

लोक सेवा आयोग
नेपाल इञ्जिनियरिङ्ग सेवा, केमेष्ट्री समूह, राजपत्र अनंकित प्रथम श्रेणी पद पदको खुला
प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

यस पाठ्यक्रमलाई दुई भागमा विभाजन गरिएको छ ।

भाग	परीक्षा	विषय	पूर्णाङ्क	प्रश्न संख्या	समय	परीक्षा प्रणाली	उत्तीर्णाङ्क
१	लिखित	सेवा सम्बन्धी	१००	५०	४५ मिनेट	वस्तुगत बहुउत्तर	४०
२	अन्तर्वार्ता		२०				

१. यथासम्भव पाठ्यक्रमका सवै एकाईवाट प्रश्नहरु सोधिनेछन् ।
२. लिखित परीक्षामा गल्ती गरेको प्रश्नोत्तरका लागि २० प्रतिशत अङ्क कट्टा गरिने छ ।
३. यस पाठ्यक्रममा जेसुकै लेखिएको भएता पनि पाठ्यक्रममा परेका ऐन, नियमहरु परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाइएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ ।
४. पाठ्यक्रम लागू हुने मिति २०६१।४।५

लोक सेवा आयोग

नेपाल इन्जिनियरिङ्ग सेवा, केमिष्ट्री समूह राजपत्र अनंकित प्रथम श्रेणी पदको खुला प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

समय :- ४५ मिनेट

प्रश्न संख्या :- ५०

पूर्णाङ्क :- १००

1. INORGANIC CHEMISTRY

1.1 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.

1.2 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.

1.3 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.

1.4 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.

1.5 Refining and purification of metals

Chromatography, ion exchange, solvent extraction, oxidative refining, parting process, zone refining, Mond's process.

2. ORGANIC CHEMISTRY

2.1 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.

2.2 Substitution and elimination reactions

Structure of alkyl halides, nucleophilic aliphatic substitution reactions, nucleophiles and leaving groups, the S_N2 reaction (kinetics, mechanism, stereo chemistry and reactivity), The S_N1 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 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.

2.4 Spectroscopic techniques

An elementary study of organic compounds structural elucidation by *uv, ir, nmr* and mass techniques.

2.5 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.

3. **PHYSICAL CHEMISTRY**

3.1 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, Vander waals constants *a* and *b*, liquefaction of gases.

3.2 Liquid state

Vapour pressure, vapour pressure and boiling point, surface tension and its determination using Stalagmeter, viscosity and determination by Ostwald viscometer, applications of surface tension and viscosity measurements.

3.3 Solid state

Crystalline and amorphous solids, classification of solids on the basis of dominant type of bond.

3.4 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

3.5 Thermodynamics

First law of thermodynamics, thermodynamic terms, Iso thermal but not reversible expansion of an ideal gas, Iso thermal reversal 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.

4. **GENERAL**

4.1 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.

4.2 Laboratory management

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