

**SECOND SEMESTER M.Sc. DEGREE [REGULAR/SUPPLEMENTARY]
EXAMINATION, APRIL 2022**

(CBCSS)

Forensic Science

FSC 2C 10—FORENSIC BIOLOGY, SEROLOGY AND DNA PROFILING

(2020 Admission onwards)

Time : Three Hours

Maximum : 30 Weightage

General Instructions

1. *In cases where choices are provided, students can attend all questions in each section.*
2. *The minimum number of questions to be attended from the Section/Part shall remain the same.*
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Part A

I. Answer any *four* of the following questions :

- a) What are the objectives of medico legal investigation ?
- b) What method is most commonly used for DNA Profiling ?
- c) What are the signs of death ?
- d) Describe Palynology and its use in crime scene investigation.
- e) Define monoclonal Antibodies giving examples.
- f) History of DNA fingerprinting.
- g) Briefly explain the blotting Techniques.

(4 × 2 = 8 weightage)

Part B

II. Answer any *four* of the following. Short answer questions :

- a) Write a Short note on the Bombay blood group.
- b) Medicolegal importance of Forensic Entomology .

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- c) What is the composition of semen ?
- d) Draw a neatly labelled Plant Cell.
- e) Describe the various types of woods.
- f) Explain the techniques of DNA isolation and its quantisation.
- g) Explain mitochondria with neat labelled diagram.

(4 × 3 = 12 weightage)

Part C

III. Answer any *two*. Long essay type questions :

- a) Explain the process of DNA finger printing.
- b) Describe the Characteristics of hair to determine the species origin, race, sex and site.
- c) Explain composition, functions, and forensic significance of urine and vaginal secretions
- d) Draw a neat labelled diagram of the spermatozoa and describe tests for the identification of semen.

(2 × 5 = 10 weightage)

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Forensic Science

FSC 2C 09—FORENSIC CHEMISTRY AND TOXICOLOGY

(2020 Admission onwards)

Time : Three Hours

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I. Answer any four of the following (Short answer type questions) (Weightage 2) :

- 1 Explain what is meant by arson. What are the common incendiary materials used by arsonists ?
- 2 Explain how petroleum products are analysed to detect adulteration.
- 3 Explain how chemicals are used to effect a "bribe trap".
- 4 What is rectified spirit ? What is it used for ?
- 5 What are designer drugs ?
- 6 Write briefly on "solvent abuse".
- 7 What are the commonly abused drugs ?

(4 × 2 = 8 weightage)

II. Answer any *four* of the following (short essay type questions) (Weightage 3) :

- 8 How are explosives classified ? Explain what is meant by a “high explosive”.
- 9 Explain how samples should be collected in a suspected methanol poisoning. Describe how they are analysed.
- 10 Write a short note on the forensic examination of inks. How is dating / age assessment of an ink sample performed ?
- 11 Write briefly on the mechanism of action of organophorus insecticial poisons.
- 12 Write briefly on food adulterants and their detection.
- 13 Write briefly on analysis of heavy metal poisoning.
- 14 Write briefly on snake bite envenomation.

(4 × 3 = 12 weightage)

III. Answer any *two* of the following (Long essay type questions) (Weightage 5) :

- 15 Describe the steps of investigation to be undertaken by an arson investigator at the scene of a suspected arson.
- 16 How are IEDs classified ? What are the components of an IED ? Briefly explain how to conduct forensic investigation of a bomb explosion site.
- 17 Explain how poisons are extracted from visceral organs and biological fluids. How is it quantified ?
- 18 Explain the functions and role of a forensic toxicologist.

(2 × 5 = 10 weightage)

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FSC 2C 08—FORENSIC PHYSICS AND BALLISTICS

(2020 Admission onwards)

Time : Three Hours

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Part A (Short Answer Type Questions)

I. Answer any *four* of the following (Weightage 2) :

- 1 Enumerate and write briefly on the forensic significance of "glass evidence".
- 2 Explain briefly the layers of "automotive paints".
- 3 Describe briefly the method of collection of soil samples from the scene of crime.
- 4 Describe the various types of dyes used on fibres.
- 5 Describe briefly the various types of "tool marks".
- 6 Describe briefly the principles of restoration of erased / obliterated serial numbers on metallic surfaces.
- 7 Describe briefly the collection of evidence for bite mark analysis.

