

RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER

SYLLABUS FOR SCREENING TEST FOR THE POST OF SENIOR SCIENTIFIC OFFICER- TOXICOLOGY DIVISION (STATE FORENSIC SCIENCE LABORATORY, RAJASTHAN, JAIPUR)

Unit-I

Analytical Chemistry : Classification of analytical methods – Classical and Instrumental, volumetric, titrimetric and gravimetric techniques, selection of proper analytical techniques: types and range of determination, accuracy, precision and errors, sample preparation, handling of reagents with safety, density and viscosity measurements. Statistical analysis : Mean, Mode, Median, Correlation and Regression analysis, Null Hypothesis, Variance, t-test, Chi-Square test. Type of Data, Measure of central tendency, Dispersion of data, Correlation, Probability and Proof.

Unit-II

Analysis of unknown samples:-

Organic: Physical examination, element detection (N, S, Cl, Br, I, F), Functional Group analysis (-OH, -COOH, -NO₂, -NH₂, -CONH₂, -CO-, -CHO, Hydrocarbons)

Inorganic: Qualitative analysis of cations and anions with special reference to cations i.e. As, Sb, Pb, Ba, Cu, Hg, Zn and Tl and anions i.e. NO₂⁻, NO₃⁻, S²⁻, SO₄²⁻, SO₃²⁻, halides and cyanides. Analysis of poisonous gases: CO, H₂S, PH₃, CH₄ and NH₃.

Unit-III

Spectroscopic and other techniques:-

Unifying principles : Electromagnetic radiation, interaction of electromagnetic radiation with matter- absorption, emission, transmission, reflection, refraction, dispersion, polarization and scattering. Basic principles, instrumentation and applications: UV- Visible, FTIR, AAS, Mass, Spectroscopy, Fluorescence and Phosphorescence spectrophotometry, ESR. Fundamentals of Acids, Bases and Buffers, pH, pK_a, and pK_b values, principles, instrumentation and applications of pH metry, Potentiometry, Conductometry and Microscopic analysis in forensic science.

Unit-IV

Chromatography and Electrophoresis: General Principles and types of chromatographic techniques: Paper chromatography, column chromatography, Thin layer chromatography, adsorption chromatography, partition chromatography, Gas chromatography, Gas-liquid chromatography, Ion exchange chromatography, Exclusion (permeation) chromatography, affinity chromatography, HPLC, HPTLC, Capillary Chromatography and Electrophoresis.

Unit-V

Basic Organic Chemistry: Important preparations and properties of alkanes, alkenes, alkynes, aromatic hydrocarbons, alcohols, phenols, carboxylic acids, aldehydes, ketones, amines and nitro compounds.

Unit-VI

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-VII

Forensic Toxicological examination and significance, Poison : Definition, classification, mode of action, chemical nature, methods of poison administration, Classification of poisoning : Accidental, homicidal and suicidal. Symptoms of poisoning and antidotes, Collection and preservation of toxicological exhibits in poisoning cases. Postmortem examination and postmortem changes, Medicolegal aspects of wounds, Modes of death.

Unit-VIII

Different methods of extraction and isolation of poisons from visceral organs and other biological specimens : Solvent extraction, distillation/steam distillation, micro diffusion, dialysis, dry ashing and wet digestion.

Pharmacology : Metabolism and excretion of poisons - Introduction, pathways of drug metabolism, nonsynthetic and synthetic pathways like oxidation, hydroxylation, N- and O-dealkylation, sulphoxide formation, conjugation, acetylation, methylation of drugs/poisons as exemplified by alcohols, aldehydes, ketones, aliphatic amines, phenols, cyanide, barbiturates, opiates, benzodiazepines and amphetamines.

Unit-IX

Analysis of volatile poisons, toxic metals and non-metallic anions in biological fluids. Analysis of pesticides : Organochlorinated, Organophosphorous, Synthetic pyrethroids, Carbamates, Aluminium phosphide and Zinc phosphide in visceral tissues.

Unit-X

Methods of analysis of acidic and neutral drugs in biological fluids, salicylic acid, benzoic acid, aspirin, meprobamate, barbiturates etc. Method of analysis of basic drugs of abuse from biological specimens : Opium and its alkaloids, atropine, strychnine, brucine, cocaine, amphetamines and its derivatives, benzodiazepines, LSD, ketamine, methaqualone and nicotine. Method of analysis of mechanical poisons- Glass, diamond and hair. Plant poisons and their examination : Dhatura, Atropa belladonna, Marking nut, Nux vomica, Oleander, Aconite, Abrus, Cannabis, Croton and poisonous fungi.

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Pattern of Question Papers:

1. Objective Type Paper
2. Maximum Marks : 100
3. Number of Questions : 100
4. Duration of Paper : Two Hours
5. All Questions carry equal marks
6. There will be Negative Marking

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