C–5076

Sub. Code
99042

B.Sc. DEGREE EXAMINATION, APRIL 2025.

Fourth Semester

Forensic Science

INSTRUMENTATION BIO-CHEMICAL

(2020 onwards)

Duration : 3 Hours Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** the questions.

1. What is a stock solution in the context of sample preparation?

2. Define the term “serial dilution.”

3. What is the principle of microscopy?

4. What is the difference between a simple microscope and a compound microscope?

5. What is the principle behind a polarized light microscope.

6. Describe the basic principle of a fluorescent microscope?

7. What is the general principle of chromatography?

8. Differentiate between paper chromatography and thin layer chromatography (TLC).

9. Define antigen and antibody in the context of immuno-chemical techniques.

10. Describe the basic principle of ELISA (Enzyme-Linked Immunosorbent Assay).

Part B $(5 \times 5 = 25)$

Answer **all** questions, choosing either (a) or (b).

11. (a) Describe the different types of centrifuges and explain how they are categorized based on size, rotor types and usage.

Or

(b) What are the general steps in preparing a stock solution and how does it differ from a standard solution?

12. (a) Discuss the components and function of the lens system in a microscope.

Or

(b) Explain how a comparison microscope works and its significance in forensic examination.

13. (a) Explain the working of a polarized light microscope and its application in the examination of forensic samples.

Or

(b) Discuss the role of a fluorescent microscope in identifying trace evidence in forensic science.

14. (a) Describe the working and significance of High-Performance Liquid Chromatography (HPLC) in forensic analysis.

Or

(b) Compare Paper Chromatography with Column Chromatography in terms of methodology and applications.

15. (a) Explain the antigen-antibody reaction and its significance in immunochemical analysis.

Or

(b) What is electrophoresis and how is it used to separate macromolecules in forensic analysis?

Part C $(3 \times 10 = 30)$

Answer **all** questions, choosing either (a) or (b).

16. (a) Explain in detail the process of sample preparation, including stock solutions, standard solutions and serial dilutions. Discuss their importance in biological and biochemical analysis.

Or

(b) Explain the safety measures and maintenance procedures required for using a centrifuge in laboratory settings. Why is it important to follow these guidelines?

17. (a) Explain the principle, ray diagrams, working and applications of a compound microscope. Compare it with a simple microscope, highlighting their differences.

Or

(b) Explain the working of a stereo microscope and its application in forensic science. How does it differ from phase contrast microscopy?

18. (a) Discuss in detail the principle, working, and forensic applications of Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM). Compare both techniques.

Or

(b) Describe the principle, ray diagrams, working and applications of a fluorescent microscope in forensic investigations. How does fluorescence enhance the detection of evidence?

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C–5077

Sub. Code
99043

B.Sc. DEGREE EXAMINATION, APRIL 2025

Fourth Semester

Forensic Science

FORENSIC SEROLOGY AND DNA TYPING

(2020 onwards)

Duration : 3 Hours Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** questions.

1. What is the significance of preserving biological evidence in forensic investigations?

2. Define the medullary index.

3. What is the composition of human blood?

4. Define antigen and antibody in the context of blood group determination.

5. Name two confirmatory tests for dried bloodstains.

6. What is the forensic significance of semen in criminal investigations?

7. What is mitochondrial DNA, and why is it important in forensic science?

8. Define alleles.

9. What is polymorphism in the context of DNA typing?

10. What is the role of PCR in DNA analysis?

Part B $(5 \times 5 = 25)$

Answer **all** questions, choosing either (a) or (b).

11. (a) Describe the process and importance of calculating the medullary index in hair analysis.

Or

(b) How is biological evidence located and preserved at a crime scene, and why is the important in forensic investigations.

12. (a) Discuss the techniques used for the collection, packaging, and preservation of blood samples in forensic cases.

Or

(b) Differentiate between precipitation, agglutination, and flocculation reactions in the context of blood grouping.

