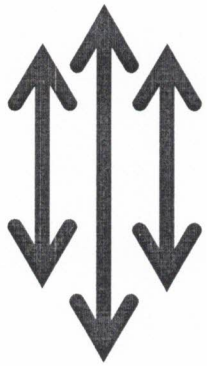
नेपाली सेना

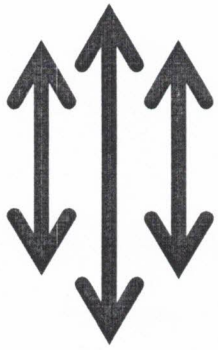
श्री भर्ना छनौट निर्देशनालय, कार्यरथी विभाग,

जंगी अड्डा



प्रा.उ.से. केमिष्ट (खुला) पदको लिखित परीक्षाको

पाठ्यक्रम



२०७७

नेपाली सेना

प्रा.उ.से. केमिष्ट (खुला) पदको लिखित परीक्षाको पाठ्यक्रम

समय: ४ घण्टा

पूर्णाङ्क : १५०
उत्तीर्णाङ्क : ६०

यो पाठ्यक्रम नेपाली सेनाको प्रा.उ.से. केमिष्ट (खुला) पदको उम्मेदवार छनौट परीक्षाको लागि निर्धारण गरिएको हो । लिखित परीक्षामा सरिक हुने उम्मेदवारहरुको पेशा सम्बन्धी विषयलाई आधारमानी प्रश्नहरु सोधिने छ ।

(क) लिखित परीक्षाको माध्यम नेपाली/अंग्रेजी वा दुवै भाषा हुनेछ ।

(ख) लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरुलाई मात्र अर्को चरणको परीक्षामा सम्मिलित गराईनेछ ।

(ग) प्रश्नपत्र निर्माण गर्दा पाठ्क्रममा समावेश भएका सबै विषयहरुलाई यथासंभव समिटनेछ ।

(घ) बस्तुगत र विषयगत संयुक्त रुपमा पूर्णाङ्क र उत्तीर्णाङ्क कायम गरिनेछ ।

(ङ) बस्तुगत र विषयगत परीक्षाको पाठ्यक्रम एउटै हुनेछ ।

(च) बस्तुगत र विषयगत विषयको लिखित परीक्षा एकैपटक वा छुट्टाछुट्टै गरी लिन सकिनेछ ।

(छ) यो पाठ्यक्रम मिति २०७७/०६/०६ गतेबाट लागु हुनेछ ।

लिखित परीक्षाको योजना र पाठ्यक्रम

विषय	पूर्णाङ्क	उत्तीर्णाङ्क	परीक्षा प्रणाली		प्रश्न संख्या अङ्क	समय
पेशा सम्वन्धी	७५	६०	बस्तुगत (Objective)	बहु वैकल्पिक प्रश्न (MCQs)	७५ प्रश्न x १ अङ्क=७५	१ घण्टा
	७५		विषयगत (Subjective)	छोटो उत्तर	७ प्रश्न x ५ अंङ्क =३५	३ घण्टा
				लामो उत्तर	४ प्रश्न x १० अङ्क =४०	

नेपाली सेना

प्रा.उ.से. केमिष्ट (खुला) पदको लिखित परीक्षाको पाठ्यक्रम

1. Physical Chemistry

1.1 **Ionic Equilibrium and Electrochemistry:** pH, buffer solution, buffer capacity and buffer range, pH change in acid base titration, theory of acid base indicator, hydrolysis of salt, Debye Huckel limiting law, activity and activity coefficient, ionic strength, elementary idea on electrical double layer, e.m.f. of a cell, Nernst equation, glass electrode, ion selective electrode and their applications, photo electrochemical and fuel cells

1.2 **Chemical Kinetics:** Effect of temperature and catalyst on reaction rate, concept of activation energy, collision theory and transition state theory of reaction rates, chain reaction, photochemical reaction, fast reaction, techniques to study fast reaction, enzyme catalyzed reaction, diffusion controlled reaction in solution kinetic salt effect , polymerization reactions, oscillating reactions

