



415

Syllabus for Ph.D. Entrance Test

Ph.D. Forensic Science – 415

Part –A

Research Methodology

RESEARCH APTITUDES-

Meaning of research, objectives of research, types of research, significance of research, research & scientific methods, research process, criteria of good research, problems encountered by researchers in India.

RESEARCH PROBLEM-

Meaning of research problem, selecting the problem, necessity of defining the problem, techniques involved in defining the problem.

RESEARCH DESIGN-

Meaning of research design, need of research design, features of a good design, important concept to research design.

DESIGN OF SAMPLE SURVEY-

Introduction, sample design, sampling and non-sampling errors, sample survey vs census survey, types of sampling designs, non-probability sampling, probability sampling.

BASIC STATISTICS-

Sampling for Collection of Data. Measure of Central Tendency- Mean, Median, and Mode. Measure of Dispersion: Mean Deviation, Standard Deviation. Standard Error of Mean and Probable Error. Coefficient Of Correlation (Karl Pearson'S' 'R'). Graphic Representation of Data. Significance of Results: - T Test, F- Ratio (Analysis Of Variance) and Chi Square Test.



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Part- B

Forensic Science

INTRODUCTION TO FORENSIC SCIENCE

Definition, History, Development and Scope of Forensic Science in India. Basic Principles of Forensic Science and its Significance, Organization and Functioning of State and Central Forensic Science Laboratories, Ethics in Forensic Science. Definition, Types, Class and Individual Characteristics, Different Searching Methods for Locating Physical Evidences at Scene of Crime, Chain of Custody. Preservation, Packing, Labeling, Transportation and Forwarding of the Following Physical Evidences- Biological Samples (Blood, Semen, Saliva, Urine, Vomit, Fecal Material, Hair etc.), Botanical Samples (Cannabis, Opium, Nux Vomica etc.), Toxicological Samples (Viscera, Adulterated Food Stuff, Blood, Urine, Vomit etc.), Post Mortem Samples, Chemical Samples Volatile Liquids, Nonvolatile Liquids, Flammable Liquids, Ballistics Samples-Firearms, Ammunitions, GSR etc., Fingerprint, Impressions and Documents, Physical Samples-Fiber, Glass, Textile, Wire & Cables, Dust & Soil Etc.

CRIME SCENE MANAGEMENT AND RECONSTRUCTION-

Meaning, Types and, Protection of Scene of Crime, Crime Scene Documentation- Note Taking, Videography, Photography and Sketching Methods, Importance of Photography, General Guidelines, Admissibility in Court, Various forms such as Videography.

Elements of Crime Scene Management: - Information Management, Technology Management, Man-Power Management & Logistic Management. Introduction to Crime Scene Reconstruction, Nature of Reconstruction, Basic Principles for Physical Evidence and Reconstruction (Recognition, Identification, Individualization And Reconstruction), Stages in Reconstruction, Types of Reconstruction, Pattern Evidence in Reconstruction (Bloodstain Pattern Analysis for Reconstruction, Glass Fracture Patterns, Fire Burn Patterns, Tire and Skid Mark Patterns), Writing A Reconstruction Report.



FINGER PRINTS, DOCUMENTS AND OTHER IMPRESSIONS -

Fingerprints: History, Types of Fingerprints, Type of Finger Print Patterns, Different Classifications, Location and Preservation of Fingerprints, Development of Latent Prints by Physical and Chemical Methods, Matching of Fingerprints.

Documents: Definition of Questioned Documents, Types of Documents, Types of Writing Instruments their Characteristics and Examination, Paper and its Examination, Basic Tools needed for Forensic Document Examination- Ultraviolet, Visible, Infrared, and Fluorescence Spectroscopy, Photomicrography, Microphotography, Visible Spectral Comparator, Electrostatic Detection Apparatus.

Hand Writing: Hand Writing and its Characteristics, Factors Affecting Hand Writing, Samples for Comparison, Comparison of Hand Writings, Disguised and Indented Writings and their Detection, Typed and Computer Generated Documents, their Comparison, Alteration in Documents and their Detection, Foot & Shoe Prints, Methods of their Preservation and Examination, Tyre Marks and Track Marks and their Examination.

FORENSIC BIOLOGY AND SEROLOGY-

Brief Description and Function of Human Digestive System, Respiratory System, Circulatory System, Nervous System, Reproductive System.

Structure, Composition and Examination of biological fluids like- Blood and Bloodstains, Seminal stains, Saliva, Urine, Pus, Feces etc.

Hair and Fiber: Hair anatomy, collection, identification of hair, determination of species origin, sex, site, and individual identification from hair, difference between animal and human hair. Classification and identification of fibers.

Forensic Botany: Introduction, Nature & Scope, Woods & their Identification and Matching, Diatoms and their Forensic Significance in Drowning Cases, Study and Identification of Pollen Grains.

DNA: Structure of DNA, Polymorphism in DNA, General idea about RFLP and PCR Methods of Biological Fluid Analysis, Merits and Demerits of RFLP and PCR, Advanced Methods for Forensic DNA Examination etc. Cases of disputed paternity & maternity problems.