13. (a) Describe the techniques used for identification of semen and how is semen sample collected from crime scene.

Or

(b) Discuss the methods used to identify blood groups from dried blood stains and their forensic importance.

14. (a) Explain the concept of mutations and how they affect human genetics. What is their relevance in forensic studies?

Or

(b) Define heredity and explain how genetic inheritance plays a role in forensic science.

15. (a) Discuss the role of DNA profiling in disputed paternity cases and missing person identification.

Or

(b) What is Single Nucleotide Polymorphism (SNP), and how is it used in forensic DNA analysis.

Part C $(3 \times 10 = 30)$

Answer **all** questions, choosing either (a) or (b).

16. (a) Explain the importance of biological evidence, such as hair, fibres, pollen, and seeds, in forensic investigations. How can these types of evidence link a person to a crime scene?

Or

(b) Describe the classification, identification, and forensic significance of fibres, How are fibres used as evidence in criminal investigation?

17. (a) Discuss the molecular biology of DNA, including its structure and function. How are variations in DNA analyzed in forensic science?

Or

(b) Describe mitochondrial DNA, its structure, and biochemical activity. Explain its forensic significance, especially in cases where nuclear DNA is not available.

18. (a) Discuss the forensic significance of Y-STR analysis and SNP analysis. How do these methods differ, and what are their respective advantages in forensic investigations?

Or

(b) Explain the different DNA typing systems such as RFLP, PCR, and SNP. Discuss their principles and forensic applications in criminal investigations.

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C–5078	Sub. Code
	99044

B.Sc. DEGREE EXAMINATION, APRIL 2025.

Fourth Semester

Forensic Science

FORENSIC TOXICOLOGY

(2020 onwards)

Duration : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define the term "Toxicology" and its importance in forensic science.

2. Give any two spot test for drugs.

3. Write any two signs and symptoms of metallic poisoning.

4. Differentiate between drug metabolism and drug toxicity.

5. What are drugs? List any two commonly consumed drugs.

6. Define the term "Forensic pharmacology".

7. Which are the pathways of drug metabolism?

8. List any two extraction methods for the analysis of toxins.

9. Briefly explain the role of a forensic toxicologist in criminal investigations.

10. What are antidotes? List any two examples.

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Define poison and classify poisons based on their origin, providing examples for each category.

Or

(b) Describe the various modes of poison administration.

12. (a) Write a note on various analytical techniques used in drug analysis.

Or

(b) Describe various spot tests and biochemical instrumentation methods used for drug analysis.

13. (a) Compare and contrast chromatography and spectrophotometric methods used in the analysis of poisons and drugs.

Or

(b) Describe various techniques involved in the examination of metallic poisons, snake venom and insect bites.

14. (a) Define absorption, distribution and metabolism as they relate to pharmacology.

Or

(b) Explain how bioanalytical techniques are applied to measure drug concentrations in biological samples for pharmacokinetic analysis.

15. (a) Explain the signs and symptoms of three common poisons and write a note on their antidotes

Or

(b) Explain the procedure of stomach washing in poisoning cases.

Part C (3 × 10 = 30)

Answer **all** questions, choosing either (a) or (b).

16. (a) Discuss the evolution of forensic toxicology as a scientific discipline. Evaluate the role of a toxicologist in criminal investigations, highlighting the importance of toxicological findings in solving cases.

Or

(b) Discuss various types of poisoning, modes of administration and their effects on vital functions.

17. (a) Discuss the principles and applications of various instrumental techniques in forensic drug analysis.

Or

(b) Explain the process of extraction, isolation and clean-up of poisons using conventional techniques.

18. (a) Describe the recommended procedures for collecting viscera samples for toxicological analysis. Discuss the appropriate types of containers and packaging materials to prevent contamination and degradation of samples during transportation and storage.

Or

(b) Explain the post-mortem findings associated with poisoning cases. Discuss how toxicological results are integrated into the overall forensic examination report.

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