1.3 **Thermodynamics:** Statistical treatment of entropy, entropy change in physical and chemical change, free energy change for reaction, Gibbs Helmhotz equation, thermodynamic criteria of equilibrium, chemical potential, partial molar quantities, Boltzman distribution law, thermodynamic properties of solution, effect of temperature and pressure on chemical potential, thermodynamics of mixing, properties of mixing, Raoult's law, Henry's law

1.4 **Spectroscopy and Solid-state Chemistry:** Electromagnetic radiation, origin of molecular spectra, types of molecular spectra: rotational spectra, vibrational spectra, vibrational rotational spectra, electronic spectra, Raman spectra, NMR spectroscopy, seven crystal system and fourteen Bravais lattice, Bragg's law, crystal structure of sodium chloride, lattice energy of ionic solid, success and limitation of classical free electron theory of metal, point defects: Frenkel and Schottky defects, Miller indices

2. Inorganic chemistry

2.1 General concept of the followings: Electro negativity, choice of electro negativity system, group electro negativity, electron affinity, anomalous electron affinity, ionization energy, intrinsic and mean bond energy, metallic bonding, Buck minister fullerene, noble gas compounds, Non aqueous solvents, Protic and non-protic solvents, Reactions of NH_3 and SO_2 2.2 Matter waves, the uncertainty principle , the wave nature of electron, interpretation of wave function , normalized and orthogonal wave functions, the wave equation, the principle of superposition, the radial equations, atomic spectra and term symbols

2.3 Molecular orbital theory, molecular orbital, LCAO approximation, valence bond theory for simple homonuclear diatomics

2.4 Bonding and applications of coordinate compounds: Valence bond theory, crystal field, characterization of coordinate compounds, Isomerism in coordination compounds, ligand

substitution reactions and trans effect, spectrochmical series, Nepelausetic effect, Jahn Teller effect, Evidence for adjusted crystal field theory

2.5 Organometallic compounds: General survey of types, synthetic methods, metallocenes

2.6 Radioactivity and nuclear reactions, ^{14}C dating, tracer technique, radiochemical analysis

3. Analytical chemistry

3.1 General concept of statistical methods in chemical analysis: Accuracy, precision, minimization of error, significant figures, mean and standard deviation, reliability of results, rejection of results, regression analysis, t-test, chi-test

3.2 Principle and applications of: Atomic absorption spectroscopy, flame photometry, uv- vis spectrophotometry, NMR, IR, mass spectroscopy, emission spectroscopy.

3.3 Solvent extraction, ion exchange chromatography, gas chromatography, HPLC, exclusion chromatography (gel permeation chromatography), affinity, partition, column, and paper chromatography, thermo gravimetric analysis, differential thermal analysis

3.4 Principle and applications of potentiometry, ion selective electrodes, pH measurement, polarography, amperometry, electrogravimetry and conductometry

3.5 Gravimetric and volumetric analysis, principles of volumetric and gravimetric analysis, uses of adsorption indicators, use of Redox indicator, metal ion indicator, use of common organic reagents in gravimetric analysis

3.6 Qualitative and quantitative analyses: use of common organic reagents, redox titration, different types of indicators, instrumentation, working principles and application of spectroscopic techniques, molecular luminescence

4. Organic Chemistry

4.1 General idea on types, mechanism and scope of Nucleophilic reaction, Elimination reaction, Addition reaction, Free radical reaction

4.2 Study and application of Oxidation and reduction reactions, Halogenations,

Acetylation, Alkylation, Acylation, Aldol condensation and related reactions

4.3 Photochemistry:Basic concept of photochemical energy, Electronic excitation, Energy transfer, Photochemistry of carbonyl compounds, Jablonski diagram, α- cleavage, β-cleavage,electro cyclic reaction, Cycloadfdition, Photo- rearrangement

4.4 Heterocyclic Chemistry: Structure and reactivity of Oxirane, Aziridine, Thirane, Pyrrole, Thiazole, Furan, Imidazole, Pyridine, Indole

