^{-1} Tl^+.	80A123
25.1.10	**Oxygen**							
	$Tl^0 + O_2 \rightarrow Tl^+ + O_2^{\bullet-}$	3.5×10^9				p.r.	D.k. at 400 nm in soln. contg. 0.1 mol L^{-1} 2-PrOH and 8×10^{-5} mol L^{-1} Tl^+.	80A123
25.1.11	**Lead(II) ions**							
	$Tl^0 + Pb^{2+} \rightarrow$	2.3×10^9				p.r.	D.k. at 400 nm in soln. contg. 0.1 mol L^{-1} 2-PrOH and 8×10^{-5} mol L^{-1} Tl^+.	80A123
25.1.12	**Tris(2,2'-bipyridine)ruthenium(II) ion**							
	$Tl^0 + Ru(bpy)_3^{2+} \rightarrow Tl^+ + Ru(bpy)_3^+$	1.0×10^{10}	7		25	p.r.	P.b.k. at 505 nm in Ar-satd. soln. contg. 0.5 mol L^{-1} 2-PrOH, 5×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$ and varied [Tl^+].	89C001
25.1.13	**Samarium(II) ion**							
	$Tl^0 + Sm^{2+} \rightarrow$	$<2 \times 10^7$				p.r.	D.k. at 400 nm in soln. contg. 0.1 mol L^{-1} 2-PrOH and 8×10^{-5} mol L^{-1} Tl^+.	80A123
25.1.14	**Thallium(I) ion**							
	$Tl^0 + Tl^+ \rightarrow Tl_2^+$	1.4×10^9	7		25	p.r.	Calcd. from $k_{obs} = 1.7 \times 10^7$ s^{-1} for increase in absorption at 420 nm in soln. contg. 0.5 mol L^{-1} 2-PrOH and 10^{-4}-10^{-2} mol L^{-1} $TlClO_4$; $k_r = 1 \times 10^7$ s^{-1}.	89C001
25.1.15	**Acetaldehyde**							
	$Tl^0 + CH_3CHO \rightarrow Tl^+ + CH_3\dot{C}HO^-$	1.0×10^9			25	p.r.	Calcd. from rate of approach to equilibrium in soln. contg. acetaldehyde and Tl^+; $k_r = 4.7 \times 10^8$ L mol^{-1} s^{-1}.	89C001

TABLE 25. Rate constants for thallium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
25.1	**Thallium(0)** — Continued							
25.1.16	**Acetone**							
	$Tl^0 + CH_3COCH_3 \rightarrow Tl^+ + (CH_3)_2\dot{C}O^-$	1.6×10^7	11.3, 12		25	p.r.	Calcd. from rate of approach to equilibrium in soln. contg. acetone, Tl^+ and 0.002 or 0.01 mol L^{-1} OH^-; $k_r = 7.1 \times 10^9$ L mol^{-1} s^{-1}.	89C001
25.1.17	**1,4-Benzoquinone**							
	$Tl^0 + Q \rightarrow Tl^+ + Q^{\cdot-}$	2.8×10^9	7.0		25	p.r.	P.b.k. in soln. contg. 5×10^{-5} mol L^{-1} benzoquinone, 1 mol L^{-1} *tert*-BuOH and 5×10^{-3} mol L^{-1} Tl_2SO_4; 42% Tl^0.	751032
25.1.18	**Formaldehyde**							
	$Tl^0 + HCHO \rightarrow Tl^+ + {}^{\cdot}CH_2O^-$	6×10^6			25	p.r.	Calcd. from rate of approach to equilibrium in soln. contg. formaldehyde and Tl^+; $k_r = 1.5 \times 10^4$ L mol^{-1} s^{-1}.	89C001
25.2	**Thallium(I) ion, complex with Tl(0)**							
25.2.1	**Thallium(I) ion, complex with Tl(0)**							
	$Tl_2^+ + Tl_2^+ \rightarrow Tl_4^{2+}$	8×10^8	12.7			p.r.	D.k. at 420 nm in Ar-satd. soln. contg. 0.2 mol L^{-1} 2-PrOH, 0.01 mol L^{-1} acetone and 0.05 mol L^{-1} $TlClO_4$.	93A299
		1.5×10^9	13			p.r.	D.k. at 420 nm and p.b.k. at 300 nm in soln. contg. 0.1 mol L^{-1} EtOH or 2-PrOH and 0.02 mol L^{-1} $TlClO_4$.	80A123
25.2.2	**Silver(I) ion**							
	$Tl_2^+ + Ag^+ \rightarrow Tl^+ + AgTl^+$	1.3×10^9				p.r.	D.k. at 420 nm in soln. contg. 0.1 mol L^{-1} 2-PrOH and $TlClO_4$.	80A123
25.2.3	**Cadmium(II) ion**							
	$Tl_2^+ + Cd^{2+} \rightarrow$	1.2×10^8				p.r.	D.k. at 420 nm in soln. contg. 0.1 mol L^{-1} 2-PrOH and $TlClO_4$.	80A123
25.2.4	**Chromium(III) ion**							
	$Tl_2^+ + Cr^{3+} \rightarrow$	2.5×10^8				p.r.	D.k. at 420 nm in soln. contg. 0.1 mol L^{-1} 2-PrOH and $TlClO_4$.	80A123
25.2.5	**Copper(II) ion**							
	$Tl_2^+ + Cu^{2+} \rightarrow$	3.1×10^9				p.r.	D.k. at 420 nm in soln. contg. 0.1 mol L^{-1} 2-PrOH and $TlClO_4$.	80A123
25.2.6	**Ferricyanide ion**							
	$Tl_2^+ + Fe(CN)_6^{3-} \rightarrow$	3.0×10^9				p.r.	D.k. at 420 nm in soln. contg. 0.1 mol L^{-1} 2-PrOH and $TlClO_4$.	80A123
25.2.7	**Nitrous oxide**							
	$Tl_2^+ + N_2O \rightarrow$	1.4×10^7			25	p.r.	γ-radiolysis studies indicate that N_2 is one of the products of this reaction.	720844
25.2.8	**Nickel(II) ion**							
	$Tl_2^+ + Ni^{2+} \rightarrow$	$<1 \times 10^5$				p.r.	D.k. at 420 nm in soln. contg. 0.1 mol L^{-1} 2-PrOH and $TlClO_4$.	80A123
25.2.9	**Hydrogen peroxide**							
	$Tl_2^+ + H_2O_2 \rightarrow 2\,Tl^+ + {}^{\cdot}OH + OH^-$	3.0×10^9				p.r.	D.k. at 420 nm in soln. contg. 0.1 mol L^{-1} 2-PrOH and $TlClO_4$.	80A123
25.2.10	**Oxygen**							
	$Tl_2^+ + O_2 \rightarrow 2\,Tl^+ + O_2^{\cdot-}$	3.0×10^9				p.r.	D.k. at 420 nm in soln. contg. 0.1 mol L^{-1} 2-PrOH and $TlClO_4$.	80A123
25.2.11	**Lead(II) ions**							
	$Tl_2^+ + Pb^{2+} \rightarrow$	1.5×10^9				p.r.	D.k. at 420 nm in soln. contg. 0.1 mol L^{-1} 2-PrOH and $TlClO_4$.	80A123

TABLE 25. Rate constants for thallium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
25.2	**Thallium(I) ion, complex with Tl(0)** — Continued							
25.2.12	**Tris(2,2'-bipyridine)ruthenium(II) ion**							
	$Tl_2^+ + Ru(bpy)_3^{2+} \rightarrow 2\ Tl^+ + Ru(bpy)_3^+$	5.2×10^9	12.7			p.r.	P.b.k. at 510 nm in Ar-satd. soln. contg. 0.05 mol L^{-1} $TlClO_4$, 0.2 mol L^{-1} 2-PrOH, 0.01 mol L^{-1} acetone and 2.2×10^{-5} mol L^{-1} $Ru(bpy)_3(ClO_4)_2$.	93A299
		5×10^9	7		25	p.r.	P.b.k. at 505 nm in Ar-satd. soln. contg. 0.5 mol L^{-1} 2-PrOH, 5×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$ and varied [Tl^+].	89C001
25.2.13	**Samarium(II) ion**							
	$Tl_2^+ + Sm^{2+} \rightarrow$	$<6 \times 10^6$				p.r.	D.k. at 420 nm in soln. contg. 0.1 mol L^{-1} 2-PrOH and $TlClO_4$.	80A123
25.2.14	**1,4-Dicyanobenzene**							
	$Tl_2^+ + DCNB \rightarrow 2\ Tl^+ + [DCNB]^{\cdot -}$	2.7×10^9	~7			p.r.	D.k. at 490 nm in deaerated soln. contg. 10^{-4} mol L^{-1} DCNB and 10^{-2} mol L^{-1} Tl_2SO_4.	730121
25.2.15	**Hydroxymethyl**							
	$Tl_2^+ + {}^{\cdot}CH_2OH + H^+ \rightarrow 2\ Tl^+ + MeOH$	4.0×10^9	6			p.r.	Calcd. from d.k. at 420 nm. and condy. change in soln. contg. MeOH and Tl^+ assuming values for $2k(Tl_2^+ + Tl_2^+)$, $k(Tl_2^+ + H_2O_2)$ and $2k(R + R)$.	80A123
25.2.16	**1-Hydroxyethyl**							
	$Tl_2^+ + CH_3\dot{C}HOH + H^+ \rightarrow 2\ Tl^+ + EtOH$	3.0×10^9	6			p.r.	Calcd. from d.k. at 420 nm. and condy. change in soln. contg. EtOH and Tl^+ assuming values for $2k(Tl_2^+ + Tl_2^+)$, $k(Tl_2^+ + H_2O_2)$ and $2k(R + R)$.	80A123
25.2.17	**1-Hydroxy-1-methylethyl**							
	$Tl_2^+ + (CH_3)_2\dot{C}OH + H^+ \rightarrow 2\ Tl^+ + 2\text{-PrOH}$	3.0×10^9	6			p.r.	Calcd. from d.k. at 420 nm. and condy. change in soln. contg. 2-PrOH and Tl^+ assuming values for $2k(Tl_2^+ + Tl_2^+)$, $k(Tl_2^+ + H_2O_2)$ and $2k(R + R)$.	80A123
25.3	**Thallium(0), complex with thallium(I) ion, dimer**							
25.3.1	**Thallium(0), complex with thallium(I) ion, dimer**							
	$Tl_4^{2+} + Tl_4^{2+} \rightarrow$	1.8×10^6	13			p.r.	Estd from dose effect on abs. at 300 nm in soln. contg. 0.02 mol L^{-1} $TlClO_4$ and 0.1 mol L^{-1} EtOH or 2-PrOH. Unclear whether k or $2k$.	80A123
25.3.2	**Tris(2,2'-bipyridine)ruthenium(II) ion, electron adduct**							
	$Tl_4^{2+} + Ru(bpy)_3^+ \rightarrow Tl_4^+ + Ru(bpy)_3^{2+}$	6×10^8	12.7			p.r.	D.k. at 510 nm in Ar-satd. soln. contg. 0.05 mol L^{-1} $TlClO_4$, 0.2 mol L^{-1} 2-PrOH, 0.01 mol L^{-1} acetone and 2.2×10^{-5} mol L^{-1} $Ru(bpy)_3(ClO_4)_2$; value obtained from computer fit.	93A299
25.4	**Thallium(II) ion**							
25.4.1	**Chloride ion**							
	$Tl^{2+} + Cl^- \rightarrow TlCl^+$	9×10^9	0	1	23	p.r.	D.k. at 290 nm in soln. contg. 3.0×10^{-3} mol L^{-1} Tl^{3+}, 3.0×10^{-3} mol L^{-1} HCl and 1 mol L^{-1} $HClO_4$; $k_r = 1.4 \times 10^5$ s^{-1}.	741038
25.4.2	**Cobalt(II) ion**							
	$Tl^{2+} + Co^{2+} \rightarrow Tl^+ + Co^{3+}$	6.2×10^3	0.6	0.75	25	f.p.	D.k. at 270 nm in soln. contg. 10^{-3} mol L^{-1} Tl^{3+}, 0.25 mol L^{-1} $HClO_4$ and 0.02-0.2 mol L^{-1} Co^{2+}; $k_r = 3.1 \times 10^{-3}$ L mol^{-1} s^{-1}.	747625

TABLE 25. Rate constants for thallium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
25.4	**Thallium(II) ion** — Continued							
25.4.3	**Cobalt(III) ion**							
	$Tl^{2+} + Co^{3+} \rightarrow Tl^{3+} + Co^{2+}$	9.5×10^6	0.3	0.55	22	f.p.	D.k. at 303 nm in soln. contg. 10^{-3} mol L^{-1} Tl^{3+} and 0.5 mol L^{-1} H^+.	757093
25.4.4	**Iron(II) ion**							
	$Tl^{2+} + Fe^{2+} \rightarrow Tl^{+} + Fe^{3+}$	2.6×10^6	0.6	0.30	25	f.p.	D.k. at 303 nm in soln. contg. 10^{-3} mol L^{-1} Tl^{3+} and 0.25 mol L^{-1} H^+; studied at 14.7-39.6 °C.; E_a = 4.8 kJ mol^{-1}.	757093
		6.7×10^6	0	1	23	p.r.	D.k. at 290 nm in soln. contg. 10^{-3} mol L^{-1} Tl^{+}, 10^{-2} mol L^{-1} Tl^{3+}, 1 mol L^{-1} $HClO_4$ and (1-2) $\times$ 10^{-3} mol L^{-1} Fe^{2+}	741017
25.4.5	**Iron(II) tris(1,10-phenanthroline-5,6-dione)**							
	$Tl^{2+} + Fe[1,10\text{-}PD]_3^{2+} \rightarrow$	4.0×10^8	3.2			p.r.	P.b.k. at 600 nm in N_2O-satd. soln. contg. Tl_2SO_4, $FeSO_4$ and 1,10-phenanthroline-5,6-dione.	93A292
25.4.6	**Iron(III) ion**							
	$Tl^{2+} + Fe^{3+} \rightarrow Tl^{3+} + Fe^{2+}$	1.1×10^6	0.6	0.30	25	f.p.	D.k. at 270 nm in soln. contg. 10^{-2} mol L^{-1} Tl^{+}, 2×10^{-3} mol L^{-1} Tl^{3+} and 0.25 mol L^{-1} $HClO_4$.	747625
25.4.7	**Perhydroxyl**							
	$Tl^{2+} + HO_2^{\bullet} \rightarrow Tl^{+} + H^{+} + O_2$	2.5×10^9	1			p.r.	D.k. in aerated soln. contg. 10^{-3} mol L^{-1} Tl^{+}. Estimated from initial decay of Tl^{2+}	660097
25.4.8	**Hydrogen peroxide**							
	$Tl^{2+} + H_2O_2 \rightarrow Tl^{+} + HO_2^{\bullet} + H^{+}$	2.8×10^7	1			p.r.	D.k. in aerated soln. contg. 10^{-3} mol L^{-1} Tl^{+} and 8.9×10^{-4} mol L^{-1} H_2O_2. Evidence for products from H_2O_2 and H_2 yields in γ-r.-irradiated Tl^{+} solutions. [710036].	660097
25.4.9	**Manganese(II) ion**							
	$Tl^{2+} + Mn^{2+} \rightarrow Tl^{+} + Mn^{3+}$	1.9×10^4	0.3	0.75	22	f.p.	D.k. at 303 nm in soln. contg. 10^{-3} mol L^{-1} Tl^{3+} and 0.5 mol L^{-1} H^+.	757093
25.4.10	**Thallium(II) ion**							
	$Tl^{2+} + Tl^{2+} \rightarrow Tl^{3+} + Tl^{+}$	1.9×10^8	0	1	23	p.r.	D.k. at 280 nm in soln. contg. 10^{-2} mol L^{-1} Tl^{3+}, 10^{-3} mol L^{-1} Tl^{+} and 1 mol L^{-1} $HClO_4$.	741017
		1.8×10^8	1	0.25	25	f.p.	D.k. at 270 nm in soln. contg. 10^{-3} mol L^{-1} Tl^{3+}, 10^{-3} mol L^{-1} Tl^{+} and 0.25 mol L^{-1} $HClO_4$; studied at 15-45 °C, E_a = 7.9 kJ mol^{-1}; recalcd. from the original data using ε_{270} = 3800 L mol^{-1} cm^{-1} [741017].	747625
		1.9×10^8	0.6	0.25				
		3.2×10^8	0.6	0.50				
		4.5×10^8	0.6	1.0				
		4.1×10^8	0.3	1.0				
		4.5×10^8	0	1.0				
25.4.11	**5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)porphinatozinc(II) ion**							
	$Tl^{2+} + ZnTMpyP^{4+} \rightarrow Tl^{+} + [ZnTMpyP]^{\bullet 5+}$	4.3×10^8	3.3	0.004		p.r.	P.b.k. at 690-700 nm in N_2O-satd. buffered soln. contg. Tl_2SO_4 and (1-4) $\times$ 10^{-4} mol L^{-1} porphyrin.	85A038
25.4.12	**6-Aminophenalenone**							
	$Tl^{2+} + 6\text{-}NH_2PHO \rightarrow Tl^{+} + [6\text{-}NH_2PHO]^{\bullet +}$	6.0×10^9				p.r.	P.b.k. at 420 nm in N_2O-satd. soln. contg. 0.005 mol L^{-1} Tl_2SO_4.	93A404
25.4.13	**Anisole**							
	$Tl^{2+} + C_6H_5OCH_3 \rightarrow Tl^{+} + [C_6H_5OCH_3]^{\bullet +}$	5.0×10^8	4		20	p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 10^{-3} mol L^{-1} Tl_2SO_4 and 10^{-4} mol L^{-1} anisole.	751171

TABLE 25. Rate constants for thallium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
25.4	**Thallium(II) ion** — Continued							
25.4.14	**Chlorpromazine, conjugate acid**							
	$Tl^{2+} + CZH^+ \rightarrow Tl^+ + [CZH]^{\cdot 2+}$	1.5×10^9	2.0			p.r.	P.b.k. at 505 nm in N_2O-satd. soln. contg. 0.003 mol L^{-1} Tl_2SO_4; overall rate constant, 86% electron transfer.	83A272
25.4.15	***Diethyl disulfide***							
	$Tl^{2+} + C_2H_5SSC_2H_5 \rightarrow Tl^+ + [C_2H_5SSC_2H_5]^{\cdot +}$	1.4×10^9	3.5			p.r.	D.k. at 260 nm and p.b.k. in N_2O-satd. soln. contg. 2×10^{-3} mol L^{-1} Tl^+ and various lower concn. of disulfide.	761143
25.4.16	**Diethyl sulfoxide**							
	$Tl^{2+} + (C_2H_5)_2SO \rightarrow Tl^+ + [(C_2H_5)_2SO]^{\cdot +}$	1.4×10^7	3.2			p.r.	D.k. in N_2O-satd. soln. contg. 5×10^{-3} mol L^{-1} Tl^+.	89A465
25.4.17	**3,5-Diiodotyrosine**							
	$Tl^{2+} + 3,5\text{-}I_2TyrOH \rightarrow$	1.0×10^9	2			p.r.	P.b.k. at 350 nm in soln. contg. 0.005 mol L^{-1} Tl^+. Reaction occurs by split path forming phenoxyl type radical and radical cation.	94A179
25.4.18	***1,2-Dimethoxybenzene***							
	$Tl^{2+} + 1,2\text{-}C_6H_4(OCH_3)_2 \rightarrow Tl^+ + [1,2\text{-}C_6H_4(OCH_3)_2]^{\cdot +}$	6.0×10^8	4		20	p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 10^{-3} mol L^{-1} Tl_2SO_4 and 10^{-4} mol L^{-1} dimethoxybenzene.	751171
25.4.19	**1,3-Dimethoxybenzene**							
	$Tl^{2+} + 1,3\text{-}C_6H_4(OCH_3)_2 \rightarrow Tl^+ + [1,3\text{-}C_6H_4(OCH_3)_2]^{\cdot +}$	8.0×10^8	4		20	p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 10^{-3} mol L^{-1} Tl_2SO_4 and 10^{-4} mol L^{-1} dimethoxybenzene.	751171
25.4.20	**1,4-Dimethoxybenzene**							
	$Tl^{2+} + 1,4\text{-}C_6H_4(OCH_3)_2 \rightarrow Tl^+ + [1,4\text{-}C_6H_4(OCH_3)_2]^{\cdot +}$	6.5×10^8	4		20	p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 10^{-3} mol L^{-1} Tl_2SO_4 and 10^{-4} mol L^{-1} dimethoxybenzene.	751171
		5.2×10^8	4		22	p.r.	P.b.k. at 430-460 nm in N_2O-satd. soln. contg. 10^{-3} mol L^{-1} Tl_2SO_4.	87A041
25.4.21	**1,4-Dimethoxybenzene radical cation**							
	$Tl^{2+} + [1,4\text{-}C_6H_4(OCH_3)_2]^{\cdot +} \rightarrow Tl^{3+} + 1,4\text{-}C_6H_4(OCH_3)_2$	6.0×10^9	4		22	p.r.	Detd. from dependence of $[1,4\text{-}C_6H_4(OCH_3)_2]^{\cdot +}$ on pulse intensity in N_2O-satd. soln. contg. 10^{-3} mol L^{-1} Tl_2SO_4.	87A041
25.4.22	**2,3-Dimethoxybenzoic acid**							
	$Tl^{2+} + 2,3\text{-}(CH_3O)_2C_6H_3CO_2H \rightarrow Tl^+ + H^+ + [2,3\text{-}(CH_3O)_2C_6H_3CO_2]^{\cdot}$	2.1×10^9	~3		20	p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 1×10^{-3} mol L^{-1} Tl_2SO_4.	771006
25.4.23	**3,4-Dimethoxybenzoic acid**							
	$Tl^{2+} + 3,4\text{-}(CH_3O)_2C_6H_3CO_2H \rightarrow Tl^+ + H^+ + [3,4\text{-}(CH_3O)_2C_6H_3CO_2]^{\cdot}$	1.7×10^9	~3		20	p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 1×10^{-3} mol L^{-1} Tl_2SO_4.	771006
25.4.24	**2,4-Dimethoxybenzoic acid**							
	$Tl^{2+} + 2,4\text{-}(CH_3O)_2C_6H_3CO_2H \rightarrow Tl^+ + H^+ + [2,4\text{-}(CH_3O)_2C_6H_3CO_2]^{\cdot}$	9.1×10^8	~3		20	p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 1×10^{-3} mol L^{-1} Tl_2SO_4.	771006
25.4.25	**2,6-Dimethoxybenzoic acid**							
	$Tl^{2+} + 2,6\text{-}(CH_3O)_2C_6H_3CO_2H \rightarrow Tl^+ + H^+ + [2,6\text{-}(CH_3O)_2C_6H_3CO_2]^{\cdot}$	1.8×10^9	~3		20	p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 1×10^{-3} mol L^{-1} Tl_2SO_4.	771006
25.4.26	**3,5-Dimethoxybenzoic acid**							
	$Tl^{2+} + 3,5\text{-}(CH_3O)_2C_6H_3CO_2H \rightarrow Tl^+ + H^+ + [3,5\text{-}(CH_3O)_2C_6H_3CO_2]^{\cdot}$	2.4×10^9	~3		20	p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 1×10^{-3} mol L^{-1} Tl_2SO_4.	771006

TABLE 25. Rate constants for thallium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
25.4	**Thallium(II) ion** — Continued							
25.4.27	**Dimethyl disulfide**							
	$Tl^{2+} + CH_3SSCH_3 \rightarrow Tl^+ \cdot [CH_3SSCH_3]^{\cdot+}$	2.3×10^9	3.5			p.r.	D.k. at 260 nm and p.b.k. in N_2O-satd. soln. contg. 2×10^{-3} mol L^{-1} Tl^+ and various lower concn. of disulfide.	761143
25.4.28	**Dimethyl sulfoxide**							
	$Tl^{2+} + DMSO \rightarrow Tl^+ + [DMSO]^{\cdot+}$	1.1×10^7	3.2			p.r.	D.k. in N_2O-satd. soln. contg. 5×10^{-3} mol L^{-1} Tl^+.	89A465
25.4.29	**Dimethyl 3,3'-thiodipropionate**							
	$Tl^{2+} + 2\ S(CH_2CH_2CO_2CH_3)_2 \rightarrow Tl^+ + [(CH_3O_2CCH_2CH_2)_2S]^{\cdot+}$	1.7×10^9	1.5		23	p.r.	P.b.k. at 510 nm in O_2-satd. soln. contg. 0.01 mol L^{-1} Tl^+ and (0.4-1.1) $\times 10^{-3}$ mol L^{-1} dimethyl 3,3'-thiodipropionate.	92A059
25.4.30	**Diphenyl selenide**							
	$Tl^{2+} + (C_6H_5)_2Se \rightarrow Tl^+ + [(C_6H_5)_2Se]^{\cdot+}$	2.6×10^9				p.r.	P.b.k. at 750 nm in N_2O-satd. soln. contg. Tl_2SO_4.	94A098
25.4.31	**Diphenyl sulfide**							
	$Tl^{2+} + (C_6H_5)_2S \rightarrow Tl^+ + [(C_6H_5)_2S]^{\cdot+}$	3×10^9				p.r.	P.b.k. at 750 nm in N_2O-satd. soln. contg. Tl_2SO_4.	94A098
25.4.32	**Diphenyl tellu...**							
	$Tl^{2+} + (C_6H_5)_2Te \rightarrow Tl^+ + [(C_6H_5)_2Te]^{\cdot+}$	3.2×10^9				p.r.	P.b.k. at 580 nm in N_2O-satd. soln. contg. Tl_2SO_4.	94A098
25.4.33	**Dipropyl sulfoxide**							
	$Tl^{2+} + (CH_3CH_2CH_2)_2SO \rightarrow Tl^+ + [(CH_3CH_2CH_2)_2SO]^{\cdot+}$	2.2×10^7	3.2			p.r.	D.k. in N_2O-satd. soln. contg. 5×10^{-3} mol L^{-1} Tl^+.	89A465
25.4.34	**Ethanol**							
	$Tl^{2+} + EtOH \rightarrow Tl^+ + H^+ + CH_3\dot{C}HOH$	8.8×10^3	0.43		23	γ-r.	Calculated from the γ-ray induced chain reaction in Tl^{2+} + ethanol solutions, taking $k(Tl^{2+} + Tl^{2+}) = 1.9 \times 10^8$ L mol^{-1} s^{-1} [741017].	700336
25.4.35	**Methanol**							
	$Tl^{2+} + MeOH \rightarrow Tl^+ + H^+ + {}^{\cdot}CH_2OH$	6.9×10^3	0.43		23	γ-r.	Calculated from the γ-ray induced chain reaction in Tl^{2+} + methanol solutions, taking $k(Tl^{2+} + Tl^{2+}) = 1.9 \times 10^8$ L mol^{-1} s^{-1} [741017].	700336
25.4.36	**Methionine**							
	$Tl^{2+} + Met \rightarrow Tl^+ + [Met]^{\cdot+}$	2.5×10^9	3.35			p.r.	D.k. at 260 nm and p.b.k. at 290 nm in N_2O-satd. soln. contg. 2×10^{-3} mol L^{-1} Tl^+ and 2×10^{-5} mol L^{-1} methionine.	81A340
25.4.37	**2-Methoxybenzoic acid**							
	$Tl^{2+} + 2\text{-}CH_3OC_6H_4CO_2H \rightarrow Tl^+ + H^+ + [2\text{-}CH_3OC_6H_4CO_2]^{\cdot}$	1.2×10^9	~3		20	p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 1×10^{-3} mol L^{-1} Tl_2SO_4.	771006
25.4.38	**3-Methoxybenzoic acid**							
	$Tl^{2+} + 3\text{-}CH_3OC_6H_4CO_2H \rightarrow Tl^+ + H^+ + [3\text{-}CH_3OC_6H_4CO_2]^{\cdot}$	1.6×10^9	~3		20	p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 1×10^{-3} mol L^{-1} Tl_2SO_4.	771006
25.4.39	**4-Methoxybenzoic acid**							
	$Tl^{2+} + 4\text{-}CH_3OC_6H_4CO_2H \rightarrow Tl^+ + H^+ + [4\text{-}CH_3OC_6H_4CO_2]^{\cdot}$	5.3×10^8	~3		20	p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 1×10^{-3} mol L^{-1} Tl_2SO_4.	771006
25.4.40	**Methylene Blue cation**							
	$Tl^{2+} + MB^+ + H^+ \rightarrow Tl^+ + [MBH]^{\cdot 3+}$	2.4×10^9	1.7			p.r.	P.b.k. at 525 nm in O_2-satd. soln. contg. 10^{-4} mol L^{-1} methylene blue and 2×10^{-3} mol L^{-1} Tl^{2+}.	89A375

TABLE 25. Rate constants for thallium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
25.4	**Thallium(II) ion** — Continued							
25.4.41	**Neutral Red cation**							
	$Tl^{2+} + NRH^+ + H^+ \rightarrow Tl^+ + [NRH_2]^{\cdot 3+}$	1.7×10^9	1.8			p.r.	P.b.k. in O_2-satd. soln. contg. 0.002 mol L^{-1} Tl^+ and 1×10^{-4} mol L^{-1} Neutra' Red.	93A100
25.4.42	***N*-Nitrosodimethylamine**							
	$Tl^{2+} + (CH_3)_2NNO \rightarrow$	1.4×10^7	2.7			p.r.	D.k. at 340 nm in N_2O-satd. soln. contg. Tl_2SO_4.	91D17
25.4.43	**Phenylthiourea**							
	$Tl^{2+} + C_6H_5NHCSNH_2 \rightarrow$	3.2×10^9	3.5			p.r.	P.b.k. at 580 nm in soln. contg. Tl^+ and 5×10^{-4} mol L^{-1} phenylthiourea; product suggested to be deprotonated radical cation.	94A002
25.4.44	**Promethazine, conjugate acid**							
	$Tl^{2+} + PZH^+ \rightarrow Tl^+ + [PZH]^{\cdot 2+}$	1.2×10^9	2.5			p.r.	P.b.k. at 505 nm in N_2O-satd. soln. contg. 0.003 mol L^{-1} Tl_2SO_4; overall rate constant, 93% electron transfer.	83A272
25.4.45	**2-Propanol**							
	$Tl^{2+} + 2\text{-PrOH} \rightarrow Tl^+ + H^+ + (CH_3)_2\dot{C}OH$	5.8×10^3	0.43		23	γ-r	Calculated from the γ-ray induced chain reaction in Tl^{2+} + 2-propanol solutions, taking $k(Tl^{2+} + Tl^{2+}) = 1.9 \times 10^8$ L mol^{-1} s^{-1} [741017].	700336
25.4.46	**Safranine cation, conjugate monoacid**							
	$Tl^{2+} + STH^{2+} \rightarrow [STH]^{\cdot 3+} + Tl^+$	2.2×10^9	2			p.r.	P.b.k. at 460 nm in O_2-satd. soln. contg. 0.002 mol L^{-1} Tl_2SO_4.	92A008
25.4.47	**Sulfacetamide**							
	$Tl^{2+} + H_2NC_6H_4SO_2NHAc \rightarrow [H_2NC_6H_4SO_2NHAc]^{\cdot +} + Tl^+$	7.0×10^8	3.3			p.r.	P.b.k. at 440 nm in N_2O-satd. soln. contg. Tl^+ and sulfacetamide.	94A208
25.4.48	**1,2,4,5-Tetramethoxybenzene**							
	$Tl^{2+} + 1,2,4,5\text{-}C_6H_2(CH_3O)_4 \rightarrow Tl^+ + [1,2,4,5\text{-}C_6H_2(CH_3O)_4]^{\cdot +}$	1.0×10^9	4			p.r.	P.b.k. at 447 nm in N_2O-satd. soln. contg. 10^{-3} mol L^{-1} Tl_2SO_4.	87A041
25.4.49	**3,3'-Thiodipropanol**							
	$Tl^{2+} + S(CH_2CH_2CH_2OH)_2 \rightarrow Tl^+ + [(CH_2OHCH_2CH_2)_2S]^{\cdot +}$	2.0×10^9	1.5		23	p.r.	P.b.k. in O_2-satd. soln. contg. 0.01 mol L^{-1} Tl^+.	92A05
25.4.50	**3,3'-Thiodipropionic acid**							
	$Tl^{2+} + S(CH_2CH_2CO_2H)_2 \rightarrow Tl^+ + [S(CH_2CH_2CO_2H)_2]^{\cdot +}$	3.8×10^9	1.5			p.r.	P.b.k. at 390 nm in O_2-satd. soln. contg. 2.0×10^{-3} mol L^{-1} Tl^+.	90A488
25.4.51	**Thionine cation**							
	$Tl^{2+} + Th^+ + H^+ \rightarrow Tl^+ + [ThH]^{\cdot 3+}$	3×10^9	2.5			p.r.	P.b.k. at 480 nm in N_2O-satd. soln. contg. 2×10^{-3} mol L^{-1} Tl^+; product is semioxidized thionine. $Tl(OH)^+$ generates same product at pH 5.8.	87A452
25.4.52	**Toluidine Blue cation**							
	$Tl^{2+} + TB^+ + H^+ \rightarrow Tl^+ + [TBH]^{\cdot 3+}$	1.7×10^9	1.8			p.r.	P.b.k. at 500 nm in soln. contg. 0.002 mol L^{-1} Tl^+.	90A238
25.4.53	**1,2,3-Trimethoxybenzene**							
	$Tl^{2+} + 1,2,3\text{-}C_6H_3(OCH_3)_3 \rightarrow Tl^+ + [1,2,3\text{-}C_6H_3(OCH_3)_3]^{\cdot +}$	3.2×10^8	4		20	p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 10^{-3} mol L^{-1} Tl_2SO_4 and 10^{-4} mol L^{-1} trimethoxybenzene.	751171
25.4.54	**1,2,4-Trimethoxybenzene**							
	$Tl^{2+} + 1,2,4\text{-}C_6H_3(OCH_3)_3 \rightarrow Tl^+ + [1,2,4\text{-}C_6H_3(OCH_3)_3]^{\cdot +}$	6.8×10^8	4		20	p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 10^{-3} mol L^{-1} Tl_2SO_4 and 10^{-4} mol L^{-1} trimethoxybenzene.	751171