(4 × 2 = 8 weightage)

Turn over

Part B (Short Essay Type Questions)

II. Answer any *four* of the following (Weightage 3) :

- 8 Discuss the accuracy of bite mark analysis from various food substances.
- 9 . Discuss the forensic significance of tyre skid marks.
- 10 Discuss the principles used in “auditory acoustic analysis” used in speaker identification.
- 11 What is meant by “internal ballistics”? Write briefly on “barrel fouling”.
- 12 Explain the differences between animal hair and human hair.
- 13 Explain the forensic examination and interpretation of tool marks.
- 14 Describe the various types of ammunition used in rifled firearms. Explain how the range of fire is determined by a ballistics expert.

(4 × 3 = 12 weightage)

Part C (Long Essay Type Questions)

III. Answer any *two* of the following (Weightage 5) :

- 15 Discuss the various factors which affect the flight of a projectile. Explain how the trajectory of a projectile is computed / analysed.
- 16 What are the components seen in Gun Shot Residue (GSR) ? Enumerate and explain the chemical techniques used in GSR analysis.
- 17 Explain briefly the chemical analysis of “paint evidence”.
- 18 Explain the procedure used for identification and comparison of “bite mark” evidence on the human body.

(2 × 5 = 10 weightage)

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Forensic Science

FSC 2C 07—FINGERPRINTS AND QUESTIONED DOCUMENTS

(2020 Admission onwards)

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Part A

- I. Answer any *four* of the following questions :
- a) Discuss the factors that affect Handwriting/Signature.
 - b) Define questioned documents ?
 - c) What are Latent Fingerprints ?
 - d) What is the significance of OVI ?
 - e) What is the skill of writing ?
 - f) Explain classification of document
 - g) List out different methods of enhancement of bloody Fingerprints.

(4 × 2 = 8 weightage)

Turn over

Part B (Short Answer Questions)

II. Answer any *four* of the following :

- a) Explain Physical matching of Documents.
- b) Explain the chemical fuming techniques in development of Latent Fingerprints at crime scenes.
- c) Discuss Henry's ten-digit classification.
- d) Write a brief note on Forgery.
- e) Describe the types of photography involved in Document Examination.
- f) Discuss the importance of poroscopy while recovering partial fingerprints from crime scene.
- g) Explain AFIS classification.

(4 × 3 = 12 weightage)

Part C (Long Essay Questions)

III. Answer any *two* questions :

- a) Discuss the various challenges in fingerprint recognition.
- b) Explain examination of typescripts, xerox and computer printouts.
- c) Discuss morphology of Dermatoglyphics.
- d) Explain the security features of the currency notes in 500 and 2000 denomination.
- e) Discuss the examination process involved in Secret Writing.

(2 × 5 = 10 weightage)

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I. Answer any *four* of the following questions :

- a) What happens when a restriction enzyme is used on DNA ?
- b) Describe Medico legal importance of Diatoms.
- c) Explain microscopic examination of animal hair
- d) Estimation of time since death.
- e) Explain the basics of forensic microbiology.
- f) What are the types of abrasion ?
- g) What do you mean by Gene knockouts ?

(4 × 2 = 8 weightage)

Part B

II. Answer any *four* of the following short answer questions :

- a) Explain Endoplasmic reticulum with neat labelled diagram.
- b) Write a brief note on DNA replication.
- c) Enumerate the difference between plant and animal cell.
- d) Explain Basic PCR and its modifications.
- e) Explain Difference between abortion and Infanticide.
- f) Write the Composition of Vaginal secretions.
- g) Explain composition, functions, and forensic significance of saliva.

(4 × 3 = 12 weightage)

Part C

III. Answer any *two* long essay type questions :

- a) Explain a proven case study using DNA finger printing.
- b) Write a detailed note on the ABO blood group.
- c) Explain the various bloodstain patterns.
- d) Elaborate the steps involved in the reconstruction of the crime scene with the aid of blood.
- e) Explain the process of examination and identification of dead bodies in mass disasters.

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Part A

I. Answer any *four* of the following (Short answer type questions) (Weightage-2) :

- 1 Differentiate between the concepts of “drug dependence” and “drug tolerance”.
- 2 Write briefly on “designer / club drugs”.
- 3 Explain briefly how TLC is used in forensic ink analysis.
- 4 Enumerate the various types of fires. What are the common causes for “house fires” ?
- 5 What are the different types of IEDs ?
- 6 Explain briefly how adhesives are analysed in the forensic lab.
- 7 What are the hematological findings of lead poisoning ?

(4 × 2 = 8 weightage)

Part B

II. Answer any *four* of the following (Short essay type questions) (Weightage-3) :

- 8 Explain the role of a forensic scientist in a “Bribe Trap case”.
- 9 “As per new studies, analytical data shows that non-alcoholic beverages are a rich source of anti-oxidants, vitamins and minerals”- briefly comment on the accuracy of this statement.