4.5 Stereochemistry:Symmetry and symmetry elements, Enantiomers , Diastereomers , Meso-isomers, Racemic mixture, Enantioselective reaction , Diastereoselective reaction , Regioselective reaction

4.6 Carbohydrate: Chemistry of Glucose, fructose, sucrose, cellulose and starch

4.7 Spectroscopy: Mass spectroscopy, Infrared spectroscopy, UV spectroscopy, H- NMR, C-NMR, new dimensions in NMR

5. Biochemistry and Applied Chemistry

5.1 Biochemistry

5.1.1 **Natural products and drug analysis:** Phytochemical screening; Isolation, purification and identification of natural molecules (essential oil, alkaloids, terpenoids, flavonoids); Biosynthesis of lipids and terpenes with taking typical examples of stearic acid and citral; Vitamins and hormone; Chemotherapy; Drugs; Synthetic drugs: types and typical examples; Identification, qualitative and quantitative analysis of various antibiotics; Quantitative analysis of dextrose, ascorbic acid, vitamin 'A' in various products

5.1.2 **Lipids:** Composition of fats, Hydrolysis, Phosphoglycerides, Rancidity types, Prevention

5.1.3 **Enzymes, Proteins and Nucleic Acids:** Enzymes and co-enzymes, Co- factors; Application of enzymes in food industries; Structure and reactions of amino acids, peptides; Protein; Nucleic acids, Biological functions of DNA and RNA; Regulation of gene expressions and Genetic code

5.2 Applied chemistry

5.2.1 **Soil, sediments and rock analysis:** Soil texture and organic matter in soil;Cu, Pb, Zn & Ag in soil, sediments and rock;Acid insoluble matter, loss on ignition, CaO, MgO, total oxide (Fe_2O_3, Al_2O_3) and SiO_2 in limestone, dolomite and magnetite

5.2.2 **Water, wastewater and air analysis:** BOD, COD, dissolved oxygen, alkalinity, ammonia, nitrite, nitrate, chloride, phosphate, sulfate, iron, manganese, arsenic and other toxic metals in water and wastewater, controlling air pollution ,ozone chemistry, ozone hole, smog; PM_{10}, TSS, SO_2, CO, CO_2, NOx in air

5.2.3 **Food, food products and feed analysis:** Proximate analysis (moisture, protein, fat and carbohydrate) of food, food products and feed; Color detection in food and food products, Simple chemical methods (quick test) for detection of food adulteration; General concept of Pesticide and pesticide residue analysis in water, soil and foodstuff.

5.2.4 **Analysis of industrial products:** Urea, Fertilizer, Bleaching powder, Alcohol, diethyl ether, TNT, Ammonium nitrate, Propellant

5.2.5 **Miscellaneous:** Application of chemical methods in preservation of archaeological property; Application of good laboratory practice and ISO 17025 concepts in the quality management; Role of Chemists in Environmental Impact Assessment

माथि उल्लेखित पाठ्यक्रमका एकाइहरुबाट सोधिने प्रश्नहरुको संख्या निम्नानुसार हुनेछ

विषय	परिक्षा प्रणाली			कै.
	वस्तुगत (Objective)	विषयगत (Subjective)		
	बहुबैकल्पिक प्रश्न (MCQS) (प्रश्नxअंक)	छोटो उतर (प्रश्नxअंक)	लामो उतर (प्रश्नxअंक)	
1	15 X 1	1x5	1x10	
2	15 X 1	1x5		
3	15 X 1	2x5	1x10	
4	15 X 1	1x5	1x10	
5	15 X 1	2x5	1x10	
Total	**75 x 1 = 75**	**7 x 5 = 35**	**4 x 10 = 40**	

प्रयोगात्मक परीक्षाको पाठ्यक्रम

समयः ६० मिनेट

पूर्णाङ्कः ५०
उत्तीर्णाङ्कः२५

S.N	Topic	Marks	Time
1	Titration and salt separation	10	20 min
2	Nitrogen Test	10	10 min
3	Analytical Test	10	10 min
4	Spectroscopic Test	10	10 min
5	Viva	10	10 min
Total		50	60 min

समाप्त