TABLE 25. Rate constants for thallium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
25.4	**Thallium(II) ion** — Continued							
25.4.55	**1,3,5-Trimethoxybenzene**							
	$Tl^{2+} + 1,3,5\text{-}C_6H_3(OCH_3)_3 \rightarrow Tl^+ + [1,3,5\text{-}C_6H_3(CH_3O)_3]^{\cdot+}$	7.0×10^8	4		20	p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 10^{-3} mol L^{-1} Tl_2SO_4 and 10^{-4} mol L^{-1} trimethoxybenzene.	751171
25.4.56	**2,3,4-Trimethoxybenzoic acid**							
	$Tl^{2+} + 2,3,4\text{-}(CH_3O)_3C_6H_2CO_2H \rightarrow Tl^+ + H^+ + [2,3,4\text{-}(CH_3O)_3C_6H_2CO_2]^{\cdot}$	1.6×10^9	~3		20	p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 1×10^{-3} mol L^{-1} Tl_2SO_4.	771006
25.4.57	**3,4,5-Trimethoxybenzoic acid**							
	$Tl^{2+} + 3,4,5\text{-}(CH_3O)_3C_6H_2CO_2H \rightarrow Tl^+ + H^+ + [3,4,5\text{-}(CH_3O)_3C_6H_2CO_2]^{\cdot}$	8.4×10^8	~3		20	p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 1×10^{-3} mol L^{-1} Tl_2SO_4.	771006
25.4.58	**2,4,5-Trimethoxybenzoic acid**							
	$Tl^{2+} + 2,4,5\text{-}(CH_3O)_3C_6H_2CO_2H \rightarrow Tl^+ + H^+ + [2,4,5\text{-}(CH_3O)_3C_6H_2CO_2]^{\cdot}$	8.2×10^8	~3		20	p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 1×10^{-3} mol L^{-1} Tl_2SO_4.	771006
25.4.59	**2,4,6-Trimethoxybenzoic acid**							
	$Tl^{2+} + 2,4,6\text{-}(CH_3O)_3C_6H_2CO_2H \rightarrow Tl^+ + H^+ + [2,4,6\text{-}(CH_3O)_3C_6H_2CO_2]^{\cdot}$	1.5×10^9	~3		20	p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 1×10^{-3} mol L^{-1} Tl_2SO_4.	771006
25.5	**Hydroxythallium(II) ion**							
25.5.1	**Iron(II) tris(1,10-phenanthroline-5,6-dione)**							
	$TlOH^+ + Fe[1,10\text{-}PD]_3^{2+} \rightarrow$	7.0×10^8	5.1			p.r.	P.b.k. at 600 nm in N_2O-satd. soln. contg. Tl_2SO_4, $FeSO_4$ and 1,10-phenanthroline-5,6-dione.	93A292
25.5.2	**Hydrogen ion**							
	$TlOH^+ + H^+ \rightarrow Tl^{2+} + H_2O$	1.4×10^{10}	2-7	var	21	p.r.	D.k. at 360 nm in N_2O-satd. soln. contg. 10^{-3} mol L^{-1} Tl_2SO_4 and $HClO_4$. Evidence for equilibrium from optical and conductivity measurements.	751130
		1.0×10^{10}		0.01	25	p.r.	D.k. at 360 nm in soln. contg. 0.001 mol L^{-1} Tl^+, 0.01 mol L^{-1} $NaClO_4$ and varied $[H^+]$; $K_{eq} = 6.0 \times 10^4$ M^{-1}.	84C015
25.5.3	**Hydroxythallium(II) ion**							
	$TlOH^+ + TlOH^+ \rightarrow$	1.9×10^9	6.5	~0		p.r.	D.k. at 260 nm in N_2O-satd. soln. contg. 5×10^{-4} mol L^{-1} Tl^+.	660097
		1.9×10^9	5.6			p.r.	D.k. in N_2O-satd. soln.	761192
25.5.4	**Adenosine**							
	$TlOH^+ + A \rightarrow Tl^+ + OH^- + A^{\cdot+}$	6.3×10^7	7-7.4	0.006	20	p.r.	D.k. at 360 nm in N_2O-satd. soln. contg. 2×10^{-3} mol L^{-1} Tl_2SO_4; mixt. with $Tl(OH)_2$.	89A247
25.5.5	**Adenylyl-(3'→5')-guanosine**							
	$TlOH^+ + ApG \rightarrow$	5×10^8	~7		20	p.r.	D.k. in N_2O-satd. soln. contg. 0.002 mol L^{-1} Tl^+ and 1×10^{-4} mol L^{-1} ApG.	93A118
25.5.6	**Chlorpromazine, conjugate acid**							
	$TlOH^+ + CZH^+ \rightarrow Tl^+ + OH^- + [CZH]^{\cdot 2+}$	1.6×10^9	6.5			p.r.	P.b.k. at 505 nm in N_2O-satd. soln. contg. 0.003 mol L^{-1} Tl_2SO_4; overall rate constant, 59% electron transfer.	83A272
25.5.7	**2'-Deoxyadenosine 5'-monophosphate**							
	$TlOH^+ + dAMP \rightarrow Tl^+ + OH^- + [dAMP]^{\cdot+}$	1.6×10^8	7-7.4	0.006	20	p.r.	D.k. at 360 nm in N_2O-satd. soln. contg. 2×10^{-3} mol L^{-1} Tl_2SO_4; mixt. with $Tl(OH)_2$.	89A247
25.5.8	**2'-Deoxyguanosine 5'-monophosphate**							
	$TlOH^+ + dGMP \rightarrow Tl^+ + OH^- + [dGMP]^{\cdot+}$	3.4×10^9	7-7.4	→0	20	p.r.	D.k. at 360 nm in N_2O-satd. soln. contg. 2×10^{-3} mol L^{-1} Tl_2SO_4; mixt. with $Tl(OH)_2$.	89A247

TABLE 25. Rate constants for thallium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref
25.5	**Hydroxythallium(II) ion** — Continued							
25.5.9	**Diethyl disulfide**							
	$TlOH^+ + C_2H_5SSC_2H_5 \rightarrow Tl^+ + OH^- + [C_2H_5SSC_2H_5]^{\bullet+}$	1.4×10^9	5.5-6			p.r.	D.k. at 260 nm and p.b.k. in N_2O-satd. soln. contg. 2×10^{-3} mol L^{-1} Tl^+ and various lower concn. of disulfide.	761143
25.5.10	**1,2-Dimethoxybenzene**							
	$TlOH^+ + 1,2\text{-}C_6H_4(OCH_3)_2 -$	1.2×10^9	>4.7			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg. 10^{-3} mol L^{-1} Tl_2SO_4 and 10^{-4} mol L^{-1} dimethoxybenzene	751086
25.5.11	**1,4-Dimethoxybenzene**							
	$TlOH^+ + 1,4\text{-}C_6H_4(OCH_3)_2 \rightarrow$	4.5×10^8	>4.7			p.r.	P.b.k. and d.k. in N_2O-satd. soln. contg 10^{-3} mol L^{-1} Tl_2SO_4 and 10^{-4} mol L^{-1} dimethoxybenzene.	751086
25.5.12	**Dimethyl disulfide**							
	$TlOH^+ + CH_3SSCH_3 \rightarrow Tl^+ + OH^- + [CH_3SSCH_3]^{\bullet+}$	$\sim 1.5 \times 10^9$	5.6			p.r.	D.k. at 260 nm and p.b.k. at 440 nm in N_2O-satd. soln. contg. 2×10^{-3} mol L^{-1} Tl^+ and various lower concn. of disulfide	761143 761192
25.5.13	**Ethanol**							
	$TlOH^+ + EtOH \rightarrow Tl^+ + H_2O + CH_3\dot{C}HOH$	$\sim 1 \times 10^6$				p.r.	D.k. at 360 nm; mixt. with $Tl(OH)_2$.	89C001
25.5.14	**Formaldehyde**							
	$TlOH^+ + HCHO \rightarrow Tl^+ + H_2O + {}^{\bullet}CHO$	$\sim 1 \times 10^9$				p.r.	D.k. at 420 nm; mixt. with $Tl(OH)_2$.	89C001
25.5.15	**Guanosine**							
	$TlOH^+ + G \rightarrow$	1.3×10^9	7-7.4	0.006	20	p.r.	D.k. at 360 nm in N_2O-satd. soln. contg. 2×10^{-3} mol L^{-1} Tl_2SO_4.	89A247
25.5.16	**Glycyltryptophan**							
	$TlOH^+ + GlyTrpH \rightarrow Tl^+ + [GlyTrp]^{\bullet} + H_2O$	1.4×10^9	7-7.4	0.006	20	p.r.	D.k. at 360 nm in N_2O-satd. soln. contg. 2×10^{-3} mol L^{-1} Tl_2SO_4; mixt. with $Tl(OH)_2$.	89A247
25.5.17	**Methanol**							
	$TlOH^+ + MeOH \rightarrow Tl^+ + H_2O + {}^{\bullet}CH_2OH$	$\sim 1 \times 10^6$				p.r.	D.k. at 360 nm in N_2O-satd. soln.; mixt. with $Tl(OH)_2$.	89C001
25.5.18	**1-Methylcytosine**							
	$TlOH^+ + 1\text{-MeCy} \rightarrow$	$<10^7$	7-7.4	0.006	20	p.r.	D.k. at 360 nm in N_2O-satd. soln. contg. 2×10^{-3} mol L^{-1} Tl_2SO_4; mixt. with $Tl(OH)_2$.	89A247
25.5.19	**Methylene Blue cation**							
	$TlOH^+ + MB^+ \rightarrow Tl^+ + [MB]^{\bullet 2+} + OH^-$	2.4×10^9	6.7			p.r.	P.b.k. at 525 nm in N_2O satd. soln. contg. 10^{-4} mol L^{-1} methylene blue and 2×10^{-3} mol L^{-1} Tl^{2+}.	89A375
25.5.20	**1-Methylthymine**							
	$TlOH^+ + 1,5\text{-}Me_2U \rightarrow$	$<10^7$	7-7.4	0.006	20	p.r.	D.k. at 360 nm in N_2O-satd. soln. contg. 2×10^{-3} mol L^{-1} Tl_2SO_4; mixt. with $Tl(OH)_2$.	89A247
25.5.21	**1,10-Phenanthroline-5,6-dione**							
	$TlOH^+ + 1,10\text{-PD} \rightarrow$	9.5×10^8	5.6			p.r.	P.b.k. at 600 nm in N_2O-satd. soln. contg. Tl_2SO_4 and 1,10-phenanthroline-5,6-dione.	93A292
25.5.22	**2-Propanol**							
	$TlOH^+ + 2\text{-PrOH} \rightarrow Tl^+ + H_2O + (CH_3)_2\dot{C}OH$	$\sim 1 \times 10^6$				p.r.	D.k. at 360 nm in N_2O-satd. soln.; mixt. with $Tl(OH)_2$.	89C001

TABLE 25. Rate constants for thallium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
25.5	**Hydroxythallium(II) ion — Continued**							
25.5.23	**Safranine cation**							
	$TlOH^+ + ST^+ \rightarrow [ST]^{\cdot 2+} + Tl^+ + OH^-$	2.0×10^9	6			p.r.	P.b.k. at 460 nm in N_2O-satd. soln. contg. 0.002 mol L^{-1} Tl_2SO_4.	92A008
25.5.24	**Thymidylyl-(3'→5')-2'-deoxyguanosine**							
	$TlOH^+ + TpdG \rightarrow$	5×10^8	~7		0	p.r.	D.k. in N_2O-satd. soln. contg. 0.002 mol L^{-1} Tl^+ and 1×10^{-4} mol L^{-1} TpdG.	93A118
25.5.25	**Toluidine Blue cation**							
	$TlOH^+ + TB^+ \rightarrow Tl^+ + OH^- + [TB]^{\cdot 2+}$	1.7×10	6.8			p.r.	P.b.k. in soln. contg. 0.002 mol L^{-1} Tl^+.	90A238
25.6	**Dihydroxythallium(II)**							
25.6.1	**Dihydroxythallium(II)**							
	$Tl(OH)_2 + Tl(OH)_2 \rightarrow$	3.2×10^5	9.0			p.r.	D.k. in N_2O-satd. soln.	761192
25.6.2	**Metiazinic acid, conjugate base**							
	$Tl(OH)_2 + MZ^- \rightarrow [MZ]^{\cdot} + Tl^+ + 2\ OH^-$	2.5×10^9	10			p.r.	D.k. at 460 nm in N_2O-satd. soln. contg. 3×10^{-3} mol L^{-1} $TlSO_4$; 71% e-transfer.	81A162
25.6.3	**Tetranitromethane**							
	$Tl(OH)_2 + C(NO_2)_4 \rightarrow Tl(III) + {}^{\cdot}NO_2 + C(NO_2)_3^-$	4×10^8	8-9			p.r.	D.k. at 410 nm and p.b.k. at 330 nm in N_2O-satd. soln. contg. 2×10^{-3} mol L^{-1} Tl^+ and ~ 10^{-4} mol L^{-1} tetranitromethane.	761192
25.7	**Chlorothallium(II) ion**							
25.7.1	**Iron(II) ion**							
	$TlCl^+ + Fe^{2+} \rightarrow TlCl + Fe^{3+}$	8×10^6	0	1	21	p.r.	Calcd. from p.b.k. at 340 nm in soln. contg. 1 mol L^{-1} $HClO_4$, 1×10^{-4} mol L^{-1} Cl^{-1}, 2.6×10^{-4} mol L^{-1} Tl(III) and 9×10^{-4} mol L^{-1} Tl(I).	761154
		6×10^5	0	1	21	p.r.	Calcd. from p.b.k. at 340 nm in soln. contg. 1 mol L^{-1} $HClO_4$, 1×10^{-4}-1 mol L^{-1} Cl^{-1}, 2.6×10^{-4} mol L^{-1} Tl(III) and 9×10^{-4} mol L^{-1} Tl(I).	761154
25.7.2	**Chloroiron(III) ion**							
	$TlCl^+ + FeCl^{2+} \rightarrow TlCl_2^+ + Fe^{2+}$	3.9×10^8	0	1	21	p.r.	D.k. at 340 nm in soln. contg. 1 mol L^{-1} $HClO_4$, 1×10^{-4} mol L^{-1} Cl^{-1}, 2.6×10^{-4} mol L^{-1} Tl(III) and 9×10^{-4} mol L^{-1} Tl(I); same k for $TlCl_2 + FeCl^{2+}$, $TlCl_3^- + FeCl^{2+}$, etc. For reaction of same Tl(II) species with $FeOH^{2+}$, $k = 3 \times 10^8$ L mol^{-1} s^{-1}.	761154
25.8	**Dichlorothallium(II)**							
25.8.1	**Iron(II) ion**							
	$TlCl_2 + Fe^{2+} \rightarrow TlCl + FeCl^{2+}$	2×10^6	0	1	21	p.r.	Calcd. from p.b.k. at 340 nm in soln. contg. 1 mol L^{-1} $HClO_4$, 1×10^{-4}-1 mol L^{-1} Cl^{-1}, 2.6×10^{-4} mol L^{-1} Tl(III) and 9×10^{-4} mol L^{-1} Tl(I).	761154
		2×10^6	0	1	21	p.r.	Calcd. from p.b.k. at 340 nm in soln. contg. 1 mol L^{-1} $HClO_4$, 1×10^{-4}-1 mol L^{-1} Cl^{-1}, 2.6×10^{-4} mol L^{-1} Tl(III) and 9×10^{-4} mol L^{-1} Tl(I).	761154

TABLE 25. Rate constants for thallium transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
25.9	**Trichlorothallate(II) ion**							
25.9.1	**Iron(II) ion**							
	$TlCl_3^- + Fe^{2+} \rightarrow TlCl_3^{2-} + Fe^{3+}$	$<1 \times 10^6$	0	1	21	p.r.	Calcd. from p.b.k. at 340 nm in soln. contg. 1 mol L^{-1} $HClO_4$, 1×10^{-4}-1 mol L^{-1} Cl^{-1}, 2.6×10^{-4} mol L^{-1} Tl(III) and 9×10^{-4} mol L^{-1} Tl(I).	761154
		1.5×10^7	0	1	21	p.r.	Calcd. from p.b.k. at 340 nm in soln. contg. 1 mol L^{-1} $HClO_4$, 1×10^{-4}-1 mol L^{-1} Cl^{-1}, 2.6×10^{-4} mol L^{-1} Tl(III) and 9×10^{-4} mol L^{-1} Tl(I).	761154
25.10	**Tetrachlorothallate(II) ion**							
25.10.1	**Iron(II) ion**							
	$TlCl_4^{2-} + Fe^{2+} \rightarrow TlCl_3^{2-} + FeCl^{2+}$	1×10^8	0	1	21	p.r.	Calcd. from p.b.k. at 340 nm in soln. contg. 1 mol L^{-1} $HClO_4$, 1×10^{-4}-1 mol L^{-1} Cl^{-1}, 2.6×10^{-4} mol L^{-1} Tl(III) and 9×10^{-4} mol L^{-1} Tl(I).	761154
25.10.2	**Tris(2,2'-bipyridine)ruthenium(III) ion**							
	$TlCl_4^{2-} + Ru(bpy)_3^{3+} \rightarrow TlCl_4^- + Ru(bpy)_3^{2+}$	2.9×10^{10}	<0	3.0		f.p./oq	P.b.k. at 452 nm, in soln. contg. $Ru(bpy)_3^{2+}$, 3.0 mol L^{-1} HCl and $Tl(NO_3)_3$ (OQ).	82A111
25.11	**Thallium(II) ions**							
25.11.1	**Thallium(II) ions**							
	Tl(II) + Tl(II) →	2.7×10^9	0	1	23	p.r.	D.k. at 300 nm in deaerated soln. contg. 0.001 mol L^{-1} Tl(I), 5×10^{-4} mol L^{-1} Tl(III), 0.001 mol L^{-1} Cl^- and 1 mol L^{-1} $HClO_4$; $k = 2.8 \times 10^9$, 2.4×10^9 and 1.9×10^9 L mol^{-1} s^{-1} in the presence of 9.7×10^{-3}, 0.1 and 0.98 mol L^{-1} Cl^-, respectively. In each case $[H^+] = 1$ mol L^{-1} and $I = 1$.	741038

TABLE 26. Rate constants for vanadium transients

No. Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
26.1 Vanadyl(III) ion							
26.1.1 Hydrogen ion							
$VO^+ + H^+ \rightarrow VOH^{2+}$	1.5×10^{10}	3.8-4.6		25	p.r.	Condy. change in Ar-satd. soln. contg. VO^{2+} and 0.12 mol L^{-1} *tert*-BuOH or 0.01-0.05 mol L^{-1} EtOH. For $VOOH + H^+ \rightarrow V(OH)_2^+$, $k = 3.5 \times 10^{10}$ L mol^{-1} s^{-1}. Values obtained by computer fit.	86A152

TABLE 27. Rate constants for tungsten transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
27.1	**12-Tungstate ion(7-), dihydrogen**							
27.1.1	**Oxygen**							
	$H_2W_{12}O_{40}^{7-} + O_2 \rightarrow$	* ~90				p.r.	D.k. in air-satd. or O_2-satd. soln. contg. 0.01 mol L^{-1} $H_2W_{12}O_{40}^{6-}$; complex kinetics.	90A069
							* Calcd. from data reported by the authors.	

TABLE 28. Rate constants for zinc transients

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
28.1	**Zinc(I) ion**							
28.1.1	**First-order reaction**							
	$Zn(I) \rightarrow Zn(II) + e_{aq}^-$	4.3×10^6 s^{-1}	≥14			p.r.	D.k. at 380 nm in deaerated soln. contg. *tert*-BuOH, ZnO and 1 to 5 mol L^{-1} OH^-	81A195
28.2	**Zinc(I) ion**							
28.2.1	**Zinc(I) ion**							
	$Zn^+ + Zn^+ \rightarrow Zn^{2+} + Zn^0$	3.5×10^8			22	p.r.	D.k. at 310 nm in soln. contg. 0.01 mol L^{-1} $ZnSO_4$ in the presence of 107 atm H_2, or 0.01-0.2 mol L^{-1} MeOH, 2-PrOH or *tert*-BuOH. Value obtained from computer fit.	771011
28.2.2	**Hydrogen atom**							
	$Zn^+ + H^\cdot \rightarrow ZnH^+$	1.9×10^9			22	p.r.	D.k. at 310 nm in soln. contg. 0.01 mol L^{-1} $ZnSO_4$ in the presence of 107 atm H_2. Value obtained from computer fit.	771011
28.2.3	**Hydroxyl**							
	$Zn^+ + {}^\cdot OH \rightarrow$	$\sim 1.5 \times 10^{10}$			18	p.r.	D.k. in soln. contg. Zn^{2+}; value corrected for $\varepsilon(Zn^+)$ = 12,800 L mol^{-1} cm^{-1} [92A182].	66A001
		$\sim 2 \times 10^{10}$			25	p.r.	Estimated from d.k. at 300 nm in Ar-satd. soln. contg. $ZnSO_4$ in absence of $^\cdot OH$ scavengers taking into account competing reactions such as $Zn^+ + Zn^+$, $Zn^+ + H_2O_2$, $^\cdot OH + {}^\cdot OH$ etc.; value corrected for $\varepsilon(Zn^+)$ = 12,800 L mol^{-1} cm^{-1} [92A182].	751027
28.2.4	**Hydroxymethyl**							
	$Zn^+ + {}^\cdot CH_2OH + H^+ \rightarrow Zn^{2+} +$ MeOH	2.5×10^9			22	p.r.	D.k. at 310 nm in soln. contg. 0.2 mol L^{-1} MeOH and 0.005 mol L^{-1} $ZnSO_4$ in absence and presence of 0.02 atm N_2O. Value obtained from computer fit.	771011
28.2.5	**1-Hydroxy-1-methylethyl**							
	$Zn^+ + (CH_3)_2\dot{C}OH + H^+ \rightarrow Zn^{2+} +$ 2-PrOH	1.3×10^9			22	p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} 2-PrOH and 0.01 mol L^{-1} $ZnSO_4$ in presence and absence of $HClO_4$. Value obtained from computer fit.	771011
28.2.6	**Carbon dioxide radical anion**							
	$Zn^+ + CO_2^{\cdot -} + H^+ \rightarrow Zn^{2+} + HCO_2^-$	$\sim 4 \times 10^9$			22	p.r.	D.k. at 310 nm in soln. contg. 0.01 mol L^{-1} formate and 0.002 mol L^{-1} $ZnSO_4$. Value obtained from computer fit.	771011
28.2.7	**2-Hydroxy-2,2-dimethylethyl**							
	$Zn^+ + {}^\cdot CH_2C(CH_3)_2OH + H^+ \rightarrow Zn^{2+}$ + *tert*-BuOH	1.0×10^9			22	p.r.	D.k. at 310 nm in soln. contg. *tert*-BuOH and $ZnSO_4$. Value obtained from computer fit.	771011
28.2.8	**Bromate ion**							
	$Zn^+ + BrO_3^- \rightarrow$	2.1×10^9		0.08		p.r.	D.k. at 313 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and varied $[BrO_3^-]$.	68G855
28.2.9	**Chlorate ion**							
	$Zn^+ + ClO_3^- \rightarrow$	$<3 \times 10^6$		0.08		p.r.	D.k. at 313 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and varied $[ClO_3^-]$.	68G855
28.2.10	**Cobalt(II) ion**							
	$Zn^+ + Co^{2+} \rightarrow$	$<3 \times 10^6$		0.08		p.r.	D.k. at 313 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and varied $[Co^{2+}]$.	68G855

TABLE 28. Rate constants for zinc transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
28.2	**Zinc(I) ion** — Continued							
28.2.11	**Tris(2,2'-bipyridine)cobalt(III) ion**							
	$Zn^+ + Co(bpy)_3^{3+} \rightarrow Zn^{2+} + Co(bpy)_3^{2+}$	2.6×10^9				p.r.	D.k. in soln. contg. 0.05 mol L^{-1} Zn^{2+}, 0.1 mol L^{-1} *tert*-BuOH and 1×10^{-4} mol L^{-1} $Co(bpy)_3^{3+}$.	720381
28.2.12	**Tris(ethylenediamine)cobalt(III) ion**							
	$Zn^+ + Co(en)_3^{3+} \rightarrow Zn^{2+} + Co(en)_3^{2+}$	2.5×10^8	5-6	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times 10^{-4}$ mol L^{-1} complex.	690428
28.2.13	***cis*-Dichlorobis(ethylenediamine)cobalt(III) ion**							
	$Zn^+ + cis\text{-}Co(en)_2Cl_2^+ \rightarrow Zn^{2+} + Co(en)_2Cl_2$	1.9×10^9	5-6	0.08		p.r.	D.k. at 350 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times 10^{-4}$ mol L^{-1} complex.	690428
28.2.14	***trans*-Dichlorobis(ethylenediamine)cobalt(III) ion**							
	$Zn^+ + trans\text{-}Co(en)_2Cl_2^+ \rightarrow Zn^{2+} + Co(en)_2Cl_2$	2.3×10^9	5-6	0.08		p.r.	D.k. at 350 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times 10^{-4}$ mol L^{-1} complex.	690428
28.2.15	**Carbonatobis(ethylenediamine)cobalt(III) ion**							
	$Zn^+ + Co(en)_2CO_3^+ \rightarrow Zn^{2+} + Co(en)_2CO_3$	4.7×10^8	5-6	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times 10^{-4}$ mol L^{-1} complex.	690428
28.2.16	***cis*-Bis(ethylenediamine)difluorocobalt(III) ion**							
	$Zn^+ + cis\text{-}Co(en)_2F_2^+ \rightarrow Zn^{2+} + cis\text{-}Co(en)_2F_2$	5.4×10^8	5-6	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times 10^{-4}$ mol L^{-1} complex.	690428
28.2.17	**Aquabis(ethylenediamine)fluorocobalt(III) ion**							
	$Zn^+ + Co(en)_2(H_2O)F^{2+} \rightarrow Zn^{2+} + Co(en)_2(H_2O)F^+$	4.7×10^8	5-6	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times 10^{-4}$ mol L^{-1} complex.	690428
28.2.18	***cis*-Amminechlorobis(ethylenediamine)cobalt(III) ion**							
	$Zn^+ + cis\text{-}Co(en)_2(NH_3)Cl^{2+} \rightarrow Zn^{2+} + cis\text{-}Co(en)_2(NH_3)Cl^+$	1.5×10^9	5-6	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times 10^{-4}$ mol L^{-1} complex.	690428
28.2.19	***cis*-Nitroamminebis(ethylenediamine)cobalt(III) ion**							
	$Zn^+ + cis\text{-}Co(en)_2(NH_3)NO_2^{2+} \rightarrow Zn^{2+} + cis\text{-}Co(en)_2(NH_3)NO_2^+$	2.7×10^9	5-6	0.08		p.r.	D.k. at 350 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times 10^{-4}$ mol L^{-1} complex.	690428
28.2.20	**Hexaamminecobalt(III) ion**							
	$Zn^+ + Co(NH_3)_6^{3+} \rightarrow Zn^{2+} + Co(NH_3)_6^{2+}$	8.4×10^8	5-6	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times 10^{-4}$ mol L^{-1} complex.	690428
28.2.21	**Pentaammine(bromo)cobalt(III) ion**							
	$Zn^+ + Co(NH_3)_5Br^{2+} \rightarrow Zn^{2+} + Co(NH_3)_5Br^+$	2.6×10^9	4.0	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$. 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times 10^{-4}$ mol L^{-1} complex.	690428
28.2.22	**Pentaammine(chloro)cobalt(III) ion**							
	$Zn^+ + Co(NH_3)_5Cl^{2+} \rightarrow Zn^{2+} + Co(NH_3)_5Cl^+$	2.2×10^9	5-6	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times 10^{-4}$ mol L^{-1} complex.	690428
28.2.23	**Pentaammine(cyano)cobalt(III) ion**							
	$Zn^+ + Co(NH_3)_5(CN)^{2+} \rightarrow Zn^{2+} + Co(NH_3)_5(CN)^+$	1.3×10^9	5-6	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times 10^{-4}$ mol L^{-1} complex.	690428

TABLE 28. Rate constants for zinc transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
28.2	**Zinc(I) ion** — Continued							
28.2.24	**Pentaammine(fluoro)cobalt(III) ion**							
	$Zn^+ + Co(NH_3)_5F^{2+} \rightarrow Zn^{2+} + Co(NH_3)_5F^+$	8.2×10^8	5-6	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times 10^{-4}$ mol L^{-1} complex.	690428
28.2.25	**Pentaammine(fumarato)cobalt(III) ion**							
	$Zn^+ + Co(NH_3)_5fumarate^+ \rightarrow Zn^{2+} + Co(NH_3)_5fumarate$	1.2×10^9	5-6	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times 10^{-4}$ mol L^{-1} complex.	690428
28.2.26	**Pentaammine(aqua)cobalt(III) ion**							
	$Zn^+ + Co(NH_3)_5(H_2O)^{3+} \rightarrow Zn^{2+} + Co(NH_3)_5(H_2O)^{2+}$	1.6×10^9	4.0	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times 10^{-4}$ mol L^{-1} complex.	690428
28.2.27	**Pentaammine(hydroxy)cobalt(III) ion**							
	$Zn^+ + Co(NH_3)_5OH^{2+} \rightarrow Zn^{2+} + Co(NH_3)_5OH^+$	1.1×10^9	6.6	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times 10^{-4}$ mol L^{-1} complex.	690428
28.2.28	**Pentaammine(azido)cobalt(III) ion**							
	$Zn^+ + Co(NH_3)_5(N_3)^{2+} \rightarrow Zn^{2+} + Co(NH_3)_5(N_3)^+$	1.5×10^9	5-6	0.08		p.r.	D.k. at 350 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times 10^{-4}$ mol L^{-1} complex.	690428
28.2.29	**Pentaammine(thiocyanato-*N*)cobalt(III) ion**							
	$Zn^+ + Co(NH_3)_5(NCS)^{2+} \rightarrow Zn^{2+} + Co(NH_3)_5(NCS)^+$	1.7×10^9	5-6	0.08		p.r.	D.k. at 350 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times 10^{-4}$ mol L^{-1} complex.	690428
28.2.30	**(Acetato)pentaamminecobalt(III) ion**							
	$Zn^+ + Co(NH_3)_5(OAc)^{2+} \rightarrow Zn^{2+} + Co(NH_3)_5(OAc)^+$	5.0×10^8	5-6	0.08		p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and (0.5-3.0) $\times 10^{-4}$ mol L^{-1} complex.	690428
28.2.31	**Hexaamminebis(μ-hydroxy)-μ-(trifluoroacetato)dicobalt(III) ion**							
	$Zn^+ + CF_3CO_2[Co(NH_3)_3]_2(OH)_2^{3+} \rightarrow$	1.2×10^9			22	p.r.	D.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} $ZnSO_4$ and 0.1 mol L^{-1} *tert*-BuOH.	83A140
28.2.32	**Hexaammine-μ-(difluoroacetato)bis(μ-hydroxy)dicobalt(III) ion**							
	$Zn^+ + CHF_2CO_2[Co(NH_3)_3]_2(OH)_2^{3+} \rightarrow$	1.0×10^9			22	p.r.	D.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} $ZnSO_4$ and 0.1 mol L^{-1} *tert*-BuOH.	83A140
28.2.33	**Hexaammine-μ-(fluoroacetato)bis(μ-hydroxy)dicobalt(III) ion**							
	$Zn^+ + CH_2FCO_2[Co(NH_3)_3]_2(OH)_2^{3+} \rightarrow$	7.6×10^8			22	p.r.	D.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} $ZnSO_4$ and 0.1 mol L^{-1} *tert*-BuOH.	83A140
28.2.34	**μ-Acetatohexaamminebis(μ-hydroxy)dicobalt(III) ion**							
	$Zn^+ + CH_3CO_2[Co(NH_3)_3]_2(OH)_2^{3+} \rightarrow$	5.5×10^8			22	p.r.	D.k. in Ar-satd. soln. contg. 0.1 mol L^{-1} $ZnSO_4$ and 0.1 mol L^{-1} *tert*-BuOH.	83A140
28.2.35	**Tris(2,2'-bipyridine)chromium(III) ion**							
	$Zn^+ + Cr(bpy)_3^{3+} \rightarrow Zn^{2+} + Cr(bpy)_3^{2+}$	1.9×10^9	~7		23	p.r.	D.k. at 310 nm in soln. contg. 0.1 mol L^{-1} *tert*-BuOH, 0.01 mol L^{-1} $ZnSO_4$ and varied $[Cr(bpy)_3^{3+}]$.	87A309
28.2.36	**Tris(1,10-phenanthroline)chromium(III) ion**							
	$Zn^+ + Cr(phen)_3^{3+} \rightarrow Zn^{2+} + Cr(phen)_3^{2+}$	1.7×10^9	~7		23	p.r.	D.k. at 310 nm in soln. contg. 0.1 mol L^{-1} *tert*-BuOH, 0.01 mol L^{-1} $ZnSO_4$ and varied $[Cr(phen)_3^{3+}]$.	87A309
28.2.37	**Bis(2,2'-bipyridine)oxalatochromium(III)ion**							
	$Zn^+ + Cr(bpy)_2(C_2O_4)^+ \rightarrow Zn^{2+} + Cr(bpy)_2(C_2O_4)$	2.2×10^9	~7		23	p.r.	D.k. at 310 nm in soln. contg. 0.1 mol L^{-1} *tert*-BuOH, 0.01 mol L^{-1} $ZnSO_4$ and varied $[Cr(bpy)_2(C_2O_4)^+]$.	87A309

