

SYLLABUS FOR THE POST OF SCIENTIFIC OFFICER (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, 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. Microscopy: principles and different types of microscopes and its forensic applications.
5. 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.
6. 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.
7. General characteristics of Skeletal, muscle, nervous system in human body and human hair.
8. Properties, classification and functions of carbohydrates, proteins, nucleic acids and lipids.
9. 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.
10. Types of DNA and their role in human identification.

11. 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.
12. Extraction of DNA from different types of biological samples, DNA extraction methods. Determining quality and quantity of DNA samples; contamination issues.
13. 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.
14. Electrophoretic techniques: Polyacrylamide gel electrophoresis, sodium dodecyl sulphate polyacrylamide gel electrophoresis, Agarose gel electrophoresis, Isoelectric focusing, Capillary electrophoresis. Visualizing proteins and DNA.
15. Wild life DNA Analysis and its applications in Forensic Science.
16. Intellectual property rights (IPR) and its importance in DNA profiling with case studies.
17. Forensic DNA profiling - International, national and state level cases.