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Best Practice Recommendations For Assessing Educational Requirements For Forensic DNA Analysts DRAFT



DRAFT Document

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1 Scope

This document provides guidance for DNA technical leaders in identifying the key elements that satisfy the biochemistry, molecular biology, genetics, statics and population genetics coursework.

2 Normative References

The following referenced documents are indispensable for the application of this standard. For dated references, only the edition cited applies. For updated references, the latest edition of the referenced document applies.

FBI, *Quality Assurance Standards for DNA Databasing Laboratories*. It is available at <https://www.fbi.gov/file-repository/quality-assurance-standards-for-dna-databasing-laboratories.pdf/view>

FBI, *Quality Assurance Standards for Forensic DNA Testing Laboratories*. It is available at <https://www.fbi.gov/file-repository/quality-assurance-standards-for-forensic-dna-testing-laboratories.pdf/view>

3 Terms and Definitions

3.1

Biochemistry or Biological Chemistry

The study of the nature of biologically important molecules in living systems, DNA replication and protein synthesis, and the quantitative and qualitative aspects of cellular metabolism.

3.2

Genetics

The study of inherited traits, genotype/phenotype relationships, and population/species differences in allele and genotype frequencies.

3.3

Molecular Biology or Molecular Genetics

The study of the theories, methods, and techniques used in the study and analysis of gene structure, organization, and function.

3.4

Statistics

The study of the collection, analysis, interpretation, presentation, and organization of data.

3.5

Population Genetics

The study of the distribution of genes in populations and of how the frequencies of genes and genotypes are maintained or changed.

4 Recommendations

4.1 Biochemistry

Specific topics should include:

- a) Structure, function, and interaction of biological macromolecules such as proteins, carbohydrates, lipids and nucleic acids
- b) Enzymes and chemistry of enzyme-catalyzed reactions
- c) Protein synthesis
- d) Signal transduction
- e) Metabolism
- f) Cell membrane transport

4.2 Genetics

Specific topics should include:

- a) Laws and patterns of inheritance
- b) Basic structure and function of genes and chromosomes
- c) Mutation
- d) Mitosis/Meiosis
- e) Recombination
- f) Gene expression

4.3 Molecular Biology or Molecular Genetics

Specific topics should include:

- a) Prokaryotic and eukaryotic genome structure and function
- b) Interrelationship of DNA, RNA, and protein synthesis
- c) Transcription, translation, replication
- d) Gene expression and regulation
- e) Recombinant DNA techniques
- f) PCR

- g) DNA sequencing

4.4 Statistics

Specific topics should include:

- a) Descriptive statistics
- b) Sampling uncertainty and sampling distributions
- c) Discrete and continuous variables
- d) Estimation and hypothesis testing, including the use of likelihoods
- e) Laws of probability and independence
- f) Bayes' Theorem

4.5 Population Genetics

Specific topics should include:

- a) Estimation and testing of measures of allelic association within and between loci (Hardy-Weinberg principle)
- b) Description and estimation of measures of relatedness at the individual and population level (population structure)
- c) Genetic drift, mutation, migration and selection

Annex A (informative)

Bibliography

- 1) SWGDAM, *SWGDAM Training Guidelines*, 2013