TABLE 28. Rate constants for zinc transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
28.2	**Zinc(I) ion** — Continued							
28.2.38	**Bis(1,10-phenanthroline)(oxalato)chromium(III) ion**							
	$Zn^+ + Cr(phen)_2(C_2O_4)^+ \rightarrow Zn^{2+} + Cr(phen)_2(C_2O_4)$	2.1×10^9	~7		23	p.r.	D.k. at 310 nm in soln. contg. 0.1 mol L^{-1} *tert*-BuOH, 0.01 mol L^{-1} $ZnSO_4$ and varied $[Cr(phen)_2(C_2O_4)^+]$.	87A309
28.2.39	**2,2'-Bipyridinebis(oxalato)chromate(III) ion**							
	$Zn^+ + Cr(bpy)(C_2O_4)_2^- \rightarrow Zn^{2+} + Cr(bpy)(C_2O_4)_2^{2-}$	2.2×10^9	~7		23	p.r.	D.k. at 310 nm in soln. contg. 0.1 mol L^{-1} *tert*-BuOH, 0.01 mol L^{-1} $ZnSO_4$ and varied $[Cr(bpy)(C_2O_4)_2^-]$.	87A309
28.2.40	**Bis(oxalato)phenanthrolinechromate(III) ion**							
	$Zn^+ + Cr(phen)(C_2O_4)_2^- \rightarrow Zn^{2+} + Cr(phen)(C_2O_4)_2^{2-}$	2.2×10^9	~7		23	p.r.	D.k. at 310 nm in soln. contg. 0.1 mol L^{-1} *tert*-BuOH, 0.01 mol L^{-1} $ZnSO_4$ and varied $[Cr(phen)(C_2O_4)_2^-]$.	87A309
28.2.41	**Dichromate(VI) ion**							
	$Zn^+ + Cr_2O_7^{2-} \rightarrow$	1.6×10^{10}		0.02	25	p.r.	D.k. in soln. contg. 0.01 mol L^{-1} $ZnSO_4$.	761072
28.2.42	**Copper(II) ion**							
	$Zn^+ + Cu^{2+} \rightarrow$	2.5×10^8		0.08		p.r.	D.k. at 313 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and varied $[Cu^{2+}]$.	68G855
28.2.43	**Hydrogen peroxide**							
	$Zn^+ + H_2O_2 \rightarrow Zn^{2+} + OH^- + {}^{\bullet}OH$	2.5×10^9			22	p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} 2-PrOH, 6.8 or 18.3×10^{-5} mol L^{-1} H_2O_2 and 0.01 mol L^{-1} $ZnSO_4$.	771011
		2.3×10^9			25	p.r.	D.k. in soln. contg. $ZnSO_4$; $E_a = 10.5$ kJ mol^{-1}.	761072
		1.8×10^9				p.r.	D.k. at 313 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$ and 0.001 mol L^{-1} MeOH.	68G855
28.2.44	**Hydrogen ion**							
	$Zn^+ + H^+ \rightarrow$	$\leq 10^6$		0.08		p.r.	D.k. at 313 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and varied $[H^+]$.	68G855
28.2.45	**Iodate ion**							
	$Zn^+ + IO_3^- \rightarrow$	3.6×10^9		0.08		p.r.	D.k. at 313 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and varied $[IO_3^-]$.	68G855
28.2.46	**Hydroxymanganese(III) ion**							
	$Zn^+ + MnOH^{2+} \rightarrow Zn^{2+} + Mn^{2+} + OH^-$	2.4×10^9	~6		23	p.r.	D.k. at 310 nm in soln. contg. 0.02 mol L^{-1} $MnSO_4$ and 0.03 mol L^{-1} $ZnSO_4$. Value obtained from computer fit.	78A041
28.2.47	**Bis(μ-oxo)(ethylenediaminetetraacetato)bis[oxomolybdate(V)] ion**							
	$Zn^+ + [Mo_2O_4(EDTA)]^{2-} \rightarrow Zn^{2+} + [Mo_2O_4(EDTA)]^{3-}$	5.0×10^9	6		25	p.r.	D.k. at 320 nm in soln. contg. 1×10^{-4} mol L^{-1} complex, 0.1 mol L^{-1} $ZnSO_4$ and 0.1 mol L^{-1} *tert*-BuOH.	85A363
28.2.48	**Bis(μ-oxo)bis[(cysteinato)oxomolybdate(V)] ion**							
	$Zn^+ + [Mo_2O_4(Cys)_2]^{2-} \rightarrow Zn^{2+} + [Mo_2O_4(Cys)_2]^{3-}$	4.5×10^9	6		25	p.r.	D.k. at 320 nm in soln. contg. 1×10^{-4} mol L^{-1} complex, 0.1 mol L^{-1} $ZnSO_4$ and 0.1 mol L^{-1} *tert*-BuOH.	85A363
28.2.49	**Nitrite ion**							
	$Zn^+ + NO_2^- \rightarrow$	2.2×10^9		0.08		p.r.	D.k. at 313 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and varied $[NO_2^-]$.	68G855

TABLE 28. Rate constants for zinc transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
28.2	**Zinc(I) ion** — Continued							
28.2.50	**Nitrate ion**							
	$Zn^+ + NO_3^- \rightarrow$	2.1×10^9		0.08		p.r.	D.k. at 313 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and varied $[NO_3^-]$.	68G855
28.2.51	**Nitrous oxide**							
	$Zn^+ + N_2O \rightarrow ZnO^+ + N_2$	1.6×10^7			22	p.r.	D.k. at 310 nm in soln. satd. with 0.3 or 1.0 atm N_2O, contg. 0.1 mol L^{-1} *tert*-BuOH and 0.1 mol L^{-1} $ZnSO_4$.	771011
						p.r.	Studied at 1-30 °C, $E_a = 35.5$ kJ mol^{-1}.	761072
28.2.52	**Nickel(II) ion**							
	$Zn^+ + Ni^{2+} \rightarrow$	$<5 \times 10^6$		0.08		p.r.	D.k. at 313 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and varied $[Ni^{2+}]$.	68G855
28.2.53	**Oxygen**							
	$Zn^+ + O_2 \rightarrow Zn^{2+} + O_2^{\cdot -}$	2.4×10^9				p.r.	D.k. at 313 nm in soln. contg. 0.02 mol L^{-1} $ZnSO_4$, 0.001 mol L^{-1} MeOH and varied $[O_2]$.	68G855
		3.3×10^9			18	p.r.	D.k. in soln. contg. Zn^{2+}.	66A001
28.2.54	**Lead(II) ions**							
	$Zn^+ + Pb^{2+} \rightarrow Zn^{2+} + Pb^+$	4.0×10^8			18	p.r.	D.k. in soln. contg. Zn^{2+}.	66A001
28.2.55	**Tris(2,2'-bipyridine)ruthenium(II) ion**							
	$Zn^+ + Ru(bpy)_3^{2+} \rightarrow Zn^{2+} + Ru(bpy)_3^+$	1.6×10^9	5.2		24	p.r.	P.b.k. at 510 nm in deaerated soln. contg. 4×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$, 0.05 mol L^{-1} $ZnSO_4$ and 0.017 mol L^{-1} *tert*-BuOH.	78A002
		1.5×10^9	6-7		24	f.p./pi	P.b.k. at 510 nm in soln. contg. $(9.0\text{-}27) \times 10^{-6}$ mol L^{-1} $Ru(bpy)_3^{2+}$ and $(1.3\text{-}10) \times 10^{-3}$ mol L^{-1} $ZnSO_4$.	771093
		2.5×10^9				p.r.	P.b.k. in soln. contg. 0.05 mol L^{-1} Zn^{2+}, 1.0 mol L^{-1} *tert*-BuOH and 5.0×10^{-5} mol L^{-1} $Ru(bpy)_3^{2+}$.	720381
28.2.56	**Hexaammineruthenium(III) ion**							
	$Zn^+ + Ru(NH_3)_6^{3+} \rightarrow Zn^{2+} + Ru(NH_3)_6^{2+}$	2.2×10^9		0.08		p.r.	D.k. in soln. contg. 0.02 mol L^{-1} $ZnSO_4$ and $(0.5\text{-}6.0) \times 10^{-4}$ mol L^{-1} $Ru(NH_3)_6^{3+}$.	701229
28.2.57	**Peroxodisulfate ion**							
	$Zn^+ + S_2O_8^{2-} \rightarrow Zn^{2+} + SO_4^{\cdot -} + SO_4^{2-}$	1.3×10^9		0.02	25	p.r.	D.k. in soln. contg. 0.01 mol L^{-1} $ZnSO_4$ and $(0.5\text{-}10) \times 10^{-4}$ mol L^{-1} $S_2O_8^{2-}$.	761072
28.2.58	**Acetone**							
	$Zn^+ + CH_3COCH_3 \rightarrow$	$<10^8$			22	p.r.	Decay at 310 nm was unaffected by presence of 3×10^{-4} mol L^{-1} acetone in soln. contg. 0.1 mol L^{-1} $ZnSO_4$ and 0.025 mol L^{-1} MeOH.	771011
28.2.59	**Allyl alcohol**							
	$Zn^+ + H_2C{=}CHCH_2OH \rightarrow [Zn(CH_2CHCH_2OH)]^+$	$\sim 10^8$			25	p.r.	D.k. in soln. contg. 0.01 mol L^{-1} $ZnSO_4$, 1.24 mol L^{-1} MeOH and 1.2×10^{-3} mol L^{-1} allyl alcohol.	761072
28.2.60	**Benzophenone**							
	$Zn^+ + (C_6H_5)_2CO \rightarrow Zn^{2+} + (C_6H_5)_2CO^-$	2.5×10^9	7.0			p.r.	P.b.k. in soln. contg. 5×10^{-3} mol L^{-1} $ZnSO_4$, ~1.0 mol L^{-1} *tert*-BuOH and 5×10^{-5} mol L^{-1} benzophenone.	751032
28.2.61	**1,4-Benzoquinone**							
	$Zn^+ + Q \rightarrow Zn^{2+} + Q^{\cdot -}$	3.0×10^9	5.7		25	p.r.	P.b.k. at 430 nm in soln. contg. Zn^{2+} and 1 mol L^{-1} *tert*-BuOH.	761134

TABLE 28. Rate constants for zinc transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
28.2	**Zinc(I) ion** — Continued							
28.2.61	**1,4-Benzoquinone** — Continued							
		4.8×10^9	7.0			p.r.	P.b.k. in soln. contg. 5×10^{-3} mol L^{-1} $ZnSO_4$, ~1.0 mol L^{-1} *tert*-BuOH and 5×10^{-5} mol L^{-1} 1,4-benzoquinone.	751032
28.2.62	**2-Methyl-1,4-naphthoquinone**							
	$Zn^+ + 2\text{-}CH_3NQ \rightarrow Zn^{2+} + [2\text{-}CH_3NQ]^{\cdot -}$	3.8×10^9	7.1			p.r.	P.b.k. in soln. contg. 0.005 mol L^{-1} Zn^{2+}, ~1.0 mol L^{-1} *tert*-BuOH and 5×10^{-5} mol L^{-1} 2-CH_3-NQ.	751032 731047
28.3	**1,4,8,11-Tetrazacyclotetradecanezinc(I) ion**							
28.3.1	**Nitrous oxide**							
	$Zn(cyclam)^+ + N_2O \rightarrow$	6.4×10^7	5-7		23	p.r.	D.k. in 0-30% N_2O-satd. soln. contg. 1.7 mol L^{-1} *tert*-BuOH and 0.09 mol L^{-1} $Zn(cyclam)^{2+}$.	80A380
28.4	**Tetrakis-4-(*N,N,N*-trimethylammonio)phenylporphinezinc(II) radical anion**							
28.4.1	**Dihydroxytetrakis(4-sulfonatophenyl)porphinatocobaltate(II) ion**							
	$[ZnTAPP]^{\cdot 3+} + CoTPPS(OH)_2^{6-} \rightarrow$	3.8×10^8	13			p.r.	D.k. at 700-740 nm in N_2- or N_2O-satd. soln. contg. 0.1 mol L^{-1} 2-PrOH and varied [Co(III) complex].	81A317
28.4.2	**Dihydroxytetrakis[4-(*N,N,N*-trimethylammonio)phenyl]porphinecobalt(II) ion**							
	$[ZnTAPP]^{\cdot 3+} + CoTAPP(OH)_2^{2+} \rightarrow$	5.4×10^8	13			p.r.	D.k. at 700-740 nm in N_2- or N_2O-satd. soln. contg. 0.1 mol L^{-1} 2-PrOH and varied [Co(III) complex].	81A317
28.4.3	**Dihydroxytetrakis(1-methylpyridinium-4-yl)porphinecobalt(II) ion**							
	$[ZnTAPP]^{\cdot 3+} + CoTMpyP(OH)_2^{2+} \rightarrow$	4.9×10^8	13			p.r.	D.k. at 700-740 nm in N_2- or N_2O-satd. soln. contg. 0.1 mol L^{-1} 2-PrOH and varied [Co(III) complex].	81A317
28.5	**5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)porphinezinc(II) radical anion**							
28.5.1	***Dihydroxytetrakis(4-sulfonatophenyl)porphinatocobaltate(II) ion***							
	$[ZnTMpyP]^{\cdot 3+} + CoTPPS(OH)_2^{6-} \rightarrow$	1.1×10^9	13			p.r.	D.k. at 700-740 nm in N_2- or N_2O-satd. soln. contg. 0.1 mol L^{-1} 2-PrOH and varied [Co(III) complex].	81A317
28.5.2	**Dihydroxytetrakis[4-(*N,N,N*-trimethylammonio)phenyl]porphinecobalt(II) ion**							
	$[ZnTMpyP]^{\cdot 3+} + CoTAPP(OH)_2^{2+} \rightarrow$	1.6×10^8	13			p.r.	D.k. at 700-740 nm in N_2- or N_2O-satd. soln. contg. 0.1 mol L^{-1} 2-PrOH and varied [Co(III) complex].	81A317
28.5.3	**Dihydroxytetrakis(1-methylpyridinium-4-yl)porphinecobalt(II) ion**							
	$[ZnTMpyP]^{\cdot 3+} + CoTMpyP(OH)_2^{2+} \rightarrow$	4.0×10^8	13			p.r.	D.k. at 700-740 nm in N_2- or N_2O-satd. soln. contg. 0.1 mol L^{-1} 2-PrOH and varied [Co(III) complex].	81A317
28.5.4	**Sulfur dioxide**							
	$[ZnTMpyP]^{\cdot 3+} + SO_2 \rightarrow ZnTMpyP^{4+} + SO_2^{\cdot -}$	8×10^8	1			p.r.	D.k. at 700 nm in N_2-satd. soln. contg. $NaHSO_3$, $ZnTMpyP^{4+}$ and 0.1 mol L^{-1} HCl or $HClO_4$.	87A083
28.6	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatozincate(II) radical anion**							
28.6.1	**Dihydroxytetrakis(4-sulfonatophenyl)porphinatocobaltate(II) ion**							
	$[ZnTPPS]^{\cdot 5-} + CoTPPS(OH)_2^{6-} \rightarrow$	2.0×10^7	13			p.r.	D.k. at 700-740 nm in N_2- or N_2O-satd. soln. contg. 0.1 mol L^{-1} 2-PrOH and varied [Co(III) complex].	81A317

TABLE 28. Rate constants for zinc transients — Continued

Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
28.6 5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatozincate(II) radical anion — Continued							
28.6.2 Dihydroxytetrakis[4-(*N,N,N*-trimethylammonio)phenyl]porphinecobalt(II) ion							
$[ZnTPPS]^{\bullet 5-}$ + $CoTAPP(OH)_2^{2+}$ →	5.5×10^8	13			p.r.	D.k. at 700-740 nm in N_2- or N_2O-satd. soln. contg. 0.1 mol L^{-1} 2-PrOH and varied [Co(III) complex].	81A317
28.6.3 Dihydroxytetrakis(1-methylpyridinium-4-yl)porphinecobalt(II) ion							
$[ZnTPPS]^{\bullet 5-}$ + $CoTMpyP(OH)_2^{2+}$ →	1.4×10^9	13			p.r.	D.k. at 700-740 nm in N_2- or N_2O-satd. soln. contg. 0.1 mol L^{-1} 2-PrOH and varied [Co(III) complex].	81A317
28.6.4 Ferricyanide ion							
$[ZnTPPS]^{\bullet 5-}$ + $Fe(CN)_6^{3-}$ → $ZnTPPS^{4-}$ + $Fe(CN)_6^{4-}$	1.0×10^9	7	0.5		f.p./pi	D.k. at 650 nm in soln. contg. 2×10^{-3} mol L^{-1} $Fe(CN)_6^{4-}$, 5.0×10^{-5} mol L^{-1} $ZnTPPS^{4-}$ and 0.5 mol L^{-1} NaCl.	87A200 86A265
28.7 5,10,15,20-Tetrakis[1-(3-sulfonatopropyl)pyridinium-4-yl]porphinatozinc(II) radical anion							
28.7.1 5,10,15,20-Tetrakis[1-(3-sulfonatopropyl)pyridinium-4-yl]porphinatozinc(II) radical anion							
$[ZnTZP]^{\bullet -}$ + $[ZnTZP]^{\bullet -}$ →	4.1×10^6	6.8			p.r.	D.k. at 620 nm in soln. contg. ZnTZP and 0.1 mol L^{-1} 2-PrOH; disproportionation reaction.	83C026
28.8 Tetrakis-*N*-methyl-2,3-pyridinoporphyrazinezinc(II) radical anion							
28.8.1 Tetrakis-*N*-methyl-2,3-pyridinoporphyrazinezinc(II) radical anion							
$[ZnTMPz]^{\bullet 3+}$ + $[ZnTMPz]^{\bullet 3+}$ → $ZnTMPz^{4+}$ + $ZnTMPz^{2+}$	1.7×10^9	7			p.r.	D.k. at 550 nm in N_2O-satd. phosphate buffered soln. contg. 10% 2-PrOH (v:v).	86B153
28.9 Trisulfophthalocyaninezincate(II) radical anion							
28.9.1 Oxygen							
$[ZnPCS]^{\bullet 4-}$ + O_2 → $ZnPCS^{3-}$ + $O_2^{\bullet -}$	4.6×10^8	7			f.p./rq	D.k. in aerated soln. contg. $[ZnPCS]^{3-}$ and 4-aminophenol (RQ).	90A022
28.10 Nitrilotriacetatozinc(II), H-abstraction product							
28.10.1 First-order reaction							
* A →	4.0×10^3 s^{-1}	4.0		22	p.r.	D.k. in N_2O-satd. soln. contg. $Zn(NTA)^-$. * Species A suggested to have site of H-abstraction different from Species B.	78A436
	7×10^2 s^{-1}	7.0					
	8×10^2 s^{-1}	9.0					
28.10.2 Nitrilotriacetatozinc(II), H-abstraction product							
* B + B →	1.9×10^8	4.0		22	p.r.	D.k. in N_2O-satd. soln. contg. $Zn(NTA)^-$. * Species B suggested to have site of H-abstraction different from Species A.	78A436
	1.3×10^7	5.0					
	0.8×10^7	7.0					
28.10.3 Oxygen							
$[ZnNTA\text{-}H]^{\bullet -}$ + O_2 →	1.5×10^8	4.0		22	p.r.	D.k. in N_2O/O_2 satd. soln. contg. $Zn(NTA)^-$.	78A436
	3.4×10^8	9.0					
28.11 Ethylenediaminetetraacetatozinc(II), H-abstraction product							
28.11.1 First-order reaction							
* C →	5.0×10^2 s^{-1}	4,5,7,9		22	p.r.	D.k. in N_2O-satd. soln. contg. $Zn(EDTA)^{2-}$. * Species C suggested to have site of H-abstraction different from Species D.	78A436
28.11.2 Ethylenediaminetetraacetatozinc(II), H-abstraction product							
* D + D →	0.5×10^7	4.0		22	p.r.	D.k. in N_2O-satd. soln. contg. $Zn(EDTA)^{2-}$. * Species D suggested to have site of H-abstraction different from Species C.	78A436
	1.2×10^6	5.0					
	1.6×10^6	7.0					
	1.0×10^6	9.0					

TABLE 28. Rate constants for zinc transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
28.11	**Ethylenediaminetetraacetatozinc(II), H-abstraction product** — Continued							
28.11.3	**Oxygen**							
	$[ZnEDTA\text{-}H]^{\bullet 2-} + O_2 \rightarrow$	2.3×10^8 4.0×10^8	4.0 9.0		22	p.r.	D.k. in N_2O/O_2 satd. soln. contg. $Zn(EDTA)^{2-}$.	78A436
28.12	**5,10,15,20-Tetrakis(1-methylpyridinium-3-yl)porphinatozinc(II), H-adduct**							
28.12.1	**First-order reaction**							
	$[Zn(3\text{-}TMpyP\text{-}H)]^{\bullet 4+} \rightarrow$	5.7×10^3 s^{-1}	3-10			p.r.	D.k. at 470 nm in N_2O-satd. soln. contg. $Zn(3\text{-}TMpyP)^{4+}$ and 0.01 mol L^{-1} KBr.	86A243
28.13	**5,10,15,20-Tetrakis(1-methylpyridinium-3-yl)porphinatozinc(II) radical cation**							
28.13.1	**5,10,15,20-Tetrakis(1-methylpyridinium-3-yl)porphinatozinc(II) radical cation**							
	$[Zn(3\text{-}TMpyP)]^{\bullet 5+}$ + $[Zn(3\text{-}TMpyP)]^{\bullet 5+} \rightarrow$	$\sim 1.5 \times 10^7$ $\sim 1.3 \times 10^8$	4-9 11			p.r.	D.k. at 700 nm in N_2O-satd. soln. contg. $Zn(3\text{-}TMpyP)^{4+}$ and 0.01 mol L^{-1} KBr; values taken from graph of k vs pH.	86A243
		3.7×10^7	2	0.01		f.p./oq	D.k. at 700 nm in soln. contg. $Zn(3\text{-}TMpyP)^{4+}$ and $S_2O_8^{2-}$ (OQ).	86A243
28.13.2	**Iron(II) ion**							
	$[Zn(3\text{-}TMpyP)]^{\bullet 5+} + Fe^{2+} \rightarrow Zn(3\text{-}TMpyP)^{4+} + Fe^{3+}$	1.2×10^8	2	0.01		f.p./oq	D.k. at 700 nm in soln. contg. $Zn(3\text{-}TMpyP)^{4+}$ and Fe^{3+} (OQ) and Fe^{2+}.	86A243
28.13.3	**Ferrocyanide ion**							
	$[Zn(3\text{-}TMpyP)]^{\bullet 5+} + Fe(CN)_6^{4-} \rightarrow Zn(3\text{-}TMpyP)^{4+} + Fe(CN)_6^{3-}$	3.2×10^9	11	0.01				86A243
28.14	**5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)porphinatozinc(II) radical cation**							
28.14.1	**5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)porphinatozinc(II) radical cation**							
	$[ZnTMpyP]^{\bullet 5+} + [ZnTMpyP]^{\bullet 5+} \rightarrow$	3.2×10^9	7.0	4.4-32.4 × 10^{-3}		p.r.	D.k. at 700 nm in N_2O-satd. soln. contg. $ZnTMpyP^{4+}$, 2.0×10^{-3} mol L^{-1} N_3^- and 2×10^{-4} mol L^{-1} phosphate buffer; $k = 4.2 \times 10^9$ and 1.1×10^{10} L mol^{-1} s^{-1} in the presence of 5×10^{-3} and 3.0×10^{-2} mol L^{-1} N_3^-, respectively. Decay involves complexes of the radical cation with azide.	88A277
		3.2×10^9	7.0			p.r.	D.k. at 700 nm in N_2O-satd. soln. contg. $ZnTMpyP^{4+}$ and N_3^-. Decay involves complexes of the radical cation with azide.	85A038
		1.1×10^9	3.2	0.1		p.r.	D.k. at 700 nm in N_2O-satd. soln. contg. $ZnTMpyP^{4+}$ and 0.1 mol L^{-1} NaCl. Decay involves complexes of the radical cation with chloride.	85A038
		9.7×10^7 5.0×10^8 7.0×10^8 9.0×10^8	3.2-7 9.0 11.0 12.0			p.r.	D.k. at 700 nm in N_2O-satd. soln. contg. $ZnTMpyP^{4+}$ and 0.01 mol L^{-1} KBr. Decay involves complexes of the radical cation with bromide.	85A038
		6×10^8	7			p.r.	D.k. at 700 nm in N_2O-satd. soln. contg. $ZnTMpyP^{4+}$ and SCN^-. Decay involves complexes of the radical cation with thiocyanate.	85A038
		4.5×10^8	7			p.r.	D.k. at 700 nm in N_2O-satd. soln. contg. 10^{-4} mol L^{-1} $ZnTMpyP^{4+}$, 0.01 mol L^{-1} KBr and 0.1% v/v pyridine. Decay involves a complex of the radical cation with pyridine.	85A038
		1.5×10^7	4.0			p.r.	D.k. at 700 nm in N_2O-satd. soln. contg. $ZnTMpyP^{4+}$ and Ag^+; $k = 1.8 \times 10^7$ L mol^{-1} s^{-1} in the presence of Tl^+.	85A038

TABLE 28. Rate constants for zinc transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
28.14	**5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)porphinatozinc(II) radical cation** — Continued							
28.14.2	**Ethylenediaminetetraacetatocobaltate(II) ion**							
	$[ZnTMpyP]^{\cdot 5+}$ + $CoEDTA^{2-}$ → $ZnTMpyP^{4+}$ + $CoEDTA^{-}$	~2.2×10^9				f.p./oq	D.k. at 700 nm in Ar-satd. soln. contg. $ZnTMpyP^{4+}$ and $CoEDTA^{-}$ (OQ).	85A430
28.14.3	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatocobaltate(II) ion**							
	$[ZnTMpyP]^{\cdot 5+}$ + $CoTPPS^{4-}$ →	2.8×10^9	7			p.r.	D.k. at 700 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} bromide ion and varied [Co(II) complex].	81A317
28.14.4	**Iron(II) ion**							
	$[ZnTMpyP]^{\cdot 5+}$ + Fe^{2+} → $ZnTMpyP^{4+}$ + Fe^{3+}	2×10^8	2.5	0.1		f.p./oq	Soln. contg. $ZnTMpyP^{4+}$, Fe^{3+} (OQ) and 0.1 mol L^{-1} NaCl.	82A321
28.14.5	**1,1'-Bis(2-sulfonatoethyl)-4,4'-bipyridinium radical anion**							
	$[ZnTMpyP]^{\cdot 5+}$ + $[SEV]^{\cdot -}$ → $ZnTMpyP^{4+}$ + SEV	8.3×10^9	6.5		20	f.p./oq	D.k. in soln. contg. $ZnTMpyP^{4+}$, SEV (OQ) and 0.04 mol L^{-1} phosphate buffer.	89A362
28.14.6	**1,1'-Bis(3-sulfonatopropyl)-4,4'-bipyridinium radical anion**							
	$[ZnTMpyP]^{\cdot 5+}$ + $[SPV]^{\cdot -}$ → $ZnTMpyP^{4+}$ + SPV	3.5×10^9				f.p./oq	D.k. at 700 nm in soln. contg. 3×10^{-5} mol L^{-1} $ZnTMpyP^{4+}$ and 1×10^{-3} mol L^{-1} SPV (OQ).	86N075
		2×10^9				f.p./oq	D.k. at 395 nm in soln. contg. $ZnTMpyP^{4+}$ and SPV (OQ).	84N212
28.14.7	**1,1'-Bis[3-(trimethylammonio)propyl]-4,4'-bipyridinium radical cation**							
	$[ZnTMpyP]^{\cdot 5+}$ + $[APV]^{\cdot 3+}$ → $ZnTMpyP^{4+}$ + APV^{4+}	3.3×10^8	6.5		20	f.p./oq	D.k. in soln. contg. $ZnTMpyP^{4+}$, APV^{4+} (OQ) and 0.04 mol L^{-1} phosphate buffer.	89A362
28.14.8	**1,1'-Dimethyl-4,4'-bipyridinium radical cation**							
	$[ZnTMpyP]^{\cdot 5+}$ + $MV^{\cdot +}$ → $ZnTMpyP^{4+}$ + MV^{2+}	2.0×10^9	6.5		20	f.p./oq	D.k. in soln. contg. $ZnTMpyP^{4+}$, MV^{2+} (OQ) and 0.04 mol L^{-1} phosphate buffer.	89A362
		1.2×10^9 5.0×10^8 3.9×10^8 1.3×10^8		0.03 0.015 0.006 →0		f.p./oq	D.k. at 390, 605 and 700 nm in Ar-satd. soln. contg. 0.01 mol L^{-1} $ZnTMpyP^{4+}$ and $(2\text{-}10) \times 10^{-3}$ mol L^{-1} MV^{2+} (OQ).	84A264
		4×10^8				f.p./oq	D.k. at 395 nm in soln. contg. $ZnTMpyP^{4+}$ and MV^{2+} (OQ).	84N212
		1.4×10^9	4.7	0.1		f.p./oq	D.k. at 605 and 705 nm in soln. contg. $ZnTMpyP^{4+}$ and 0.015 mol L^{-1} MV^{2+} (OQ).	82N168
		3.7×10^8	5.0	0.05		f.p./oq	D.k. in soln. contg. $ZnTMpyP^{4+}$ and MV^{2+} (OQ).	81F164
28.14.9	**1,1'-Dipropyl-4,4'-bipyridinium radical cation**							
	$[ZnTMpyP]^{\cdot 5+}$ + $[C_3V]^{\cdot +}$ → $ZnTMpyP^{4+}$ + C_3V^{2+}	3×10^8				f.p./oq	D.k. at 395 nm in soln. contg. $ZnTMpyP^{4+}$ and C_3V^{2+} (OQ).	84N212
28.14.10	**1,1'-Dihexyl-4,4'-bipyridinium radical cation**							
	$[ZnTMpyP]^{\cdot 5+}$ + $[C_6V]^{\cdot +}$ → $ZnTMpyP^{4+}$ + C_6V^{2+}	4×10^8				f.p./oq	D.k. at 395 nm in soln. contg. $ZnTMpyP^{4+}$ and C_6V^{2+} (OQ).	84N212
28.14.11	**1,1'-Diheptyl-4,4'-bipyridinium radical cation**							
	$[ZnTMpyP]^{\cdot 5+}$ + $[C_7V]^{\cdot +}$ → $ZnTMpyP^{4+}$ + C_7V^{2+}	8.4×10^8				f.p/oq	D.k. at 700 nm in soln. contg. $ZnTMpyP^{4+}$ and 3×10^{-3} mol L^{-1} C_7V^{2+} (OQ).	85A430
28.14.12	**1,1'-Dioctyl-4,4'-bipyridinium radical cation**							
	$[ZnTMpyP]^{\cdot 5+}$ + $[C_8V]^{\cdot +}$ → $ZnTMpyP^{4+}$ + C_8V^{2+}	6×10^8				f.p./oq	D.k. at 395 nm in soln. contg. $ZnTMpyP^{4+}$ and C_8V^{2+} (OQ).	84N212
28.14.13	**1,1'-Didodecyl-4,4'-bipyridinium radical cation**							
	$[ZnTMpyP]^{\cdot 5+}$ + $[C_{12}V]^{\cdot +}$ → $ZnTMpyP^{4+}$ + $C_{12}V^{2+}$	3×10^8				f.p./oq	D.k. at 395 nm in soln. contg. $ZnTMpyP^{4+}$ and $C_{12}V^{2+}$ (OQ).	84N212

