

नेपाल सरकार

## शिक्षक सेवा आयोग

खुला प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

२०७३

तह : निम्न माध्यमिक

विषय : विज्ञान

**Section B: Curriculum, Pedagogy and Technology in Science Teaching in Lower Secondary Level  
- 40 Marks****Unit 1. Study of the Science Curriculum**

- 1.1 Development of science teaching in Nepal
- 1.2 Characteristics of Science
- 1.3 Study of the curriculum of science teaching in primary, lower secondary and secondary levels in Nepal
- 1.4 Trends in science curriculum construction
- 1.6 Assess and corrective measures of present science curriculum of primary and lower secondary on the basis of objectives, learner's ability, national and social need
- 1.7 Reform efforts of science curriculum in Nepal

**Unit 2. Textbooks, Teachers' Guide, Reference Materials and Instructional Objectives**

- 2.1 Textbook and its importance
- 2.2 The use of Teachers' Guide in science teaching
- 2.3 Curricular materials of science education in Nepal
- 2.4 Importance and use of following instructional materials in science teaching
  - 2.4.1 ICT
  - 2.4.2 Environment outside the classroom
  - 2.4.3 Low cost and locally available instructional materials
  - 2.4.4 Audio visual materials
  - 2.4.5 Self - learning materials (SLM)
- 2.5 Meaning, needs, types, criteria for selection, procedure of writing and use of action verbs in writing instructional objectives in science teaching
- 2.6 The objectives of Science Teaching
  - 2.6.1 Long Range Goals of the Science Teaching
  - 2.6.2 Bloom's Taxonomy (Categories of objectives in measuring goals of science instruction)
- 2.7 Objectives of Science Teaching in Lower Secondary Level (importance of science in primary and lower secondary curricula)
- 2.8 Professional development of science teachers

**Unit 3. Plan of Science Teaching**

- 3.1 Annual, unit and lesson plan
- 3.2 Strategies for effective lesson plan

**Unit 4. Learning Theories and Learning Psychology**

- 4.1 Psychology of Learning science
  - 4.1.1 Piaget's theory
  - 4.2.2 Bruner's theory
  - 4.2.3 Gagne's theory
  - 4.2.4 Ausubel's theory
- 4.2 Motivational factors in learning and thinking science

4.3 Creativity and Scientific Attitudes

4.4 Theories of motivation

### **Unit 5. Teaching Methods and Technologies**

5.1 Problems and issues of science education and develop science teaching standards

5.2 Teaching methods and their applications in science teaching

5.3 Importance of laboratory works (experiments) and demonstration in science teaching

5.4 Constructivism and constructivist method in science teaching

5.5 Interactive and inquiry teaching in science

5.6 Instructional Model of teaching-learning science

5.6.1 5E - model

5.6.2 Herbart's instructional model

5.6.3 Yager's constructivist model

5.6.4 Inquiry based learning model

5.7 The implications of Science for science teaching (Scientific and Technological Literacy and Scientific and Technology Society)

### **Unit 6. Evaluation**

6.1 Present Status of examination system and their defects

6.2 Efforts to improve the examination system

6.3 The concept, scope, purpose and types of evaluation

6.4 Construction and standardization of test items: Planning test, specification chart

6.6 Letter grading in evaluation – grading descriptors, grade point, assigning grade

6.7 Alternative techniques in evaluation –CAS, project work, portfolio assessment, diagnostic test and error analysis, remedial teaching, strategies of prevention

