RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER
SYLLABUS FOR SCREENING TEST FOR THE POST OF SENIOR SCIENTIFIC OFFICER- BIOLOGY DIVISION (STATE FORENSIC SCIENCE LABORATARY, RAJASTHAN, JAIPUR)

Fundamentals of Forensic Science and Scope of Forensic Biology: Definitions, History and Development.
Crime Scene Management & Investigation; Collection, Lifting, Preservation, Packing and Forwarding of different kinds of biological exhibits for analysis.

Legal & Court Procedure pertaining to Expert Testimony, Admissibility of Scientific & Technical evidence- 293 CrPc.

Tools and Techniques: Microscopy- Basic principles and working of simple and compound, comparison, phase-contrast, stereo-zoom, polarizing, Fluorescence, Scanning Electron & transmission electron microscope and U.V. light sources.

Immunological techniques: General principles, Precipitin reaction, Gel immune-diffusion, Immuno-electrophoresis, Radio Immuno Assay , ELISA, Immune system, immune response, innate and acquired immunity, antigens, antibodies, Immunoglobulins, raising of anti-sera, Lectins -their forensic significance. Buffers and biological reagents, Methods of sterilization employed for biological work.

Biosystematics & Taxonomy: Chemotaxonomy, Cytotaxonomy, Molecular Taxonomy and General classification of Animals.

Human Anatomy & Physiology : Cell structure and function: Membrane structure and its role in transportation. Cell organelles and Cell Division. Basic structure of DNA and RNA. Protein Synthesis, karyotyping. Sex Chromosomes/sex chromatin. Abnormal cell growth and tumors.

Introduction to Body Function: External and internal environment, homeostasis. Negative and positive feedback mechanism. Structure and function of the major organ systems : digestive, skeleton, respiratory, endocrine, nervous, excretory, reproductive, cardiovascular and neuromuscular. Mode of communication within the body. Importance of electrolytes, acids and alkalis, carbohydrates, proteins and fats in the body.

Tissues of the body: Epithelia and glands. Classification of epithelia/glands and their functions. Connective tissues. Cartilage- structure and types, Gross structure of bones, formation of bone, fracture and healing.

Skin and its appendages: Structure and functions, pigmentation, blood and nerve supply. Structure of hair, hair cycle- anagen, catagen, telogen. Sebaceous glands, nails, sweat gland. Skeletal muscle, striated and non-striated, muscle. Organization of muscle fibres. Tendons and Nerves.

Body Fluids & their stains: Introduction to various types of body fluids, Composition, Physical pattern and Identification of seminal stains: presumptive tests (U.V. test, Florence test, Spermine (Barberio) test, Choline test, Acid phosphatase test) and confirmatory test including Azoospermic semen stain (p-30, *Prostate-specific antigen* or PSA, Microscopic examination), Morphological structure of spermatozoa of human and animals, Identification of lochial and menstrual blood stains by microscopic, biochemical and immuno-electrophoretic method, Identification and examination of other body fluids/stains–vaginal, saliva, urine, faeces, vomit etc., Secretor and non –secretor. Identification and examination of body tissues of human/animal.

Forensic Anthropology: Personal identification techniques as somatoscopy and somatometry. Anatomical description of skeleton of human/animal as relevant to forensic, Ossification & Identification of bones for determination of age, sex, race, stature etc., Forensic Anthropometry/Osteometry and tools involved in it. Determination of personal identity, Sex differences in skull, Pelvis and other bones. Calculation of stature from long bones, Identification of burnt bones, Recovery and identification of skeletal remains in accident, crimes and mass disasters. Recovery, packaging and storage of fleshed and burnt bone remains of human/animal, forensic importance of skeletal pathology and trauma of bones.

Facial reconstructions & Superimposition: Cranio facial superimposition techniques as Photographic & Video superimposition.

Forensic Odontology: Dentition pattern, types, structure and growth of teeth, eruption sequence, age determination, identity of person, role in mass disaster, dental anomalies and their significance in personal identification. Bite marks analysis of human/animal.

Hair and Fibres : Morphology and Biochemistry of human/animal hair, determination of origin, race, sex and site.

Types and Identification of Fibres: Man-made and Natural fibres and its Forensic significance.

Forensic Botany : General plant classification schemes. specialisation of forensic botany-morphology, anatomy, systematic, ecology, limnology, Plant architecture- roots, stems, flowers, leaves. Practical plant classification schemes:- vegetables/herbs, fruit bearing trees and plants, trees, shrubs and grasses, plant cell structure and functions. Basic plant tissues.