TABLE 28. Rate constants for zinc transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
28.14	**5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)porphinatozinc(II) radical cation** — Continued							
28.14.14	**1-Dodecyl-1'-methyl-4,4'-bipyridinium radical cation**							
	$[ZnTMpyP]^{\bullet 5+} + [C_{12}MV]^{\bullet +} \rightarrow ZnTMpyP^{4+} + C_{12}MV^{2+}$	6×10^8				f.p./oq	D.k. at 395 nm in soln. contg. $ZnTMpyP^{4+}$ and $C_{12}MV^{2+}$ (OQ).	84N212
28.14.15	**Ethylenediaminetetraacetate ions**							
	$[ZnTMpyP]^{\bullet 5+} + EDTA \rightarrow ZnTMpyP^{4+} + [EDTA_{ox}]^{\bullet}$	* 1.9×10^7				f.p./oq	D.k. at 700 nm in Ar-satd. soln. contg. 2×10^{-4} mol L^{-1} $ZnTMpyP^{4+}$, 0.001 mol L^{-1} $CoEDTA^-$ (OQ) and 5×10^{-3} mol L^{-1} EDTA.	85A430
		* 2.7×10^6	5.0	0.05		f.p./oq	D.k. in soln. contg. $ZnTMpyP^{4+}$, 0.005 mol L^{-1} MV^{2+} (OQ) and (1-20) $\times 10^{-3}$ mol L^{-1} EDTA.	81F164
							* Unexplained discrepancy in these data.	
28.14.16	**1-Methyl-1'-tetradecyl-4,4'-bipyridinium radical cation**							
	$[ZnTMpyP]^{\bullet 5+} + [C_{14}MV]^{\bullet +} \rightarrow ZnTMpyP^{4+} + C_{14}MV^{2+}$	5×10^9				f.p/oq	D.k. at 602 nm in soln. contg. 5×10^{-5} mol L^{-1} $ZnTMpyP^{4+}$ and 10^{-3} mol L^{-1} $C_{14}MV^{2+}$ (OQ).	81N002
28.14.17	**1-Methyl-1'-(2-sulfonato)ethyl-4,4'-bipyridinium radical cation**							
	$[ZnTMpyP]^{\bullet 5+} + [MSEV]^{\bullet} \rightarrow ZnTMpyP^{4+} + MSEV^-$	5.5×10^9	6.5		20	f.p./oq	D.k. in soln. contg. $ZnTMpyP^{4+}$, $MSEV^-$ (OQ) and 0.04 mol L^{-1} phosphate buffer.	89A362
28.14.18	**1-Methyl-1'-[3-(trimethylammonio)propyl]-4,4'-bipyridinium radical cation**							
	$[ZnTMpyP]^{\bullet 5+} + [MTMAPV]^{\bullet 2+} \rightarrow ZnTMpyP^{4+} + MTMAPV^{3+}$	1.0×10^9	6.5		20	f.p./oq	D.k. in soln. contg. $ZnTMpyP^{4+}$, $MTMAPV^{3+}$ (OQ) and 0.04 mol L^{-1} phosphate buffer.	89A362
28.15	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatozincate(II) radical cation**							
28.15.1	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatozincate(II) radical cation**							
	$[ZnTPPS]^{\bullet 3-} + [ZnTPPS]^{\bullet 3-} \rightarrow$	1.5×10^5	7			p.r.	D.k. at 700 nm in N_2O-satd. soln. contg. 0.01 mol L^{-1} SCN^- and 10^{-4} mol L^{-1} $ZnTPPS^{4-}$. Decay involves complexes of the radical cation with SCN^-. When SCN^- is replaced by Br^- decay is approximately first-order with half-life ~6 s between pH 3.2 and 7 and then half-life decreases with increasing pH (half-life = 3 ms at pH 13).	85A038
28.15.2	**Superoxide radical anion**							
	$[ZnTPPS]^{\bullet 3-} + O_2^{\bullet -} \rightarrow$	1.1×10^9	7.5			f.p./oq	D.k. at 700 nm in N_2/O_2 (95:5) satd. soln. contg. 1.5×10^{-4} mol L^{-1} $ZnTPPS^{4-}$, 3×10^{-3} mol L^{-1} metronidazole (OQ) and 2.5×10^{-2} mol L^{-1} phosphate buffer.	88A285
28.15.3	**5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatocobaltate(II) ion**							
	$[ZnTPPS]^{\bullet 3-} + CoTPPS^{4-} \rightarrow$	1.1×10^8	7			p.r.	D.k. at 700 nm in N_2O-satd. soln. contg. 0.1 mol L^{-1} bromide ion and varied [Co(II) complex].	81A317
28.15.4	**Ferrocyanide ion**							
	$[ZnTPPS]^{\bullet 3-} + Fe(CN)_6^{4-} \rightarrow ZnTPPS^{4-} + Fe(CN)_6^{3-}$	3.7×10^7	9	0.01		p.r.	D.k. at 700 nm in N_2O-satd. soln. contg. $ZnTPPS^{4-}$ and 0.01 mol L^{-1} KBr.	85S167
28.15.5	**Oxygen**							
	$[ZnTPPS]^{\bullet 3-} + O_2 \rightarrow$	$<2 \times 10^4$	7.5			f.p./oq	D.k. at 700 nm in N_2/O_2 (95:5) satd. soln. contg. 1.5×10^{-4} mol L^{-1} $ZnTPPS^{4-}$, 3×10^{-3} mol L^{-1} metronidazole (OQ) and 2.5×10^{-2} mol L^{-1} phosphate buffer.	88A285
28.15.6	**1,1'-Bis(carboxyethyl)-4,4'-bipyridinium radical ion (1+)**							
	$[ZnTPPS]^{\bullet 3-} + [CEV]^{\bullet +} \rightarrow ZnTPPS^{4-} + CEV^{2+}$	6×10^8			25	f.p./oq	D.k. in soln. contg. $ZnTPPS^{4-}$ and CEV^{2+} (OQ).	82N022

TABLE 28. Rate constants for zinc transients — Continued

Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
28.15 5,10,15,20-Tetrakis(4-sulfonatophenyl)porphinatozincate(II) radical cation — Continued							
28.15.7 1,1'-Bis(2-sulfonatoethyl)-4,4'-bipyridinium radical anion							
$[ZnTPPS]^{\bullet 3-} + [SEV]^{\bullet -} \rightarrow ZnTPPS^{4-} + SEV$	9×10^8	6.5		20	f.p./oq	D.k. in soln. contg. $ZnTPPS^{4-}$, SEV (OQ) and 0.04 mol L^{-1} phosphate buffer.	89A362
28.15.8 1,1'-Bis[3-(trimethylammonio)propyl]-4,4'-bipyridinium radical cation							
$[ZnTPPS]^{\bullet 3-} + [APV]^{\bullet 3+} \rightarrow ZnTPPS^{4-} + APV^{4+}$	3.3×10^{10}	6.5		20	f.p./oq	D.k. in soln. contg. $ZnTPPS^{4-}$, APV^{4+} (OQ) and 0.04 mol L^{-1} phosphate buffer.	89A362
28.15.9 1,1'-Dimethyl-4,4'-bipyridinium radical cation							
$[ZnTPPS]^{\bullet 3-} + MV^{\bullet +} \rightarrow ZnTPPS^{4-} + MV^{2+}$	2×10^9	~7		22	f.p./oq	D.k. at 600 and 460 nm in soln. contg. 2×10^{-5} mol L^{-1} $ZnTPPS^{4-}$, $(2\text{-}5) \times 10^{-4}$ mol L^{-1} MV^{2+} (OQ) and 0.2 mol L^{-1} NaCl or 0.05 mol L^{-1} $ZnSO_4$.	85F141
28.15.10 1-Methyl-1'-(2-sulfonato)ethyl-4,4'-bipyridinium radical cation							
$[ZnTPPS]^{\bullet 3-} + [MSEV]^{\bullet} \rightarrow ZnTPPS^{4-} + MSEV^{-}$	3.7×10^9	6.5		20	f.p./oq	D.k. in soln. contg. $ZnTPPS^{4-}$, $MSEV^{-}$ (OQ) and 0.04 mol L^{-1} phosphate buffer.	89A362
28.15.11 1-Methyl-1'-[3-(trimethylammonio)propyl]-4,4'-bipyridinium radical cation							
$[ZnTPPS]^{\bullet 3-} + [MTMAPV]^{\bullet 2+} \rightarrow ZnTPPS^{4-} + MTMAPV^{3+}$	2×10^{10}	6.5		20	f.p./oq	D.k. in soln. contg. $ZnTPPS^{4-}$, $MTMAPV^{3+}$ (OQ) and 0.04 mol L^{-1} phosphate buffer.	89A362
28.15.12 Nitrobenzene radical anion							
$[ZnTPPS]^{\bullet 3-} + [C_6H_5NO_2]^{\bullet -} \rightarrow ZnTPPS^{4-} + C_6H_5NO_2$	2×10^8	~7			f.p./oq	D.k. in soln. contg. $ZnTPPS^{4-}$ nitrobenzene (OQ).	85F141
28.15.13 Tryptophan							
$[ZnTPPS]^{\bullet 3-} + TrpH \rightarrow$	$<4 \times 10^5$	9.2			f.p./oq	D.k. at 700 nm in Ar-satd. soln. contg. $ZnTPPS^{4-}$ and 4×10^{-4} mol L^{-1} metronidazole (OQ).	86A063
28.15.14 Tyrosine							
$[ZnTPPS]^{\bullet 3-} + TyrOH \rightarrow$	8.2×10^7	9.2			f.p./oq	D.k. at 700 nm in Ar-satd. soln. contg. $ZnTPPS^{4-}$ and 4×10^{-4} mol L^{-1} metronidazole (OQ).	86A063
28.16 Hydroxy(tetrakis(2-hydroxyphenyl)porphinato)zinc(II) radical cation, deprotonated							
28.16.1 Hydroxy(tetrakis(2-hydroxyphenyl)porphinato)zinc(II) radical cation, deprotonated							
$(HO)[ZnT(o\text{-}OP)P]^{\bullet 4-} + (HO)[ZnT(o\text{-}OP)P]^{\bullet 4-} \rightarrow$	2.7×10^7	12			p.r.	D.k. at 680 nm in N_2O-satd. soln. contg. 10^{-4} mol L^{-1} zinc porphyrin and 0.01 mol L^{-1} KBr.	86A242
28.17 Hydroxy(tetrakis(3-hydroxyphenyl)porphinato)zinc(II) radical cation, deprotonated							
28.17.1 Hydroxy(tetrakis(3-hydroxyphenyl)porphinato)zinc(II) radical cation, deprotonated							
$(HO)[ZnT(m\text{-}OP)P]^{\bullet 4-} + (HO)[ZnT(m\text{-}OP)P]^{\bullet 4-} \rightarrow$	3.4×10^7	12			p.r.	D.k. at 680 nm in N_2O-satd. soln. contg. 10^{-4} mol L^{-1} zinc porphyrin and 0.01 mol L^{-1} KBr; $k = 3.2 \times 10^7$ and 4.0×10^7 L mol^{-1} s^{-1} at pH 13 and 14, respectively.	86A242
28.18 5,10,15,20-Tetrakis[1-(3-sulfonatopropyl)pyridinium-4-yl]porphinatozinc(II) radical cation							
28.18.1 5,10,15,20-Tetrakis[1-(3-sulfonatopropyl)pyridinium-4-yl]porphinatozinc(II) radical cation							
$[ZnTZP]^{\bullet +} + [ZnTZP]^{\bullet +} \rightarrow$	3.0×10^9	7.0			p.r.	D.k. at 700 nm in N_2O-satd. soln. contg. 10^{-4} mol L^{-1} ZnTZP and 0.01 mol L^{-1} KBr. Decay involves a complex of the radical cation with bromide.	85A038

TABLE 28. Rate constants for zinc transients — Continued

No.	Reaction	k (L mol^{-1} s^{-1})	pH	I	t(°C)	Method	Comment	Ref.
28.19	**5,10,15,20-Tetrakis[1-(3-sulfonatopropyl)pyridinium-2-yl]porphinatozinc(II) radical cation**							
28.19.1	**Iron(II) ions**							
	$[Zn(2\text{-}TZP)]^{+} + Fe(II) \rightarrow Zn(2\text{-}TZP) + Fe(III)$	3.2×10^5	0			f.p./oq	D.k. at 700 nm in soln. contg. Zn(2-TZP), Fe(III) (OQ), 1 mol L^{-1} nitric acid and added Fe(II).	87A261
28.20	**5,10,15,20-Tetrakis(2-*N*-hexylpyridyl)porphinatozinc(II) radical cation**							
28.20.1	**Iron(II) ions**							
	$[Zn(2\text{-}THpyP)]^{\bullet 5+} + Fe(II) \rightarrow Zn(2\text{-}THpyP)^{4+} + Fe(III)$	3.2×10^5	0			f.p./oq	D.k. at 700 nm in soln. contg. Zn(2-THpyP)$^{4+}$, Fe(III) (OQ), 1 mol L^{-1} nitric acid and added Fe(II).	87A261
28.21	**Tetrakis-4-(*N*,*N*,*N*-trimethylammonio)phenylporphinezinc(II) radical cation**							
28.21.1	**Tetrakis-4-(*N*,*N*,*N*-trimethylammonio)phenylporphinezinc(II) radical cation**							
	$[ZnTAPP]^{\bullet 5+} + [ZnTAPP]^{\bullet 5+} \rightarrow$	7×10^6	7			p.r.	D.k. at 700 nm in N_2O-satd. soln. contg. 10^{-4} mol L^{-1} ZnTAPP^{4+} and 0.01 mol L^{-1} KBr. Decay involves a complex of the radical cation with bromide.	85A038
28.22	**5,10,15,20-Tetrakis(2,6-dichloro-3-sulfonatophenyl)porphinatozincate(II) radical cation**							
28.22.1	**5,10,15,20-Tetrakis(2,6-dichloro-3-sulfonatophenyl)porphinatozincate(II) radical cation**							
	$[ZnTCPPS]^{\bullet 3-} + [ZnTCPPS]^{\bullet 3-} \rightarrow ZnTCPPS^{4-} + ZnTCPPS^{2-}$	2×10^7	7			p.r.	D.k. at 700 nm in N_2O-satd. soln. contg. ZnTCPPS^{4-} and 0.01 mol L^{-1} NaN_3; unclear whether k or $2k$.	90R041
28.22.2	**1,4-Benzosemiquinone radical ion**							
	$[ZnTCPPS]^{\bullet 3-} + Q^{\bullet -} \rightarrow ZnTCPPS^{4-} + Q$	4.8×10^9	7			f.p./oq	D.k. in N_2-satd. soln. contg. ZnTCPPS^{4-}, benzoquinone (OQ) and 0.2 mol L^{-1} Na_2SO_4.	90R041
28.22.3	**2,6-Dimethylbenzosemiquinone radical ion**							
	$[ZnTCPPS]^{\bullet 3-} + [2,6\text{-}(CH_3)_2Q]^{\bullet -} \rightarrow ZnTCPPS^{4-} + 2,6\text{-}(CH_3)_2Q$	4.8×10^9	7			f.p./oq	D.k. in N_2-satd. soln. contg. ZnTCPPS^{4-}, 2,6-dimethylbenzoquinone (OQ) and 0.2 mol L^{-1} Na_2SO_4.	90R041
28.22.4	**1,4-Benzenediol**							
	$[ZnTCPPS]^{\bullet 3-} + QH_2 \rightarrow ZnTCPPS^{4-} + Q^{\bullet -} + 2\,H^{+}$	8.8×10^8	7			f.p./oq	D.k. in N_2-satd. soln. contg. ZnTCPPS^{4-}, benzoquinone (OQ), excess hydroquinone and 0.2 mol L^{-1} Na_2SO_4.	90R041
28.23	**Zinc(II) uroporphyrin radical cation**							
28.23.1	**Nicotinamide adenine dinucleotide**							
	$[ZnUP]^{\bullet +} + NAD \rightarrow ZnUP + NAD^{+}$	1.4×10^8	7		25	f.p./oq	D.k. at 380 and 670 nm in soln. contg. zinc(II) uroporphyrin, NAD^{+} (OQ), 1.1×10^{-4} mol L^{-1} K_2HPO_4 and 0.1 mol L^{-1} KCl.	75A245
28.23.2	***N*-Benzyl-3-carbamylpyridinyl**							
	$[ZnUP]^{\bullet +} + C_6H_5CH_2\dot{p}yCONH_2 \rightarrow ZnUP + C_6H_5CH_2py^{+}CONH_2$	1.4×10^8	7		25	f.p./oq	D.k. at 380 and 670 nm in soln. contg. zinc(II) uroporphyrin, *N*-benzylnicotinamide (OQ), 1.1×10^{-4} mol L^{-1} K_2HPO_4 and 0.1 mol L^{-1} KCl.	75A245
28.24	**Zinc(II) hematoporphyrin radical anion**							
28.24.1	**Zinc(II) hematoporphyrin radical anion**							
	$[ZnHP]^{\bullet -} + [ZnHP]^{\bullet -} \rightarrow [ZnHP]_2^{2-}$	2.1×10^8	13			p.r.	D.k. in N_2O-satd. soln. contg. 1.0 mol L^{-1} 2-PrOH, 1×10^{-5} mol L^{-1} zinc(II) hematoporphyrin, 1×10^{-4} mol L^{-1} $ZnSO_4$ and 0.1 mol L^{-1} NaOH; unclear whether k or $2k$.	741040

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8. Molecular Formula Index

$C_2H_4CoNO_2^+$ Glycinatocobalt(II) ion *6.47*

$C_2H_4CuNO_2^+$ Glycinatocopper(II) ion *8.47.3*

$C_2H_4NO_2^-$ Glycine, negative ion *1.7.8, 1.9.5*

C_2H_4O Acetaldehyde *25.1.15*

$C_2H_4O_2$ Acetic acid *6.4.5, 6.5.7, 6.6.21, 15.8.14, 15.10.18*

$C_2H_5BiO^{3+}$ 1-Hydroxyethylbismuth(IV) ion *4.3*

$C_2H_5CdO^+$ 1-Hydroxyethylcadmium(II) ion *5.11*

$C_2H_5CrO^{2+}$ 1-Hydroxyethylchromium(III) ion *7.28a*
2-Hydroxyethylchromium(III) ion *7.29*

$C_2H_5CuO^{2+}$ 2-Hydroxyethylcopper(III) ion *8.67*

$C_2H_5NO_2$ Glycine *1.5.19*

$C_2H_5NO_2.Ni$ Glycinatonickel(III) ion *15.33*

$C_2H_5NiO^+$ 1-Hydroxyethylnickel(II) ion *15.21*

C_2H_5O 1-Hydroxyethyl *5.1.4, 6.103.1, 10.10.5, 15.1.4, 22.3.53*
2-Hydroxyethyl *8.5.24*

$C_2H_6N_2O$ *N*-Nitrosodimethylamine *25.4.42*

C_2H_6O Ethanol *25.4.34, 25.5.13*

C_2H_6OS Dimethyl sulfoxide *25.4.28*

$C_2H_6O_2$ Ethylene glycol *1.5.18, 1.7.7*

$C_2H_6S_2$ Dimethyl disulfide *1.5.17, 1.7.6, 25.4.27, 25.5.12*

$C_2H_7Cu^{2+}$ 2-Ammonioethylcopper(II) ion *8.31*

C_2H_7NO 2-Aminoethanol *1.7.1*

$C_2H_8CoN_2^+$ Ethylenediaminecobalt(II) ion *6.29*

$C_2H_8N_2.Ni$ Ethylenediaminenickel(III) ions *15.32*

$C_2H_{15}CrO_5^{2+}$ Pentaaqua(ethyl)chromium(III) ion *22.50.21*

$C_2H_{15}CrO_6^{2+}$ Pentaaqua(methoxymethyl)chromium(III) ion *22.3.14, 22.50.23*

$C_2H_{18}CoN_5O_2^{2+}$
(Acetato)pentaamminecobalt(III) ion *5.1.27, 15.1.26, 28.2.30*

$C_2H_{20}Co_2F_3N_6O_2^{3+}$
Hexaamminebis(μ-hydroxy)-μ-(trifluoroacetato)dicobalt(III) ion *5.1.29, 15.9.2, 28.2.31*

$C_2H_{21}Co_2F_2N_6O_2^{3+}$
Hexaammine-μ-(difluoroacetato)bis(μ-hydroxy)dicobalt(III) ion *5.1.30, 15.9.3, 28.2.32*

$C_2H_{22}Co_2FN_6O_2^{3+}$
Hexaammine-μ-(fluoroacetato)bis(μ-hydroxy)dicobalt(III) ion *5.1.31, 15.9.4, 28.2.33*

$C_2H_{23}Co_2N_6O_2^{3+}$
μ-Acetatohexaamminebis(μ-hydroxy)dicobalt(III) ion *5.1.32, 15.9.5, 28.2.34*

$C_2O_4^{2-}$ Oxalate ion *22.50.79*

$C_3H_3CuNO_2^+$ 2-Ammonio-1-carboxyethylcopper(II) ion *8.30*

$C_3H_4CuO_2^+$ 1-Carboxyethylcopper(III) ion *8.69*

$C_3H_5CrO_3^{2+}$ 1-Carboxy-1-hydroxyethylchromium(III) ion *7.34*

C_3H_5NO Acrylamide *8.5.21*

$C_3H_6NO_2^-$ Alanine, negative ion *1.9.2*

C_3H_6O Acetone *25.1.16, 28.2.58*
Allyl alcohol *6.1.25, 15.1.40, 28.2.59*

$C_3H_7BiO^{3+}$ 1-Hydroxy-1-methylethylbismuth(IV) ion *4.4*

$C_3H_7CdO^+$ 1-Hydroxy-1-methylethylcadmium(II) ion *5.12*

$C_3H_7CrO^{2+}$ 1-Hydroxy-1-methylethylchromium(III) ion *7.29a*
2-Hydroxy-1-methylethylchromium(III) ion *7.30*

$C_3H_7NO_2S$ Cysteine *22.50.71*

$C_3H_7NiO^+$ 1-Hydroxy-1-methylethylnickel(II) ion *15.22*

C_3H_7O 1-Hydroxy-1-methylethyl *5.1.5, 6.106.2, 10.10.6, 11.2.5, 15.1.5, 19.37.5, 22.3.55*

C_3H_8O 2-Propanol *6.75.1, 8.14.2, 25.4.45, 25.5:22*

$C_3H_9CuN_2O_2$ Aminomethyl(glycinato)copper(II) *8.43a*

$C_3H_{11}CuN_2^{3+}$ 1,3-Diammonio-2-propylcopper(II) ion *8.34*

$C_3H_{17}CrO_5^{2+}$ Pentaaqua(isopropyl)chromium(III) ion *22.50.22*

$C_3N_3Ni^{2-}$ Tris(cyano)nickelate(I) ion *15.3*

$C_4CoN_4^{2-}$ Tetracyanocobaltate(II) ion *6.44*

$C_4H_3CuO_5$ 1,2-Dicarboxy-2-hydroxyethylcopper(III) ion *8.71*

$C_4H_4AgO_4$ Silver(II)-succinate complex *1.14*

$C_4H_4CoNO_4$ Iminodiacetatocobalt(II), H-abstraction product *6.59*

$C_4H_4CuO_8^{3-}$ Tetraformatocuprate(I) ion *8.7, 22.50.44*

$C_4H_4Mo_2O_{14}^{3-}$
Bis(μ-oxo)bis[aqua(oxalato)-oxomolybdate(IV)(V) ion *14.3*

$C_4H_4NNiO_4$ Iminodiacetatonickelate(II), H-abstraction product *15.27*

$C_4H_4O_4$ Fumaric acid *8.5.22*
Maleic acid *8.5.25*

$C_4H_5BrCoNO_4$
Bromo(iminodiacetato)cobalt(III) *6.77*

$C_4H_5Br_2CoNO_4^-$
Dibromo(iminodiacetato)cobaltate(III) ion *6.76*

$C_4H_{19}CoN_6O_2^{2+}$ *cis*-Nitroamminebis(ethylenediamine)-cobalt(III) ion *5.1.16, 28.2.19*

$C_4H_{19}N_4O_2Pt^{2+}$ Aquabis(ethylenediamine)hydroxy-platinum(III) ion *19.36*

$C_4H_{20}N_4O_2Pt^{3+}$ Diaquabis(ethylenediamine)platinum(III) ion *19.38*

$C_4N_4Ni^{2-}$ Tetracyanonickelate(II) ion *22.3.29*

$C_4N_4Ni^{3-}$ Tetracyanonickelate(I) ion *15.2*

$C_4N_4Pt^{3-}$ Tetracyanoplatinate(I) ion *19.6*

$C_5ClCoN_5^{4-}$ Chloro(pentacyano)cobaltate(II) ion *6.42*

$C_5CoN_5^{3-}$ Pentacyanocobaltate(II) ion *6.43*

$C_5CoN_5^{4-}$ Pentakis(cyano-*C*)cobaltate(I) ion *6.2*

$C_5FeN_5^{3-}$ Pentacyanoferrate(II) ion *9.6*

$C_5FeN_6O^{3-}$ Pentacyanonitrosylferrate(II) ion *9.7*

$C_5H_3N_2O_2^-$ 4-Pyrimidinecarboxylate ion *15.1.43*

$C_5H_6N_2$ 2-Methylpyrazine *9.6.1*

$C_5H_7CoO_2^+$ Acetylacetonatocobalt(II) ion *6.38*

$C_5H_7CrO_2^+$ Acetonylacetonatochromium(II) ion *7.26*

$C_5H_7N_3O$ 1-Methylcytosine *25.5.18*

$C_5H_8O_2^-$ 2-Carboxy-2,2-dimethylethyl anion *9.7.6, 22.37.7*

C_5H_9 Cyclopentyl *15.1.7*

$C_5H_9CrO_2^{2+}$ 2-Carboxy-2,2-dimethylethylchromium(III) ion *7.35*

$C_5H_9CuO_2^+$ 2-Carboxy-2,2-dimethylethylcopper(II) ion *8.37*

$C_5H_9CuO_2^{2+}$ 2-Carboxy-2,2-dimethylethylcopper(III) ion *8.72*

$C_5H_9Ni^+$ Cyclopentylnickel(II) ion *15.24*

$C_5H_9O_2^-$ Trimethylacetate ion *1.5.31, 1.7.9*

$C_5H_{11}NO_2S$ Methionine *1.5.20, 25.4.36*

$C_5H_{13}CuN_2O_2$ β-Alaninato(2-aminoethyl)copper(III) *8.83*

$C_5H_{13}CuN_2O_4^+$ Bis(glycinato)methylcopper(III) ion *8.82*

$C_5H_{14}ClCrNO_5^{3+}$ Pentaaqua(3-chloropyridine)chromium(III) ion *22.3.20*

$C_5H_{15}CrNO_5^{3+}$ Pentaaqua(pyridine)chromium(III) ion *22.3.19*

$C_5H_{16}CoN_4O_3^+$ Carbonatobis(ethylenediamine)cobalt(III) ion *5.1.12, 28.2.15*

$C_5H_{21}CoN_6O^{3+}$ Pentaammine(pyridine)cobalt(III) ion, OH adduct *6.95*

$C_5H_{23}Co_2N_8O_4^{3+}$ μ-4-Pyrimidinecarboxylatobis[hydroxo-tris(ammine)cobalt(III)] ion *15.1.28*
μ-5-Pyrimidinecarboxylatobis[hydroxo-tris(ammine)cobalt(III)] ion *15.1.27*

$C_6CoO_{12}^{3-}$ Trioxalatocobaltate(III) ion *6.1.11, 17.3.8*

$C_6FeN_6^{3-}$ Ferricyanide ion *3.1.3, 6.98.1, 8.84.3, 9.13.2, 9.34, 15.28.2, 22.24.2, 25.1.6, 25.2.6, 28.6.4*

$C_6FeN_6^{4-}$ Ferrocyanide ion *9.49.8, 19.31.1, 19.37.3, 19.45.3, 19.46.4, 22.46.1, 22.50.53, 28.13.3, 28.15.4*

C_6H_4BrO 4-Bromophenoxyl *22.3.44*

C_6H_4ClO 4-Chlorophenoxyl *22.3.47*

$C_6H_4CuO_2$ 4-Hydroxyphenoxycopper(II) ion, conjugate base *8.40*

$C_6H_4CuO_2^+$ 4-Hydroxyphenoxycopper(III) ion, conjugate base *8.78*

C_6H_4IO 4-Iodophenoxyl *22.3.56*

$C_6H_4O_2$ 1,4-Benzoquinone *1.2.7, 5.1.60, 6.1.28, 7.2.5, 8.15.10, 10.6.3, 10.7.1, 10.8.4, 10.9.1, 10.10.8, 10.11.3, 10.12.3, 10.13.1, 15.1.41, 15.8.16, 15.10.20, 17.2.3, 22.3.41, 22.35.3, 25.1.17, 28.2.61*

$C_6H_4O_2^-$ 1,4-Benzosemiquinone, radical ion *28.22.2*

$C_6H_5CoNO_6^-$ Nitrilotriacetatocobaltate(II) ion, H-abstraction product *6.60*

$C_6H_5CuO_2^{2+}$ 2-Hydroxyphenoxycopper(III) ion *8.76*
3-Hydroxyphenoxycopper(III) ion *8.77*

$C_6H_5MnNO_6^-$ Nitrilotriacetatomanganate(II) ion, H-abstraction product *13.9*

$C_6H_5NNiO_6^-$ Nitrilotriacetatonickelate(II), H-abstraction product *15.29*

$C_6H_5NO_2$ Nitrobenzene *1.1.12, 1.2.10, 1.3.9*

$C_6H_5NO_2^-$ Nitrobenzene radical anion *28.15.12*

$C_6H_5NO_6Zn$ Nitrilotriacetatozinc(II) H-abstraction product *28.10*

C_6H_5O Phenoxyl *22.3.63*

$C_6H_6AgNO_6^-$ Nitrilotriacetatoargentate(II) *1.12*

$C_6H_6CdNO_6^{2-}$ Nitrilotriacetatocadmium(I) ion *5.10*

$C_6H_6CoNO_6^{2-}$ Nitrilotriacetatocobaltate(I) ion *6.3*

$C_6H_6CuNO_6^-$ Nitrilotriacetatocuprate(II) ion *8.46.2*

$C_6H_6NNiO_6^{2-}$ Nitrilotriacetatonickelate(I) ion *15.17*

$C_{12}H_{24}N_4Ni^{2+}$ 5,7-Dimethyl-1,4,8,11-tetraazacyclotetradeca-4,7-dienenickel(II) ion *6.100.5*

$C_{12}H_{26}CdN_2O_4^{+}$ 1,4,10,13-Tetraoxa-7,16-diazacycloctadecanecadmium(I) ion *5.3*

$C_{12}H_{29}ClN_3Pt^{+}$ Chloro(tetraethyldiethylenetriamine)platinum(II) H reaction product *19.13*

$C_{12}H_{29}CoN_3^{2+}$ Tetraethyldiethylenetriaminecobalt(II) ion *6.35*

$C_{12}H_{29}CrN_4^{2+}$ (Methyl)-1,4,8,12-tetraazacyclopentadecanechromium(III) ion *22.50.28*

$C_{12}H_{30}CoN_8^{2+}$ 1,3,6,8,10,13,16,19-Octaazabicyclo[6.6.6]-eicosanecobalt(II) ion *6.54, 22.50.4, 22.55.3, 22.57.1, 22.59.3*

$C_{12}H_{30}CoN_8^{3+}$ 1,3,6,8,10,13,16,19-Octaazabicyclo[6.6.6]-eicosanecobalt(III) ion *22.3.9, 22.18.1, 22.19.2*

$C_{12}H_{30}N_6Ni^{3+}$ Bis(1,4,7-triazacyclononane)nickel(III) ion *15.34*

$C_{12}H_{30}N_8Rh^{2+}$ 1,3,6,8,10,13,16,19-Octaazabicyclo[6.6.6]-eicosanerhodium(II) ion *21.9*

$C_{12}H_{32}Cl_2N_3OPt^{+}$ Chloro(tetraethyldiethylenetriamine)-platinum(II), $Cl_2^{\bullet-}$ reaction product *19.42*

$C_{12}H_{33}ClN_3O_2Pt^{+}$ Chloro(tetraethyldiethylenetriamine)-platinum(II), OH reaction product *19.43*

$C_{13}H_8O$ 9-Fluorenone *5.1.63, 5.3.6, 5.4.4, 5.5.3, 6.6.24*

$C_{13}H_9NO$ 6-Aminophenalenone *1.5.6, 25.4.12*

$C_{13}H_{10}O$ Benzophenone *5.1.59, 5.2.2, 5.3.3, 5.4.1, 5.5.1, 6.1.27, 28.2.60*

$C_{13}H_{11}NS$ 10-Methylphenothiazine *14.4.1*

$C_{13}H_{13}N_2O$ *N*-Benzyl-3-carbamylpyridinyl *28.23.2*

$C_{13}H_{14}N_2^{+}$ 1,1′-Trimethylene-2,2′-bipyridinium radical cation *22.50.82*

$C_{13}H_{15}N_2O_3S$ 1-Methyl-1′-(2-sulfonato)ethyl-4,4′-bipyridinium radical cation *28.14.17, 28.15.10*

