

**SYLLABUS FOR THE POST OF SCIENTIFIC OFFICER (BIOLOGY and DNA) IN
FORENSIC SCIENCE LABORATORY AND ITS UNITS- POLICE DEPARTMENT**

1. Definition and scope of Forensic Science – History and Development of Forensic Science, Organization of the Forensic Science laboratory. Central and state forensic science laboratories India, Directorate of forensic sciences. Functions of a Forensic Scientist.
2. Physical Evidence : Their significance, class and individual characteristics, identification and individualization of physical evidence, Locards’s exchange principle, Mobile forensic science laboratory and its deployment in scenes of crimes.
3. The scene of Crime: Crime scene search for physical evidence, photography, sketching, collection, preservation, packing and transportation of evidence, maintaining the chain of custody.
4. Evaluation of blood and blood stain: Visual examination, Ultra Violet, Infrared examination, Microscopy, Spectroscopy, Spectrophotometry, Chromatography, Colour and crystal tests, Luminol tests.
5. Composition and biochemical functions of body fluids: i.e. blood, semen, saliva, urine sweat, biochemical nature and forensic significance.
6. Semen:- Nature, location, identification of semen, seminal stains and spermatozoa. Visual observation test, Physical test, Ultra Violet test, Microscopic test, Chemical tests and enzymatic tests.
7. Types and distribution of body fluids: Blood, blood stains, semen, seminal stains, urine (formation, composition, properties); amniotic fluid, sweat (formation, composition, properties); saliva, vaginal fluid, epithelial cells, etc., their analysis and forensic significance.
8. General characteristics of Skeletal, muscle, nervous system in human body.
9. Properties, classification and functions of carbohydrates, proteins, nucleic acids and lipids.
10. Morphology and composition of hair and fibers. Methods used in their elucidation – applications to forensic science.
11. Forensic serology: Types and properties of antigens and antibodies, principles. Determination of species origin of blood and blood stains, Blood grouping techniques in fresh and dried blood stains. Blood grouping types and their importance in Forensic analysis. Estimation of age of blood stains. Secretors and non-secretors status.

12. Immunoassay methods: Immunoprecipitation, Immunodiffusion, Immunoelectrophoresis, Immunofluoresces, Radioimmunoassay (RIA) and ELISA.
13. Diatom examination: Importance of Diatom examination in forensic samples, Methods of examination and significance in drowning cases.
14. Nucleic Acids: Structure and functions, Isolation of DNA and RNA from biological sources. Physiochemical properties of nucleic acids, melting of DNA, T_m ; factors affecting T_m , Cot curve, classification of DNA based on cot curve. Chemical reactions of DNA and RNA.
15. Types of DNA and their role in human identification.
16. DNA profiling: History of DNA Typing, human genetics, heredity, alleles, mutations, population genetics, Hardy Weinberg Law, Variations and Polymorphism. Mitosis, meiosis, Cell theory, cell structure and function in eukaryotes.
17. Methods of DNA Fingerprinting (profiling): RFLP and STR methods.
18. Sequencing of DNA: Maxam Gilbert method, Sanger method. Chargaff's rule, secondary structure of DNA. Watson and Crick model; B and Z DNA, other models of DNA structure. Other secondary structural features in DNA, stem loop structure, palindromic sequences, cruciforms. DNA protein interaction; zinc finger, leucine zipper, helix-turn-helix, other motifs, DNA bending and kinks.
19. Extraction of DNA from different types of biological samples, DNA extraction methods. Determining quality and quantity of DNA samples; contamination issues.
20. DNA amplification: Principle, Methodology, types of Polymerase Chain Reaction (PCR), PCR inhibitors and solutions, PCR primers and primer designing, applications of PCR in cloning and forensic science.
21. Electrophoretic techniques: Polyacrylamide gel electrophoresis, sodium dodecyl sulphate polyacrylamide gel electrophoresis, Agarose gel electrophoresis, Isoelectric focusing, Capillary electrophoresis. Visualizing proteins and DNA.
