National Forensic Sciences University

Syllabus for the Post of Assistant Chemical Analyser - Gr. B (Contractual Basis)
Directorate of Forensic Science Laboratory
Home Department, State of Maharashtra

Paper style:

Paper type: Multiple Choice Question
Total Question: 60 (48 question from unit I to X and 12 questions from Unit – XI)
Negative Marking: No Negative Marking
Examination Duration: 60 Minutes

Examination Schedule:

Date of Examination: 5th April 2025
Reporting time: 9.30 am
Examination time: 11.00 am to 12.00 pm

In case of any query send email to recruit_dfs@nfsu.ac.in.

Check **https://nfsu.ac.in/Contarctual_Recruitment** for the syllabus, seating arrangement and any other updated related to the said recruitment.

Keep a note that the university will not send separate email individually pertaining the recruitment process of said post

UNIT I

Basics of Physical, Inorganic and Organic Chemistry Properties of alkanes, alkenes, alkynes, aromatic hydrocarbons, alcohols, phenols, carboxylic acids, aldehydes, ketones, amines and nitro compounds.
Proteins: Classification, Structure and Properties, Molecular weight determination, Isoelectric point, coagulation and denaturation. Carbohydrates: Classification, Structure and Reactions. Fats and Lipids: Classification, Structure and Reactions. Alkaloids: Classification, Isolation and Identification.

UNIT II

Analytical Chemistry: Classification of analytical methods – Classical and Instrumental. Good Laboratory Practices, Standard Operating Procedures, quality assurance and quality control, validation of analytical methods. Sample Preparation Techniques: Liquid-liquid extraction/solvent extraction-partition coefficient, distribution ratio and percent extraction. Accelerated and Microwave assisted extraction, protein precipitation and solid phase extraction (SPE).

UNIT III

General Principles of Biochemical Analysis: pH and Buffers, Physiological solution Centrifugation Techniques, Basic principle of sedimentation, various types of centrifuges, Density Gradient Centrifugation, Preparative Centrifugation, analysis of sub-cellular fractions, Ultra centrifuge-Refrigerated Centrifuges. Microscopy: Basic principles of microscopy, Simple and Compound microscope, Study of different types of microscopes: Comparison microscope, Phase contrast microscope, Stereoscopic microscope, polarizing microscope, Fluorescence microscopy, IR microscopy, Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM)

UNIT IV

Electromagnetic radiations: General properties of electromagnetic radiations, Wave and Quantum mechanical properties, Interaction of EMR with matter, electronic spectra and molecular structure, Internal standards and standard addition calibration methods. Introduction, Theory, Principle, Instrumentation and Applications of Spectroscopic Techniques: Ultraviolet and Visible Spectroscopy, Infrared Spectroscopy, FT-IR, Raman Spectroscopy, FT-Raman spectroscopy, Flame emission spectrometry, Atomic Absorption Spectrometry and Atomic Fluorescence Spectrometry.

UNIT V

Separation Techniques: Introduction to Chromatography: Partition, Adsorption, Ion exchange, Size Exclusion Chromatography. Introduction, Theory, Principle, Instrumentation and Applications of Thin Layer Chromatography, High Performance Thin Layer Chromatography, Gas Chromatography; Gas-liquid and gas-solid chromatography, High Performance Liquid Chromatography, Gas Chromatography – Head Space: Principle, instrumentation and applications. Emerging and Hyphenate Techniques: Theory, Instrumentation and Applications Mass Spectroscopy, Inductively Coupled Plasma-Mass Spectroscopy, X-Ray Spectroscopy, Gas Chromatography - Mass Spectroscopy (GC– MS) and GC – MS – MS (Tandem), Liquid Chromatography-Mass Spectroscopy (LC – MS) and LC – MS – MS (Tandem),

UNIT VI

Basics of Forensic Science: Definition, history, principle, scope and development of Forensic science, Forensic Science Laboratories in India, Functions and responsibility of Forensic scientist. Crime: Definition, types of crimes, Modus Operandi. Basics of Crime Scene Investigation. Law as per Bhartiya Sakshya Adhiniyam, Bhartiya Nagrik Suraksha Sanhita, Bhartiya Nyaya Sanhita. Court testimony: Admissibility of expert testimony, pre court preparation and court appearance, examination in chief, cross examination and re- examination.

UNIT VII

Explosives: Introduction, Classification and chemistry of explosives; Post blast investigation. Systematic examination of explosive and explosion residues (organic and inorganic) by colour test and other instrumental techniques. Fires & Arson Investigation: Introduction, Chemistry of Fire, Investigation of Fire and Arson, Analysis of Fire Debris by Instrumental methods. Introduction to Petroleum Products and Analysis of Petrol, Kerosene and Diesel as per BIS Specifications. Bribe Trap Case: Examination of Chemicals (Phenolphthalein) used in Bribe trap cases. Food Adulteration: Introduction and detection for common food adulterants.

UNIT VIII

Introduction to Drugs, Designer Drugs, Drugs of abuse, mode of administration, pharmacological action, biotransformation, types, appearance, production and chemical characteristics, Common terminology of various drugs of forensic importance. Introduction to Controlled Substances, Controlled Substance Act, Classification of controlled substances, Precursor chemicals, Narcotic raids and clandestine drug laboratories evidences and forensic examination. Provisions under Drugs Act, Excise Act and NDPS Act. Alcoholic Beverages: Forensic Analysis of alcoholic beverages, country made liquor, illicit liquor and medicinal preparations containing alcohol as constituents.

UNIT IX

Forensic Toxicology: Introduction and concepts of forensic toxicological examination and its significance. Law related to poisons, Introduction to Poisons, form of poisons, classification of Poisons and methods of administration of poison, Mode of action of poison, Diagnosis and management of poisoning cases. Factors affecting the effect of poison, Symptoms of poisoning and antidotes. Types of poisoning cases. Collection and preservation of toxicological exhibits in poisoning cases. Postmortem examination and postmortem changes. Medico-legal aspects in poisoning cases. Collection and preservation of biological evidences (viscera and /or body fluids) and circumstantial evidences in fatal and survival cases Classification of matrices. Isolation and Extraction of poison/ drug by Solvent extraction, distillation/steam distillation, micro diffusion, dialysis, dry ashing and wet digestion.

UNIT X

Method of analysis of Inorganic poisons (metallic, non-metallic and anions). Method of analysis of Neutral poison. Method of analysis of Basic drugs / poisons. Method of analysis of Acidic drugs / poisons. Method of analysis of volatile poisons and noxious gases. Method of analysis of Insects and animal poisons. Method of analysis of Plant poisons, Method of analysis Mechanical poisons. Toxicological analysis of decomposed materials. Interpretation of toxicological findings and preparation of reports, Forensic pharmacology, Pathways of poison/drug metabolism, absorption, distribution, pharmacokinetics and metabolism, pathways of drug metabolism, drug toxicity, excretion of drugs and poisons. Detection of poison on the basis of their metabolic studies. Submission of samples to the laboratory, postmortem examination, specific analysis plan / approach to toxicological examinations of poisoning samples.

UNIT XI – Marathi Proficiency test

Marathi language Fundamentals, literature and culture, general rules of Marathi grammar, write and speak concepts in Marathi language, sentence formation and correction or error identification and correction in Marathi language, question and answer from paragraph in Marathi language etc.,