$C_{13}H_{15}N_3O_3$ Glycyltryptophan *25.5.16*

$C_{13}H_{17}FeN^{+}$ (Dimethylaminomethyl)ferricenium *9.38*

$C_{13}H_{27}N_7NiO_2^{+}$ 8-Methyl-8-nitro-1,3,6,10,13,15-hexaazatricyclo[13.1.1.1^{13,15}]octadecane-nickel(II) ion, electron adduct *15.14*

$C_{13}H_{27}N_7NiO_2^{3+}$ 8-Methyl-8-nitro-1,3,6,10,13,15-hexaazatricyclo[13.1.1.1^{13,15}]octadecane-nickel(III) ion *15.53*

$C_{13}H_{29}N_7Ni^{+}$ 8-Amino-8-methyl-1,3,6,10,13,15-hexaazatricyclo[13.1.1.1^{13,15}]octadecane-nickel(I) ion *15.15*

$C_{13}H_{29}N_7Ni^{3+}$ 8-Amino-8-methyl-1,3,6,10,13,15-hexaazatricyclo[13.1.1.1^{13,15}]octadecane-nickel(III) ion *15.54*

$C_{13}H_{31}CrN_4^{2+}$ (Ethyl)-1,4,8,12-tetraazacyclopentadecane-chromium(III) ion *22.50.29*

$C_{14}H_6O_8S_2^{2-}$ 9,10-Anthraquinone-2,6-disulfonate ion *6.4.6, 7.2.4, 8.15.8, 15.8.15, 15.10.19*

$C_{14}H_7O_5S^{-}$ 9,10-Anthraquinone-2-sulfonate ion *6.6.22, 8.15.9*

$C_{14}H_8CrN_2O_8^{-}$ 2,2′-Bipyridinebis(oxalato)chromate(III) ion *5.1.37, 28.2.39*

$C_{14}H_8CrN_2O_8^{2-}$ 2,2′-Bipyridinebis(oxalato)chromate(II) ion *7.21*

$C_{14}H_8FeN_6^{-}$ Tetracyano(2,2′-bipyridine)ferrate(III) ion *9.3.1, 9.32*

$C_{14}H_8FeN_6^{3-}$ 2,2′-Bipyridinetetracyanoferrate(II) ion, electron adduct *9.3*

$C_{14}H_8O_2$ 9,10-Anthraquinone *5.1.57, 6.1.26*

$C_{14}H_{10}O_2$ Benzil *5.1.58, 5.2.1, 5.3.2*

$C_{14}H_{14}N_2O_4^{+}$ 1,1′-Bis(carboxymethyl)-4,4′-bipyridinium radical cation *22.50.64*

$C_{14}H_{16}N_2^{+}$ 1,1′-Tetramethylene-2,2′-bipyridinium radical cation *22.50.80*

$C_{14}H_{16}N_2O_6S_2^{-}$ 1,1′-Bis(2-sulfonatoethyl)-4,4′-bipyridinium radical anion *19.47.2, 22.50.67, 28.14.5, 28.15.7*

$C_{14}H_{17}O_4^{-}$ 6-Hydroxy-2,5,7,8-tetramethylchroman-2-carboxylate ion *13.17.2, 13.18.4*

$C_{14}H_{18}N_2^{+}$ 1,1′,2,2′-Tetramethyl-4,4′-bipyridinium radical cation *22.50.81*

$C_{14}H_{18}N_2O_2^{-}$ 1,1′-Bis(2-hydroxyethyl)-4,4′-bipyridinium radical cation *22.50.65*

$C_{14}H_{21}CuN_2O_{10}^{3-}$ (1-Hydroxybutyl)ethylenediamine-tetraacetatocuprate(II) ion *8.41*

$C_{14}H_{24}CoN_4^+$ 2,3,9,10-Tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraenecobalt(I) ion *6.4*

$C_{14}H_{24}CoN_4^{2+}$ 2,3,9,10-Tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraenecobalt(II) ion *6.55, 6.100.1, 13.25.1, 22.50.8*

$C_{14}H_{24}CoN_4O_2^+$ 2,3,9,10-Tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraenecobalt(II) ion, superoxide adduct *6.56*

$C_{14}H_{24}CuN_4^+$ 2,3,9,10-Tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraenecopper(I) ion *8.16*

$C_{14}H_{24}N_4Ni^{3+}$ 2,3,9,10-Tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraenenickel(II) ion *6.100.8*

$C_{14}H_{26}CoN_4O_2^+$ Dihydroxy(2,3,9,10-tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraene)cobalt(III) ion *6.6.10, 15.8.4, 15.10.7*

$C_{14}H_{28}CoN_4O_2^{3+}$ 2,3,9,10-Tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraenecobalt(III) ion *15.10.6*

$C_{14}H_{28}FeN_4O_2^{2+}$ Diaqua(2,3,9,10-tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraeneiron(II) ion *9.9*

$C_{14}H_{30}CoN_4S_3^{2+}$ 8-Methyl-1,3,13,16-tetraaza-6,10,19-trithiabicyclo[6.6.6]eicosanecobalt(II) ion *6.53, 22.50.3*

$C_{14}H_{32}CoN_4^{2+}$ 2,3,9,10-Tetramethyl-1,4,8,11-tetraazacyclotetradecanecobalt(II) ion *22.50.6, 22.55.2, 22.59.2*

$C_{14}H_{32}CuN_6^+$ 3,6,10,13,16,19-Hexaazabicyclo[6.6.6]eicosanecopper(I) ion *8.12*

$C_{14}H_{32}N_4Ni^+$ 1,4,8,11-Tetramethyl-1,4,8,11-tetraazacyclotetradecanenickel(I) ion *15.7*

$C_{14}H_{32}N_4Ni^{2+}$ 1,4,8,11-Tetramethyl-1,4,8,11-tetraazacyclotetradecanenickel(II) ion *22.3.28*

$C_{14}H_{33}CrN_4^{2+}$ (1-Methylethyl)-1,4,8,12-tetraazacyclopentadecanechromium(III) ion *22.50.31*
(Propyl)-1,4,8,12-tetraazacyclopentadecanechromium(III) ion *22.50.30*

$C_{14}H_{34}CoN_8^{2+}$ 1,8-Diamino-3,6,10,13,16,19-hexaazabicyclo[6.6.6]eicosanecobalt(II) ion *6.52, 22.55.5, 22.57.2, 22.59.4*

$C_{14}H_{34}N_8Pt^{3+}$ 1,8-Diamino-3,6,10,13,16,19 hexaazabicyclo[6.6.6]eicosaneplatinum(III) ion *19.44*

$C_{14}H_{36}CoN_8^{4+}$ 1,8-Diamino-3,6,10,13,16,19-hexaaza bicyclo[6.6.6]eicosanecobalt(II) ion, conjugate diacid *6.51, 22.55.4*

$C_{15}H_{12}NO_2S^-$ Metiazinic acid, conjugate base *25.6.2*

$C_{15}H_{14}O_3$ 4,4′-Dimethoxybenzophenone *5.1.61, 5.2.3, 5.3.4, 5.4.2*

$C_{15}H_{16}N_3S^+$ Toluidine Blue cation *25.5.25*

$C_{15}H_{19}BrN_4Ni^{2+}$ Bromo-α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,6,11,13,15-hexaenenickel(III) ion *15.69*

$C_{15}H_{19}Br_2N_4Ni^+$ Dibromo-α,2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,6,11,13,15-hexaenenickel(III) ion *15.66*

$C_{15}H_{21}BrN_4NiO^{2+}$ Aquabromo-α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,6,11,13,15-hexaenenickel(III) ion *15.65*

$C_{15}H_{21}CoO_6^-$ Tris(acetylacetonato)cobaltate(II) ion *6.36*

$C_{15}H_{21}CrO_6^-$ Tris(acetylacetonato)chromate(II) ion *7.24*

$C_{15}H_{21}O_6Ru^-$ Tris(acetylacetonato)ruthenate(II) ion *22.41*

$C_{15}H_{22}CuN_4^+$ α-2,12-Dimethyl-3,7,11,17 tetraazabicyclo[11.3.1]heptadeca-1(17),2,11,13,15-pentaenecopper(I) ion *8.17*

$C_{15}H_{22}CuN_4^{2+}$ α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,11,13,15-pentaenecopper(II) ion *15.10.9*

$C_{15}H_{22}N_4Ni^+$ α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,11,13,15-pentaenenickel(I) ion *15.13*

$C_{15}H_{22}N_4Ni^{2+}$ α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,11,13,15-pentaenenickel(II) ion *15.10.13*

$C_{16}H_{32}ClCuN_4^{2+}$
Chloro-5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecopper(III) ion *8.51*

$C_{16}H_{32}Cl_2N_4Ni^{+}$
Dichloro(5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)nickel(III) ion *15.49*

$C_{16}H_{32}CoN_4^{+}$ 5,7,7,12,12,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,14-dienecobalt(I) ion *6.7*
N-meso-5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecobalt(I) ion *6.5*
N-rac-5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecobalt(I) ion *6.6*

$C_{16}H_{32}CoN_4^{2+}$
5,7,7,12,12,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,14-dienecobalt(II) ion *22.3.8*
N-rac-5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecobalt(II) ion *6.5.2, 6.100.2, 13.25.2*

$C_{16}H_{32}CuN_4^{+}$ 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecopper(I) ion *8.15*

$C_{16}H_{32}CuN_4^{3+}$
5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecopper(III) ion *8.52*

$C_{16}H_{32}EuN_2O_5^{2+}$
4,7,13,16,21-Pentaoxa-1,10-diazabicyclo[8.8.5]tricosaneeuropium(II) ion *22.50.46*

$C_{16}H_{32}EuN_2O_5^{3+}$
4,7,13,16,21-Pentaoxa-1,10-diazabicyclo[8.8.5]tricosaneeuropium(III) ion *22.3.26, 22.29.1*

$C_{16}H_{32}N_4Ni^{+}$ 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienenickel(I) ion *15.10, 15.46.1*

$C_{16}H_{32}N_4Ni^{2+}$
5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienenickel(II) ion *6.100.7*

$C_{16}H_{32}N_4Ni^{3+}$
5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienenickel(III) ion *15.46*

$C_{16}H_{33}CoN_4^{2+}$
Hydrido-*prim-N-rac*-5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecobalt(III) ion *6.81*
Hydrido-*N-rac*-5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecobalt(III) ion *6.80*

$C_{16}H_{33}CoN_4O^{+}$
5,7,7,12,14,14-Hexamethyl-1,4,7,11-tetraazacyclotetradeca-4,11-diene(hydroxo)nickel(III) ion *15.47*

$C_{16}H_{33}CuN_4^{2+}$
5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene(hydrido)copper(III) ion *8.55*

$C_{16}H_{34}CoN_4O_2^{+}$
5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienedihydroxycobalt(III) ion *6.6.9*

$C_{16}H_{35}CoN_4O_2^{2+}$
Aqua(5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)hydroxycobalt(III) ion *15.8.3, 15.10.5*

$C_{16}H_{35}N_4Ni^{2+}$
5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanenickel(II) ion, *OH* reaction product *15.25*

$C_{16}H_{36}AgN_4^{2+}$
5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanesilver(II) ion *7.4.1, 15.10.1, 15.49.1, 21.11.3*

$C_{16}H_{36}CoN_4^{2+}$
5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanecobalt(II) ion *6.50, 22.50.7*

$C_{16}H_{36}CuN_4^{+}$ 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanecopper(I) ion *8.14*

$C_{16}H_{36}CuN_4^{2+}$
5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanecopper(II) ion *6.100.3*

$C_{16}H_{36}CuN_4^{3+}$
5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanecopper(III) ion *8.50*

$C_{16}H_{36}N_4Ni^{+}$ 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanenickel(I) ion *15.8*

$C_{16}H_{36}N_4Ni^{2+}$
5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanenickel(II) ion *6.100.6*

$C_{24}H_{18}N_{12}Ru^{+}$
(2,2′-Bipyrazine)(2,2′-bipyridine)(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct *22.10*
(2,2′-Bipyrazine)bis(2,2′-bipyrimidine)-ruthenium(II) ion, electron adduct *22.16*
(2,2′-Bipyrazine)bis(2,2′-bipyridine)-ruthenium(II) ion, electron adduct *22.8*
(2,2′-Bipyridine)bis(2,2′-bipyrimidine)-ruthenium(II) ion, electron adduct *22.14*
Bis(2,2′-bipyrazine)(2,2′-bipyrimidine)-ruthenium(II) ion, electron adduct *22.22*
Bis(2,2′-bipyrazine)(2,2′-bipyridine)-ruthenium(II) ion, electron adduct *22.20*
Bis(2,2′-bipyridine)(2,2′-bipyrimidine)-ruthenium(II) ion, electron adduct *22.6*
Tris(2,2′-bipyrazine)ruthenium(II) ion, electron adduct *22.18*
Tris(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct *22.12*

$C_{24}H_{19}N_{12}ORu^{2+}$
Tris(2,2′-bipyrazine)ruthenium(II) ion, OH-adduct *22.25*

$C_{24}H_{19}N_{12}Ru^{2+}$
(2,2′-Bipyrazine)(2,2′-bipyridine)(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct, protonated *22.1*
(2,2′-Bipyrazine)bis(2,2′-bipyridine)-ruthenium(II) ion, electron adduct, protonated *22.9*
(2,2′-Bipyrazine)bis(2,2′-bipyrimidine)-ruthenium(II) ion, electron adduct, protonated *22.17*
(2,2′-Bipyridine)bis(2,2′-bipyrimidine)-ruthenium(II) ion, electron adduct, protonated *22.15*
Bis(2,2′-bipyrazine)(2,2′-bipyridine)-ruthenium(II) ion, electron adduct, protonated *22.21*
Bis(2,2′-bipyrazine)(2,2′-bipyrimidine)-ruthenium(II) ion, electron adduct, protonated *22.23*
Bis(2,2′-bipyridine)(2,2′-bipyrimidine)-ruthenium(II) ion, electron adduct, protonated *22.7*
Tris(2,2′-bipyrazine)ruthenium(II) ion, electron adduct, protonated *22.19*
Tris(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct, protonated *22.13*

$C_{24}H_{22}N_{2}^{+}$ 1,1′-Dibenzyl-4,4′-bipyridinium radical cation *22.50.72*

$C_{24}H_{22}N_{2}O_{6}S_{2}$
1,1′-Bis(4-sulfonatobenzyl)-4,4′-bipyridinium zwitterion *22.3.43*

$C_{24}H_{22}N_{2}O_{6}S_{2}^{-}$
1,1′-Bis(4-sulfonatobenzyl)-4,4′-bipyridinium zwitterion, radical anion *22.50.66*

$C_{24}H_{24}CoN_{2}^{2+}$
Bis(4,4′-dimethyl-2,2′-bipyridine)cobalt(II) ion *6.12.1*

$C_{24}H_{24}CoN_{4}^{+}$ Bis(4,4′-dimethyl-2,2′-bipyridine)cobalt(I) ion *6.15*

$C_{24}H_{38}N_{2}^{+}$ 1,1′-Diheptyl-4,4′-bipyridinium radical cation *28.14.11*

$C_{25}H_{19}CuN_{4}O^{+}$
Bis(1,10-phenanthroline)(2-hydroxyethyl)-copper(II) ion *8.42*

$C_{25}H_{22}N_{6}Ru^{2+}$
Ammine(2,2′-bipyridine)(2,2′:6′,2″-terpyridine)ruthenium(II) ion *22.50.60*

$C_{25}H_{22}N_{6}Ru^{3+}$
Ammine(2,2′-bipyridine)(2,2′:6′,2″-terpyridine)ruthenium(III) ion *22.53*

$C_{25}H_{38}N_{2}^{+}$ 1-Methyl-1′-tetradecyl-4,4′-bipyridinium radical cation *22.50.78, 28.14.16*

$C_{26}H_{16}CrN_{4}O_{4}$
Bis(1,10-phenanthroline)(oxalato)-chromate(II) *7.22*

$C_{26}H_{16}CrN_{4}O_{4}^{+}$
Bis(1,10-phenanthroline)(oxalato)-chromium(III) ion *5.1.36, 28.2.38*

$C_{26}H_{20}CuN_{4}^{+}$ Bis(5-methyl-1,10-phenanthroline)copper(I) ion *8.22*

$C_{26}H_{20}N_{6}RuS_{2}^{3+}$
2,2′-Bipyridinebis[2-(2-thiazolyl)pyridine]-ruthenium(III) ion *22.64*

$C_{26}H_{23}N_{6}Ru^{2+}$
2-(Aminomethyl)pyridinebis(2,2′-bipyridine)ruthenium(III) ion, deprotonated *22.48.1, 22.49*

$C_{26}H_{24}FeN_{6}^{+}$ Dicyanobis(4,4′-dimethyl-2,2′-bipyridine)iron(III) ion *9.2.1*

$C_{26}H_{24}FeN_{6}^{-}$ Dicyanobis(4,4′-dimethyl-2,2′-bipyridine)ferrate(II), electron adduct *9.2*

$C_{26}H_{24}N_{6}Ru^{3+}$
2-(Aminomethyl)pyridinebis(2,2′-bipyridine)ruthenium(III) ion *22.48*

$C_{26}H_{42}N_{2}^{+}$ 1,1′-Dioctyl-4,4′-bipyridinium radical cation *28.14.12*

$C_{28}H_{22}N_{6}RuS^{3+}$
Bis(2,2′-bipyridine)[2-(2-thiazolyl]pyridine]ruthenium(III) ion *22.63*

$C_{28}H_{24}CuN_{4}^{+}$ Bis(2,9-dimethyl-1,10-phenanthroline)copper(I) ion *8.23*

$C_{36}H_{36}N_6Rh^{3+}$
Tris(4,4′-dimethyl-2,2′-bipyridine)-rhodium(III) ion *22.3.34*

$C_{36}H_{36}N_6Ru^{+}$ Tris(4,4′-dimethyl-2,2′-bipyridine)-ruthenium(II) ion, electron adduct *22.30*

$C_{36}H_{36}N_6Ru^{3+}$
Tris(4,4′-dimethyl-2,2′-bipyridine)-ruthenium(III) ion *8.5.12, 22.51*

$C_{36}H_{36}Ru^{3+}$ Tris(5,5′-dimethyl-2,2′-bipyridine)-ruthenium(III) ion *22.52*

$C_{36}H_{37}FeN_4O_5$
1-Hydroxyethyliron(III) protoporphyrin *9.22*
2-Hydroxyethyliron(III) protoporphyrin *9.24*

$C_{36}H_{43}FeN_4O_4$
Iron(II) deuteroporphyrin (2-propoxy)(2-propanol) *9.26.1*

$C_{36}H_{44}FeN_4O_4$
Iron(II) deuteroporphyrin (2-propanol)$_2$ *9.12, 9.42.1*

$C_{37}H_{21}Cl_3CrN_6O_2^{2+}$
Tris(5-chloro-1,10-phenanthroline)-chromium(III), carboxyl radical addn. product *7.13*

$C_{37}H_{24}CrN_6O_2^{2+}$
Tris(1,10-phenanthroline)chromium(III), carboxyl radical addn. product *7.10*

$C_{37}H_{39}FeN_4O_5$
1-Hydroxy-1-methylethyliron(III) protoporphyrin *9.23*
2-Hydroxy-1-methylethyliron(III) protoporphyrin *9.25*

$C_{37}H_{43}F_3FeN_4O_4^{+}$
Iron(III) deuteroporphyrin (2-propoxy)(2-propanol), $\cdot CF_3$ reaction product *9.44*

$C_{37}H_{44}F_3FeN_4O_4$
Trifluoromethyliron(III) deuteroporphyrin (2-propoxy)(2-propanol) *9.26*

$C_{37}H_{45}Cl_2FeN_4O_4^{+}$
Iron(III) deuteroporphyrin (2-propanol)$_2$, $\cdot CHCl_2$ radical adduct *9.43*

$C_{37}H_{47}FeN_4O_4^{+}$
Iron(III) deuteroporphyrin (2-propanol)$_2$, methyl radical adduct *9.42*

$C_{38}H_{30}N_8Ru^{+}$ Bis(2,2′-bipyridine)(dipyrido[3,2-*a*:2′,3′-*c*]phenazine)ruthenium(II) ion, electron adduct *22.28*

$C_{38}H_{31}N_8Ru^{2+}$
Bis(2,2′-bipyridine)(dipyrido[3,2-*a*:2′,3′-*c*]phenazine)ruthenium(II) ion, electron adduct, protonated *22.27*

$C_{38}H_{32}N_8Ru^{3+}$
Bis(2,2′-bipyridine)(dipyrido[3,2-*a*:2′,3′-*c*]phenazine)ruthenium(II) ion, electron adduct, diprotonated *22.26*

$C_{39}H_{30}CrN_6^{2+}$
Tris(5-methyl-1,10-phenanthroline)-chromium(II) ion *7.15*

$C_{39}H_{30}N_6Ru^{3+}$
Tris(5-methyl-1,10-phenanthroline)-ruthenium(III) ion *8.5.16, 10.3.7, 22.60*

$C_{40}H_{24}MnN_8$ 5,10,15,20-Tetrakis(4-pyridyl)porphinatomanganese(II) *13.5*

$C_{40}H_{34}Co_2N_9O_2^{3+}$
μ-Amido-μ-peroxidotetrakis(2,2′-bipyridine)dicobalt(III) ion *6.113, 22.50.17*

$C_{40}H_{36}ClN_4O_{17}Sb^{+}$
Chloro(oxo)antimony(V) uroporphyrin I radical anion *23.1*

$C_{40}H_{36}N_4O_{16}Zn^{+}$
Zinc(II) uroporphyrin radical cation *28.23*

$C_{40}H_{37}CrN_8O_8^{-}$
Tris(2,2′-bipyridine)chromium(III), EDTA radical addn. product *7.5*

$C_{41}H_{57}FeN_4O_7$
Iron(III) deuteroporphyrin dimethyl ester (2-propanol)$_2$, 1-hydroxy-1-methylethylperoxyl adduct *9.45*

$C_{42}H_{32}N_6Ru^{+}$ Bis(2,2′-bipyridine)(6,7-dihydro-5,8-dimethyldibenzo[*b*,*j*][1,10]phenanthroline)ruthenium(II) ion, electron adduct *22.29*

$C_{42}H_{36}CrN_6^{2+}$
Tris(4,7-dimethyl-1,10-phenanthroline)-chromium(II) ion *7.16*
Tris(5,6-dimethyl-1,10-phenanthroline)-chromium(II) ion *7.17*

$C_{42}H_{36}N_6Ru^{+}$ Tris(4,7-dimethyl-1,10-phenanthroline)-ruthenium(II) ion, electron adduct *22.32*

$C_{42}H_{36}N_6Ru^{3+}$
Tris(4,7-dimethyl-1,10-phenanthroline)-ruthenium(III) ion *6.39.5, 6.52.3, 6.54.4, 8.5.17, 10.3.6, 22.59*
Tris(5,6-dimethyl-1,10-phenanthroline)-ruthenium(III) ion *8.5.18, 10.3.5, 22.58*

$C_{42}H_{54}CoN_{13}O_4Ru^{3+}$
Bis(2,2′-bipyridine)ruthenium(II)(4-carboxy-4′-methyl-2,2′-bipyridine)-(prolylprolinato)pentaamminecobalt(III) ion, electron adduct *22.5*

$C_{44}H_{16}Cl_8N_4O_{12}S_4Zn^{3-}$
5,10,15,20-Tetrakis(2,6-dichloro-3-sulfonatophenyl)porphinatozincate(II) radical cation *28.22*

$C_{56}H_{60}N_8Zn^{3+}$ Tetrakis-4-(*N,N,N*-trimethylammonio)phenylporphinezinc(II) radical anion *28.4*

$C_{56}H_{60}N_8Zn^{5+}$ Tetrakis-4-(*N,N,N*-trimethylammonio)phenylporphinezinc(II) radical cation *28.21*

$C_{56}H_{62}CoN_8O_2^{2+}$ Dihydroxytetrakis[4-(*N,N,N*-trimethylammonio)phenyl]porphinecobalt(II) ion *28.4.2, 28.5.2, 28.6.2*

$C_{62}H_{89}CoN_{13}O_{14}P$ Cobal(I)amin *6.18*

$C_{62}H_{89}CoN_{13}O_{15}P$ Hydroxocob(III)alamin *6.18.2*

$C_{62}H_{90}BrCoN_{13}O_{14}P$ Bromocob(III)alamin *6.94*

$C_{64}H_{24}Co_2N_{16}O_{24}S_8^{10-}$ 3,10,17,24-Tetrasulfophthalocyanine-cobaltate(I) ion dimer *6.20*

$C_{64}H_{76}N_8Zn^{5+}$ 5,10,15,20-Tetrakis(2-*N*-hexylpyridyl)-porphinatozinc(II) radical cation *28.20*

$C_{66}H_{48}CrN_6^{2+}$ Tris(4,4′-diphenyl-2,2′-bipyridine)-chromium(II) ion *7.7*

$C_{72}H_{48}CrN_6^{2+}$ Tris(4,7-diphenyl-1,10-phenanthroline)-chromium(II) ion *7.19*

$C_{72}H_{56}MnN_{12}O_4^{4+}$ α,α,α,β-Tetrakis[2-(*N*-methylisonicotinamido)phenyl]-porphinatomanganese(II) ion *13.7*

Cd^+ Cadmium(I) ion *5.1, 5.1.1*

Cd^{2+} Cadmium(II) ion *25.1.3, 25.2.3*

$CeO_{12}S_3^{2-}$ Cerium(IV) sulfate complex *8.5.1*

Cl^- Chloride ion *8.51.1, 8.52.2, 12.4.2, 19.20.2, 19.38.1, 25.4.1*

$ClCo^{2+}$ Chlorocobalt(III) ion *6.100*

$ClCoH_{15}N_5^{2+}$ Pentaammine(chloro)cobalt(III) ion *5.1.19, 6.1.8, 15.1.19, 17.3.3, 28.2.22*

ClCu Copper(I) chloride *8.6, 22.50.43*

$ClFe^{2+}$ Chloroiron(III) ion *25.7.2*

$ClH_{15}N_5Os^{2+}$ Pentaammine(chloro)osmium(III) ion *22.3.31*

$ClH_{15}N_5Ru^+$ Pentaammine(chloro)ruthenium(II) ion *22.42*

$ClH_{15}N_5Ru^{2+}$ Pentaammine(chloro)ruthenium(III) ion *22.43.1*

ClHg Mercury(I) chloride *10.8*

$ClHgO_2$ Chloromercury(I)peroxyl *10.9*

$ClMn^{2+}$ Chloromanganese(III) ion *13.25*

ClO_3^- Chlorate ion *28.2.9*

$ClTl^+$ Chlorothallium(II) ion *25.7*

Cl_2Cu^- Copper(I) chloride complex *8.2.1, 8.4.1*

$Cl_2H_2O_2Pt^-$ Dichlorobis(hydroxy)platinate(III) ion *19.31*

$Cl_2H_6N_2Pt^-$ *cis*-Diamminedichloroplatinate(I) ion *19.2*
trans-Diamminedichloroplatinate(I) ion *19.3*

$Cl_2H_7N_2OPt$ *cis*-Diamminedichloroplatinum(II), OH reaction product *19.22*
trans-Diamminedichloroplatinum(II), OH reaction product *19.23*

$Cl_2H_8N_4Pt^+$ Tetraammineplatinum(II), $Cl_2^{\bullet-}$ reaction product *19.21*

Cl_2Hg^- Dichloromercurate(I) ion *22.50.56, 22.51.3, 22.56.2, 22.62.3*

Cl_2Mn^+ Dichloromanganese(III) ion *13.26*

Cl_2Tl Dichlorothallium(II) *25.8*

Cl_3Cu^{3-} Copper(0) chloride complex *8.1*

Cl_3Tl^- Trichlorothallate(II) ion *25.9*

Cl_4Fe^{2-} Tetrachloroferrate(II) ion *22.50.49*

Cl_4HOPt^{2-} Tetrachlorohydroxyplatinate(III) *19.30*

$Cl_4H_3O_2Pt^{2-}$ Aquatetrachlorohydroxyplatinate(III) ion *19.29*

Cl_4Pt^{3-} Tetrachloroplatinate(I) ion *19.5*

Cl_4Tl^2 Tetrachlorothallate(II) ion *25.10*

$Cl_5H_2OPt^{2-}$ Aquapentachloroplatinate(III) ion *19.28*

Cl_5Pt^{2-} Pentachloroplatinate(III) ion *19.27*

Cl_6Ir^{2-} Hexachloroiridate(IV) ion *12.5, 15.29.4*

Cl_6Pt^{3-} Hexachloroplatinate(III) ion *19.26*
Tetrachloroplatinate(II), $Cl_2^{\bullet-}$ reaction product *19.25*

Co^+ Cobalt(I) ion *6.1, 6.1.3*

Co^{2+} Cobalt(II) ion *22.3.2, 25.4.2, 28.2.10*

Co^{3+} Cobalt(III) ion *6.99, 25.4.3*

$CoFH_{15}N_5^{2+}$ Pentaammine(fluoro)cobalt(III) ion *5.1.21, 6.1.7, 15.1.21, 28.2.24*

CoH_3N^{2+} Amminecobalt(II) ion *6.26*

$CoH_6N_2^{2+}$ Bis(ammine)cobalt(II) ion *6.25*

$CoH_9N_3^{2+}$ Tris(ammine)cobalt(II) ion *6.24*

$CoH_9N_6O_6$ Trinitrotrisamminecobalt(III) *6.1.12, 17.3.6*

$CoH_{12}N_4^{2+}$ Tetraamminecobalt(II) ion *6.23*

$CoH_{15}N_5^{2+}$ Pentaamminecobalt(II) ion *6.22*

$CoH_{15}N_8^{2+}$ Pentaammine(azido)cobalt(III) ion *5.1.25, 15.1.24, 28.2.28*

9. Chemical Name Index

10. Appendix I. Spectral Properties, pK_a's and Other Data

This section contains data which are relevant to the tables of rate constants. Table 22B contains the data set for the reaction in Table 22, entry 22.50.74, where a selected value is given. Figure 1 is a graphical display of the data. Data for optical absorption and acid-base equilibria of metal transients have been collected in tables having the same number as the rate constant tables, but with the suffix A. Thus, Table 13A contains spectral data for manganese transients. References in the tables which follow are listed by RCDC serial number and may be found in Sec. 7, References to Tables.

TABLE 1A. Spectral properties and pK_a's of silver transients

	Species	λ_{max} (nm)	ε (L mol^{-1} cm^{-1})	Ref.	pK_a	Ref.	Entry No.[a]
Ag(0)	Ag^0	360	16000	93A166			1.1
	Ag_2^+	310	~14500[b]	93A166			1.2
	Ag_4^{2+}	265	30000-40000	93A166			1.2.1
	$Ag_2(NH_3)_n^+$	~340	~9000[b]	680435			1.3
	$Ag_4(NH_3)_n^{2+}$	~250	~6000[b]	680435			1.3.2
Ag(II)	Ag^{2+}	275	5400	78C006	5.35[c]	78C006	1.4
	$Ag(trimethylacetate)_n^{(2-n)+}$	~320[b]	~3700[b]	80A307			1.4.31
	$AgOH^+$	315	5500	78C006	8.35[c]	78C006	1.5
	$Ag(2\text{-aminoethanol})^{2+}$	~300[b]	~5200[b]	82A098			1.6.1
	$Ag(2\text{-aminoethanol})_2^{2+}$	~300[b]	~4300[b]	82A098			1.6.1
	Ag(α-aminoisobutyrate)(OH)	~310[b]	~7100[b]	80A307			1.6.2
	$Ag(\alpha\text{-aminoisobutyrate})_2$	~310[b]	~7800[b]	80A307			1.6.2
	$Ag(ethylene\ glycol)^{2+}$	~310[b]	~6000[b]	82A098			1.6.7
	$Ag(ethylene\ glycol)_2^{2+}$	~310[b]	~4600[b]	82A098			1.6.7
	$AgGly(OH)/AgGly(OH)_2^-$	~310[b]	~5900[b]	80A307			1.6.8
	$Ag(Gly)_2$	~315[b]	~7000[b]	80A307			1.6.8
	$Ag(OH)_2$	290	6500	78C006			1.7
	$Ag(NH_3)_4^{2+}$	265	~10500[b]	79A304			1.8
	$Ag(NH_3)_3OH^+$	290	~7900[b]	79A304			1.9
	$AgNTA^-$	~280[b]	~5700[b]	80A307			1.11
	$AgEDTA^{2-}$	~280[b]	~4100[b]	80A307			1.12
	$Ag(II)(^-O_2CCH_2CH_2CO_2^-)$	~310[b]	~3700[b]	80A307			1.13

[a]In Table 1.
[b]Evaluated from graph.
[c]Refers to $Ag(H_2O)^{2+} \rightleftarrows AgOH^+ + H^+$, etc.

TABLE 2A. Spectral properties of aluminum transients

	Species	λ_{max} (nm)	ε (L mol^{-1} cm^{-1})	Ref.	Entry No.[a]
Al(III)	$[Al(pts)]^{\cdot -}$	580	27000[b]	89R092	2.1
		635	27000[b]		

[a]In Table 2.
[b]Evaluated from graph.

