Himachal Pradesh
Public Service Commission

No.03-08/2025-PSC(R-II) **Dated: 27-01-2026**

Syllabus of Paper-II i.e. Descriptive type Subject Aptitude Test (SAT) for recruitment to the post of Assistant Director (Biology & Serology), Group-A (Job Trainee) in the Directorate of Forensic Services, Home Department, H.P. The SAT paper shall be of 03 hours duration having 120 Marks. The SAT paper shall have two parts, i.e. Part-I and Part-II and shall cover following topics of Master Degree in Forensic Science/ Botany/ Zoology/ Bio-Chemistry/ Bio-Technology/ Molecular Biology/ Micro-Biology/ Physical Anthropology level.

Part-I (60 Marks)

1. General Forensic Science:

- **Introduction and scope of Forensic Science:** Definition, nature and scope of forensic Science in the crime investigation. Multidisciplinary and multi professional nature, need of forensic Science.
- **History and Development of Forensic Science-**The evolution of scientific investigation methods and techniques; Forensic science set-ups in the national and international forum, FBI, GEQD etc. Modern instrumental methods viz LVA(Layered Voice analysis), audio comparison and video comparison; BEOS (Brain Oscillation Electrical Signature); DNA Profiling and Digital Forensics etc.
- **Principles of Forensic Science -** Locard's Exchange Principle, Law of natural variation, law of comparison, law of probability, law of individualisation etc.
- **Crime Scene Management-**Systematic approach in crime scene investigation including securing the scene, identifying evidence, collection, packaging and forwarding of evidence, chain of custody etc. photography, videography, 3 D recording, sketching and notes preparation, various search methods. The reconstruction of crime scene, hypothesis formulation, testing of Hypothesis.
- **Type of Evidences-**Physical, digital and trace evidence, location and identifying evidence. The significance of evidence in linking perpetrator to the crime, d-linking innocent. Standard Operating Instructions for collection of Physical, Digital and trace evidence from scene of crime.
- **Chemometrics:** Introduction to chemometrics; application of statistical tools in interpretation of data, multivariate analysis (PCA, PLS, cluster analysis,discriminant analysis); calibration models; pattern recognition; and their applications.

- **Report writing-** Preparation of scientific test report, essential of reportsadmissibility of test reports. Writing of scene of crime reports. Expert testimony, Examination-in-chief, cross-examination, re-examination. Related Laws -BNS, BNSS, BSA 2023, IT Act 2000, POCSO Act, NDPS Act, MVA Act etc.
- **Concept of Quality Management System-** ISO/IEC 17025, ISO 9001 standard, accreditation, certification, Calibration, proficiency testing, blind testing, inter and intra laboratory comparison, internal audit, uncertainty measurement, Z score, limit of detection (LOD), limit of quantification (LOQ) Verification and validation methods.
- **Laboratory Information Management Systems –** The management of laboratory information, protection of data, traceability of record andtransparency in laboratory operations.
- **Research Methodology -** Research design, hypothesis formulation, sampling, data collection techniques, statistical interpretation, literature review, and scientific paper writing skills. Plagiarism - types of plagiarism, plagiarism detection tools, and ethical responsibilities in research and report preparation. Citation index and impact factor.
- **Ethics -** Impartiality, honesty, confidentiality and adherence to professional conduct throughout forensic practice.
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Part-II (60 Marks)

1. Cell Biology:-

- Animal and plant Cell Structure and its components(Cell membrane, cytoplasm and genetic material), Nucleated and non nucleated cells, Cellular organelles, Cell division (mitosis, meiosis), Chromosomes and their types, cell cycle.
- Bio- molecules- Structure composition and function (Nucleic acids, Carbohydrates, lipid, proteins).
- DNA, mitochondrial DNA, RNA types, replication, transcription, translation, protein synthesis,
- Enzymes types and their functions, kinetics of enzymes, regulation, inhibition, iso-enzymes.
- pH and buffer System.

2. Anatomy and physiology :-

- Structure, organisation and relationship of parts within the living organisms.
- Circulatory system, Respiratory system, digestive system, reproductive system, excretory system etc in the Human system.

