

प्राविधिक शिक्षा तथा व्यावसायिक तालिम परिषद् र पोखरा महानगरपालिकाद्वारा संचालित

गण्डकी बहुप्राविधिक शिक्षालय

पोखरा – २९ भण्डारढिक, कास्की

प्राविधिक तथा प्रशिक्षण सेवा, सामान्य प्रशिक्षण समूह, भौतिकशास्त्र उपसमूह

अधिकृतस्तर छैटौं र सातौं तहको भौतिकशास्त्र प्रशिक्षक पदको खुला प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

सेवा: प्राविधिक तथा प्रशिक्षण	समूह: सामान्य प्रशिक्षण	उपसमूह: भौतिकशास्त्र
पद: भौतिकशास्त्र प्रशिक्षक	स्तर: अधिकृत छैटौं र सातौं	किसिम: खुला
पाठ्यक्रमको रूपरेखा: यस पाठ्यक्रमको आधारमा निम्नानुसार दुई चरणमा परीक्षा लिइनेछ :-		
प्रथम चरण: लिखित परीक्षा		पूर्णाङ्क: ११०
दोस्रो चरण: अन्तरवार्ता, शैक्षिक योग्यता र अनुभव		पूर्णाङ्क: ४०

प्रथम चरण: लिखित परीक्षा

पत्र	विषय	पूर्णाङ्क	उत्तीर्णाङ्क	परिक्षा प्रणाली	प्रश्न संख्या x अङ्क भार	समय
प्रथम	खण्ड (क) सामान्य ज्ञान तथा ऐन नियमहरू	१५	१६	बस्तुगत बहुवैकल्पिक प्रश्नहरू (MCQS)	१५ x १ = १५	३० मिनेट
	खण्ड (ख) सेवा सम्बन्धी	२५		बस्तुगत बहुवैकल्पिक प्रश्नहरू (MCQS)	२५ x १ = २५	
दोस्रो	सेवा सम्बन्धी	७०	२८	विषयगत प्रश्नहरू	१० x ७ = ७०	२ घण्टा ३० मिनेट

दोस्रो चरण: अन्तरवार्ता, शैक्षिक योग्यता र अनुभव

विषय	पूर्णाङ्क	परिक्षा प्रणाली
अन्तरवार्ता	२५	मौखिक (Interview)
शैक्षिक योग्यता	१०	शैक्षिक योग्यता प्रमाणपत्रको आधारमा
कार्य अनुभव	५	सम्बन्धित बिषयको दखलताको आधारमा

शैक्षिक योग्यता र अनुभवको मुल्याङ्कन गण्डकी बहुप्राविधिक शिक्षालयमा करार कर्मचारी/प्रशिक्षक छनौट तथा ब्यबस्थापन गर्ने सम्बन्धी कार्यविधि, २०७७ बमोजिम हुनेछ ।

द्रष्टव्य:

१. यो पाठ्यक्रमको योजनालाई प्रथम चरण र दोस्रो चरण गरी दुई भागमा विभाजन गरिएको छ ।
२. माथि उल्लेखित सेवा अन्तर्गतका समूह उप-समूहहरूको खुला प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम उपर्युक्त बमोजिम हुनेछ ।

३. लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुनेछ ।
४. बस्तुगत बहुबैकल्पिक प्रश्नहरूको गलत उत्तर दिएका प्रत्येक गलत उत्तर वापत २० प्रतिशत अङ्क कट्टा गरिनेछ । तर उत्तर नदिएमा त्यस वापत अङ्क दिइने छैन र अङ्क पनि कट्टा गरिने छैन ।
५. वस्तुगत बहुउत्तर हुने परीक्षामा परीक्षार्थीले उत्तर लेख्दा अंग्रेजी ठूलो अक्षर (Capital Letters) A, B, C, D मा लेख्नुपर्नेछ । सानो अक्षर (Small letters) a, b, c, d मा लेखेको वा अन्य कुनै संकेत गरेको भए सबै उत्तरपुस्तिका रद्द हुनेछ ।
६. बहुबैकल्पिक प्रश्नहरू हुने परीक्षामा कुनै प्रकारको क्याल्कुलेटर प्रयोग गर्न पाइने छैन ।
७. विषयगत प्रश्नका लागि तोकिएका अंकका हकमा एउटा लामो प्रश्न वा एउटै प्रश्नका दुई वा दुई भन्दा बढी भाग वा एउटै प्रश्न अन्तर्गत दुई वा बढी टिप्पणीहरू सोध्न सकिनेछ ।
८. परीक्षामा सोधिने प्रश्नसंख्या, अंक र अङ्कभार यथासम्भव सम्बन्धित पत्र/विषयमा भए अनुसार हुनेछ ।
९. परीक्षामा परीक्षार्थीले मोवाइल वा यस्तै प्रकारका विद्युतीय उपकरण परीक्षा हलमा लैजान पाइने छैन ।
१०. विषयगत प्रश्न हुने पत्रका हकमा प्रत्येक खण्डका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरू हुनेछन्। परीक्षार्थीले प्रत्येक खण्डका प्रश्नहरूको उत्तर सोही खण्डको उत्तरपुस्तिकामा लेख्नु पर्नेछ ।
११. यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयबस्तुमा जेसुकै लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम तथा नीतिहरू परीक्षाको मितिभन्दा ३ (तीन) महिना अगाडि (संशोधन भएका वा संशोधन भई हटइएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ ।
१२. प्रथम चरणको लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र द्वितीय चरणमा सम्मिलित गराइनेछ ।