TABLE 3A. Spectral properties and pK_as of gold transients

	Species	λ_{max} (nm)	ε ($L\ mol^{-1}\ cm^{-1}$)	Ref.	pK_a	Ref.	Entry No.[a]
Au(0)	$Au(CN)_2^{2-}$	410[b]	10500[b]	89A310			3.1
		410	7500	680302			
	$Au(CN)_2H^-$	430	6000	89A310	5.9	89A310	
	$Au(CN)_2H_2$	260[b]	4200[b]	89A310	5.2	89A310	3.3
		270	3200	680302			
Au(II)	$(OH)Au(CN)_2^-$	270	6300	91A018			3.4
		440[b]	2000[b]				
	$(OH)Au(CN)_2H$	270	1400	91A018	5.7	91A018	3.5
	d	270[b,c]	4700[b]	700580			3.6
	e	260[b,c]	6200[b]				
		310[b]	4000[b]				
		325	5800	680302			
	f	260[b]	7300[b]	700580			
		320[b]	4300[b]				
	g	265[b]	8800[b]				
		330[b]	5000[b]				
Au(III)	$(OH)_2Au(CN)_2H$	270	700	91A018	~6	91A018	3.5.1

[a]In Table 3.
[b]Evaluated from graph.
[c]Shoulder.
[d]Au^{II} in the absence of Cl^-.
[e]10^{-3} mol L^{-1} Cl^-.
[f]10^{-2} mol L^{-1} Cl^-.
[g]10^{-1} mol L^{-1} Cl^-.

TABLE 4A. Spectral properties of bismuth transients

	Species	λ_{max} (nm)	ε ($L\ mol^{-1}\ cm^{-1}$)	Ref.	Entry No.[a]
Bi(II)	Bi^{2+}	285	24000	88A493	4.1
Bi(IV)	$BiCH_2OH^{3+}$	420	20000	88A493	4.2
	$BiCH(CH_3)OH^{3+}$	420	9000	88A493	4.3
	$BiC(CH_3)_2OH^{3+}$	415	8000	88A493	4.4
	$BiCH_2C(CH_3)_2OH^{3+}$	410	7000	88A493	4.5
	$BiCOOH^{3+}$	400	3600	88A493	4.6

[a]In Table 4.

TABLE 5A. Spectral properties of cadmium transients

	Species	λ_{max} (nm)	ε ($L\ mol^{-1}\ cm^{-1}$)	Ref.	Entry No.[a]
Cd(0)	Cd^0	260	20000	92N098	5.1.7
Cd(I)	Cd^+	300	13940	92A182	5.1
		300	11800	88A124	
		301	14000	751153	
		~300[b]	~16500[b]	751064	
	Cd^+ 21	310	11500	93A362	5.2
	Cd^+ 22	285	10600	93A362	5.3
	Cd^+ 221	290	6000	88A124	5.4
	Cd^+ 222	240	6200	88A124	5.5
	$Cd(cyclam)^+$	340	11000	80A380	5.6
	Cd^IL^c	320-330	~8000	701228	5.7-5.10
	$CdEDTA^{3-}$	320	9700	80A072	5.7
		350	8000	690277	

[a]In Table 5.
[b]Evaluated from graph.
[c]L = en, Gly^-, NTA, EDTA.

TABLE 6A. Spectral properties and pK_a's of cobalt transients

	Species	λ_{max} (nm)	ε (L mol^{-1} cm^{-1})	Ref.	pK_a	Ref.	Entry No.[a]
Co(I)	Co^+	315	2400	761136			6.1
		315	2100	751027			
		370	2080				
	$Co(CN)_5^{4-}$	280	~8000	710097			6.2
	$CoNTA^{2-}$	360	2300	79A255			6.3
	N-meso-Co(4,11-dieneN$_4$)$^+$	635	~10200[b]	91A513			6.5
	N-meso-Co(4,11-dieneN$_4$)(CO$_2$)$^+$	470	288	91A513			6.5.3
	N-meso-Co(4,11-dieneN$_4$)(H)$^{2+}$	440	445	91A513	13.9	91A513	6.5.5
	N-rac-Co(4,11-dieneN$_4$)$^+$	630	~10600[b]	91A513			6.6
	prim-N-rac-Co(4,11-dieneN$_4$)(H)$^{2+}$	440	520	91A513	11.8[c]	91A513	6.8
					11.6[d]	91A513	
	sec-N-rac-Co(4,11-dieneN$_4$)(H)$^{2+}$	440	300	91A513	11.5[d]	91A513	
					10.3[f]	91A513	
					9.3[g]	91A513	
	prim-N-rac-Co(4,11-dieneN$_4$)(CO)$^+$	860	125	89A098			6.6.3
		400[h]	700				
	prim-N-rac-Co(4,11-dieneN$_4$)(CO$_2$)$^+$	440[i]	510	91A513			6.6.4
	sec-N-rac-Co(4,11-dieneN$_4$)(CO$_2$)$^+$	470	210	91A513			6.6.4
	$Co(bpy)_n^+$	620	5100	79A034			6.10
	$Co(bpy)^+$	670	4100	85A034			6.11
	$Co(bpy)_2^+$	570	5400	85A034			6.12
	$Co(bpy)_2(H)^{2+}$				6.9	84A112	6.12.2
	$Co(bpy)_3^+$	610	6200	85A034			6.13
	$Co(4,4'\text{-}Me_2bpy)^+$	660	4500	85A034			6.14
	$Co(4,4'\text{-}Me_2bpy)_2^+$	500	5400	85A034			6.17
	$Co(4,4'\text{-}Me_2bpy)_3^+$	610	6300	85A034			6.18
Co(II)	$Co(bpy)_3^{2+}$	300	42000	79A034			6.41
	$Co(phen)_3^{2+}$	270	56000	79A034			6.42
	$CoEDTA(O_2)^{3-}$	290	~13000	84A249			6.60
	$Co(NTA\text{-}H)^-$	<250	6400[j]	79A255			6.62
	$Co(cyclam)(O_2)^{2+}$	360	2600	90A079			6.65
	$CoCp_2$	360	1750	88A066			6.67
Co(III)	$[Co(NH_3)_5(mbpy)]^{\bullet 3+}$	380	11000	89A115			6.68
		580	6500				
	$[Co(NH_3)_5(O_2CCH_2py\text{-}4\text{-}CONH_2)]^{\bullet 2+}$	310	800	83B029			6.70
		410	400				
	$[Co(NH_3)_5(HO_2CCH_2py\text{-}4\text{-}CONH_2)]^{\bullet 3+}$	313	3200	83B029			6.71
		412	2000				
	$[Co(NH_3)_5(O_2CCH(CH_3)py\text{-}4\text{-}CONH_2)]^{\bullet 2+}$	310	>800	83B029			6.72
		400	>370				
	$[Co(NH_3)_5(HO_2CCH(CH_3)py\text{-}4\text{-}CONH_2)]^{\bullet 3+}$	320	1000	83B029			6.73
		415	500				
	$[Co(NH_3)_5(O_2C(CH_2)_3py\text{-}4\text{-}CONH_2)]^{\bullet 2+}$	315	650	83B029			6.74
		400	300				
	$[Co(NH_3)_5(HO_2C(CH_2)_3py\text{-}4\text{-}CONH_2)]^{\bullet 3+}$	320	1650	83B029			6.75
		413	1200				
	$CoEDTA(O_2)^{2-}$	260	10000	84A249			6.81
	$[Co(NH_3)_5pyOH]^{\bullet 3+}$	325	1700	79A213			6.95
		~330	~1500	76A265			
	$[Co(NH_3)_5naOH]^{\bullet 3+}$	~380	~2800	76A265			6.96
	$[Co(NH_3)_5isnOH]^{\bullet 3+}$	~330	~2000	76A265			6.97
	$CH_3CoNTA(H_2O)^-$	245	14000	88A343			6.101
		390	170				
		600	90				

TABLE 6A. Spectral properties and pK_a's of cobalt transients —Continued

Species	λ_{max} (nm)	ε (L mol^{-1} cm^{-1})	Ref.	pK_a	Ref.	Entry No.[a]
$HOCH_2CoNTA(H_2O)^-$	256	9300	88A343			6.102
	396	310				
	600	30				
$HOCH(CH_3)CoNTA(H_2O)^-$	262	9000	88A343			6.103
	410	580				
	570	40				
$O_2CCH_2CoNTA(H_2O)^{2-}$	266	7000	88A343			6.104
	380[h]	200				
	610	90				
$C_2H_5OCH(CH_3)CoNTA(H_2O)^{2-}$	275	8700	88A343			6.105
	420	790				
	580	40				
$HOC(CH_3)_2CoNTA(H_2O)^-$	263	11000	88A343			6.106
	412	530				
	550	80				
$CoNTA(Br)(H_2O)^-$	290	12000	88A343			6.107
	410[h]	200				
	580	150				
$HOCH_2CoHEDTA(H_2O)^-$	270	14000	88A343			6.108
	380	230				

[a]In Table 6.
[b]Evaluated from graph.
[c]In 0.5 mol L^{-1} phosphate.
[d]In 0.1 mol L^{-1} phosphate.
[e]At 25°C.
[f]At 45°C.
[g]At 65°C.
[h]Shoulder.
[i]Spectrum is temperature dependent, λ_{max} = 440 nm at 0°C (six-coordinated), λ_{max} = 520 nm (ε = 1100 L mol^{-1} cm^{-1}) at 60°C (five-coordinated).
[j]ε at 250 nm.

TABLE 7A. Spectral properties of chromium transients

	Species	λ_{max} (nm)	ε (L mol^{-1} cm^{-1})	Ref.	Entry No.[a]
Cr(II)	$Cr(bpy)_3^{2+}$	475	4100	87A309	7.4
		565	3700		
		465	3900	81A060	
		490	3400		
		562	4600		
	$Cr(4,4'\text{-}Me_2bpy)_3^{2+}$(pH ~1)	470	4600	81A060	7.6
		560	4500		
	$Cr(4,4'\text{-}Ph_2bpy)_3^{2+}$ [b]	485	4900	81A060	7.7
	$Cr(phen)_3^{2+}$(pH 2)	475	4200	87A309	7.9
		560	3900		
		430[c]	3600	81A060	
		700	2500		
	$Cr(5\text{-}Clphen)_3^{2+}$(pH 2)	480	3300	81A060	7.11
	$Cr(5\text{-}Brphen)_3^{2+}$(pH ~1)	485	3900	81A060	7.14
	$Cr(5\text{-}Mephen)_3^{2+}$(pH ~1)	485	3500	81A060	7.15
	$Cr(4,7\text{-}Me_2phen)_3^{2+}$ [b]	440	3700	81A060	7.16
	$Cr(5,6\text{-}Me_2phen)_3^{2+}$(pH ~1)	420[c]	4200	81A060	7.17
		480	3000		
	$Cr(5\text{-}Phphen)_3^{2+}$ [b]	480	2600	81A060	7.18
	$Cr(4,7\text{-}Ph_2phen)_3^{2+}$ [b]	430	6800	81A060	7.19
	$Cr(bpy)_2(C_2O_4)$	350	3200	87A309	7.20
		495	2400		
		580	2000		
	$Cr(bpy)(C_2O_4)_2^{2-}$	350	4300	87A309	7.21
		485	1700		
		610	1100		
	$Cr(phen)_2(C_2O_4)$	340	2900	87A309	7.22
		480	2500		
		575	1600		
	$Cr(phen)(C_2O_4)_2^{2-}$	340	3500	87A309	7.23
		470	2000		
		600	600		
Cr(III)	CrH^{2+}	380	190	741142	7.27
	CrO_2^{2+}	245	7800	751063	7.2.3
		290	3200		
		248	6900	751215	
		290	3000		
	$CrCH_2CH_2OH^{2+}$	390	380	91A477	7.29
		390	450	82A030	
	$CrCH(CH_3)CH_2OH^{2+}$	285	2100	91A477	7.30
		390	310		
	$CrCH(CH_3)CH(CH_3)OH^{2+}$	280	2600	91A477	7.31
		400	450		
	$CrCH_2C(CH_3)_2CH_2OH^{2+}$	270[c]	>2100	741146	7.32
		410	>170		
	$CrCOH(CH_3)CO_2H^{2+}$	305	1500	741146	7.34
		385	230		
	$CrCH_2C(CH_3)_2CO_2H^{2+}$	<270	>2200	741146	7.35
		410	>310		
	$CrCH_2C(CH_3)_2NH_3^{3+}$	~280[d]	~1300[d]	92A073	7.36
		~400[d]	~200[d]		

[a] In Table 7.
[b] In methanol.
[c] Not λ_{max}.
[d] Evaluated from graph.

TABLE 8A. Spectral properties and pK_a's of copper transients

	Species	λ_{max} (nm)	ε (L mol^{-1} cm^{-1})	Ref.	pK_a	Ref.	Entry No.[a]
Cu(0)	Cu^0	375	5600	84A439			8.2
Cu(I)	$Cu(Me_2pyo[14]trieneN_4)^+$	~350	~1100	86A210			8.17
	$Cu(bpy)_2^+$	430	4800	85A059			8.18
	$Cu(phen)_2^+$	430	7800	88A392			8.19
		430	5400	87G275			
		435	6900	83A299			
	$Cu(5\text{-}Clphen)_2^+$	440	6000	85A059			8.20
	$Cu(5\text{-}NO_2phen)_2^+$	450	7320	85A059			8.21
	$Cu(5\text{-}CH_3phen)_2^+$	430	5960	85A059			8.22
	$Cu(2,9\text{-}Me_2phen)_2^+$	454	7500	85A059			8.23
Cu(II)	$CuCH_3^+$	~390[b]	~2100[b]	86A115			8.28
	$CuCH(CH_2NH_3)CO_2^+$	360	1500	92A134			8.30
	$CuCH_2C(CH_3)_2OH^+$	400	1400	88A410			8.32
	$CuCH_2C(CH_3)_2NH_3^{2+}$	385	5500	92A073			8.33
	$CuCH(CH_2NH_3)_2^{3+}$	355	2100	93A473			8.34
	$CuCH(CH_2NMe_2H)_2^{3+}$	370	780	93A473			8.35
	$CuCH_2C(CH_3)_2CO_2H^+$	380	1850	90A474			8.37
	$CuCH_2C(CH_3)(NH_3)CO_2^+$	355	2100	92A215			8.38
	$CuCHCH(OH)(CH_2)_4^+$	360	880	91A152			8.39.1
	$Cu(OC_6H_4\text{-}4\text{-}O)$	425	4300	78A449			8.40
	Cu(acrylamide)$^+$	250	6200	761186			8.5.21
		315	1400				
	Cu(fumaric acid)$^+$	335	3000	751092			8.5.26
	Cu(maleic acid)$^+$	345	2800	751092			8.5.29
Cu(III)	$Cu(Me_2pyo[14]trieneN_4)(OH)^{2+}$	~350	~2300	86A210			8.44
	$Cu(OH)_2^+$	290	3500	78C006	4.0[c]	78C006	8.46
	$Cu(OH)_3$	280	7400	78C006			
	$Cu^{III}(NH_3)_n$	290	5600	710775			8.48
	$Cu^{III}(en)_n$(pH=8.0)	300	2100	710775			8.49
	$Cu^{III}(en)_n$(pH=11.3)	300	2500				
	$Cu(4,11\text{-}dieneN_4)^{3+}$	315	5500	79A080			8.52
	$Cu^{III}(Gly)_2$	310	7800	710775			8.57
	$Cu^{III}(Ala)_2$	300	5500	89G017			8.58
		305	4700	710775			
	$Cu^{III}(\beta\text{-}Ala)_2$	310	4700	710775			8.59
	$Cu^{III}(\alpha\text{-aminobutyric acid})_2$	310	3000	710775			8.60
	$Cu^{III}(\beta\text{-aminobutyric acid})_2$	310	3300	710775			8.61
	$Cu^{III}(\gamma\text{-aminobutyric acid})_2$	310	3500	710775			8.62
	$Cu^{III}(\alpha\text{-aminoisobutyric acid})_2$	310	3200	710775			8.63
	$CuOC_6H_4\text{-}2\text{-}OH^{2+}$	380	410	78A449			8.76
	$CuOC_6H_4\text{-}3\text{-}OH^{2+}$	420	4500	79A272			8.77
	$CuOC_6H_4\text{-}4\text{-}O^+$	425	870	78A449			8.78
	$CuOC_6H_3\text{-}5\text{-}Me\text{-}3\text{-}OH^{2+}$	450	3500	79A272			8.79
	cis-$[HOCH_2Cu(NTA)(H_2O)]^-$	430	200	86B151			8.84

[a]In Table 8.
[b]Evaluated from graph.
[c]For $Cu(OH)_2(H_2O)^+ \rightleftarrows Cu(OH)_3 + H^+$.

TABLE 9A. Spectral properties and pK_a's of iron transients

	Species	λ_{max} (nm)	ε (L mol^{-1} cm^{-1})	Ref.	pK_a	Ref.	Entry No.[a]
Fe(II/?)	$Fe(bpy)(CN)_4^{3-}$	~365[b]	~16000[b]	91A067			9.3
		~530[b]	~7000[b]				
		370	13000	90A171			
	$Fe(4,4'\text{-}Me_2bpy)(CN)_4^{3-}$	~375[b]	~14000[b]	90A499			9.4
		~520[b]	~6000[b]				
		370	10000	90A171			
	$Fe(CN)_5N(O)R^{3-}$ [c]	~250	~9000	79A134			9.7
		475	5000				
Fe(II)	$Fe(tim)(H_2O)_2^{2+}$	650	4400	84A403			9.9
Fe(II/?)	$Fe(bpy)_2(bpyOH)^{2+}$	350	~5000	90A015			9.13
		530	~4000				
Fe(II,III)	$FeHO_2Fe^{4+}$	450[d]	1240	730038			9.15
Fe(III)	FeH^{2+}	325	650	690434			9.16
	$FeHO_2^{2+}$	450[d]	140	730038			9.17
		430[d]	280	690434			
	Fe(III)PP(H)	550	10000	86A511			9.20
	$HOCH_2Fe(III)PP$	575	9000	85A006			9.21
		680	4800				
	$HOCH(CH_3)Fe(III)PP$	560	13000	85A006			9.22
		680	4200				
	$(CH_3)_2C(OH)Fe(III)PP$	570	11000	85A006			9.23
		660	5300				
	$HOCH_2CH_2Fe(III)PP$	560	7000	86A511			9.24
	$HOCH_2CH(CH_3)Fe(III)PP$	550	8000	86A511			9.25
	$CH_3FeNTA(H_2O)^-$	~310[b]	~8500[b]	88A426			9.28
	CO_2FeNTA^{2-}	405	620	88A184			9.29
	$CO_2FeHEDTA^{2-}$	420	950	88A184			9.30
Fe(IV)	$FeO(OH)_n^{2-n}$	240	~5500	86A018			9.46
		420	520				
	$FeO(P_2O_7)_2^{6-}$	420	1200	90A373			9.49
	$HOFe^{IV}SiW_{11}O_{39}^{5-}$	355	8600	90A253			9.50
Fe(V)	$H_2FeO_4^-$				9.5	89A354	9.51
	$HFeO_4^{2-}$	270[d]	4700	91Z208	10.1	89A354	9.52
		368	990				
	FeO_4^{3-}	270[d]	5300	91Z208			9.53
		368	990				
		390	1500	86A018			

[a] In Table 9.
[b] Evaluated from graph.
[c] R = $^{\bullet}CH_2C(CH_3)_2OH$, $^{\bullet}CH_2C(CH_3)(NH_3^+)CO_2^-$, $^{\bullet}CH_2N(CH_3)C(O)CH_3$, $^{\bullet}CH_2C(CH_3)_2NH_3^+$, $^{\bullet}CH_2C(CH_3)(OH)CO_2^-$, $^{\bullet}CH_2C(CH_3)_2CO_2^-$
[d] Not λ_{max}.

TABLE 10A. Spectral properties and pK_a's of mercury transients

	Species	λ_{max} (nm)	ε (L mol^{-1} cm^{-1})	Ref.	pK_a	Ref.	Entry No.[a]
Hg(0)	Hg^0	254	2800	751203			10.1
Hg(0,I)	Hg_2^+	285	13000	79A063			10.2
		300[b]	6700				
Hg(I)	Hg^+	250	14000[c]	731080	5.1[d]	751044	10.3
	HgOH	233	~10000[e]	751044			10.4
		260[f]	5300				
	Hg_2O [g]	215	8700[h]	751044			10.4.1
	HgBr	350	4300	761042			10.6
	HgCl	330	2300	730043			10.8
	HgCN	285	3500	761042			10.10
		285	3800	751203			
	HgI	355	≥3200	761042			10.11
	HgSCN	415	4400	761042			10.12

[a]In Table 10.
[b]λ at half-height.
[c]ε at 255 nm.
[d]For $Hg^+ + H_2O \rightleftarrows HgOH + H^+$.
[e]Evaluated from graph.
[f]Shoulder.
[g]Or $Hg_2(OH)_2$.
[h]ε at 220 nm.

TABLE 11A. Spectral properties and pK_a's of indium transients

	Species	λ_{max} (nm)	ε (L mol^{-1} cm^{-1})	Ref.	pK_a	Ref.	Entry No.[a]
In(0)	In^0	500	≥1800	89A492			11.1
In(I)	In_2^+	310	≥8000	89A492			11.1.1
		460	≥2100				
In(II)	In^{2+}	250[b]	~20000[c]	84A008	4.5[d]	84A008	11.2

[a]In Table 11.
[b]Not λ_{max}.
[c]Evaluated from graph.
[d]Refers to $In(H_2O)^{2+} \rightleftarrows InOH^+ + H^+$.

TABLE 12A. Spectral properties of iridium transients

	Species	λ_{max} (nm)	ε (L mol^{-1} cm^{-1})	Ref.	Entry No.[a]
Ir(II)	Ir(II)[b]	280	1740	731066	12.1
Ir(III/?)	$Ir(bpy)_2(C^3,N'\text{-Hbpy})^{2+}$	395	10600	85A160	12.2

[a]In Table 12.
[b]From $IrCl_6^{3-} + e_{aq}^-$.

TABLE 13A. *Spectral properties of manganese transients*

	Species	λ_{max} (nm)	ε ($L\ mol^{-1}\ cm^{-1}$)	Ref.	Entry No.[a]
Mn(II)	$Mn[NTA\text{-}H]^-$	~300[b]	~3000[b]	78A436	13.9
	$Mn[EDTA\text{-}H]^{2-}$	290	2800	78A436	13.10
		430	820		
Mn(III)	$MnOH^{2+}$	310	420	78A041	13.12
		~420[b]	~200[b]	761109	
	MnO_2^+	~420[b]	~300[b]	761109	13.13
	MnO_2^+-formate	270	3200	84A189	13.14
	Mn(III)-phosphate	~270[b]	~2800[b]	84A384	13.17
	MnO_2^+-phosphate	270	3100	84A384	13.18
	Mn(III)-pyrophosphate	260	6200	84A189	13.19
	MnO_2^+-sulfate	270	2200	84A189	13.21
	$MnEDDA(O_2)^-$	~445[b]	~360[b]	90A116	13.27
	$MnEDDA(OH)_2^-$	~440[b]	~300[b]	90A116	13.27
	$CH_3Mn(NTA)(H_2O)^-$	310	4700	88A426	13.28
Mn(IV)	$[HOMn(cyclam)Cl_2]^+$	480	260	87A488	13.33
	[HO-*meso*-$Mn(aneN_4)Cl_2]^+$	320	920	87A488	13.34
		450	190		
	[HO-*rac*-$Mn(aneN_4)Cl_2]^+$	260	1700	87A488	13.35
		450	150		

[a]In Table 13.
[b]Evaluated from graph.

TABLE 14A. Spectral properties of molybdenum transients

Species	λ_{max} (nm)	ε ($L\ mol^{-1}\ cm^{-1}$)	Ref.	Entry No.[a]
$HP_2Mo_8O_{62}^{6-}$	750	2800	82A107	14.1
$[Mo_2O_4(EDTA)]^{3-}$	~520[b]	~550[b]	85A363	14.2

[a]In Table 14.
[b]Evaluated from graph.

TABLE 15A. Spectral properties and pK_a's of nickel transients

	Species	λ_{max} (nm)	ε (L mol^{-1} cm^{-1})	Ref.	pK_a	Ref.	Entry No.[a]
Ni(I)	Ni^+	300	4800	751027			15.1
		300	6000	741037			
	$Ni(CN)_4^{3-}$	270	13300	741072			15.2
	$Ni([13]aneN_4)^+$	~380[b]	~3100[b]	85A145			15.4
	$Ni(MeNO_2[13]aneN_4)^+$	290	3800	88A391			15.5
	$Ni(cyclam)^+$	375	4500	85A032			15.6
	$Ni(Me_4[14]aneN_4)^+$	355	3150	85A032			15.7
	$Ni(aneN_4)^+$	380	5150	761039			15.8
	$Ni(Me_{10}cyclam)^+$	335	3600	85A032			15.9
	$Ni(4,11\text{-}dieneN_4)^+$	460	3900	761039			15.10
	$Ni(MeNO_2[18]aneN_6)^+$	290	640	88A391			15.14
	$Ni(MeNH_2[18]aneN_6)^+$	360	720	88A391			15.15
	NiL^+ [c]	360	540	88A391			15.16
	$NiNTA^{2-}$	300	1980	80A194			15.17
Ni(II)	$NiCH_2OH^+$	250[d]	~7000[b]	741037			15.19
	$NiCO_2$	250[d]	~500[b]	741037			15.20
	$NiCHOHCH_3^+$	~270[b]	~6500[b]	741037			15.21
	$NiCOH(CH_3)_2^+$	250[d]	~5000[b]	741037			15.22
	$NiCH(CH_3OC_2H_5^+$	~300[b]	~6500[b]	741037			15.23
	Ni(IDA-H)	~245	3000	81A023			15.27
	Ni(IDA)(IDA-H)$^{2-}$	255	5800	81A023			15.28
	$Ni(NTA\text{-}H)^-$	290	2050	80A194			15.29
		290	2050(pH 4)	78A436[e]			
		290	1600(pH 9)	78A436[e]			
Ni(III)	$Ni(NH_3)_n^{3+}$	295	1400	720460			15.31
	$Ni(en)_n^{3+}$	295	2000	720461			15.32
	$Ni(Gly)_n^{(3-n)+}$	285	2800	720461			15.33
	$Ni([13]aneN_4)^{3+}$	~520[b]	~2500[b]	86A470			15.35
	$Ni(MeNO_2[13]aneN_4)^{3+}$	520	3400	88A391			15.36
		360	~800				
		310	~2400				
	Ni(10,13-diene-H)$^{2+}$	330	6850	82A060			15.38
		600	2500				
	$Ni(trifluoro\text{-}10,13\text{-}dieneN_4\text{-}H)(H_2O)_2^{2+}$	355	4600	84A277	5.1[f]	84A277	15.40
		580	1800				
	$CH_3Ni(cyclam)(H_2O)^{2+}$	~300[b]	~2000[b]	88A444			15.41
		~530[b]	~100[b]				
	$Ni(cyclam)^{3+}$ [g]	~525[b]	~1000(pH 6)	80A350			15.42
		~280[b]	~2300[b](pH 6)				
		~300[b]	~5600[b](pH 3.1)				
	$Ni(cyclam)^{3+}$ [h]	~300[b]	~12000[b](pH 6)	85A032			
	$\beta\text{-}Ni(aneN_4)^{3+}$ [g]	~550[b]	~1200[b](pH 3.2)	81A285			15.43
		~300[b]	~2600[b](pH 3.2)				
	$Ni(aneN_4)^{3+}$	~550[b]	~1100[b]	79A249			15.44
	$Ni(aneN_4)SO_4^+$	~320[b]	~9500[b]	79A249			15.44.5
		~400[b]	~5000[b]				
	$Ni(4,11\text{-}dieneN_4)^{3+}$ [h]	~320[b]	~8500[b](pH 1)	79A038			15.45
	$Ni(4,11\text{-}dieneN_4)^{3+}$ [g]	535	1500	771151			
		~320[b]	~8500[b](pH 0.2)	79A038			
		~550[b]	~3000[b](pH 5.3)				

TABLE 15A. Spectral properties and pK_a's of nickel transients —Continued

	Species	λ_{max} (nm)	ε ($L\ mol^{-1}\ cm^{-1}$)	Ref.	pK_a	Ref.	Entry No.[a]
	$Ni(tetraeneN_4)^{3+}$	~330[b]	~6000[b]	79A038			15.50
	$Ni([16]aneN_5)^{3+}$	290	6900	83A322			15.52
	$Ni(MeNO_2[18]aneN_6)^{3+}$	545	410	88A391			15.53
		370sh	~600				
		310	~1100				
	$Ni(MeNH_2[18]aneN_6)^{3+}$	545	2900	88A391			15.54
		390sh	~1200				
		340	~1800				
	NiL^{3+} [c]	530	620	88A391			15.55
		300sh	~400				
	$Ni(Me_2pyo[14]trieneN_4)(H_2O)_2^{3+}$				4	81A144	15.60
	$Ni(Me_2pyo[14]hexaeneN_4)Br^{2+}$	265	15000	82A087			15.69
		360	4500				
	$NiEDTA^-$ [i]	~570[b]	2600	91A292			15.70
	$NiEDTA^-$ [g]	~290[b]	~1700[b]	751135			
	$NiEDTA(H_2O)^-$	~580[b]	2010	91A292			15.72
Ni(IV)	NiO_2^+	265	2700	761134	3.2[j]	761134	15.73

[a]In Table 15.
[b]Evaluated from graph.
[c]L = 3,7-Bis(2-aminoethyl)-1,3,5,7-tetraazabicyclo[3.3.1]nonane.
[d]Not λ_{max}.
[e]Species suggested to be Ni(III).
[f]pK_a for L → L-H.
[g]Obtained from $^{\bullet}OH$.
[h]Obtained from $Br_2^{\bullet-}$.
[i]Obtained from $CO_3^{\bullet-}$.
[j]For $NiO_2H^{2+} \rightleftarrows NiO_2^+ + H^+$.

TABLE 17A. Spectral properties of lead transients

	Species	λ_{max} (nm)	ε ($L\ mol^{-1}\ cm^{-1}$)	Ref.	Entry No.[a]
Pb(0)	Pb^0 [b]	300	12000	92A206	17.1
		660	970		
Pb(I)	Pb^+	320	2500	92A206	17.2
	Pb(I) [c]	275	6400	78A206	17.3
		315	11000		
Pb(III)	Pb(III) [d]	430	6500	84A446	17.7
	$Pb(OH)_2^+$	~370[e]	~2700[e]	90A095	17.8
	$Pb(OH)_4^-$	~275[e]	~9700[e]	90A095	17.9
		~350[e]	~6400[e]		

[a]In Table 17.
[b]Species could be Pb_2^{2+}.
[c]In the presence of Cl^-.
[d]In the presence of 11 mol L^{-1} HCl.
[e]Evaluated from graph.

TABLE 18A. Spectral properties of palladium transients

	Species	λ_{max} (nm)	ε ($L\ mol^{-1}\ cm^{-1}$)	Ref.	Entry No.[a]
Pd(I)	Pd^+	290	6400	94A210	18.1
	$Pd(HypO)_2^-$	260	1800	93A224	18.2
Pd(III)	Pd^{3+}	250	4700	94A210	18.1.1

[a]In Table 18.

TABLE 19A. Spectral properties and pK_a's of platinum transients

	Species	λ_{max} (nm)	ε (L mol^{-1} cm^{-1})	Ref.	pK_a	Ref.	Entry No.[a]
Pt(I)	*cis*-$Pt(NH_3)_2Cl_2^-$	<250	>1200[b]	85A090			19.2
	$PtBr_4^{3-}$	320	3000	92A259			19.4
	$PtCl_4^{3-}$	310	2900	680169			19.5
	$Pt(en)_2^+$	300	1650	751188			19.77
	Pt(dien)Cl	335	2780	751188			19.8
	cis-$Pt(Gly)_2^-$	240	~5100	771053			19.9
	trans-$Pt(Gly)_2^-$	250	~5500	771053			19.10
Pt(II/?)	$Pt(en)_2^{2+}$/H	420	220	751188			19.11
	$Pt(dien)Cl^+$/H	410	520	751188			19.12
	$Pt(Et_4dien)Cl^+$/H	290	2620	751188			19.13
	cis-$Pt(Gly)_2$/H	~250	~4100	771053			19.14
	trans-$Pt(Gly)_2$/H	260	~5800	771053			19.15
Pt(I,II)	$Pt_2(P_2O_5H_2^{2-})_4^{5-}$	~420	~13000	84A241			19.16
		~600	~1700				
Pt(III)	$Pt(NH_3)_4(H_2O)(OH)^{2+}$	270	>2900	82A074	9.8	82A074	19.18
	$Pt(NH_3)_4(H_2O)_2^{3+}$	270[c]		86A017	6.4	82A074	19.20
	$Pt(NH_3)_4(H_2O)Cl^{2+}$	270	3300	86A017			19.20.2
	$PtCl_6^{3-}$	440	2800	89A250			19.26
	$PtCl_4(H_2O)_2^-$	410	3500	87A472	3.5	87A472	19.28.1
	$PtCl_4(OH)(H_2O)^{2-}$	450	2780	89A250			19.29
		455	3500	89A203	9-10	89A203	
		450	2800	680169			
	$PtCl_4(OH)_2^{3-}$ [d]	410	3960	89A250			19.30
	$PtCl_2(OH)_2^-$ [d]	410	4400	89A203			19.31
	$PtBr_4(OH)^{2-}$	530	1420	92A259			19.32
	$PtBr_4(OH)_2^{3-}$	420	2260	92A259			19.32.1
	$PtBr_6^{3-}$	540	1650	92A259			19.33
	$PtBr_5(OH)^{3-}$	440	2350	92A259			19.33.1
	$Pt(en)_2Cl^{2+}$	260	8000	80A286			19.35
		265	7120	751188			
	$Pt(en)_2(H_2O)(OH)^{2+}$	270	~4500	80A286			19.36
	$Pt(en)_2(H_2O)_2^{3+}$	<250[c]		80A286	6.8	82A074	
	$Pt(en)(en\text{-}H))^{2+}$	340	2900	80A286			19.37
		480	1500				
Pt(II,III)	$Pt_2(P_2O_5H_2^{2-})_4^{3-}$	310	7600	86A578			19.47

[a]In Table 19.
[b]At 250 nm.
[c]ε value not given.
[d]These are probably the same species; the authors have interpreted the structure differently.

