

नेपाल आयल निगम लिमिटेड

सहायकस्तर तह ४ प्रवविधिक, सहायक (ल्याब) पदको खुल्ला प्रतियोगितात्मक लिखित तथा प्रयोगात्मक परीक्षाको पाठ्यक्रम

पाठ्यक्रमको रूपरेखा : यस पाठ्यक्रमको आधारमा निम्नानुसार दुई चरणमा परीक्षा लिइनेछ ।

प्रथम चरण :

लिखित परीक्षा पूर्णाङ्क : १००

प्रयोगात्मक परीक्षा पूर्णाङ्क : ५०

दोश्रो चरण :

अन्तर्वार्ता पूर्णाङ्क : २०

प्रथम चरण:

खण्ड	विषय	परीक्षाको किसिम	पूर्णाङ्क	उत्तिर्णाङ्क	प्रश्नको किसिम	प्रश्न संख्या अंकभार	समय
क.	ल्याब सम्बन्धी	लिखित	१००	३५	वस्तुगत बहुउत्तर	२५X२=५०	२ घण्टा
					छोटो उत्तर	५X१०=५०	
ख.	ल्याब सम्बन्धी	प्रयोगात्मक	५०	१८			१ घण्टा

१. प्रथम चरण विषयगत (लिखित) र प्रयोगात्मक परीक्षा अलग अलग हुनेछ ।

२. प्रयोगात्मक परीक्षाका लागि लिखित परीक्षामा समेत भएका परीक्षार्थीहरु मध्येबाट लिखित परीक्षामा प्राप्त Merit को आधारमा १ देखि ५ पद सम्मको लागि थप ५ जना र ६ भन्दा बढी पदका लागि दोब्बर संख्या निर्धारण गरिनेछ ।

३. परीक्षाको माध्यम अंग्रेजी वा नेपाली वा दुवै हुनेछ ।

४. प्रयोगात्मक परीक्षाको प्रश्न निम्नानुसार हुनेछन् :

S.N.	Topic	No. of Questions	Marks
1.	सम्पूर्ण पाठ्यक्रम	एक	४०
2.	विषयवस्तुको पहिचान (VIVA)	एक	१०

सहायक (ल्याव) तह ४ को पदको लिखित परीक्षाको विस्तृत पाठ्यक्रम

A) INORGANIC CHEMISTRY

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, electronegativity, electron affinity.
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, pH and H^+ ion concentration of strong acids, neutralization.
3. Principles of qualitative and quantitative analysis
Solubility product, common ion effect, their application in group separation, principles of volumetric and gravimetric analysis.
4. Environmental pollution
An elementary study of environmental pollution (in air and water) arising due to the presence of dust, carbon, CO, CO₂, NO_x, SO_x, H₂S and heavy metals.
5. Refining and purification
Chromatography (column, paper), ion exchange, solvent extraction, oxidative refining, parting process, zone refining, fractional distillation.
6. Carbon
Allotropes of carbon, preparation and properties of oxides of carbon (CO, CO₂), general knowledge of source CO₂ emission in atmosphere, photosynthesis and carbon sequestration.
7. Water
Structure of water, solvent properties of water, hard and soft water, hydrogen bonding.

B) ORGANIC CHEMISTRY

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. 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).
3. Aromaticity
Aliphatic and aromatic compounds, structure of benzene, Kekule structure, stability of benzene ring, Huckel's 4n+2 rule, electrophilic aromatic substitution reaction, effect of substituent group, orientation, mechanism of electrophilic aromatic substitution reaction.
4. Spectroscopic techniques
An elementary study of organic compounds structural elucidation by uv, ir, nmr and mass techniques.
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.
6. Hydrocarbons
Classification of hydrocarbons, sources of hydrocarbons, nomenclature. Aliphatic and aromatic hydrocarbons. Alkanes, alkenes and alkynes; nomenclature, preparation, properties and uses. General knowledge of petrochemical compounds, fossil fuels, flash point, auto ignition temperature, octane number, anti-knocking .

7. Alcohols
Classification, distinction between 1°, 2° and 3° alcohols, industrial preparation of ethanol, uses of ethanol in industries and as vehicle fuel.
8. Carbohydrates
Classification of carbohydrates, structure of glucose, chemical conversion to alcohol.

C) PHYSICAL CHEMISTRY

1. Atomic structure
Sub atomic particles, their masses and charges, atomic mass unit, Daltons atomic theory, Rutherford's experiment, Bohr's model, Heisenberg uncertainty principle, Pauli's exclusion principle, Hund's rule of maximum multiplicity, elementary idea of quantum mechanical model of atom, quantum numbers, isotopes and fractional weights, nuclear fission and fusion.
2. Chemical bonding
Valency, octet rule, chemical bonds and Lewis structure, ionic and covalent bonds, ionic character of covalent bond, coordinate covalent bond, metallic bonds, intermolecular and Van der Waals's forces, shapes of compound such as NH₃, CH₄, PF₅, BF₃,
3. Oxidation and Reduction
Electronic concept of oxidation and reduction reactions, oxidation number, balancing redox reaction by oxidation number and ion electron methods.
4. Chemical equilibrium
Equilibrium in physical processes, features of dynamic equilibrium, LeChatelier's principle: effect of pressure, temperature, concentration and catalyst on chemical equilibrium, equilibrium constant K_p and K_c
5. Gaseous State
Postulates of kinetic molecular theory and their significance, Boyle's law, temperature scale and Charles'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, Van der Waals constants a and b, liquefaction of gases.
6. 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.
7. Solid state
Crystalline and amorphous solids, classification of solids on the basis of dominant type of bond.
8. 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, temperature dependence of reaction rates, reaction mechanisms, catalysis
9. Thermodynamics
First law of thermodynamics, thermodynamic terms, isothermal but not reversible expansion of an ideal gas, isothermal reversible expansion of an ideal gas, enthalpy of physical and chemical changes, Hess's law of constant heat summation, spontaneous and non-spontaneous changes, second law of thermodynamics, spontaneity and entropy change, entropy as a measure of randomness, a molecular interpretation of entropy, the free-energy function and equilibrium, free energy and temperature, free energy and the equilibrium constant, criteria of spontaneity.

D) GENERAL

1. Treatment of analytical data

Nature of analytical measurements, significant figures, precision and accuracy, errors, basic statistical concepts, average and measures of dispersion, standard deviation, confidence limits, elements of standards and measures. Data processing in spread sheets.

2. Laboratory management

General idea of safety precaution in the laboratory, care and maintenance of laboratory equipments.

नेपाल आयल निगम लिमिटेड “ पेट्रोलियम पदार्थ गुणस्तर नियन्त्रण विनियम, २०६४ ”