

नेपाल सरकार
शिक्षक सेवा आयोग
खुला प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम
२०७२

तह : माध्यमिक

विषय : विज्ञान

Section A : Curriculum and Technologies of Teaching Science in Secondary Level - 40 Marks

A. Science Teaching Theories and Technology

1 Nature, Objectives and Psychology of Learning

- 1.1 Nature and objectives of teaching science
- 1.2 Psychology of learning in relation to science (Piaget's, Bruner, Gagne's theories)
- 1.3 Bloom's taxonomy
- 1.4 Science and Technology Literacy (STL) and Science, Technology and Society (STS), perspectives of epistemology and ontology
- 1.5 Creativity and scientific attitude for science education
- 1.6 Programmed learning and instructional module in science education.

2 Curriculum and Evaluation

- 2.1 Curriculum and curricular materials in science education, critical analysis of secondary and higher secondary science curriculum of Nepal
- 2.2 Innovative science curriculum (SAARC countries, UK and USA) and science project
- 2.3 Study of development of science education in Nepal
- 2.4 Evaluation of students' learning : Types of evaluation, percentage and grading system of evaluation, science theory of test paper, professional initiatives in MGT teachers.
- 2.5 Item analysis of SLC science (latest year)
- 2.6 Suggestions to improve the evaluation system

3 Methods of Teaching Science

- 3.1 Different approaches and techniques of learning science
- 3.2 Recent trends in science education, constructivism and constructivist method
- 3.3 Use of ICT in teaching science
- 3.4 Science teaching through open and distance learning mode
- 3.5 Interactive and inquiry teaching in science education
- 3.6 Theories of motivation.

4 Instructional Planning

- 4.1 Annual and unit plan
- 4.2 Models of lesson plan : ABC, Herbartian, Yager's, concept mapping, investigative, discovery and laboratory
- 4.3 Professional development of science teachers and problems of teaching science in Nepal
- 4.4 Action research and its application in science teaching
- 4.5 Use of locally available instructional material in science teaching.

B. Teaching Science**5 Teaching Physics**

- 5.1 Teaching measurement
- 5.2 Teaching motion
- 5.3 Teaching force
- 5.4 Teaching simple machine
- 5.5 Teaching density
- 5.6 Teaching pressure
- 5.7 Teaching work, energy and power
- 5.8 Teaching alternative source of energy
- 5.9 Teaching heat
- 5.10 Teaching light
- 5.11 Teaching sound
- 5.12 Teaching magnetism.

6 Teaching Chemistry

- 6.1 Teaching atomic structure
- 6.2 Teaching chemical bond and chemical reaction
- 6.3 Teaching periodic table
- 6.4 Teaching solution
- 6.5 Teaching acid, base and salt
- 6.6 Teaching metal and non-metal
- 6.7 Teaching some gases
- 6.8 Teaching carbon and its compounds
- 6.9 Teaching materials used in daily life.

7 Teaching Biology

- 7.1 Teaching land and aquatic beings
- 7.2 Teaching flowering plant

- 7.3 Teaching major plants & animals of Nepal
- 7.4 Teaching classification of animals and plants
- 7.5 Teaching plant and animal cell
- 7.6 Teaching life processes
- 7.7 Teaching human body
- 7.8 Teaching heredity
- 7.9 Teaching metabolism
- 7.10 Teaching life cycle of some animals & plants
- 7.11 Teaching adaptation
- 7.12 Teaching evolution
- 7.13 Teaching tissue
- 7.14 Teaching human physiology
- 7.15 Teaching sexual and asexual reproduction

8 Teaching Astrology and Geology

- 8.1 Teaching rocks
- 8.2 Teaching structure of earth's land mass
- 8.3 Teaching climate change
- 8.4 Teaching natural hazards and disasters
- 8.5 Teaching earth, moon & sun
- 8.6 Teaching planets, stars and eclipse

Subjective Section B : Subject Specific Content Knowledge - 40 Marks

A. Physics, Geology and Astronomy

9 Mechanics, Heat and Optics

9.1 Mechanics

- 9.1.1 Scalars and vectors
- 9.1.2 Simple harmonic motion
- 9.1.3 Kepler's laws
- 9.1.4 Verification of acceleration due to gravity
- 9.1.5 Surface tension, Bernoulli's theorem and its consequences
- 9.1.6 Stoke's law
- 9.1.7 Newton's laws of motion
- 9.1.8 Gravitational potential energy
- 9.1.9 Escape velocity
- 9.1.10 Altitude, depth and latitude

- 9.1.11 Pressure and its principles
- 9.1.12 Moment of inertia
- 9.1.13 Torque equations of motion for a rotating rigid body
- 9.1.14 Elasticity
- 9.1.15 Newton's formula for viscous force

9.2 Heat

- 9.2.1 First and second laws of thermodynamics
- 9.2.2 Isothermal and adiabatic process
- 9.2.3 Molar heat capacity
- 9.2.4 Calorimetry
- 9.2.5 Carnot's theorem
- 9.2.6 Heat engines and their efficiency
- 9.2.7 Enthalpy and entropy