CHEMICAL SEPARATION AND INSTRUMENTAL TECHNIQUES

Sample pretreatment techniques like- Distillations, Sublimation, Crystallization, Solvent Extraction etc.

Chromatographic Techniques: Definition, Different Classification like- According to Mode, Principle, Stationary Phase, etc., brief idea about Column Chromatography, Paper Chromatography, Thin Layer Chromatography, Gas Liquid Chromatography, Liquid Chromatography, Hyphenated Chromatography As- LC-MS, GG-MS etc.

Spectroscopic Methods— Principle, Apparatus, Procedure & Importance: Emission Spectroscopy, Atomic Absorption Spectroscopy, UV Spectroscopy, Electron Spectroscopy, Raman Spectroscopy, IR & FTIR Spectroscopy, Neutron Activation Analysis, Mass Spectrometry, Nuclear Magnetic Resonance spectroscopy

Electrophoresis- Principle, Types, Equipment and Processing, Immune electrophoresis, Analysis of Proteins by electrophoresis and their detection.

CHEMICAL EXAMINATION& PHYSIOLOGY/ PHARMACOLOGY OF-

Insecticide & pesticide, pharmaceutical compounds, Analysis of petroleum products

Analysis of illicit liquor including methyl and ethyl alcohol and alcohol in body fluids and breath
Extraction, isolation and identification of poisons from body fluids, Psychotropic Drugs: sedatives, stimulants, opiates extraction, isolation and identification from viscera, tissue and biological fluids.

FORENSIC MEDICINE&FORENSIC TOXICOLOGY-

Meaning And Scope, Identification of a Person: Through all Factors in Fixing Identity, Post-Mortem Examination (Autopsy) (Types of Autopsy, Objectives, Procedures), Meaning & Modes of Death, and their Characteristics, Signs of Death and Post-Mortem Changes. Wounds and their Characteristics, Injuries due to Heat, Lighting, Electricity and Radiation, Firearm Injuries, Differentiation between Ante-Mortem and Post-Mortem Wounds.

Poison and Types of Poisoning, Action of Poison, Factors Modifying the Action of Poison, Extraction, Isolation and Clean-Up Procedures- For Non-Volatile Organic Poison, Volatile



Poisons, Toxic Cations or Metallic Poisons, Toxic Anions From Viscera, Drugs, Botanical Evidence, Biological Evidence etc.

BALLISTIC-

Types of Ammunition, Classification and Constructional Features of Different Types of Cartridges, Types of Primers and Priming Composition, Propellants and Their Compositions, Various Types of Bullets and Compositional Aspects, Smooth Bore Firearm Projectile, Identification of Origin, Improvised Ammunition and Safety Aspects for Handling Firearms. Definition, Ignition of Propellants, Shape and Size of Propellants, Manner of Burning, Various Factors Affecting The Internal Ballistics, Principal Problems of Exterior Ballistics, Vacuum Trajectory, Effect of Air Resistance on Trajectory, Base Drag, Yaw, Shape of Projectile and Stability, Trajectory, Computation, Ballistics Coefficient and Limiting Velocity, Measurements of Trajectory Parameters. Effect of Projectile on Hitting The Target: Function of Bullet Shape, Striking Velocity, Striking Angle of Intermediate Target, Tumbling of Bullets, Effect of Instability of Bullet, Effect of Intermediate Targets, Influence of Range, Cavitation's- Temporary and Permanent Cavities, Ricochet and Its Effects, Stopping Power, Wound Ballistics; Threshold Velocity for Penetration of Skin/Flesh/Bones, Preparation of Gel Block, Penetration of Projectiles in Gel Block and Other Targets, Nature of Wounds of Entry, Exit, Initial Track with Various Ranges and Velocities with Various Types of Projectiles, Evaluation of Injuries Caused Due to Shot-Gun, Rifle, Handguns and Country Made Firearms, Post-Mortem and Anti-Mortem Firearm Injuries. Principles and Practice of Identification of Firearms, Different Types of Marks Produced During Firing Process on Cartridge and on Bullet, Identification of Various Parts of Firearms, Class and Individual Characteristics.

PHYSICAL ANALYSIS OF THE FOLLOWING-

Soil, Glass, Paint, Laquers, Cement, Inks, Paper, and Tool marks, Tyre marks, Shoes Prints, Forensic examination of vehicles in cases of accident, Examination & Identification of deceased from skeletal remains, Identification & individualization from foot prints, Identification & individualization from teeth.



BOMBS & EXPLOSIVES-

Composition, Classification, ignition, combustion and detonation, examination of country made bombs, improvised explosive devices (IEDs), Detection of explosives by chemiluminescence, mass spectrometry, differential mobility spectrometry, microcantilever sensors, X-ray diffraction

Nuclear Quadrupole Resonance detection of explosive, Detection of Explosives by Millimeter-wave Imaging

Neutron Techniques for Detection of Explosives, Detection of Explosives by Millimeter-wave Imaging, Laser-based Detection Methods of Explosives.

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