Nepal Rastra Bank
Syllabus for
Junior Assayer
Contract

Stages of Examination

1. **First Stage:** Written Examination **Full Marks: 100** **Pass Marks: 40**
2. **Second Stage:** Interview **Full Marks: 20**

Remarks:

1. In written examination, questions shall be asked in English.
2. Objective questions will be asked.
3. 20% marks will be deducted for each incorrect answer.
4. The candidates selected from the written examination will be called for the second stage examination.
5. This syllabus is applicable from September 11, 2023.

First Stage: Written Examination Full Marks: 100 Time : 1 hour

Examination System	Section	Number of Question and Marks	Marks
Multiple Choice Questions	1	5 questions × 2	10
	2.1	5 questions × 2	10
	2.2	5 questions × 2	10
	2.3	5 questions × 2	10
	2.4	5 questions × 2	10
	2.5	5 questions × 2	10
	2.6	5 questions × 2	10
	2.7	5 questions × 2	10
	2.8	5 questions × 2	10
	2.9	5 questions × 2	10
Total	**50 questions × 2 Mark**		**100**

1. General Awareness and Contemporary Issues

1.1 Geographical, socio-cultural, economic and demography of Nepal

1.2 The Constitution of Nepal

1.3 Governance system and Government (Federal, Provincial and Local)

1.4 Government planning, budgeting and accounting system

1.5 Banking and financial sector of Nepal

1.6 Nepal Rastra Bank : history, objectives, organizational structure and functions

1.7 Current Macroeconomic situation of Nepal

1.8 Major events and current affairs of national and international importance

1.9 Minting in Nepal: history, current scenario and coins in Nepal

2. Technical Subject

2.1 General and Physical Chemistry

2.1.1 Language of Chemistry: classification of compounds, monoatomic Tons, polyatomic ions, written chemical formula, binary ionic compounds, ternary ionic compounds, binary molecular compounds, binary acids, ternary oxyacids.

2.1.2 Gasseous State: Postulates of kinetic molecular theory and their significance, Boyle's law, temperature scale and Charle's law, Dalton's law of partial pressure the ideal gas law, Molecular diffusion and Graham's law, molecular collision and mean free path, intermolecular forces, critical temperature and pressure, departures from ideal gas law, Vander waals constants a and b, liquefaction of gases.

2.1.3 Liquid State: Vapour pressure, vapour pressure and boiling point, surface tension and its determination using Stalagnometer, viscosity and determination by Ostwald viscometer, applications of surface tension and viscosity measurements.

2.1.4 Solid State: Crystalline and amorphous solids, classification of solids on the basis of dominant type of bond.

2.1.5 Chemical Kinetics: Concept of rate of reaction, dependence of reaction rate on concentration, measurement of reaction rate, order and molecularity of a reaction, rate equations for zero, first and second order reactions, the temperature dependence of reaction rates, reaction mechanisms, catalysis.

2.2 Inorganic Chemistry

2.2.1 Periodic Classification of Elements and Physical Properties: Periodicity of elements, s,p,d and f blocks, long form of periodic table, discussion on properties

like atomic, ionic and covalent radii, ionization potential, screening or shielding effect, electronegetivity, electron affinity.

2.2.2 Acids and Bases: Bronsted and Lewis acid- base concept, hard and soft acids and bases, relative strengths of acids and bases and effect of substituents and solvents on them.

2.2.3 Principles of Qualitative and Quantitative Analysis: Solubility product, common ion effect, their application in group separation, principles of volumetric and gravimetric analysis, analysis of ores found in Nepal.

2.2.4 Environmental Pollution: An elementary study of environmental pollution (in air and water) arising due to the presence of dust, carbon, CO, CO2, NOx, SOx H2 S and heavy metals.

2.2.5 Refining and Purification of Metals: Chromatography, ion exchange, solvent extraction, oxidative refining, parting process, zone refining, Mond's process.

2.3 Organic Chemistry

2.3.1 Organic Reaction Mechanism: Energetic of reaction, energy profile diagrams, exothermic and endothermic reactions, types of mechanisms, thermodynamic and kinetic requirement of reaction, Methods of determining mechanism.

