

RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER

SYLLABUS FOR SCREENING TEST FOR THE POST OF SENIOR SCIENTIFIC OFFICER- ARSON & EXPLOSIVES 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 Spectroscopy. 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

Petroleum Products: Definition, types, sampling methods, specifications and characteristics as per BIS. Analytical tools for qualitative and quantitative analysis of petroleum products. Principles of techniques and Instruments used in detection of adulterants in petroleum products.

Unit VIII

Hydrocarbons : Cracking and reforming of hydrocarbons, distillation range of fuel oils of petroleum origin; Gasoline, Kerosene, diesel etc. and their correlation with GLC. Analysis of Lubricating oil, Grease, paints, adhesives and synthetic fibers. Determination of relative density, flashpoint, viscosity index, cetane number, octane number and dyes.

Unit- IX

Arson and Burning cases: Legal definition of Arson and its motives. Types and chemistry of fire, fire safety and fire fighting techniques. Prevention of fire, Role of forensic science in investigation of fire, cause of ignition and evidence collection.

Arson residue examination: Arson debris, burnt articles, flammable liquids, their collection, preservation and analysis.

Dowry death cases: Investigation and analysis.

Unit- X

Explosive: General aspects of explosive, their composition, properties and classification-high and low, Primary and secondary, military and commercial etc.

Explosion theory, Explosive and improvised explosive devices.

Theory and types of Non-explosive explosions.

Sampling and analysis of debris from explosion sites.

Laws: IPC Sections related to Arson and Explosives; EC Act; Petroleum Act.

* * * * *

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

* * * * *