- Human skeleton, differentiation between male and female skeleton, skull (Cranium and facial bones), Hyoid bone, Thoracic cage, ear, ossicles, sutures, structure of teeth and growth, dental anomalies, bite marks, bone fracture, age and sex determination from skeleton, animal skeleton and its identification.
- Physiology of Blood, types of blood group, Rh factor, human blood, avian blood, identification of blood, Identification of menstrual blood.
- Other biological fluids i.e. semen, saliva, urine etc. identification and detection, using chemical and instrumental methods, importance of secretors and non secretors.
- Tissues of body: epithelia and glands, their classification and functions, connective tissues, cartilage-structure and types.
- Hair Anatomy, Medulla, cortex, cuticle, hair follicle, comparison of hair samples, differentiation between animal hair and human hair.

3. Wood and Timber:

- General Introduction, wood anatomy, Difference between softwoods and hardwoods, Sapwood and Heartwood, types of annual Rings; Properties and seasoning of woods; uses of woods;
- structure and identification important timber plants namely *Pinus*, *Cedrus*, *Tectona* and *Populus*,
- Non wood forest Products: (I) Bamboo-The Green Gold of India, Its structure, Properties and uses;(II)-Cork–Its structure, properties and uses
- Tannins and Dyes; Gums and Resins and their identification.

4. BIOLOGY AND DIVEERSITY OF ALAGAE AND FUNGI:-

- Algae: Algae in diversified habitats (terrestrial, freshwater, marine), Thallus organization in algae, Cell ultra-structure, Reproduction (Vegetative, asexual, sexual) and patterns of lifecycle, Criteria for classification of algae (pigments, reserved food, flagella), Fine structure of algal plastids, Algal blooms, Algalbio fertilizers;, Economic importance of algae.,
- Fungi: Introduction to Mycology: General characteristics of fungi, their significance to human, organization of fungal cell, thallus and modifications thereof; ultra-structure, reproduction (vegetative, asexual, sexual), recent trends in classification, Comparative study.

- Phytoplankton;Diatoms and their significance in anti-mortem and post-mortem drowning, dry drowning, wet drowning etc. Microscopy and study of Diatoms. Methods of analysis of Diatoms from water and bone samples, concept of Diatom database.
- History and scope of microbiology, landmarks in microbiology, major groups of microorganism, characterization, identification and classification of microorganism;, Structure,Microbial forensics and its usage in crime investigation, bioterrorism, analysis of microbes, as trace evidence, to determine and cause and time since death;Advance molecular techniques like DNA sequencing to analyse microbial communities.
- History of plant pathogens, concept, diagnoses, classification, importance and identification of unknown diseases; symptomology and disease development, Host-pathogen interaction at plant and cellular level: Mechanism of pathogen attack and defense: Physical, Physiological, biochemical and molecular aspects, Host-pathogen- interaction at population level,Transmission and spread of plant pathogens, disease epidemics,, modelling and disease forecasting to control crop losses.

5. Wildlife Forensics and Entomology:-

- Classification of species as per IUCN Red Data Book: CITES: Wildlife (Protection) Act, 1972 of India and other related acts.
- Morphological identification and examination of feathers, skin or any other body parts.
- Microscopic identification of medicinal and rare plant species.
- History and classification of insects and other arthropods. Life cycle of insects and its relevance in forensics, dipterans larval development and succession on carrion and its relationship to PMI, impact of ecological factors on insect's developments, rearing insects and calculating PMI.

6. Tools and Techniques:-

- Microscope, principles of microscopy, type of microscope-compound, comparison, Phase contrast, stereo-zoom, Polarizing, Fluorescence, confocal microscopy, scanning electron microscope (SEM) and transmission electron microscope (TEM). Principles of microscopy, importance of eyepiece.
- Theory, principles and application of Electrophoresis, capillary Electrophoresis, Principles and application, Immuno-electrophoresis etc.

- Theory, principles and application of UV visible Spectroscopy, Fluorescence spectroscopy, Infra-Red spectroscopy, Raman Spectroscopy, Nuclear magnetic Resonance, XS-ray diffraction, Mass Spectrometry.
- Theory, principles and application of DNA extraction, quantification, and sequencing techniques.
- Concept of probability andlikelihood ratio,t-test, importance of p-value, Chi square test etc.

Sd/
Secretary
H. P. Public Service Commission