2.3.2 Substitution and Elimination Reactions: Structure of alkyl halides, nucleophilic aliphatic substitution reactions, nucleophiles and leaving groups, the SN2 reaction (kinetics, mechanism, stereo chemistry and reactivity), The SN1 reaction (kinetics, mechanism, stereo chemistry and reactivity), structure of alkenes, the E2 reaction (kinetics, mechanism, orientation and reactivity), the E1 reaction (kinetics, mechanism, orientation and reactivity).

2.3.3 Aromaticity : Aliphatic and aromatic compounds, structure of benzene, Kekule structure, stability of benzene ring, Huckel's 4n+2 rule, electropilic aromatic substitution reaction, effect of substituent group, orientation, mechanism of electrophilic aromatic substitution reaction.

2.3.4 Spectroscopic Techniques: An elementans study of organic compounds structurel elucidation by uv,ir, nmr and mass techniques.

2.3.5 Purification of Organic Compounds: Methods of purification of crude organic compound, determination of purity of organic compounds, principles and practices behind identification of functional group in organic compounds. Elementary idea of phytochemical analysis, insecticides and chemical preservatives for old books and manuscripts, idea of soft drink and alcohol analysis, general concept of food analysis.

2.4 Polymer Technology

2.4.1 Classification of polymerization reactions such as condensation, free radical, ionic, coordination reactions, their mechanism and rate.

2.4.2 Suspension and emulsion polymerization; copolymerization.

2.4.3 Batch and continuous reactors; different molecular weights with methods of determination.

2.4.4 Molecular weight distribution, crystalline and amorphous structure, viscoelasticity; rubber.

2.4.5 Elasticity; glass transition; production of plastics, rubbers, fibers; polymer theology.

2.4.6 Polymer Processing; analysis using non-Newtonian fluid model.

2.5 Thermodynamics

2.5.1 General: Boyle's law, Charles's law and combined gas law.

2.5.2 First law of thermodynamics: Definition of first law, total internal energy and mechanical equivalent of heat engine.

2.5.3 Second law of thermodynamics: Definition of second law and thermal efficiency of heat engine.

2.5.4 Thermodynamics properties of fluid.

2.5.5 Basic thermodynamic process: Constant volume process, constant pressure process, constant temperature process, adiabatic process and polytropic process.

2.6 Safety and Waste Management

2.6.1 Types of hazards in chemical industries, Hazards due to high pressure & explosions, dust & vapor cloud explosions, vacuum temperature, inflammable materials, toxic materials, chemicals, chemical reactions and operations, electrostatics, ionizing radiation etc.

2.6.2 Noise hazards effects of noise hazards on personnel and plant operation.

2.6.3 Fire & Explosion indices and hazard analysis.

2.6.4 Safety protection, equipment's for personal & plant for various hazards. Safety procedures.

2.6.5 Disaster management, insurance, worker's safety Act etc.

2.6.6 Sources and effects of environmental pollution, air pollution, water pollution, land pollution, management of industrial waste reuse, recycling, impact of pollution on environment and its assessment.

2.6.7 Magnitude of industrial waste problem, effluent standards and stream standard.

2.7 Applied Chemistry

2.7.1 Introduction of Applied Chemistry

2.7.2 Inorganic Chemical Industries

2.7.3 Metallurgical Industries

2.7.4 Electrochemical Industries

2.7.5 Safety Considerations in Chemical Process Industries

2.8 Analytical Chemistry

2.8.1 Basic Concept

2.8.2 General concept of statistical methods in Chemical Analysis

2.8.3 Titrimetric methods of Analysis

2.8.4 Gravimetric methods of Analysis

2.8.5 Separation method

2.8.6 Cheomatography

2.8.7 Instrumental methods

2.9 Laboratory management

2.9.1 Introduction and objective of the laboratory management

2.9.2 Laboratory management framework

2.9.3 Lab hazards and lab safety

2.9.4 General idea of safety precaution in the laboratory,

2.9.5 Care and maintenance of laboratory equipments.

2.9.6 Total Quality Management Framework.

- Quality Assessment
- Quality Assurance
- Quality Laboratory Procedures
- Quality Control