प्रथम पत्र: सामान्य ज्ञान तथा ऐन नियमहरू र सेवा सम्बन्धित विषय

पूर्णाङ्क – ४०

खण्ड क: सामान्य ज्ञान तथा ऐन नियमहरू

१५ x १ = १५

१. विश्वको प्रमुख ऐतिहासिक घटनाहरू
२. नेपालको इतिहास
३. नेपालको भूगोल
४. नेपालको आर्थिक, राजनीतिक, सामाजिक र सांस्कृतिक व्यवस्था
५. नेपालका प्रचलित धर्म, संस्कृति, जात जाति, भाषा, साहित्य र कला
६. खेलकूद तथा मनोरन्जन सम्बन्धी विविध जानकारी
७. बिज्ञान र प्रविधि, प्रसिद्ध बैज्ञानिक र तिनको योगदान
८. वातावरण प्रदूषण तथा जलवायु परिवर्तन
९. अन्तर्राष्ट्रिय संघ संस्था (संयुक्त राष्ट्रसंघ, इयू, आसियान, बिमष्टेक र सार्क)
१०. नेपालको बैदेशिक सम्बन्ध र परराष्ट्र नीति
११. राष्ट्रिय र अन्तर्राष्ट्रिय महत्वका समसामयिक घटना तथा नविनतम गतिविधिहरू
१२. दिगो विकासका लक्ष्यहरू
१३. प्राविधिक शिक्षा तथा व्यावसायिक तालीमको पृष्ठभूमि, लक्ष्य र उद्देश्य
१४. प्राविधिक तथा व्यावसायिक शिक्षा एव तालिम नीति, २०६९
१५. गण्डकी बहुप्राविधिक शिक्षालय संग सम्बन्धित ऐन, नियम तथा कार्यविधिहरू

खण्ड ख: सेवा सम्बन्धी विषय

२५ x १ = २५

दोस्रो पत्रको सेवा सम्बन्धी विषयको पाठ्यक्रम नै प्रथम पत्रको खण्ड “ख” को सेवा सम्बन्धी विषयको पाठ्यक्रम हुनेछ ।

Section A

Unit 1: Mechanics

- i. **Physical Quantity and Measurement:** Error, precision, scalar and vector products, addition and subtraction of vectors, resolution of a vector, vector differentiation and integration theorems, coordinate systems and differential operators in various coordinate systems
- ii. **Linear Motion:** Equation of motion, projectile motion and applications, Newton's laws of motion and applications, conservation laws, work and energy, friction, elastic and inelastic collisions, power and efficiency
- iii. **Circular and Rotational Motion:** Angular and linear velocity and acceleration, centripetal force, applications, rotational kinetic energy, moment of inertia and its theorems, torque and angular acceleration of a rigid body, angular momentum and its conservation, work and power in rotational motion
- iv. **Gravitation:** Kepler's laws of planetary motion, Newton's law of gravitation, deduction of Newton's law of gravitation from Kepler's laws, variation of 'g', mass and weight, center of mass and center of gravity, motion of a satellite, rocket launching technology, geostationary satellite and parking orbit
- v. **Oscillations:** Equation of simple harmonic motion (SHM), linear restoring force, energy in SHM, kinetic and potential energy of mass spring system, free, damped and forced oscillations and resonance