9.3 Optics

- 9.3.1 Lens maker's formula
- 9.3.2 Chromatic aberration
- 9.3.3 Telescope and microscope
- 9.3.4 Spherical mirrors and their formula
- 9.3.5 Wave nature of light
- 9.3.6 Huygen's principle
- 9.3.7 Young's double slit experiment
- 9.3.8 Newton's rings
- 9.3.9 Fraunhofer's diffraction, diffraction of grating
- 9.3.10 Polarisation of light

9.4 Numerical problems related to mechanics, heat and optics.

10 Waves, Sound, Electricity, Magnetism and Modern Physics

10.1 Wave and Sound

- 10.1.1 Progressive waves and stationary waves
- 10.1.2 Waves in pipes and strings
- 10.1.3 Doppler's effect
- 10.1.4 Force oscillations and resonance
- 10.1.5 Sonometer
- 10.1.6 Acoustic of building and reverberation of sound

10.2 Electricity

- 10.2.1 Basic concepts of direct current,

- 10.2.2 Resistance, resistivity and conductivity
- 10.2.3 Temperature coefficient
- 10.2.4 Energy and power in d.c. circuit
- 10.2.5 Faraday's laws of electromagnetic induction
- 10.2.6 Function of generator, dynamo and transformer
- 10.2.7 Motor effect
- 10.2.8 Threshold energy/frequency
- 10.2.9 Hysteresis loss
- 10.2.10 Lenz's law
- 10.2.11 Self and mutual induction

10.3 Magnetism

- 10.3.1 Deflection of electrons in electric and magnetic fields
- 10.3.2 Photons and Photoelectric effect
- 10.3.3 Einstein's photoelectric equation
- 10.3.4 Stopping potentials

10.4 Modern Physics

- 10.3.5 He-Ne lasers
- 10.3.6 X-rays
- 10.3.7 Fission and fusion.

- 10.5 Numerical problems related to Waves, Sound, Electricity and Magnetism

11 Geology and Astronomy

12.1 Geology

- 11.1.1 History of the earth
- 11.1.2 Geographical diversity/diversion of Nepal
- 11.1.3 Rocks and minerals
- 11.1.4 Tectonic movement and earthquake
- 11.1.5 Natural disasters
- 11.1.6 Vulnerability
- 11.1.7 Climate change

12.2 Astronomy

- 11.2.1 Solar system
- 11.2.2 Satellites
- 11.2.3 Solar and lunar eclipse
- 11.2.4 Birth and death of stars
- 11.2.5 Hubble's law

11.2.6 Galaxy and constellations

11.2.7 Brightness of stars

11.2.8 Pulsars and quasars

B. Chemistry

12 Atomic Structure, Periodic Table and Gases

13.1 Discovery of electron, proton and neutron, Bohr's atomic model, wave mechanical concept, de-Broglie's equation, Schrodinger's wave equation; molecular and valance bond theory, hydrogen bonding; entropy change and Gibb's free energy, e.m.f. of Daniel cell and Nernst's equation, relation between enthalpy change and internal energy

13.2 Modern periodic table, characteristics of element on the basis of electronic configuration, physical and chemical properties of elements on the basis of groups and periods, collision theory and photochemical reaction, Redox reactions

13.3 Manufacture of ammonia, nitric acid, sulphuric acid, bromine, iodine, sodium carbonate and sodium hydroxide, Lother-Meyer volume curve

13.4 Some related numerical problems.

13 Metallurgy and Materials Used in Daily Life

13.1 Extraction, properties and uses of copper, iron, silver, gold, aluminium

13.2 Preparation, properties and uses of plastics, cement, ceramics, glass, pesticides, fibers, soap, detergent and chemical fertilizers.

14 Hydrocarbons

14.1 Aromatic and aliphatic compounds, Alkane, alkenes and alkynes, Preparation of aniline, nitrobenzene, Estimation of nitrogen, Stereo chemistry and isomerism, Alcohol and phenol and Aldehydes and ketones

14.2 Carbohydrates, proteins and amino acids, Baeyer Strain theory, Fischer projection formula and Electrophilic substitution reaction.

C. Biology

15 Classification and Lifecycle

15.1 Lifecycle of typical algae, fungus, bryophytes, pteridophytes and gymnosperm (spyrogyra, mushroom, cycas and fern)

15.2 Life cycle of mosquito, honey bee, silk worm, ascaris, taenia, snail

15.3 Lifecycle of toad, rat carp fish and rice

15.4 Description of some angiospermic families

15.5 Dicot stem, mitosis and meiosis cell division, Mendel's laws of inheritance

15.6 Mechanism of photosynthesis and respiration, structure and function of nucleic acid (DNA and RNA).

16 Economic Biology and Environmental Science

16.1 Economic plants : medicinal, timber and oil yielding plants

- 16.2 Apiculture, pisciculture and sericulture
- 16.3 Physiological system of rabbit and human (digestive, circulatory, respiratory, excretory, reproductive, skeleton and nervous system), blood groups
- 16.4 Evolution, mutation, determination of sex,
- 16.5 Bio-diversity
- 16.6 Ecology and ecosystem
- 16.7 Bio-geo-chemical cycle.

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