

Syllabus for the post of Scientific Officer (Chemistry & Toxicology) in H.P. State Forensic Science Laboratory, Department of Home, H.P.

- 1 History and Development of Forensic Science, Definition of Forensic Science, Need of Forensic Science, Basic Principles of Forensic Science (Law of individuality, Principles of exchange, law of probability). Crime scene management (location, recording, preservation, packing & forwarding). Reconstruction of crime scene, physical evidences –types and importance. Expert testimony, organizational set-up and management of Forensic labs, NABL Accreditation of forensic labs, role of forensic scientist in Criminal Justice Delivery System.
- 2 **General Chemistry:** Atoms, molecules and mole concept, IUPAC nomenclature of organic compounds. Principles of stereochemistry, conformational analysis, isomerism and chirality. Reactive intermediates and organic reactions mechanisms. Concepts of aromaticity. Oxidation and reduction of functional groups. Chemistry of aromatic and aliphatic heterocyclic compounds. Qualitative and quantitative aspects of analysis: Sampling, evaluation of analytical data, errors, accuracy and precision, methods of their expression, normal law of distribution, indeterminate errors. Optical methods of analysis: Origin of spectra, interaction of radiation with matter, fundamental laws of spectroscopy and selection rules, validity of Beer–Lambert’s law. Classification of electroanalytical methods, basic principle of pH metric, potentiometric and conductometric titrations. Techniques used for the determination of equivalence point. Techniques used for the determination of pKa values. Concept of Normality, Molarity, Molality and their calculations. Sample extraction techniques and removal of interference from sample extracts: Classification and principle and efficiency of the technique. Mechanism of extraction. Technique of extraction: batch, continuous and counter current extractions.
- 3 Extraction techniques, such as headspace extraction, liquid liquid extractions (LLE), solid phase extraction (SPE) membrane–based extraction, micro extraction techniques, solvent extraction, pressurized liquid extraction (PLE), microwave assisted extraction (MAE), ultrasonication and supercritical fluid extraction (SFE). Qualitative and quantitative aspects of extraction.
Instrumentation: Microscope and its parts, function, application in forensic science. UV visible, I.R., FT–IR, Atomic absorption spectroscopy, Mass spectrometry. Raman spectroscopy, Neutron activation analysis, N.M.R. x-ray analysis, x-ray diffraction analysis, x-ray fluorescence analysis. Thermal techniques- TGA and DTA, Chromatography-Theory and techniques, Column, Paper, TLC, Ion exchange. GC, HPLC, HPTLC, CG–MS and LC–MS. Theory and principles. High and Low Voltage electrophoresis, gel electrophoresis, Immune electrophoresis, ISO–electrophoresis. Radio analytical techniques and activation analysis. Titrimetric Analysis.
Statistics: Type of data, measure of central tendency, dispersion of data, correlation, probability and proof .
Application: Preliminary screening methods for some chemical constituents. Spot test and crustal test. Analysis of Dyes and pigments. Analysis of Explosives materials. Determination of adulteration in edible oils, Food commodities, fertilizers, cement, ornaments. Nature and chemistry of fire, analysis of incendiary material from debris. Analysis of petroleum products for adulteration. Analysis of Dyes used in trap cases.
Toxicology: Definition, classification, Mode of action, factors modifying mode of action of poison . Analytical classification of poison. Types of poisoning. Routes of administration ADME, pharmacokinetics, phramcodynamics, LD₅₀, Biological half life, Extraction and isolation of poison from biological specimen. Qualitative and Quantitative analysis of toxicants. Analysis of corrosive and irritant poisons, Anions and cations . Estimation of liquor in breath, blood and urine.
Analysis of methanol ethanol, Acetone, Chloroform, ether, Denatured spirit and Mehtanol poisoning, analysis of CO and other Poisonous gases. Insecticide and Pesticide and their analysis. Alkaloids- Definition, classification, isolation and general properties. Analysis of Morphine, codeine, Brucine, strychnine, Nicotine, atropine, hyosyamine, Cocaine. Dhatura Papavar somniferum, atropa belladonna, marking nut, Nux vomica, Oleander, Aconite, abrus, cannabis sativa, Coca, croton , snake venom and canthridine. Analysis of Barbiturates, Chloral hydrate, tranquilizers. Examination of synthetic and designer drugs of abuse. Abusive drugs used in Sports. Food poisoning, Botulism, Ptomaine poisoning.
(70 questions of 70 marks).
Twenty (20) questions consisting of General Knowledge pertaining to state of Himachal Pradesh
(20 questions of 20 marks).
Ten (10) questions consisting of General Knowledge of National & International affairs.
(10 questions of 10 marks).
- 4 The Screening test will be of 100 marks to be attempted in two hour”