Unit 2: Mechanical Properties of Solids and Fluids

- i. **Elasticity:** Elasticity and plasticity, Hooke's law, moduli of elasticity and determinations, elastic potential energy, relationship among various elastic constants and applications in bending moments
- ii. **Fluid:** Pressure, variation of atmospheric pressure with altitude, Pascal's law, Archimedes' principle, pressure in a fluid, Nicholson's hydrometer, molecular theory of surface tension, surface energy, angle of contact, capillarity and applications and theory of soap bubble
- iii. **Viscosity:** Fluid dynamics, Newton's formula, coefficient of viscosity, equation of continuity and its applications, Bernoulli's theorem and applications, Reynold's number, Poiseuille's formula, Stoke's law and applications
- iv. **Hygrometry:** Dew point, saturated and unsaturated vapor pressure, triple point, relative humidity and measurement, effect of vapor pressure on boiling points
- v. **Atmospheric Physics:** Atmospheric phenomena, aerosol and pollution, ozone layer, greenhouse effect, acid rain

Unit 3: Heat and Thermodynamics

- i. **Heat and Temperature:** Concept of heat and temperature, temperature scales, relationship among

thermal expansivities and their determinations, absolute and apparent expansion of a liquid

- ii. **Thermal Properties of Matter:** Specific heat capacity and measurement, Newton's law of cooling, measurement of specific heat capacity of liquids by the method of cooling, change of phases, latent heat, specific latent heat of fusion and vaporization and their measurement, triple point and superfluidity
- iii. **Transfer of Heat:** Conduction, convection, radiation, thermal conductivity and determination, convective coefficient, black-body radiation, Stefan-Boltzmann law, Wien's displacement law, Planck's radiation law and Rayleigh Jeans law
- iv. **Kinetic theory of Gases:** Boyle's law, Charles's law and ideal gas equation, derivation of pressure exerted by gas, Maxwell Boltzmann distribution of velocity, root mean square speed and Van der Waals equation.
- v. **Thermodynamics:** Laws of thermodynamics, processes, heat capacities of an ideal gas and relation between them, isothermal and adiabatic processes for an ideal gas, heat engines and efficiency, refrigerator, entropy and disorder, Maxwell's thermodynamic relations, Boltzmann factor, Bose-Einstein and Fermi-Dirac statistics

Unit 4: Optics

- i. **Reflection:** Laws of reflection, plane mirror, curve mirror, real and virtual images and determination of focal length of curve mirror
- ii. **Refraction:** Laws of refraction, refractive index and its determination, total internal reflection and its applications, optical fiber, refraction through prism, white light spectrum and dispersion
- iii. **Lenses:** Spherical lenses, lens maker's formula, power of a lens, combination of thin lenses in contact, defect of vision, nature and remedy, optical instruments, applications, and aberration at spherical surfaces
- iv. **Wave Nature of Light:** Huygens's wave theory and application, velocity of light, interference, Young's double slit experiment, Fresnel's biprism, Lloyd's mirror, interference in thin film, Newton's ring, Michelson interferometer
- v. **Diffraction and Polarization:** Fresnel and Fraunhofer diffraction, zone plate, diffraction grating, dispersive and resolving power of grating element, transverse nature of light, crystal polarizer, Malus law, Brewster's law, production and analysis of polarized light, principle of Nicol prism, optical activity and circular dichroism

Unit 5: Curriculum and Evaluation

- i. **Curriculum and Text book:** Comparative study of physics curriculum, text books and teacher manual of Diploma level
- ii. **Teaching aids:** Development and use of ICT (integrated communication technology) in teaching physics

- iii. **Evaluation:** Test items, marking scheme of physics of Diploma level and specification grid
- iv. **Assessment:** Continuous assessment system. grade and grading system
- v. **Teaching Learning Science:** Method of teaching, scientific method, problem solving method, demonstration method, discovery method, laboratory method and cooperative learning method

Section B

Unit 6: Electrostatics & Electric Circuits

- i. **Electrostatics:** Electric charges, charging by induction, Coulomb's law in electrostatics, electric field, lines of force, Gauss law and applications, electric potential, potential difference, equipotential surfaces, electron volt, potential gradient and field, electric dipole and quadrupole, relation among D, E and P
- ii. **Capacitor:** Capacitor and capacitance, parallel plate capacitor, combination of capacitors, energy of charged capacitor, effect of a dielectric, types of capacitor, charging and discharging of capacitor
- iii. **Electric Circuits:** Electric currents, Ohm's law, electrical resistance, resistivity, conductivity, potential divider, super conductors, perfect conductors, conversion of galvanometer into voltmeter and ammeter, ohmmeter, electromotive force of a source, internal resistance, Kirchhoff's laws, Joule's law and its verification, Wheatstone Bridge circuit, potentiometer and applications
- iv. **Thermo Electricity and Electrolysis:** Seebeck, Peltier and Thomson effects, thermocouple, variation of thermo e.m.f. with temperature, thermoelectric parameters, thermopile, Wiedemann-Franz law, Faraday's laws of electrolysis and verification and Faraday's constant
- v. **Digital Electronics and Communications:** Boolean algebra, concept of logic Gates (OR, AND, NOT, NOR and NAND Gates, concept of amplitude and frequency modulations, optical fiber communications)