Wood anatomy: Various types of woods, timbers, seeds and leaves and their forensic importance. Xylotomy-types of sections, staining and preparation of slides. Identification and matching of various types of wood, seeds and leaves.

Planktonic study: Various types of phytoplankton, diatoms and their forensic importance. Different kinds of diatoms and their morphology, Importance of diatom test in drowning cases, history of diatom test, drowning associated diatoms. Precaution in collection, preservation and forwarding of biological samples for diatom test, methods of isolation of diatoms from different body tissue/ bone marrow and water sample i.e. drowning medium. Preparation and observation of slides.

Forensic Palynology: Study and identification of pollen grains and its forensic importance.

Narcotics, poisonous and alkaloid plants : Morphology and anatomy of plants, types of plants yielding drugs of abuse – opium, cannabis, coca, tobacco. Identification of plants of *Cannabis sativa* (*Ganja & bhang*) , opium (*Papaver somniferum*), tobacco (*Nicotiana tabacum*) etc. in criminal cases.

Forensic Microbiology: Isolation, classification and identification of microbial organism, cell structure of bacteria and fungi, their spores, microbes of soil and spoiled food, microbial organism related to sexual transmitted disease, Collection, Preservation and Forwarding of Samples, Microorganism encountered in biological warfare and its Forensic application.

Forensic Environmental Biology: Different kind of ecosystems, effects of pollution in aquatic habitat, identification of Algal bloom and their composition, Eutrophication and their effects, Identification methods for coliform bacteria , BOD (biological oxygen demand).

Wild life Forensics: Wild life, Importance of protected and endangered species of Animals and Plants. National and International scenario of wild life, Sanctuaries and National parks. Relevant provision of wild life and environmental act. Types of wildlife crimes, different methods of poaching of wildlife animals, Illegal Trade of wildlife material, Identification and examination of different kinds of wildlife crime exhibits. Examination of fabricated hides, ivory, nail etc.

Forensic Medicine: Death - Signs of death and changes after death. Somatic & Molecular death, Early changes after death - Algor mortis, rigor mortis, cadaveric spasm, heat stiffening, cold stiffening, changes in blood, cadaveric lividity etc. Late changes – putrefaction- external and internal changes. Adipocere, mummification, gastric and urinary bladder content and time of death from growth of hair and nails. Destruction of body and tissues by bacteria, maggots and other insects, determining time since death from different parameters, Medico legal aspects of death.

Forensic Entomology: Introduction, History, Significance, Classification and Biology of insects and other arthropods, Life cycle and forensic application of insects, determination of time since death (postmortem interval ie PMI) - Dipterans larval development & succession on carrion and its relationship to determine time of death, impact of ecological factors on insects developments, rearing insects & calculating PMI, identification of larval instars, determining whether the body has been moved, linking suspect to the scene, Forensic Entomo-toxicology-

identification of drugs and toxins from the insects and larvae feeding on the body, collection and preservation of entomological evidence at a crime scene.

Forensic Genetics: Elements of human genetics- Introduction, principles of heredity, human genetic variations, human chromosomes, chromosomal aberration, Mendelian, Dominant, recessive and sex-linked inheritances, polymorphic traits. Heritable human diseases. Metabolic/molecular basis and detection of inherited disease, Mendelian Population, gene pool, Hardy-Weinberg equilibrium and deviation, genotypes, phenotypes, multiple alleles, genetic variants, gene structure, gene mapping and gene Expression. Genetic markers and their forensic significance. Mutation – Classification, causes, mechanism, role of genetic analysis and evolution.

Structure of DNA, functions and its properties, Human genome, History of DNA fingerprinting, utility of DNA fingerprinting in crime investigation in parentage dispute, wild life, veterinary and agriculture etc., Legal and Ethical issues. Collection, preservation and transport of samples viz, semen, saliva, hair, bone, flesh etc for DNA profiling, DNA methodology for isolation, typing, interpretation of results, STR analysis, polymerase chain reaction, types and it's application, mitochondrial analysis, determination of sex & species and racial origin.

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Pattern of Question Papers:

1. Objective Type Paper
2. Maximum Marks : 100
3. Number of Questions : 100
4. Duration of Paper : Two Hours
5. All Questions carry equal marks
6. There will be Negative Marking

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