### **Unit 7. Teaching Science and Environment in Lower Secondary Level**

#### **7.1 Teaching Physics**

7.1.1 Teaching measurement

7.1.2 Teaching force

7.1.3 Teaching motion

7.1.4 Teaching velocity and acceleration

7.1.5 Teaching simple machine

7.1.6 Teaching pressure

7.1.7 Teaching work, energy and power

7.1.8 Teaching heat

7.1.9 Teaching light

7.1.10 Teaching sound

7.1.11 Teaching electricity

7.1.12 Teaching magnetism

#### **7.2 Teaching Chemistry**

7.2.1 Teaching state of matter

7.2.2 Teaching mixture

7.2.3 Teaching composition of air

7.2.4 Teaching structure of matter

7.2.5 Teaching periodic classification of elements

7.2.6 Teaching acid, base and salt

7.2.7 Teaching metal and non-metal, major ores found in Nepal (iron, copper, limestone, graphite, zinc)

7.2.8 Teaching valency and electronic configuration

7.2.9 Teaching some useful chemicals

### 7.3 Teaching Biology

7.3.1 Teaching living beings

7.3.2 Teaching cell and tissue

7.3.3 Teaching life process

7.3.4 Teaching classification of animals and plants

7.3.5 Teaching some micro organisms ( bacteria, virus, fungi)

### 7.4 Teaching Astro-Geo Science

7.4.1 Teaching structure of earth

7.4.2 Teaching weather and climate

7.4.3 Teaching formation of shadow

7.4.4 Teaching solar and lunar eclipses

7.4.5 Teaching the universe

## Section C : Content Knowledge of Subject Matter

-40 Marks

### A. Physics, Geology and Astronomy

20 Marks

#### Unit 8. Mechanics, Heat and Optics

##### 8.1 Mechanics

8.1.1 Scalar and vector quantities

8.1.2 Newton's laws of motion

8.1.3 Conservation of Momentum

8.1.4 Verification of Newton's laws of Gravitation

8.1.5 Work, Energy and Power

8.1.6 Hooke's law

8.1.7 Simple Harmonic Motion and its Application

8.1.8 Pressure in a fluid

8.1.9 Archimedes Principle

##### 8.2 Heat and Optics

8.2.1 Thermal expansion

8.2.2 Specific heat capacity

8.2.3 First and second laws of thermodynamics

8.2.4 Nature and propagation of light

8.2.5 Refraction at plane surfaces

8.2.6 Newton's rings

8.2.7 Defects of vision and their correction

8.2.8 Phenomenon of polarization of light

8.3 Numerical problems related to mechanics, heat and optics

#### Unit 9. Waves, Sound, Electricity and Magnetism

##### 9.1 Wave and Sound

9.1.1 Longitudinal and Transverse motion of waves

9.1.2 Ultra and Infra sound

9.1.3 Sound pollution

## 9.1.4 Sonometer

**9.2 Electricity and Magnetism**

## 9.2.1 Ohm's law

## 9.2.2 Electromotive force and potential difference

## 9.2.3 Thermoelectric effect-Seebeck Effect

## 9.2.4 Faraday's laws of electromagnetic induction

## 9.2.5 Factors affecting resistance

## 9.2.6 Magnetic field and angle of declination

## 9.2.7 Dia-, Para- and Ferro-magnetic materials

## 9.2.8 Magnetic effect of current-Oersted's experiment

## 9.3 Numerical Problems relation to waves, sound, electricity and magnetism

**Unit 10. Modern Physics**

## 10.1 Cathode rays, X-Rays and Radioactivity (Meaning, Properties and Uses)

## 10.2 Nuclear Reaction : Meaning and its Types

**Unit 11. Astro-Geo Science****11.1 Geology**

## 11.1.1 History of the earth

## 11.1.2 Structure of the earth

## 11.1.3 Types of rocks

## 11.1.4 Green House Effect

## 11.1.5 Water Cycle

## 11.1.6 Natural disasters

## 11.1.7 Minerals

## 11.1.8 Volcano and earthquake

## 11.1.9 Ozone layer, its importance and depletion of ozone layer

**11.2 Astronomy**

## 11.2.1 Solar system

## 11.2.2 Galaxies

## 11.2.3 Lunar and solar eclipses

## 11.2.4 Birth and death of stars and its significance

## 11.2.5 Satellites

## 11.2.6 Constellations

## 11.2.7 Heliocentric theory

**B. Chemistry****10 Marks****Unit 12. Chemical Arithmetic, Atomic Structure, Electronic Theory of Valency and Bonding****12.1 Chemical Arithmetic**

## 12.1.1 Postulates of Dalton's atomic theory

## 12.1.2 Law of conservation of mass

## 12.1.3 Law of constant proportions

## 12.1.4 Law of multiple proportions

## 12.1.5 Law of reciprocal proportions

## 12.1.6 Law of gaseous volumes

**12.2 Atomic Structure and, Electronic Theory of Valency and Bonding**

## 12.2.1 Discovery of fundamental particles of atom

## 12.2.2 Bohr's model of atom and its limitation

## 12.2.4 Electronic configuration of the atom and ions

## 12.2.5 Octet rule

12.2.6 Ionic and Covalent bonds, ionic and covalent compounds and their properties

**Unit 13. Periodic Table**

13.1 Modern periodic law and modern periodic table

13.2 Characteristics of element on the basis of electronic configuration

13.3 Ionization Potential, Electron affinity and Electro negativity

Unit 14. Laboratory preparation of hydrogen, oxygen, carbon dioxide, nitrogen and ammonia gases

Unit 15. Metallurgy

15.1 Characteristics of metals, non-metals and metalloids

15.2 Extraction, properties and uses of copper, zinc, mercury, iron and silver

Unit 16. Properties and uses of chemical and organic fertilizers and Properties and uses of pesticides (insecticides, herbicides, weedicides and fungicides)

Unit 17. Basics of organic chemistry

17.1 Definition of organic compounds

17.2 Bonding and Hybridization

17.3 Tetravalency and catenation property of carbon

17.4 Differences between organic and inorganic compounds

17.5 Alkanes, alkenes and alkynes (structures, general preparation - including laboratory preparation of ethene and ethyne, properties and uses)

**C. Biology**

**10 Marks**

Unit 18. Cell Biology, Biodiversity, Economic Biology, Sociobiology and Environmental Science

18.1. Cell Biology, Biodiversity and Economic Biology

18.1.1 Structures of plant and animal cell

18.1.2 Plant and animal tissues with their functions

18.1.3 Protoplasm and Chromosome

18.1.4 Mitosis and Meiosis cell division

18.1.5 Laws of inheritance (Mendalism), Mono-hybrid cross

18.1.6 Life cycle of plasmodium volvox, paramecium, marchentia and funaria

18.1.7 Economic importance of nostoc, virus, mushroom, earthworm, silkworm, honey bee, jute, cotton, cardamom and coffee

18.1.8 General characters and classification of leguminosae, compositae, protozoa, porifera, mollusca and chordata

18.1.9 Metabolism: Photosynthesis/Respiration, Mineral nutrition

18.2. Sociobiology and Environmental Science

18.2.1. Diseases: Typhoid, Tuberculosis and Cancer

18.2.2 Structural and functional aspects of Pond and Forest Ecosystems

18.2.3 Interaction of biotic and abiotic factors

18.2.4 Ecological pyramids, productivity

18.2.5 In-situ and Ex-situ Conservation of animals

18.2.6. Bio-Geo-Chemical cycles: carbon and nitrogen

18.2.7. Physiological system of human (digestive, circulatory, respiratory, excretory, urinary, reproductive, muscular, skeleton, nervous system and glandular system)

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