Unit 7: Electromagnetism

- i. **Magnetism:** Neutral points, calculation of magnetic moments and pole strength of a bar magnet, deflection magnetometer, vibration magnetometer, elements of earth magnetism and their variation, dip circle, permeability, susceptibility, hysteresis and types of magnetic materials
- ii. **Magnetic Field and Force:** Magnetic field lines and magnetic flux, force on moving charge and on a conductor, Lorentz force, torque on rectangular coil, moving coil galvanometer, Hall Effect, magnetic field of a moving charge, Biot and Savart law and applications, Ampere's law and application
- iii. **Electromagnetic Induction:** Faraday's laws, induced emf, Lenz's law, A. C. generators, eddy currents, self-inductance and mutual inductance, energy stored in an inductor,

transformer, ballistic galvanometer, search coil, Grassot's flux meter and earth inductor

- iv. **Maxwell's Electromagnetic Equations:** Maxwell's equations and use in propagation of electromagnetic wave, derivation of Gauss's, Faraday's, Biot-Savart's and Ampere's law on the basis of Maxwell's electromagnetic equations and pointing vector
- v. **A. C. Circuit:** Introduction, phasor and phase diagram, AC through resistor R, inductor L and capacitor C and their series combinations, impedance and admittance, resonance in LCR series circuit and quality factor, wattless current and choke coil

Unit 8: Acoustic and Quantum Mechanical Waves

- i. **Basic Properties of Waves:** Progressive and stationary waves, principle of superposition, beats, velocity of sound wave in solid, liquid and gas, Newton's formula for velocity of sound in gas and Laplace correction and effect of physical factor on velocity of sound
- ii. **Acoustic Phenomena:** Musical notes, overtones and harmonics, characteristics of sound, pressure amplitude, intensity of sound, decibel unit, Doppler's effect and applications, infrasonic and ultrasonic waves, noise pollution, acoustic of building and reverberation of sound
- iii. **Waves in Pipe and String:** Waves in pipes, vibration in closed and open-end pipes, end correction, waves in string, modes of vibration of stretched string, laws of transverse vibration of string and its verification
- iv. **Quantum Mechanics:** De Broglie theory, wave particle duality, uncertainly principle, Einstein's photoelectric equation, Rutherford scattering, Bohr's theory of hydrogen atom, spectral series, emission and absorption spectra and Zeeman effect
- v. **Quantum Mechanical Wave Propagation:** Schrodinger's wave equation, probability density, normalization of wave function, solutions of Schrodinger equation for free particle, potential step and infinite potential well

Unit 9: Modern Physics

- i. **Sub-Atomic Particles:** Electron and its discovery, Milikan's oil drop experiment, cathode rays, Thomson experiment, nuclear composition, properties of proton and neutron, isotopes, Einstein's mass-energy relation, binding energy of nucleus and nuclear spin.
- ii. **Crystal Structures, Devices and Circuits:** Basis and crystal structure, Bravais Lattices, cubic crystal structure, difference between metals, band theory of solids, semiconductors, semiconductor diodes and transistor and network theorems (Superposition, Thevenin and Norton)
- iii. **Radioactivity:** Laws of radioactive disintegration, carbon dating, energy released in nuclear fusion and fission, source of solar energy, particle detector, particle accelerators, particles and antiparticles, baryons

and leptons

- iv. **The Universe:** Big bang and Hubble law, solar system, galaxy, neutron star, white dwarf, dark matter, black hole and gravitational wave
- v. **Special theory of Relativity:** Lorentz transformations and addition of velocities, light cone, proper time and time dilation, covariance and transformation of electromagnetic fields.

Unit 10: Recent Trends in Physics

- i. **Radio-Communications and Waves:** Wireless communication, global positioning system (GPS) and remote sensing, seismic waves, wave patterns of Gorkha earthquake 2015 and lightening
- ii. **Superconductor and Modern Technology:** Meissner effect, types of superconductors, the BCS theory, cooper pair, superconductivity at high temperature, Josephson's effect, holography, nanotechnology, integrated circuits and applications
- iii. **Econo-Physics:** Application of theory of physics in economics, efficient market hypothesis and pioneering approaches
- iv. **Energy:** Various sources of energy, renewable and nonrenewable energy, energy crisis and resolutions, energy and preservation of environment, future needs and applications with reference to Nepal.
- v. Medical use of nuclear and atomic radiations (MRI, CT-Scan, X-Rays and Radiotherapy) and possible health hazards