TABLE 20A. Spectral properties of rhenium transients

	Species	λ_{max} (nm)	ε (L mol^{-1} cm^{-1})	Ref.	Entry No.[a]
Re(VI)	ReO_4^{2-}	290	1700	85A234	20.1

[a]In Table 20.

TABLE 21A. Spectral properties of rhodium transients

	Species	λ_{max} (nm)	ε (L mol^{-1} cm^{-1})	Ref.	Entry No.[a]
Rh(I)	$Rh(bpy)_2^+$	510	10000	81A134	21.11.2
Rh(I,II)	$Rh_2(1,3\text{-diisocyanopropane})_4^{3+}$	438	34500	79A167	21.4
		705	2000		
Rh(II)	$Rh(bpy)_2^{2+}$	~300[b]	~23000[b]	83A046	21.10
		~350[b]	~3500[b]		
	$[Rh(bpy)_2]_2^{4+}$	350[c]	~8000[b]	83A046	21.10.1
	$Rh(bpy)_3^{2+}$	~300[b]	~30000[b]	83A046	21.11
		~350[b]	~5000[b]		

[a]In Table 21.
[b]Evaluated from graph.
[c]Not λ_{max}.

TABLE 22A. Spectral properties and pK_a's of ruthenium transients

	Species	λ_{max} (nm)	ε (L mol^{-1} cm^{-1})	Ref.	pK_a	Ref.	Entry No.[a]
Ru(I)	$Ru(NH_3)_5N_2^+$	310	700	710234			22.1
Ru(II/?)	$Ru(bpy)_2(CN)_2^-$	~350[b]	~12500[b]	84A177			22.2
		~590[b]	~5500[b]				
	$Ru(bpy)_3^+$	350	18300	91A198			22.3
		490	13900				
		490	14000	767412			
		510	12000	720381			
	$Ru(bpy)_2(bpm)^+$	340	21500	91A198			22.6
		460	13400				
		480[d]	12700				
	$Ru(bpy)_2(bpmH)^{2+}$	330	18800	91A198	7.7	91A198	22.7
		420	12100				
		440[d]	11700				
	$Ru(bpy)_2(bpz)^+$	470	11000	91A198			22.8
	$Ru(bpy)_2(bpzH)^{2+}$	450	12100	91A198	9.2	91A198	22.9
		530	3700				
	$Ru(bpy)(bpm)(bpz)^+$	350[d]	15900	91A198			22.10
		470[d]	8200				
	$Ru(bpy)(bpm)(bpzH)^{2+}$	410	10000	91A198	8.8	91A198	22.11
		480[d]	6400				
	$Ru(bpm)_3^+$	330	19000	91A198			22.12
		450	11500				
		480	11100				
	$Ru(bpm)_2(bpmH)^{2+}$	330	18600	91A198	6.3	91A198	22.13
		370[d]	12200				
		430	9200				
	$Ru(bpm)_2(bpy)^+$	340	21200	91A198			22.14
		440	13300				
		480[d]	10600				
	$Ru(bpm)(bpmH)(bpy)^{2+}$	340	21200	91A198	6.9	91A198	22.15
		390	13000				
	$Ru(bpm)_2(bpz)^+$	360	18400	91A198			22.16
		460	8900				
		490[d]	8700				
	$Ru(bpm)_2(bpzH)^{2+}$	330[d]	17900	91A198	7.7	91A198	22.17
		450[d]	7900				
		500[d]	5200				
	$Ru(bpz)_3^+$	460	12700	91A198			22.18
	$Ru(bpz)_2(bpzH)^{2+}$	440	11800	91A198	7.1	91A198	22.19
		470[d]	10500				
	$Ru(bpz)_2(bpy)^+$	370	16100	91A198			22.20
		490	9200				
	$Ru(bpz)(bpzH)(bpy)^{2+}$	400	9100	91A198	8.0	91A198	22.21
		460	8300				
		500	7500				
	$Ru(bpz)_2(bpm)^+$	360	18100	91A198			22.22
		460	10100				
		490	10000				
	$Ru(bpz)(bpzH)(bpm)^{2+}$	450	9500	91A198	7.2	91A198	22.23
		480[d]	7800				
	$Ru(bpy)_3\text{-}OH^{2+}$	750	1800	86A034			22.24
	$Ru(bpz)_3\text{-}OH^{2+}$	~440[b]	~10600	88A091			22.25
		~550	~3400				
		~750	~900				

TABLE 22A. Spectral properties and pK_a's of ruthenium transients —Continued

	Species	λ_{max} (nm)	ε (L mol^{-1} cm^{-1})	Ref.	pK_a	Ref.	Entry No.[a]
	$Ru(NH_3)_5NO^{2+}$	280	3700	78A110			22.37
		350	750				
	$Ru(NH_3)_5N(O)CH_2C(CH_3)_2OH^{2+}$	343	4500	751077			22.37
		740	22				
	$Ru(NH_3)_5N(O)R^{2+e}$	342	4500	79A134			
		740	22				
Ru(I,II)	$[(NH_3)_5RuN_2Ru(NH_3)_5]^{3+}$	500	1460	82A135			22.38
Ru(II,II/?)	$[(NH_3)_5RuN_2Ru(NH_3)_5]$-$OH^{4+}$	220[c]	~15000	82A135			22.39
		235[c]	~13500				
		250[c]	~29000				
		260[c]	~15000				
		435	1870				
Ru(II,III)	$[(NH_3)_5RuN_2Ru(NH_3)_5]^{5+}$	250	28000	82A135			22.40
Ru(III)	$Ru(NH_3)_5N_2^{3+}$	430	2250	710234			22.45
Ru(III/?)	$(NH_3)_5Ru(C_4O_4$-OH)	~460	~400	88A030			22.70

[a]In Table 22.
[b]Evaluated from graph.
[c]Not λ_{max}.
[d]Shoulder.
[e]R = $^{\bullet}CH_2C(CH_3)_2OH$, $^{\bullet}CH_2C(CH_3)(NH_3^+)CO_2^-$, $^{\bullet}CH_2N(CH_3)C(O)CH_3$, $^{\bullet}CH_2C(CH_3)_2NH_3^+$, $^{\bullet}CH_2C(CH_3)(OH)CO_2^-$, $^{\bullet}CH_2C(CH_3)_2CO_2^-$.

TABLE 22B. Values of the bimolecular rate constant for the reaction
$Ru(bpy)_3^{3+} + MV^{\bullet+} \rightarrow Ru(bpy)_3^{2+} + MV^{2+}$
in aqueous solution

$k^{a,b}$	pH	I^c	$k_N^{a,d}$	t(°C)	ε^e	Ref.
4.0e9	5.5	0.1	4.0e9		13600	91A143
3.8e9		0.015[f]	3.8e9		13700	91N125
2.6e9		0.0017	2.6e9	23	13700	90A389
2.6e9		0.0032	2.6e9	23	13700	90A389
2.7e9		0.0062	2.7e9	23	13700	90A389
2.8e9		0.012	2.8e9	23	13700	90A389
4.2e9		0.15	4.2e9	23	13700	90A389
4.8e9		0.30	4.8e9	23	13700	90A389
5.5e9		0.57	5.5e9	23	13700	90A389
5.5e9		1.0	5.5e9	23	13700	90A389
1.1e10[h]		2.4	1.1e10	23	13700	90A389
5.0e9		0.3[f]	5.0e9		13600	89E329
2.8e9		0.02	3.4e9	20	11300	88A025
3.4e9		0.08	4.1e9	20	11300	88A025
4.2e9		0.16	5.2e9	20	11300	88A025
4.8e9		0.35	5.8e9	20	11300	88A025
5.3e9		0.80	6.4e9	20	11300	88A025
5.6e9[h]		1.60	6.8e9	20	11300	88A025
4.3e9	7	0.4	4.9e9		12000	85F435
1.4e10[h]	0.3	1.5[g]	1.8e10		11000	82A111
7.1e9[h]		1.5	8.9e9		11000	82A111
6.6e9[h]		3.0	8.3e9		11000	82A111
9.8e9[h]	4.7	3.1	12.3e9		11000	82A111
2.0e9	6.9	0.04	2.4e9		11300	81A042
4.4e9	7-9	0.5	5.5e9	25	11000	81N003
2.4e9		0.03[f]	2.9e9		11300	78A351

[a]All values obtained from flash photolysis experiments.
[b]L mol^{-1} s^{-1}.
[c]mol L^{-1}.
[d]Normalized assuming $\varepsilon(MV^{\bullet+}) = 13700$ L mol^{-1} cm^{-1} [82B053].
[e]$MV^{\bullet+}$ at ~600 nm, L mol^{-1} cm^{-1}.
[f]Calculated from data given by authors.
[g]Value of I probably incorrect, 0.5 mol L^{-1} H_2SO_4.
[h]These values do not appear in Figure 1.

TABLE 24A. Spectral properties of tin transients

	Species	λ_{max} (nm)	ε (L mol^{-1} cm^{-1})	Ref.	Entry No.[a]
Sn(III)	Sn(III)	280	5300	86A208	24.1

[a]In Table 24.

TABLE 25A. Spectral properties and pK_a's of thallium transients

	Species	λ_{max} (nm)	ε (L mol^{-1} cm^{-1})	Ref.	pK_a	Ref.	Entry No.[a]
Tl(0)	Tl^0	420	2840	89C001			25.1
	Tl_2^+	420	11700	89C001			25.2
Tl(II)	Tl^{2+}	270[b]	~3800[c]	741017	4.78[d]	84C015	25.4
	$TlOH^+$	360	3160	84C015			25.5
		360	3000	761192	7.7[d]	761192	
	$Tl(OH)_2$	370	3800	761192			25.6
	$TlCl^+$	263	~7700[c]	741038			25.7
		342	~4300[c]				
	$TlCl_2$	280	~6400[c]	741038			25.8
		342	~7000[c]				
	$TlCl_3^-$	304	~10300[c]	741038			25.9
		362	~9400[c]				

[a]In Table 25.
[b]Not λ_{max}.
[c]Evaluated from graph.
[d]Refers to $Tl(H_2O)^{2+} \rightleftarrows Tl(OH)^+ + H^+$ and $Tl(OH)(H_2O)^+ \rightleftarrows Tl(OH)_2 + H^+$.

TABLE 27A. Spectral properties of tungsten transients

Species	λ_{max} (nm)	ε (L mol^{-1} cm^{-1})	Ref.	Entry No.[a]
$H_2W_{12}O_{40}^{7-}$	680	2100	90A069	27.1

[a]In Table 27.

TABLE 28A. Spectral properties of zinc transients

	Species	λ_{max} (nm)	ε (L mol^{-1} cm^{-1})	Ref.	Entry No.[a]
Zn(I)	Zn^+	305	12,800	92A182	28.2
		310	13,000	771011	
	$Zn(cyclam)^+$	330	7800	80A380	28.3
Zn(II)	$[ZnTZP]^{\bullet -}$	438	210000	83C026	28.7
	$[ZnNTA\text{-}H]^{\bullet -}$ [b]	280	2400(pH 4)	78A436	28.10
		290	5200(pH 9)	78A436	
	$[ZnEDTA\text{-}H]^{2-}$ [c]	290	2650(pH 4.5)	78A436	28.11
		290	5200(pH 9)	78A436	
	$[Zn(3\text{-}TMpyP)]^{\bullet 5+}$	700	31000	85A430	28.13
				84A264	
	$[ZnTMpyP]^{\bullet 5+}$	700	9000	82N168	28.14
		700	7000	81S157	
	$[ZnTPPS]^{\bullet 3-}$	460	8500	81C041	28.15
		600	3100		
	$[ZnTZP]^{\bullet +}$	560	15000	83C026	28.18
		605	5000		

[a]In Table 28.
[b]Also represented in Table 28 as A or B.
[c]Also represented in Table 28 as C or D.

11. Appendix II. List of Metal Transients

Table 1. Silver

1.1 Silver atom
1.2 Silver(I) ion, complex with Ag(0)
1.3 Amminesilver(0)-silver(I) complex
1.4 5,10,15,20-Tetrakis(4-sulfonatophenyl)-porphinatoargentate(I) ion
1.5 Silver(II) ion
1.6 Hydroxysilver(II) ion
1.7 Mono- and dihydroxysilver(II)
1.8 Dihydroxysilver(II)
1.9 Tetraamminesilver(II) ion
1.10 Diammine(hydroxy)silver(II)
1.11 Triammine(hydroxy)silver(II) ion
1.12 Nitrilotriacetatoargentate(II)
1.13 Ethylenediaminetetraacetatoargentate(II)
1.14 Silver(II)-succinate complex

Table 2. Aluminum

2.1 Aluminum(III) sulfophthalocyanine, radical anion

Table 3. Gold

3.1 Dicyanoaurate(0) ion
3.2 Hydrogen dicyanoaurate(0) ion
3.3 Dihydrogen dicyanoaurate(0)
3.4 Dicyanohydroxyaurate(II) ion
3.5 Dicyano(hydroxy)aurate(II) ion, protonated
3.6 Gold(II)

Table 4. Bismuth

4.1 Bismuth(II) ion
4.2 Hydroxymethylbismuth(IV) ion
4.3 1-Hydroxyethylbismuth(IV) ion
4.4 1-Hydroxy-1-methylethylbismuth(IV) ion
4.5 2-Hydroxy-2-dimethylethylbismuth(IV) ion
4.6 Carboxybismuth(IV) ion

Table 5. Cadmium

5.1 Cadmium(I) ions
5.2 1,4,10-Trioxa-7,13-diazacyclopentadecane-cadmium(I) ion
5.3 1,4,10,13-Tetraoxa-7,16-diazacyclotadecane-cadmium(I) ion
5.4 4,7,13,16,21-Pentaoxa-1,10-diazabicyclo[8.8.5]tricosanecadmium(I) ion
5.5 4,7,13,16,21,24-Hexaoxa-1,10-diazabicyclo[8.8.8]-hexacosanecadmium(I) ion
5.6 1,4,8,11-Tetrazacyclotetradecanecadmium(I) ion
5.7 Ethylenediaminetetraacetatocadmate(I) ion
5.8 Ethylenediaminecadmium(I) ion
5.9 Glycinatocadmium(I) ion
5.10 Nitrilotriacetatocadmium(I) ion
5.11 1-Hydroxyethylcadmium(II) ion
5.12 1-Hydroxy-1-methylethylcadmium(II) ion
5.13 5,10,15,20-Tetrakis(4-sulfonatophenyl)-porphinatocadmate(II) radical anion

Table 6. Cobalt

6.1 Cobalt(I) ion
6.2 Pentakis(cyano-*C*)cobaltate(I) ion
6.3 Nitrilotriacetatocobaltate(I) ion
6.4 2,3,9,10-Tetramethyl-1,4,8,11-tetraaza-cyclotetradeca-1,3,8,10-tetraenecobalt(I) ion
6.5 *N-meso*-5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecobalt(I) ion
6.6 *N-rac*-5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecobalt(I) ion
6.7 5,7,7,12,12,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,14-dienecobalt(I) ion
6.8 2,2′-Bipyridinecobalt(I) ion
6.9 2,2′-Bipyridinecobalt(I) ion
6.10 Bis(2,2′-bipyridine)cobalt(I) ion
6.11 Tris(2,2′-bipyridine)cobalt(I) ion
6.12 4,4′-Dimethyl-2,2′-bipyridinecobalt(I) ion
6.13 4,4′-Dimethyl-2,2′-bipyridinecobalt(I) ions
6.14 4,4′-Dimethyl-2,2′-bipyridinecobalt(I) ion, protonated
6.15 Bis(4,4′-dimethyl-2,2′-bipyridine)cobalt(I) ion
6.16 Tris(4,4′-dimethyl-2,2′-bispyridine)cobalt(I) ion
6.17 5,10,15,20-Tetrakis(4-sulfonatophenyl)-porphinatocobaltate(I) ion
6.18 Cobal(I)amin
6.19 3,10,17,24-Tetrasulfophthalocyaninecobaltate(I) ion
6.20 3,10,17,24-Tetrasulfophthalocyaninecobaltate(I) ion dimer
6.21 *N*-Methyltetrakis(4-sulfonatophenyl)--porphinatocobaltate(II) radical anion
6.22 Pentaamminecobalt(II) ion
6.23 Tetraamminecobalt(II) ion
6.24 Tris(ammine)cobalt(II) ion
6.25 Bis(ammine)cobalt(II) ion
6.26 Amminecobalt(II) ion
6.27 Tris(ethylenediamine)cobalt(II) ion
6.28 Bis(ethylenediamine)cobalt(II) ion
6.29 Ethylenediaminecobalt(II) ion
6.30 Bis(diethylenetriamine)cobalt(II) ion
6.31 Diethylenetriaminecobalt(II) ion
6.32 Triethylenetetraminecobalt(II) ion
6.33 Hydroxytriethylenetetraminecobalt(II) ion
6.34 Nitrito(triethylenetetramine)cobalt(II) ion
6.35 Tetraethyldiethylenetriaminecobalt(II) ion
6.36 Tris(acetylacetonato)cobaltate(II) ion
6.36 Tris(acetylacetonato)cobaltate(II) ion
6.37 Bis(acetylacetonato)cobalt(II)
6.38 Acetylacetonatocobalt(II) ion
6.39 Tris(2,2′-bipyridine)cobalt(II) ion
6.40 Tris(1,10-phenanthroline)cobalt(II) ion
6.41 3,10,17,24-Tetrasulfophthalocyaninecobaltate(II) ion
6.42 Chloro(pentacyano)cobaltate(II) ion
6.43 Pentacyanocobaltate(II) ion
6.44 Tetracyanocobaltate(II) ion
6.45 Tris(glycinato)cobaltate(II) ion
6.46 Bis(glycinato)cobalt(II)
6.47 Glycinatocobalt(II) ion
6.48 Ethylenediaminetetraacetatocobaltate(II) ion
6.49 1,4,8,11-Tetraazacyclotetradecanecobalt(II) ion

6.50 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanecobalt(II) ion
6.51 1,8-Diamino-3,6,10,13,16,19-hexaazabicyclo[6.6.6]eicosanecobalt(II) ion, conjugate diacid
6.52 1,8-Diamino-3,6,10,13,16,19-hexaazabicyclo[6.6.6]eicosanecobalt(II) ion
6.53 8-Methyl-1,3,13,16-tetraaza-6,10,19-trithiabicyclo[6.6.6]eicosanecobalt(II) ion
6.54 1,3,6,8,10,13,16,19-Octaazabicyclo[6.6.6]-eicosanecobalt(II) ion
6.55 2,3,9,10-Tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraenecobalt(II) ion
6.56 2,3,9,10-Tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraenecobalt(II) ion, superoxide adduct
6.57 Iminodiacetatocobaltate(II) ion, superoxide adduct
6.58 Ethylenediaminetetraacetatocobaltate(II) ion, superoxide adduct
6.59 Iminodiacetatocobalt(II), H-abstraction product
6.60 Nitrilotriacetatocobaltate(II) ion, H-abstraction product
6.61 Ethylenediaminetetraacetatocobaltate(II) ion, H-abstraction product
6.62 3,10,17,24-Tetrasulfophthalocyaninecobaltate(II) ion, superoxide adduct
6.63 1,4,8,11-Tetraazacyclotetradecanecobalt(II) ion, dioxygen adduct
6.64 5,10,15,10-Tetrakis(1-methylpyridyl)porphinato-(thiocyanato)cobalt(II) ion
6.65 Cobaltocene
6.66 Pentaammine(1-methyl-4,4′-bipyridinium)cobalt(III) ion, electron adduct
6.67 Pentaammine(4-nitrobenzoato)cobalt(III) ion, electron adduct
6.68 Pentaammine[4-(aminocarbonyl)-1-(carboxymethyl)pyridinio]cobalt(III) radical anion
6.69 Pentaammine[4-(aminocarbonyl)-1-(carboxymethyl)pyridinio]cobalt(III) radical, protonated
6.70 Pentaammine[4-(aminocarbonyl)-1-(1-carboxyethyl)pyridinio]cobalt(III) radical anion
6.71 Pentaammine[4-(aminocarbonyl)-1-(1-carboxyethyl)pyridinio]cobalt(III) radical, protonated
6.72 Pentaammine[4-(aminocarbonyl)-1-(1-carboxypropyl)pyridinio]cobalt(III) radical anion
6.73 Pentaammine[4-(aminocarbonyl)-1-(1-carboxypropyl)pyridinio]cobalt(III) radical, protonated
6.74 3,10,17,24-Tetrasulfophthalocyaninecobaltate(III) radical anion (reduced ligand)
6.75 3,10,17,24-Tetrasulfophthalocyaninecobaltate(III) radical anion (oxidized ligand)
6.76 Dibromo(iminodiacetato)cobaltate(III) ion
6.77 Bromo(iminodiacetato)cobalt(III)
6.78 Hydroxy(iminodiacetato)cobalt(III)
6.79 Ethylenediaminetetraacetatocobaltate(III) ion, superoxide adduct
6.80 Hydrido-*N-rac*-5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecobalt(III) ion
6.81 Hydrido-*prim-N-rac*-5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecobalt(III) ion
6.82 Hydroxymethyl(5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)cobalt(III) ion
6.83 1-Hydroxyethyl(5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)cobalt(III) ion
6.84 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene(2,2,2-trifluoro-1-hydroxyethyl)cobalt(III) ion
6.85 1,2-Dihydroxyethyl(5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)cobalt(III) ion
6.86 1-Methylethyltetrakis(4-sulfonatophenyl)-porphinatocobaltate(III) ion
6.87 Hydroxymethyltetrakis(4-sulfonatophenyl)-porphinatocobaltate(III) ion
6.88 1-Hydroxy-1-methylethyltetrakis(4-sulfonatophenyl)porphinatocobaltate(III) ion
6.89 (Methyl)-3,10,17,24-tetrasulfophthalocyaninecobaltate(III) ion
6.90 (2-Hydroxy-2,2-dimethylethyl)-3,10,17,24-tetrasulfophthalocyaninecobaltate(III) ion
6.91 (2-Hydroxy-1-methylpropyl)-3,10,17,24-tetrasulfophthalocyaninecobaltate(III) ion
6.92 (2-Hydroxyethyl)-3,10,17,24-tetrasulfophthalocyaninecobaltate(III) ion
6.93 (2-Hydroxy-1-methylethyl)-3,10,17,24-tetrasulfophthalocyaninecobaltate(III) ion
6.94 Bromocob(III)alamin
6.95 Pentaammine(pyridine)cobalt(III) ion, OH adduct
6.96 Pentaammine(nicotinamide)cobalt(III) ion, OH adduct
6.97 Pentaammine(isonicotinamide)cobalt(III) ion, OH adduct
6.98 Tris(2,2′-bipyridine)cobalt(III) ion, OH adduct
6.99 Cobalt(III) ion
6.100 Chlorocobalt(III) ion
6.101 Aqua(methyl)nitrilotriacetatocobaltate(III) ion
6.102 Aqua(hydroxymethyl)nitrilotriacetatocobaltate(III) ion
6.103 Aqua(1-hydroxyethyl)nitrilotriacetatocobaltate(III) ion
6.104 Aqua(carboxymethyl)nitrilotriacetatocobaltate(III) ion
6.105 Aqua(1-ethoxyethyl)nitrilotriacetatocobaltate(III) ion
6.106 Aqua(1-hydroxy-1-methylethyl)nitrilotriacetatocobaltate(III) ion
6.107 Aqua(bromo)nitrilotriacetatocobaltate(III) ion
6.108 Aqua(hydroxymethyl)[*N*-(2-hydroxyethyl)-*N*,*N*′,*N*′-ethylenediaminetriacetato]cobaltate(III) ion
6.109 *O*-Sulfito(tetraethylenepentamine)cobalt(III) ion
6.110 Decaammine-μ-peroxidodicobalt(III) ion
6.111 μ-Amido-μ-peroxidooctakisamminedicobalt(III) ion
6.112 μ-Amido-μ-peroxidotetrakis(ethylenediamine)-dicobalt(III) ion
6.113 μ-Amido-μ-peroxidotetrakis(2,2′-bipyridine)-

dicobalt(III) ion
6.114 μ-Amido-μ-peroxidotetrakis(1,10-phenanthroline)-dicobalt(III) ion
6.115 5,10,15,20-Tetrakis(4-sulfonatophenyl)-porphinatocobaltate(III), radical cation

Table 7. Chromium

7.1 Chromium(I) ion
7.2 Chromium(II) ion
7.3 *trans*-Diaqua-1,4,8,11-tetraazacyclotetradecane-chromium(II) ion
7.4 Tris(2,2′-bipyridine)chromium(II) ion
7.5 Tris(2,2′-bipyridine)chromium(III), EDTA radical addn. product
7.6 Tris(4,4′-dimethyl-2,2′-bipyridine)chromium(II) ion
7.7 Tris(4,4′-diphenyl-2,2′-bipyridine)chromium(II) ion
7.8 Tris(1,10-phenanthroline)chromium(II) ion
7.9 Tris(1,10-phenanthroline)chromium(III), EDTA radical addn. product
7.10 Tris(1,10-phenanthroline)chromium(III), carboxyl radical addn. product
7.11 Tris(5-chloro-1,10-phenanthroline)chromium(II) ion
7.12 Tris(5-chloro-1,10-phenanthroline)chromium(III), EDTA radical addn. product
7.13 Tris(5-chloro-1,10-phenanthroline)chromium(III), carboxyl radical addn. product
7.14 Tris(5-bromo-1,10-phenanthroline)chromium(II) ion
7.15 Tris(5-methyl-1,10-phenanthroline)chromium(II) ion
7.16 Tris(4,7-dimethyl-1,10-phenanthroline)chromium(II) ion
7.17 Tris(5,6-dimethyl-1,10-phenanthroline)chromium(II) ion
7.18 Tris(5-phenyl-1,10-phenanthroline)chromium(II) ion
7.19 Tris(4,7-diphenyl-1,10-phenanthroline)chromium(II) ion
7.20 Bis(2,2′-bipyridine(oxalato)chromate(II)
7.21 2,2′-Bipyridinebis(oxalato)chromate(II) ion
7.22 Bis(1,10-phenanthroline)(oxalato)chromate(II)
7.23 Bis(oxalato)phenanthrolinechromate(II) ion
7.24 Tris(acetylacetonato)chromate(II) ion
7.25 Bis(acetylacetonato)chromate(II)
7.26 Acetonylacetonatochromium(II) ion
7.27 Hydridochromium(III) ion
7.27a Hydroxymethylchromium(III) ion
7.28 Dihydroxymethylchromium(III) ion
7.28a 1-Hydroxyethylchromium(III) ion
7.29 2-Hydroxyethylchromium(III) ion
7.29a 1-Hydroxy-1-methylethylchromium(III) ion
7.30 2-Hydroxy-1-methylethylchromium(III) ion
7.31 2-Hydroxy-1,2-dimethylethylchromium(III) ion
7.32 2-Hydroxy-2,2-dimethylethylchromium(III) ion
7.33 2-Ethoxyethylchromium(III) ion
7.34 1-Carboxy-1-hydroxyethylchromium(III) ion
7.35 2-Carboxy-2,2-dimethylethylchromium(III) ion
7.36 2-Ammonio-2,2-dimethylethylchromium(III) ion
7.37 *cis*-Diammine(aqua)(1,4,8,11-tetraazacyclotetradecane)chromium(III) ion
7.38 *trans*-Dihydroxy-1,4,8,11-tetraazacyclotetradecane-chromium(III), OH reaction product
7.39 Chromate(V)
7.40 Chromate(V) ion

Table 8. Copper

8.1 Copper(0) chloride complex
8.2 Copper atom
8.3 Copper(I) chloride complex with copper(0)
8.4 Copper(I) ion complex with copper(0)
8.5 Copper(I) ion
8.6 Copper(I) chloride
8.7 Tetraformatocuprate(I) ion
8.8 Tetraacetatocuprate(I) ion
8.9 Ethylenediaminetetraacetatocuprate(I) ion
8.10 Bis(alaninato)cuprate(I)
8.11 Bleomycin-copper(I) complex
8.12 3,6,10,13,16,19-Hexaazabicyclo[6.6.6]eicosane-copper(I) ion
8.13 1,4,8,11-Tetraazacyclotetradecanecopper(I) ion
8.14 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecane-copper(I) ion
8.15 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecopper(I) ion
8.16 2,3,9,10-Tetramethyl-1,4,8,11-tetraazacyclo-tetradeca-1,3,8,10-tetraenecopper(I) ion
8.17 α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]-heptadeca-1(17),2,11,13,15-pentaenecopper(I) ion
8.18 Bis(2,2′-bipyridine)copper(I) ion
8.19 Bis(1,10-phenanthroline)copper(I) ion
8.20 Bis(5-chloro-1,10-phenanthroline)copper(I) ion
8.21 Bis(5-nitro-1,10-phenanthroline)copper(I) ion
8.22 Bis(5-methyl-1,10-phenanthroline)copper(I) ion
8.23 Bis(2,9-dimethyl-1,10-phenanthroline)copper(I) ion
8.24 5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)-porphinatocopper(II), radical anion
8.25 5,10,15,20-Tetrakis(4-sulfonatophenyl)-porphinatocuprate(II), radical anion
8.26 Tetrakis-4-(*N*,*N*,*N*-trimethylammonio)-phenylporphinecopper(II), radical anion
8.27 Hydridocopper(II) ion
8.28 Methylcopper(II) ion
8.29 Carboxylatocopper(II)
8.30 2-Ammonio-1-carboxyethylcopper(II) ion
8.31 2-Ammonioethylcopper(II) ion
8.32 2-Hydroxy-2,2-dimethylethylcopper(II) ion
8.33 2-Ammonio-2,2-dimethylethylcopper(II) ion
8.34 1,3-Diammonio-2-propylcopper(II) ion
8.35 2-(Dimethylammonio)-1-(dimethylammoniomethyl)ethylcopper(II) ion
8.36 2-(Dimethylammonio)ethylcopper(II) ion
8.37 2-Carboxy-2,2-dimethylethylcopper(II) ion
8.38 2-Ammonio-2-carboxypropylcopper(II) ion
8.39 Copper(II) ion, complex with cyclohexene
8.40 4-Hydroxyphenoxycopper(II) ion, conjugate base
8.41 (1-Hydroxybutyl)ethylenediamine-tetraacetatocuprate(II) ion
8.42 Bis(1,10-phenanthroline)(2-hydroxyethyl)copper(II) ion
8.43 Bis(1,10-phenanthroline)(2-hydroxy-2,2-dimethylethyl)copper(II) ion

8.43a Aminomethyl(glycinato)copper(II)
8.44 α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]-heptadeca-1(17),2,11,13,15-pentaenecopper(II) ion OH-adduct
8.45 Copper(III)
8.46 Dihydroxycopper(III) ion
8.47 Trihydroxycopper(III)
8.48 Amminecopper(III) complex
8.49 Ethylenediaminecopper(III) complex
8.50 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecane-copper(III) ion
8.51 Chloro-5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecopper(III) ion
8.52 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienecopper(III) ion
8.53 1,4,8,11-Tetraazacyclotetradecane(hydrido)copper(III) ion
8.54 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraaza-cyclotetradecane(hydrido)copper(III) ion
8.55 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraaza-cyclotetradeca-4,11-diene(hydrido)copper(III) ion
8.56 2,2,4,11,11,13-Hexamethyl-1,5,10,14-tetraaza-cyclooctadeca-4,13-diene(hydrido)copper(III) ion
8.57 Bis(glycine)copper(III) complex
8.58 Bis(alanine)copper(III) complex
8.59 Bis(β-alanine)copper(III) complex
8.60 Bis(α-aminobutyric acid)copper(III) complex
8.61 Bis(β-aminobutyric acid)copper(III) complex
8.62 Bis(γ-aminobutyric acid)copper(III) complex
8.63 Bis(α-aminoisobutyric acid)copper(III) complex
8.64 Hydroperoxocopper(III) ion
8.65 Methylcopper(III) ion
8.66 Trichloromethylcopper(III) ion
8.67 2-Hydroxyethylcopper(III) ion
8.68 Carboxymethylcopper(III) ion
8.69 1-Carboxyethylcopper(III) ion
8.70 2-Hydroxy-2,2-dimethylethylcopper(III) ion
8.71 1,2-Dicarboxy-2-hydroxyethylcopper(III) ion
8.72 2-Carboxy-2,2-dimethylethylcopper(III) ion
8.73 2-Ammonio-2-carboxypropylcopper(III) ion
8.74 Benzylcopper(III) ion
8.75 (4-Chlorophenyl)methylcopper(III) ion
8.76 2-Hydroxyphenoxycopper(III) ion
8.77 3-Hydroxyphenoxycopper(III) ion
8.78 4-Hydroxyphenoxycopper(III) ion, conjugate base
8.79 3-Hydroxy-5-methylphenoxycopper(III) ion
8.80 (4-Methoxyphenyl)methylcopper(III) ion
8.81 (4-Methylphenyl)methylcopper(III) ion
8.82 Bis(glycinato)methylcopper(III) ion
8.83 β-Alaninato(2-aminoethyl)copper(III)
8.84 *cis*-Aqua(hydroxymethyl)(nitrilotriacetato)-cuprate(III) ion
8.85 *cis*-Aqua(1-hydroxyethyl)(nitrilotriacetato)-cuprate(III) ion
8.86 *cis*-Aqua(1-hydroxy-1-methylethyl)(nitrilo-triacetato)cuprate(III) ion

