

Ph. D Written Test Format and Syllabus

Forensic Science, Faculty of Science

Ph.D. Admission Test Format

The written test consists of two parts.

1. **Part A:** Research Methodology 25 questions.
2. **Part B:** Forensic Science 25 questions

Part A: Research Methodology Syllabus:

Research Fundamentals:

Meaning of research; objectives of research; characteristics of good research, Research problem: Identification, selection, and techniques for defining research problem, Research process, Research outcomes, Review of Literature, Hypothesis: Definition and Types

Types of Research:

Types of research, fundamental and applied research, qualitative and quantitative. Research Design: Types of research design – Exploratory, Descriptive, Casual Analytical

Sampling, Data Collection and analysis:

Types and sources of data: Primary and secondary, Methods of collecting data: questionnaire, interview, observation, case study, experiments etc., Sampling and sampling methods, characteristics of good sample, sampling techniques, Statistical Methods for Data Analysis: measures of central tendency and dispersion

Research Report:

Main body of report, abstract and keywords, Referencing styles and bibliography. Journal and author indexing

Ethics in Research:

Biasing: Definition and Types, Plagiarism -Definition and forms, IPR, copyright infringement, AI Generated Content

Part B: Forensic Science

Foundations of Forensic Science, Crime Scene Investigation and Legal Framework:

Definition, history, development, scope, and ethics in forensic science , the organization of forensic science laboratories, NCRB, and NICFS , quality control management in forensic institutions , the nature, types, search methods, collection, preservation, packing, and forwarding of physical and trace evidence, chain of custody, nature, types, and preservation of the scene of crime , criminal investigations concerning unnatural deaths, criminal assaults, sexual offences, poisoning, and vehicular accidents , the types, powers, jurisdiction, and admissibility of evidence in courts , the definition of experts, the provisions in BNSS. 2023 and the Indian Evidence Act relating to experts and their reports, court procedures pertaining to expert testimony and witnesses, criminal profiling focusing on the profile of the victim and culprit along with its role in crime investigation.

Instrumental Methods and Forensic Physical Sciences:

Polarizing, comparison, stereoscopic, fluorescent, and electron microscopes , UV, visible, IR, Raman, atomic absorption, and emission spectrophotometry , neutron activation analysis , x-rays and x-ray based techniques such as XRD and XRF , mass spectroscopy , chromatographic techniques including TLC, GLC, HPLC, and HPTLC , hyphenated techniques encompassing GC-MS, LC-MS, IR-MS, and ICP-MS , high and low voltage electrophoresis , immunoelectrophoresis , the principle, types, techniques, and applications of immunoassays , the nature, types, structure, and examination of hair and fibers , the application of pollens and diatoms in forensic investigation , the nature, types, and forensic examination of dust and soil , the nature, composition, and forensic examination of paint, lacquer, and varnishes , the composition, types, fractures, and examination of glass , the general composition and forensic analysis of cement, mortar, and concrete , fire and arson analysis of petroleum products and other incendiary materials , the definition, types, and analyses of explosives , country-made bombs, improvised explosive devices (IEDs), and their examination.

Forensic Biology, DNA Technology and Medico-Legal Sciences:

Detection and identification of blood stains, species of origin, blood group systems, techniques for the determination of blood groups of blood stains, the detection of seminal and other body fluids along with their blood grouping, disputed paternity and maternity , DNA structure, and DNA extraction and profiling techniques, DNA phenotyping, RNA profiling, and

their applications, wildlife forensics including the Wildlife (Protection) Act, 1972, scope, evidences, and identification, modes and manners of deaths, sexual offences and their medicolegal importance, amendments in law related to sexual offences, post-mortem examination and post-mortem changes, the estimation of time since death, the types and medicolegal importance of injuries and wounds including gunshot wounds, the determination of species of origin, sex, age, stature, and individual identification through skeletal remains, identification through skull superimposition and facial reconstruction, human dentition, type of teeth, determination of age, and bite marks, and forensic entomology.

Forensic Chemistry, Toxicology and Ballistics:

Ethyl alcohol in beverages, liquors, biological fluids, and breath, the analysis of methanol and denaturants, illicit liquors, the analysis of chemicals in trap cases, the metabolism and chemical examination of insecticides, pesticides, tranquilizers, sedatives, hypnotics, stimulants, narcotics, opiates, and drugs of abuse along with their analyses and toxicity, plant poisons, metallic poisons, extraction, isolation, and clean-up procedures for the identification of common poisons from viscera, tissues, and body fluids, firearm types, classification, ammunition, and their compositions, the forensic examination of firearms, ammunition, projectiles like bullets, shots, and slugs, and shell cases, gunshot residues analysis, ballistics dynamics including the concepts of velocity, penetration, dispersion, ricochet, accidental discharge, and the determination of range in firearm cases, the examination of country-made firearms, the basics of internal, external, and terminal ballistics, the meaning, types, and examination of tool marks, and the restoration of erased markings on metal surfaces.

Questioned Documents, Fingerprints, Impression Evidence and Digital Forensics:

History, characteristics, types, classification, preservation, development, lifting, comparison, and examination of chance prints for fingerprints, the computerization of fingerprints and AFIS, track marks including footprints, shoe prints, tire marks, their preservation, casting, comparison, skid marks, and gait patterns, voice analysis introduction, significance, voice spectrography, legal aspects, and limitation, the reproduction of documents through photographic and mechanical means and their examination, the examination of alterations such as erasures, obliterations, and additions, indentations, secret writings, and charred documents, scientific examinations of inks and papers with modern methods, the age of documents, the examination of typescripts, handwriting class and individual



characteristics, factors affecting handwriting, standard samples for comparison, the identification of handwritings and signatures, and the detection of forged signatures and forgeries, types of computer crimes, digital evidence, and mobile phone forensics.