Turn over

- 10 Comment briefly on the objectives of the NDPS Act 1985.
- 11 Describe briefly the consequences of fuel adulteration.
- 12 Describe briefly how poisons are extracted from human visceral organs / body fluids.
- 13 What are the various toxins involved in food poisoning ? Explain the mode of action, signs and symptoms of botulinum toxicity.
- 14 What are the components of snake venom ? What are the signs and symptoms of snake bite envenomation ?

(4 × 3 = 12 weightage)

Part C

III. Answer any *two* of the following (Long essay type questions) (Weightage-5) :

- 15 How does an arson investigator differentiate between a “natural fire” and an “arson” ? What are the samples to be collected from such a fire scene and explain the precautions to be taken while collecting such evidences ?
- 16 A farmer was brought dead to hospital and there was a suspicion of “organo phosphorus poisoning”. Describe the various organs and body fluids to be collected in this case and explain their preservation. Mention how they should be transported to and stored in the laboratory.
- 17 A petrol pump was punished for adulteration of fuel. Explain the principles and method of analysis of petrol to rule out adulteration. Briefly describe the BIS standards for motor gasoline (petrol).
- 18 As a forensic scientist, you are asked to visit a bomb blast site. Write a note on “post blast analysis”. What are “high” and “low” explosives ? How would you differentiate the type of explosive used, from an analysis of the “blast scene” ?

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Part A

I. Answer any *four* of the following (Short answer type questions) (Weightage-2) :

- 1 What is "glass" ? What are the different types of glass available mentioning the use of each type ?
- 2 Describe the various pigments used in paints.
- 3 What is soil ? Describe the various components of soil.
- 4 Describe briefly how fibres are analysed using comparison microscopy.
- 5 Describe briefly the collection of evidence bearing toolmarks.
- 6 Describe briefly the types of marks which are usually erased and attempted to be restored.
- 7 Describe briefly the principle of "bite mark analysis".

(4 × 2 = 8 weightage)

II. Answer any *four* of the following (short essay type questions) (Weightage-3) :

- 8 Discuss the method / procedure by which erased or obliterated marks are restored.
- 9 Discuss the significance of tire impression and how they should be collected and preserved.
- 10 Discuss the various factors which affect the voice sample analysis.
- 11 What are rifled firearms? Explain the characteristics and working of a standard rifled firearm.
- 12 Describe the forensic examination of glass fracture of a vehicle windshield and its interpretation.
- 13 Explain the forensic examination and interpretation of tool marks.
- 14 What is meant by terminal ballistics? Explain the various factors involved and their role in the effect of projectiles on target.

(4 × 3 = 12 weightage)

III. Answer any *two* of the following (Long essay type questions) (Weightage-5) :

- 15 Discuss the admissibility and reliability of bite mark evidence analysis in courts of law.
- 16 Explain the concept of “class and individual characteristics” used for linking cartridge cases and projectiles with firearms.
- 17 Explain how postal / metallic seal evidence is analysed.
- 18 Describe and explain the instrumental analysis and interpretation of “paint evidence”.

(2 × 5 = 10 weightage)

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Part A

I. Answer any four of the following questions :

- a) Write the full form of :
 - i) SAFE ii) NADE iii) AAFS iv) AFDE
- b) Mention the different techniques involved in Inkjet Printing.
- c) Write a note on the different types of erasures.
- d) What are hypothenar configurations of palm prints ?
- e) What is Edegeoscopy ?
- f) Develop Latent fingerprint from skin.
- g) Explain processing of Post developed prints.

(4 × 2 = 8 weightage)

Turn over

Part B

II. Answer any *four* of the following. Short Answer Questions :

- a) Write a note on the preliminary examination of the questioned document.
- b) Write a brief note on the comparison of genuine and forged signatures.
- c) "Whether mirror writing is one of the methods of Disguise writing" ? Discuss.
- d) Explain the preparation and uses of silver physical development process.
- e) Explain development of Latent fingerprints from sticky and wet surfaces.
- f) Explain the security features of the currency notes in 500 denomination.
- g) Discuss Decipherment of secret, indented and charred documents.

(4 × 3 = 12 weightage)

Part C

III. Answer any *two*. Long Essay Type Questions :

- a) Describe the history of Forensic Document Examination.
- b) Write a detailed note on examination of Type Written Document.
- c) Discuss the factors that affect Handwriting/Signature.
- d) Discuss the importance of poroscopy while recovering partial fingerprints from crime scene
- e) Discuss Henry's ten -digit classification.

(2 × 5 = 10 weightage)