SPECIFIC PAPER SYLLABUS FOR THE POST OF SCIENTIFIC OFFICER (CHEMICAL SECTION)

IN THE DIRECTORATE OF FSL IN THE DEPARTMENT OF POLICE

I. **Introduction to forensic science**

Definition and scope of forensic science; History and development; Basic principles; Organization structure of forensic science laboratories including mobile units; Functions of a forensic scientist.

II. **Crime scene investigation and management**

Definition of crime scene; Classification of crime scenes – indoor & outdoor / primary & secondary; Significance of crime scene – Lucard's principle of exchange; Duties of first officer and crime scene investigator of the scene of crime; Specialized personnel at the scene of crime; Crime scene survey; Protection and recording of crime scene - photography / video recording and sketching; Crime scene search for physical evidence – Discovery, collection, preservation, packing and forwarding of physical clues; Collection of standard / reference samples; Chain of custody/events; Reconstruction of the scene of crime.

III. **Physical evidence**

Definition of Physical evidence and its significance; Types of physical evidence and their sources – availability of physical tools at the crime scenes relating to homicide, suicide, house breaking and theft, dacoit, firing, explosions, cyber crimes, terrorist attack and mass disaster (vehicle and plane accidents, air crash, industrial accidents, cyclones etc.); Study of class and individual characteristics – Identification, Comparison and Individualization of physical evidences.

IV. **Research Methodology And Statistics in Forensic Science**

Definition and concept of research; Purpose, characteristics and types of research; Process of research; Formulation of objectives; Formulation of Hypothesis; Resarch design – experimental / non experimental; Review of literature; Methods of research (survey, observation, case study, experimental, historical and comparative methods). Difficulties in research work; writing of research proposal, report and research paper – stages of preparation – report formatting – characteristics – structure – documentation; Footnotes and bibliography – editing and evaluating the final draft – and checklist for good proposal / report / research; Basic knowledge of organizing conferences, symposia, workshop, exhibition etc.,

Statistics: - Types of data – basic concepts of frequency distribution; measure of central values – mean, median and mode; mean and standard deviation; correlation and regression analysis; variance and discriminating power; Tests of hypothesis – Tests of significant attributes; Z-test of signification and coefficient of correlation; Small sample test; T-test; Paired Test; Chi-square test; F test of equality of variance; Large sample test; Normal test.

V. **Inorganic Chemistry**

chemical periodicity – Main group of elements & their compounds; concept of acids and bases, Hard, soft acid base concept, Non aqueous solvents; organic metallic compounds – synthesis bonding & structure and reactivity; characterization of inorganic compounds.

VI. **Analytical chemistry**

separation, spectroscopic, electro & thermo analytical methods; Chromatography techniques, volumetric and gravimetric analysis.

VII. **Physical chemistry**

Atomic structure and spectroscopy; term symbols; many electron systems and anti-symmetry principles; Molecular spectroscopy; Basic principles of magnetic resonance; Solid state – Crystal structures; Bragg's law and its applications; Band structure of solids.

VIII. **Organic chemistry**

Benzonide and Non-Benzonide compounds – generation and reactions; Chemistry of natural products – Carbohydrates, proteins and peptides, fatty acids, nucleic acids, turpenes, steroids and alkaloids; Structure determination of organic compounds by IR, UVs, NMR and mass spectrophotometer.

IX. **Solvent extraction**

Advantages and applications of solid phase extraction, accelerated solvent extraction, super critical carbon-di-oxide extraction, Ultrasonic extraction, Heat reflex extraction, Microwave assisted extraction etc.,

X. **Trace analysis**

Sample preparation, dissolution, digestion and fusion; Nature of trace analysis; scales of working and sources of errors; spot tests and spectroscopic methods.

XI. **Screening tests**

Screening tests commonly engaged in chemical & toxicological analysis of alcohol, drugs, Narcotics and Psychotropic substances, pesticides, poisons and their metabolites, Explosives and petroleum products.

XII. **Instrumental methods of analysis**

Introduction principles & Applications of Thin layer chromatography (TLC), High Performance Thin Layer Chromatography (HPTLC), Gas Chromatography (GC), High Performance Liquid Chromatography (HPLC), Atomic Absorption Spectrophotometry (AAS), UV – visible Spectrophometry (UV-VIS); Infrared spectrophotometry (IR); Inductively coupled plasma atomic emission spectrophotometer (ICP-AES); X-ray fluorescence photometry (XRF); Nuclear magnetic resonance spectrometry (NMR); Gas Chromatograph-Mass Spectrophotometer (GC-MS); Inductively coupled Plasma Mass spectrometer (ICP – MS).