Table 9. Iron

9.1 Bis(2,2′-bipyridine)dicyanoferrate(II), electron adduct
9.2 Dicyanobis(4,4′-dimethyl-2,2′-bipyridine)ferrate(II), electron adduct
9.3 2,2′-Bipyridinetetracyanoferrate(II) ion, electron adduct
9.4 Tetracyano(4,4′-dimethyl-2,2′-bipyridine)ferrate(II) ion, electron adduct
9.5 Iron(II) oxalate
9.6 Pentacyanoferrate(II) ion
9.7 Pentacyanonitrosylferrate(II) ion
9.8 Acetonitrile(aqua)-2,3,9,10-tetramethyl-1,4,8,11-tetraazacyclotetradeca-1,3,8,10-tetraeneiron(II) ion
9.9 Diaqua(2,3,9,10-tetramethyl-1,4,8,11-tetraaza-cyclotetradeca-1,3,8,10-tetraeneiron(II) ion
9.10 5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)porphinatoiron(II) ion
9.11 α,α,α,β-Tetrakis(*N*-methylisonicotinamidophenyl)-porphinatoiron(II) ion
9.12 Iron(II) deuteroporphyrin (2-propanol)$_2$
9.13 Tris(2,2′-bipyridine)iron(II) ion, OH-adduct
9.14 Bis(2,2′-bipyridine)dicyanoferrate(II), OH reaction product
9.15 Hydroperoxide-iron(III) iron(II) complex
9.16 Hydridoiron(III) ion
9.17 Hydroperoxide-iron(III) complex
9.18 Hydroperoxide-sulfatoiron(III) complex
9.19 Hydroperoxide-sulfatoiron(III) iron(II) complex
9.20 Hydridoiron(III) protoporphyrin
9.21 Hydroxymethyliron(III) protoporphyrin
9.22 1-Hydroxyethyliron(III) protoporphyrin
9.23 1-Hydroxy-1-methylethyliron(III) protoporphyrin
9.24 2-Hydroxyethyliron(III) protoporphyrin
9.25 2-Hydroxy-1-methylethyliron(III) protoporphyrin
9.26 Trifluoromethyliron(III) deuteroporphyrin (2-propoxy)(2-propanol)
9.27 Tris(1,10-phenanthroline)iron(III) ion
9.28 Aqua(methyl)nitrilotriacetatoferrate(III) ion
9.29 Carboxylato(nitrilotriacetato)ferrate(III) ion
9.30 Carboxylato(2-hydroxyethylethylenediamine-triacetato)ferrate(III) ion
9.31 Diethylenetriaminepentaacetatoferrate(III), DTPA radical adduct
9.32 Tetracyano(2,2′-bipyridine)ferrate(III) ion
9.33 Sulfatoiron(III) ion
9.34 Ferricyanide ion
9.35 Carboxyferricenium
9.36 1,1′-Dicarboxyferricenium
9.37 Hydroxymethylferricenium
9.38 (Dimethylaminomethyl)ferricenium
9.39 Tris(2,2′-bipyridine)iron(III) ion, OH-adduct
9.40 Tris(2,2′-bipyridine)iron(III) ion, H-adduct
9.41 5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)porphineiron(III)-superoxide complex
9.42 Methyliron(IV) deuteroporphyrin (2-propanol)$_2$
9.43 Iron(III) deuteroporphyrin (2-propanol)$_2$, $^{\bullet}CHCl_2$ radical adduct
9.44 Iron(III) deuteroporphyrin (2-propoxy)(2-propanol), $^{\bullet}CF_3$ reaction product

9.45 Iron(III) deuteroporphyrin dimethyl ester (2-propanol)$_2$, 1-hydroxy-1-methylethylperoxyl adduct
9.46 Ferrate(IV) ion
9.47 5,10,15,20-Tetrakis(4-sulfonatophenyl)-porphinatoferrate(III) radical cation
9.48 Carbonatoiron(IV)
9.49 Iron(IV) pyrophosphate
9.50 Iron(IV) (hydroxo)undecatungstosilicate ion
9.51 Dihydrogenferrate(V) ion
9.52 Hydrogenferrate(V) ion
9.53 Ferrate(V) ion

Table 10. Mercury

10.1 Mercury atom
10.2 Mercury(I) ion, complex with mercury(0)
10.3 Mercury(I) ion
10.4 Mercury(I) hydroxide
10.5 Mercury(I)
10.6 Mercury(I) bromide
10.7 Bromomercury(I)peroxyl
10.8 Mercury(I) chloride
10.9 Chloromercury(I)peroxyl
10.10 Mercury(I) cyanide
10.11 Mercury(I) iodide
10.12 Mercury(I) thiocyanate
10.13 Thiocyanatomercury(I)peroxyl

Table 11. Indium

11.1 Indium atoms
11.2 Indium(II) ion
11.3 Tetrakis(4-*N*-methylpyridyl)porphineindium(III) radical anion
11.4 5,10,15,20-Tetrakis(4-sulfonatophenyl)-porphinatoindate(III) radical cation

Table 12. Iridium

12.1 Hexachloroiridate(III) ion, electron adduct
12.2 Bis(2,2′-bipyridine)([2,2′-bipyridin]-3-yl-*C*,*N*′)-iridium(III) ion, conjugate acid, electron adduct
12.3 Bis(2,2′-bipyridine)([2,2′-bipyridin]-3-yl-*C*,*N*′)-iridium(III) ion, electron adduct
12.4 Bis(2,2′-bipyridine)([2,2′-bipyridin]-3-yl-*C*,*N*′)-iridium(IV) ion, conjugate monoacid
12.5 Hexachloroiridate(IV) ion

Table 13. Manganese

13.1 5,10,15,20-Tetrakis(4-sulfonatophenyl)-porphinatomanganate(II) radical anion
13.2 5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)-porphinatomanganese(II) radical anion
13.3 5,10,15,20-Tetrakis(4-sulfonatophenyl)-porphinatomanganate(II) ion
13.4 5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)-porphinatomanganese(II) ion
13.5 5,10,15,20-Tetrakis(4-pyridyl)-porphinatomanganese(II)
13.6 5,10,15,20-Tetrakis[4-(*N*,*N*,*N*-trimethyl-ammonio)phenyl]porphinatomanganese(II) ion
13.7 α,α,α,β-Tetrakis[2-(*N*-methylisonicotinamido)-phenyl]porphinatomanganese(II) ion
13.8 5,10,15,20-Tetrakis(4-carboxyphenyl)-porphinatomanganate(II) ion
13.9 Nitrilotriacetatomanganate(II) ion, H-abstraction product
13.10 Ethylenediaminetetraacetatomanganate(II) ion, H-abstraction product
13.11 Manganese(III) ion
13.12 Hydroxymanganese(III) ion
13.13 Peroxidomanganese(III) ion
13.14 Peroxidomanganese(III) formate
13.15 Hydroperoxidomanganese(III) formate complex
13.16 Peroxidomanganese(III)-manganese(II) formate complex
13.17 Manganese(III) phosphate complex
13.18 Peroxidomanganese(III) phosphate complex
13.19 Manganese(III) pyrophosphate complex
13.20 Manganese(III) sulfate complex
13.21 Peroxidomanganese(III) sulfate complex
13.22 Hydroperoxidomanganese(III) sulfate complex
13.23 Peroxidomanganese(III)-manganese(II) sulfate complex
13.24 Dibromomanganese(III) ion
13.25 Chloromanganese(III) ion
13.26 Dichloromanganese(III) ion
13.27 Peroxido(ethylenediaminediacetato)manganate(III) ion
13.28 Aqua(methyl)nitrilotriacetatomanganate(III) ion
13.29 Bromo[5,10,15,20-tetrakis(4-sulfonatophenyl)-porphinatomanganate(III) ion
13.30 2-Hydroxy-2,2-dimethylethyltetrakis(4-sulfonatophenyl)porphinatomanganate(III) ion
13.31 Bromo[5,10,15,20-tetrakis(1-methylpyridinium-4-yl)porphinatomanganate(III) ion
13.32 2-Hydroxy-2,2-dimethylethyl[5,10,15,20-tetrakis(1-methylpyridinium-4-yl)porphinatomanganate(III) ion
13.33 Dichlorohydroxy(1,4,7,11-tetraazacyclotetradecane)manganese(IV) ion
13.34 Dichloro-*meso*-5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradecane(hydroxy)-manganese(IV) ion
13.35 Dichloro-*rac*-5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradecane(hydroxy)-manganese(IV) ion
13.36 Manganese(V)

Table 14. Molybdenum

14.1 18-Molybdodiphosphate ion(7-), conjugate acid
14.2 Bis(μ-oxo)(ethylenediaminetetraacetato)-bis[oxomolybdate(IV)(V)] ion
14.3 Bis(μ-oxo)bis[aqua(oxalato)oxomolybdate(IV)(V) ion
14.4 Octacyanomolybdate(V) ion
14.5 *cis*-Octaaqua-μ-oxo-bis(oxo)dimolybdenum(IV) ion
14.6 Hexaaquadi-μ-oxodioxodimolybdenum(V,VI) ion

Table 15. Nickel

15.1 Nickel(I) ion
15.2 Tetracyanonickelate(I) ion
15.3 Tris(cyano)nickelate(I) ion
15.4 1,4,7,10-Tetraazacyclotridecanenickel(I) ion
15.5 9-Methyl-9-nitro-1,4,7,11-tetraazacyclotridecanenickel(II) ion, electron adduct
15.6 1,4,8,11-Tetraazacyclotetradecanenickel(I) ion
15.7 1,4,8,11-Tetramethyl-1,4,8,11-tetraazacyclotetradecane-nickel(I) ion
15.8 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecane-nickel(I) ion
15.9 1,4,5,7,7,8,11,12,14,14-Decamethyl-1,4,8,11-tetraazacyclotetradecane-nickel(I) ion
15.10 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienenickel(I) ion
15.11 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-1,4,8,11-tetraenenickel(I) ion
15.12 α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]-heptadeca-1(17),13,15-trienenickel(I) ion
15.13 α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]-heptadeca-1(17),2,11,13,15-pentaenenickel(I) ion
15.14 8-Methyl-8-nitro-1,3,6,10,13,15-hexaazatricyclo[13.1.1.1^{13,15}]octadecanenickel(II) ion, electron adduct
15.15 8-Amino-8-methyl-1,3,6,10,13,15-hexaazatricyclo[13.1.1.1^{13,15}]octadecanenickel(I) ion
15.16 3,7-Bis(2-aminoethyl)-1,3,5,7-tetraazabicyclo[3.3.1]nonanenickel(I) ion
15.17 Nitrilotriacetatonickelate(I) ion
15.18 *N*-Methyl-5,10,15,20-tetrakis(4-sulfonatophenyl)-porphinatonickelate(II), radical anion
15.19 Hydroxymethylnickel(II) ion
15.20 Carboxylatonickel(II)
15.21 1-Hydroxyethylnickel(II) ion
15.22 1-Hydroxy-1-methylethylnickel(II) ion
15.23 1-Ethoxyethylnickel(II) ion
15.24 Cyclopentylnickel(II) ion
15.25 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanenickel(II) ion, OH reaction product
15.26 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienenickel(II) ion, OH reaction product
15.27 Iminodiacetatonickelate(II), H-abstraction product
15.28 Bis(iminodiacetato)nickelate(II), H-abstraction product
15.29 Nitrilotriacetatonickelate(II), H-abstraction product
15.30 Ethylenediaminetetraacetatonickelate(II), H-abstraction product
15.31 Ammminenickel(III) ions
15.32 Ethylenediaminenickel(III) ions
15.33 Glycinatonickel(III) ion
15.34 Bis(1,4,7-triazacyclononane)nickel(III) ion
15.35 1,4,7,10-Tetraazacyclotridecanenickel(III) ion
15.36 9-Methyl-9-nitro-1,4,7,11-tetraazacyclotridecanenickel(III) ion
15.37 11,13-Dimethyl-1,4,7,10-tetraazacyclotrideca-10,13-dienenickel(III) ion
15.38 11,13-Dimethyl-1,4,7,10-tetraazacyclotrideca-10,13-dienenickel(III) ion, conjugate base
15.39 Aquabromo-11-methyl-13-(trifluoromethyl)-1,4,7,10-tetraazacyclotrideca-10,13-dienenickel(III) ion
15.40 Diaqua-11-methyl-13-(trifluoromethyl)-1,4,7,10-tetraazacyclotrideca-10,13-dienenickel(III) ion, conjugate base
15.41 Aquamethyl(1,4,8,11-tetraazacyclotetradecane)-nickel(III) ion
15.42 1,4,8,11-Tetraazacyclotetradecanenickel(III) ion
15.43 β-*rac*-(5,7,7,12,12,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecane)nickel(III) ion
15.44 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanenickel(III) ion
15.45 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradecanedi(phosphato)nickel(III) ion
15.46 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-dienenickel(III) ion
15.47 5,7,7,12,14,14-Hexamethyl-1,4,7,11-tetraazacyclotetradeca-4,11-diene(hydroxo)nickel(III) ion
15.48 Bromo(5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)nickel(III) ion
15.49 Dichloro(5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene)nickel(III) ion
15.50 5,7,7,12,14,14-Hexamethyl-1,4,8,11-tetraazacyclotetradeca-1,4,8,11-tetraenenickel(III) ion
15.51 1,4,8,12-Tetraazacyclopentadecanenickel(III) ion
15.52 1,4,7,10,13-Pentaazacyclohexadecanenickel(III) ion
15.53 8-Methyl-8-nitro-1,3,6,10,13,15-hexaazatricyclo[13.1.1.1^{13,15}]octadecanenickel(III) ion
15.54 8-Amino-8-methyl-1,3,6,10,13,15-hexaazatricyclo[13.1.1.1^{13,15}]octadecanenickel(III) ion
15.55 3,7-Bis(2-aminoethyl)-1,3,5,7-tetraazabicyclo[3.3.1]nonanenickel(III) ion
15.56 Diaqua-α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),13,15-trienenickel(III) ion
15.57 Hydroxy-α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),13,15-trienenickel(III) ion
15.58 Aquabromo-α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),13,15-trienenickel(III) ion
15.59 Aqua-α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),13,15-triene(thiocyanato)nickel(III) ion
15.60 α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,11,13,15-pentaene(hydroxo)nickel(III) ion
15.61 α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,11,13,15-pentaenebis(hydroxo)nickel(III) ion
15.62 Aquabromo-α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,11,13,15-pentaenenickel(III) ion
15.63 Aqua-α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,11,13,15-pentaene(thiocyanato)nickel(III) ion

15.64 α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,11,13,15-pentaenebis(thiocyanato)nickel(III) ion
15.65 Aquabromo-α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,6,11,13,15-hexaenenickel(III) ion
15.66 Dibromo-α,2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,6,11,13,15-hexaenenickel(III) ion
15.67 Aqua-α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,6,11,13,15-hexaene(thiocyanato)nickel(III) ion
15.68 α-2,12-Dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,6,11,13,15-hexaenebis(thiocyanato)nickel(III) ion
15.69 Bromo-α-2,12-dimethyl-3,7,11,17-tetraazabicyclo[11.3.1]heptadeca-1(17),2,6,11,13,15-hexaenenickel(III) ion
15.70 Ethylenediaminetetraacetatonickelate(III) ion
15.71 Hydroxy(ethylenediaminetetraacetato)nickelate(III) ion
15.72 Aqua(ethylenediaminetetraacetato)nickelate(III) ion
15.73 Dioxonickel(IV) ion
15.74 Dioxonickel(IV) ion, protonated

Table 16. Osmium

16.1 Tris(2,2′-bipyridine)osmium(III) ion
16.2 Tris(5,5′-dimethyl-2,2′-bipyridine)osmium(III) ion
16.3 Tris(1,10-phenanthroline)osmium(III) ion
16.4 Tris(5-chloro-1,10-phenanthroline)osmium(III) ion

Table 17. Lead

17.1 Lead atom
17.2 Lead(I) ion
17.3 Lead(I)
17.4 Tetrakis(1-methylpyridinium-4-yl)porphinatolead(II) radical cation
17.5 Tetrakis(1-methylpyridinium-3-yl)porphinatolead(II) radical cation
17.6 5,10,15,20-Tetrakis(4-sulfonatophenyl)-porphinatoplumbate(II) radical cation
17.7 Lead(III)
17.8 Dihydroxylead(III) ion
17.9 Tetrahydroxyplumbate(III) ion
17.10 Hydroxy(oxo)lead(IV) ion

Table 18. Palladium

18.1 Palladium(I) ion
18.2 Bis(hydroxyprolinato)palladate(I) ion
18.3 5,10,15,20-Tetrakis(4-sulfonatophenyl)-porphinatopalladate(II) radical anion

Table 19. Platinum

19.1 Triammineaquaplatinum(I) ion
19.2 *cis*-Diamminedichloroplatinate(I) ion
19.3 *trans*-Diamminedichloroplatinate(I) ion
19.4 Tetrabromoplatinate(I) ion
19.5 Tetrachloroplatinate(I) ion
19.6 Tetracyanoplatinate(I) ion
19.7 Bis(ethylenediamine)platinum(I) ion
19.8 Chloro(diethylenetriamine)platinum(I)
19.9 *cis*-Bis(glycinato)platinate(I) ion
19.10 *trans*-Bis(glycinato)platinate(I) ion
19.11 Bis(ethylenediamine)platinum(II), H reaction product
19.12 Chloro(diethylenetriamine)platinum(II), H reaction product
19.13 Chloro(tetraethyldiethylenetriamine)platinum(II), H reaction product
19.14 *cis*-Bis(glycinato)platinum(II), H reaction product
19.15 *trans*-Bis(glycinato)platinum(II), H reaction product
19.16 Octahydrogen tetrakis(μ-diphosphito)diplatinate(I)(II) ion
19.17 Tetraamminehydridoplatinum(III) ion
19.18 Tetraammine(aqua)hydroxyplatinum(III) ion
19.19 Tetraamminebis(hydroxy)platinum(III) ion
19.20 Tetraamminebis(aqua)platinum(III) ion
19.21 Tetraammineplatinum(II), $Cl_2^{\bullet-}$ reaction product
19.22 *cis*-Diamminedichloroplatinum(II), OH reaction product
19.23 *trans*-Diamminedichloroplatinum(II), OH reaction product
19.24 *cis*-Dichlorobis(isopropylamine)-*trans*-dihydroxyplatinate(III) ion
19.25 Tetrachloroplatinate(II), $Cl_2^{\bullet-}$ reaction product
19.26 Hexachloroplatinate(III) ion
19.27 Pentachloroplatinate(III) ion
19.28 Aquapentachloroplatinate(III) ion
19.29 Aquatetrachlorohydroxyplatinate(III) ion
19.30 Tetrachlorohydroxyplatinate(III)
19.31 Dichlorobis(hydroxy)platinate(III) ion
19.32 Tetrabromo(hydroxy)platinate(III) ion
19.33 Hexabromoplatinate(III) ion
19.34 Bis(ethylenediamine)platinum(II), $Cl_2^{\bullet-}$ reaction product
19.35 Chlorobis(ethylenediamine)platinum(III) ion
19.36 Aquabis(ethylenediamine)hydroxyplatinum(III) ion
19.37 Bis(ethylenediamine)platinum(III) ion, deprotonated
19.38 Diaquabis(ethylenediamine)platinum(III) ion
19.39 Chloro(diethylenetriamine)platinum(II), $Cl_2^{\bullet-}$ reaction product
19.40 Chloro(diethylenetriamine)platinum(II), OH reaction product
19.41 Diethylenetriamine(pyridine)platinum(II) ion OH-adduct
19.42 Chloro(tetraethyldiethylenetriamine)platinum(II), $Cl_2^{\bullet-}$ reaction product
19.43 Chloro(tetraethyldiethylenetriamine)platinum(II), OH reaction product
19.44 1,8-Diamino-3,6,10,13,16,19-hexaazabicyclo[6.6.6]eicosaneplatinum(III) ion
19.45 *cis*-Bis(glycinato)platinum(II), OH reaction product
19.46 *trans*-Bis(glycinato)platinum(II), OH reaction product
19.47 Octahydrogen tetrakis(μ-diphosphito)diplatinate(II)(III) ion
19.48 *cis*-[Dichlorobis(1-(2-hydroxyethyl)-2-methyl-5-

nitroimidazole-N^3)]platinum(III) ion

19.49 *cis*-Dichlorobis(isopropylamine)-*trans*-dihydroxyplatinum(IV), OH reaction product

Table 20. Rhenium

20.1 Rhenate(VI) ion

Table 21. Rhodium

21.1 Chlorotris[3-(diphenylphosphino)-benzenesulfonato]rhodate(0) ion

21.2 η^5-Pentamethylcyclopentadienyl(2,2′-bipyridine)rhodium(I) ion

21.3 Tris(2,2′-bipyridine)rhodium(I) ion

21.4 Tetrakis[μ-(1,3-diisocyanopropane)]dirhodium(I)(II) ion

21.5 η^5-Pentamethylcyclopentadienyl(2,2′-bipyridine)(hydroxy)rhodium(II) ion

21.6 η^5-Pentamethylcyclopentadienyl(2,2′-bipyridine)(iodo)rhodium(II) ion

21.7 Aquatriamminerhodium(II) ion

21.8 Tetraamminerhodium(II) ion

21.9 1,3,6,8,10,13,16,19-Octaazabicyclo[6.6.6]-eicosanerhodium(II) ion

21.10 Bis(2,2′-bipyridine)rhodium(II) ion

21.11 Tris(2,2′-bipyridine)rhodium(II) ion

21.12 η^5-Pentamethylcyclopentadienyl(2,2′-bipyridine)hydridorhodium(III) ion

21.13 Tetraammine(superoxido)rhodium(III) ion

Table 22. Ruthenium

22.1 Pentaammine(dinitrogen)ruthenium(I) ion

22.2 Bis(2,2′-bipyridine)bis(cyano)ruthenate(II) ion, electron adduct

22.3 Tris(2,2′-bipyridine)ruthenium(II) ion, electron adduct

22.4 Bis(2,2′-bipyridine)(4-carboxy-4′-methyl-2,2′-bipyridine)ruthenium(II) ion, electron adduct

22.5 Bis(2,2′-bipyridine)ruthenium(II)(4-carboxy-4′-methyl-2,2′-bipyridine)(prolylprolinato)-pentaamminecobalt(III), electron adduct

22.6 Bis(2,2′-bipyridine)(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct

22.7 Bis(2,2′-bipyridine)(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct, protonated

22.8 (2,2′-Bipyrazine)bis(2,2′-bipyridine)ruthenium(II) ion, electron adduct

22.9 (2,2′-Bipyrazine)bis(2,2′-bipyridine)ruthenium(II) ion, electron adduct, protonated

22.10 (2,2′-Bipyrazine)(2,2′-bipyridine)(2,2′-bipyrimidine) ruthenium(II) ion, electron adduct

22.11 (2,2′-Bipyrazine)(2,2′-bipyridine)(2,2′-bipyrimidine) ruthenium(II) ion, electron adduct, protonated

22.12 Tris(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct

22.13 Tris(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct, protonated

22.14 (2,2′-Bipyridine)bis(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct

22.15 (2,2′-Bipyridine)bis(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct, protonated

22.16 (2,2′-Bipyrazine)bis(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct

22.17 (2,2′-Bipyrazine)bis(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct, protonated

22.18 Tris(2,2′-bipyrazine)ruthenium(II) ion, electron adduct

22.19 Tris(2,2′-bipyrazine)ruthenium(II) ion, electron adduct, protonated

22.20 Bis(2,2′-bipyrazine)(2,2′-bipyridine)ruthenium(II) ion, electron adduct

22.21 Bis(2,2′-bipyrazine)(2,2′-bipyridine)ruthenium(II) ion, electron adduct, protonated

22.22 Bis(2,2′-bipyrazine)(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct

22.23 Bis(2,2′-bipyrazine)(2,2′-bipyrimidine)ruthenium(II) ion, electron adduct, protonated

22.24 Tris(2,2′-bipyridine)ruthenium(II) ion, OH-adduct

22.25 Tris(2,2′-bipyrazine)ruthenium(II) ion, OH-adduct

22.26 Bis(2,2′-bipyridine)(dipyrido[3,2-*a*:2′,3′-*c*]phenazine)ruthenium(II) ion, electron adduct, diprotonated

22.27 Bis(2,2′-bipyridine)(dipyrido[3,2-*a*:2′,3′-*c*]phenazine)ruthenium(II) ion, electron adduct, protonated

22.28 Bis(2,2′-bipyridine)(dipyrido[3,2-*a*:2′,3′-*c*]phenazine)ruthenium(II) ion, electron adduct

22.29 Bis(2,2′-bipyridine)(6,7-dihydro-5,8-dimethyldibenzo[*b*,*j*][1,10]phenanthroline) ruthenium(II) ion, electron adduct

22.30 Tris(4,4′-dimethyl-2,2′-bipyridine)ruthenium(II) ion, electron adduct

22.31 Tris(1,10-phenanthroline)ruthenium(II) ion, electron adduct

22.32 Tris(4,7-dimethyl-1,10-phenanthroline)ruthenium(II) ion, electron adduct

22.33 Tris(5-chloro-1,10-phenanthroline)ruthenium(II) ion, electron adduct

22.34 Tris(1,4,5,8-tetraazaphenanthrene)ruthenium(II) ion, electron adduct, protonated

22.35 Tris(1,4,5,8-tetraazaphenanthrene)ruthenium(II) ion, electron adduct

22.36 *trans*-Tetraammine(aqua)nitrosylruthenium(II) ion

22.37 Pentaamminenitrosylruthenium(II) ion

22.38 Decaammine(dinitrogen)diruthenium(I-II) ion

22.39 Decaammine(dinitrogen)diruthenium(II) ion, OH-adduct

22.40 Decaammine(dinitrogen)diruthenium(II-III) ion

22.41 Tris(acetylacetonato)ruthenate(II) ion

22.42 Pentaammine(chloro)ruthenium(II) ion

22.43 Pentaammine(aquo)ruthenium(II) ion

22.44 Tris(2,2′-bipyridine)ruthenium(II) ion, H-adduct

22.45 Pentaammine(dinitrogen)ruthenium(III) ion

22.46 Hexacyanoruthenate(III) ion

22.47 Bis(2,2′-bipyridine)bis(cyano)ruthenium(III) ion

22.48 2-(Aminomethyl)pyridinebis(2,2′-bipyridine) ruthenium(III) ion

22.49 2-(Aminomethyl)pyridinebis(2,2′-bipyridine) ruthenium(III) ion, deprotonated

22.50 Tris(2,2′-bipyridine)ruthenium(III) ion
22.51 Tris(4,4′-dimethyl-2,2′-bipyridine)ruthenium(III) ion
22.52 Tris(5,5′-dimethyl-2,2′-bipyridine)ruthenium(III) ion
22.53 Ammine(2,2′-bipyridine)(2,2′:6′,2″-terpyridine)ruthenium(III) ion
22.54 Tris(4-triethylphosphonio-2,2′-bipyridine)ruthenium(III) ion
22.55 Tris(1,10-phenanthroline)ruthenium(III) ion
22.56 Tris(5-bromo-1,10-phenanthroline)ruthenium(III) ion
22.57 Tris(5-chloro-1,10-phenanthroline)ruthenium(III) ion
22.58 Tris(5,6-dimethyl-1,10-phenanthroline) ruthenium(III) ion
22.59 Tris(4,7-dimethyl-1,10-phenanthroline) ruthenium(III) ion
22.60 Tris(5-methyl-1,10-phenanthroline) ruthenium(III) ion
22.61 Tris(5-phenyl-1,10-phenanthroline) ruthenium(III) ion
22.62 Tris(3,4,7,8-tetramethyl-1,10-phenanthroline) ruthenium(III) ion
22.63 Bis(2,2′-bipyridine)[2-(2-thiazolyl]pyridine]ruthenium(III) ion
22.64 2,2′-Bipyridinebis[2-(2-thiazolyl)pyridine] ruthenium(III) ion
22.65 Tris[2-(2-thiazolyl)pyridine]ruthenium(III) ion
22.66 Tris(2,2′-bithiazole)ruthenium(III) ion
22.67 Tris[2-(1,2,4-thiadiazol-5-yl)pyridine]ruthenium(III) ion
22.68 Hexaammineruthenium(III) ion, OH reaction product
22.69 Pentaammine(chloro)ruthenium(III) ion, OH reaction product
22.70 Pentaammine(acetylenedicarboxylato)ruthenium(III), OH-adduct

Table 23. Antimony

23.1 3,8,13,18-Tetrakis(carboxymethyl)porphine-2,7,12,17-tetrapropanoato(chloro)-oxoantimony(V) radical anion

Table 24. Tin

24.1 Tin(III)
24.2 Dichloro[5,10,15,20-tetrakis(4-sulfonatophenyl)-porphinatostannate(IV) radical anion
24.3 5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)-porphinatotin(IV) radical anion

Table 25. Thallium

25.1 Thallium(0)
25.2 Thallium(I) ion, complex with Tl(0)
25.3 Thallium(0), complex with thallium(I) ion, dimer
25.4 Thallium(II) ion
25.5 Hydroxythallium(II) ion
25.6 Dihydroxythallium(II)
25.7 Chlorothallium(II) ion
25.8 Dichlorothallium(II)
25.9 Trichlorothallate(II) ion
25.10 Tetrachlorothallate(II) ion
25.11 Thallium(II) ions

Table 26. Vanadium

26.1 Vanadyl(III) ion

Table 27. Tungsten

27.1 12-Tungstate ion(7−), dihydrogen

Table 28. Zinc

28.1 Zinc(I)
28.2 Zinc(I) ion
28.3 1,4,8,11-Tetrazacyclotetradecanezinc(I) ion
28.4 Tetrakis-4-(*N*,*N*,*N*-trimethylammonio)phenyl-porphinezinc(II) radical anion
28.5 5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)-porphinezinc(II) radical anion
28.6 5,10,15,20-Tetrakis(4-sulfonatophenyl)-porphinatozincate(II) radical anion
28.7 5,10,15,20-Tetrakis[1-(3-sulfonatopropyl)-pyridinium-4-yl]porphinato-zinc(II) radical anion
28.8 Tetrakis-*N*-methyl-2,3-pyridinoporphyrazinezinc(II) radical anion
28.9 Trisulfophthalocyaninezincate(II) radical anion
28.10 Nitrilotriacetatozinc(II), H-abstraction product
28.11 Ethylenediaminetetraacetatozinc(II), H-abstraction product
28.12 5,10,15,20-Tetrakis(1-methylpyridinium-3-yl)-porphinatozinc(II), H-adduct
28.13 5,10,15,20-Tetrakis(1-methylpyridinium-3-yl)-porphinatozinc(II) radical cation
28.14 5,10,15,20-Tetrakis(1-methylpyridinium-4-yl)-porphinatozinc(II) radical cation
28.15 5,10,15,20-Tetrakis(4-sulfonatophenyl)-porphinatozincate(II) radical cation
28.16 Hydroxy(tetrakis(2-hydroxyphenyl)porphinato)-zinc(II) radical cation, deprotonated
28.17 Hydroxy(tetrakis(3-hydroxyphenyl)porphinato)-zinc(II) radical cation, deprotonated
28.18 5,10,15,20-Tetrakis[1-(3-sulfonatopropyl)-pyridinium-4-yl]porphinatozinc(II) radical cation
28.19 5,10,15,20-Tetrakis[1-(3-sulfonatopropyl)-pyridinium-2-yl]porphinatozinc(II) radical cation
28.20 5,10,15,20-Tetrakis(2-*N*-hexylpyridyl)-porphinatozinc(II) radical cation
28.21 Tetrakis-4-(*N*,*N*,*N*-trimethylammonio)-phenylporphinezinc(II) radical cation
28.22 5,10,15,20-Tetrakis(2,6-dichloro-3-sulfonato-phenyl)porphinatozincate(II) radical cation
28.23 Zinc(II) uroporphyrin radical cation
28.24 Zinc(II) hematoporphyrin radical anion