

**SYLLABUS FOR THE POST OF SCIENTIFIC OFFICER - CHEMICAL SECTION,  
NARCOTICS SECTION & TOXICOLOGY SECTION IN FORENSIC SCIENCE  
LABORATORIES (POLICE DEPARTMENT) KARNATAKA STATE**

1. Introduction, definition, principles, scope and branches of Forensic Science.
2. Crime Scene Investigation: Definition of crime scene, Classification of crime scenes indoor & outdoor, primary & secondary, macroscopic & microscopic crime scenes, Significance of crime scene and ethics of crime scene investigation.
3. Physical Evidence: Definition, Classification, Sources, Significance and value of physical evidence. Linkage between crime scene, victim and criminal. Study of crime scenes relating to Gas explosions, Fire and arson, homicide, suicide, murder, mass disaster (Bomb blasts, Vehicle and Train accidents, Air-crash, Industrial accidents etc).
4. Atomic structure and spectroscopy, term symbols, many electron systems and anti-symmetry principles, Basic principles of magnetic resonance, Solid state - Crystal structures, Bragg's law and its applications, Band structure of solids.
5. Chemical periodicity, main group of elements and their compounds, concept of acids and bases, hard soft acid base concept, non aqueous solvents, organometallic compounds-synthesis, bonding & structure and reactivity, characterization of inorganic compounds.
6. Chemistry of natural products – carbohydrates, proteins and peptides, fatty acids, nucleic acids, steroids and alkaloids.
7. Qualitative analysis: Sample preparation, dissolution, digestion and fusion, Nature of trace analysis, spot tests and spectroscopic methods. Screening tests commonly engaged in chemical analysis of drugs samples.
8. Quantitative analysis: Volumetric and Gravimetric analysis.
9. Chromatography: Introduction – IUPAC definition – development methods – classification Theory (distribution coefficient rate of travel, retention time, adjusted retention time, retention volume, corrected retention volume, adjusted retention volume, Specific retention volume, relative retention, column capacity, separation number, peak capacity). Shapes of chromatographic peak, column efficiency, zone broadening, Van Deemter equation, resolution, optimization of column performance.
10. Introduction, principle, procedure and applications of – Paper chromatography, Thin Layer Chromatography (TLC) and High Performance Thin Layer Chromatography (HPTLC).
11. Gas Chromatography: Principles, Carrier gas, stationery phase, instrumentation, sample injection, column, detectors (FID, ECD, TCD, automatic emission detector and thermionic detectors). Effect of temperature of retention, temperature programming, GC-MS, qualitative and quantitative analysis of alcohols.

12. High Performance Liquid Chromatography (HPLC): Scope, Instrument, stationary phase, structural types of columns, packing column for bonded phase. Detector (absorbance detector, RI detector and electrochemical detector, Pre-column and post column derivatisation, mobile phase selection, effect of solvent strength, optimization.
13. Spectrophotometry - Basic principles, Beer-Lambert's Law. Principle and biochemical applications of UV-Vis spectrophotometry, atomic absorption spectroscopy. Theory and applications of IR, Fourier Transform Infrared spectroscopy (FTIR), Nuclear Magnetic Resonance spectroscopy (NMR) in the study of macromolecular structures, Raman spectroscopy, Mass spectroscopy.
14. Statistics: Types of data- basic concepts of frequency distribution, measure of central values- mean, median and mode, mean and standards deviation, correlation and regression analysis, variance and discriminating power, biostatistics: Z-test, Student "t" test, chi square test, correlation, ANOVA test.
15. History and definition of Forensic Toxicology, General principles and management of acute poisoning, Definition, classification of poisons, mode of action, signs and symptoms in cases of common poisons. Heavy metal poisoning and metal antagonists, lead, mercury, arsenic. Organophosphorous, Organochloro, Carbamate pesticides and Pyrethroids poisoning cases. Environmental impact on insecticides, Drug dependence and its management, Clinical toxicology, Action and administration of Drugs and Poisons, Different methods of extraction of drugs and poisons, clean up procedures and analysis.
16. History of Drug Abuse and related common terminologies, Routes of administration, action and symptoms of Narcotic Drugs and Psychotropic Substances, Different methods of extraction of drugs, clean up procedures, analysis and field tests.
17. Solvent extraction: Advantage and application, Derivation of the relation between the percentage extraction and number of extraction, relation between distribution ratio and distribution coefficient, quantitative treatment of neutral chelate in extraction systems, pH extraction curve, masking agent, salting out technique, single extraction verses multiple extractions, solid phase extraction, accelerated solvent extraction, ultrasonic extraction, heat reflux extraction.