

Government of Nepal
Teacher's Service Commission
Lower secondary Level Curriculum of subjective Exam 2078

Subject: Mathematics and Science

Full marks: 100

Time: 3 hrs

Section: A

1. Instructional Pedagogy

- 1.1. **Basic Level Curriculum (6-8):** Analytical study of basic level (6-8) Mathematics and Science Curriculum
- 1.2. **Uses of Learning Theories in Mathematics and Science Teaching:** Piaget's theory of developmental stages of intellectual growth, Ausubel's theory of meaningful verbal learning, Gagne's model of sequential learning, Burner's model of concept learning,
- 1.3. **Methods of Teaching/Learning:** Teaching/learning tools and strategies for teaching basic level (6-8) mathematics and science, Use of Information and Communication Technology (ICT) in teaching/ learning
- 1.4. **Instructional Planning and Classroom Management:** Annual, unit and lesson plan, classroom management
- 1.5. **Student Assessment:** Continuous assessment system, Specification grids

2. Teaching Arithmetic, Algebra and Statistics

- 2.1 **Number System:** The system of real numbers, decimal and binary number system
- 2.2 **Application of percentage and fraction:** Unitary method; profit, loss and discount; simple interest
- 2.3 **Algebraic Expressions and Exponents:** Factorization of binomials and trinomials, HCF and LCM of maximum three expressions, Indices and Surds
- 2.4 **Equality and inequality:** Trichotomy Law, linear equations in one and two variables, quadratic equation in one variable.
- 2.5 **Measures of Central tendency:** Arithmetic mean, median and mode for discrete data.

3. Teaching Geometry, Mensuration and Sets

- 3.1 **Teaching Geometry:** Triangle, Quadrilateral and Polygon (Classification, Properties, Construction), Congruency and similarity of two triangles.
- 3.2 **Teaching Mensuration:** Surface area and volume of cylinder, cube and cuboid
- 3.3 **Teaching Co-ordinate geometry:** Distance between two points and its application in geometrical figures

- 3.4 **Teaching Transformation:** Introduction to Reflection, Rotation and Translation, direction bearings, scale drawing and tessellations
- 3.5 **Teaching Sets:** Introduction and types of Sets, Venn- diagram.

4. Teaching Mechanics, Earth and Space

- 4.1 **Simple machine and friction:** Concept and mechanism of transfer of force, types and uses of simple machine, Velocity ratio, mechanical advantage, friction, efficiency of the machine, examples of local simple machines.
- 4.2 **Rest , Motion and Force :** Rest and motion, uniform and non- uniform motion, distance, displacement, speed, velocity, acceleration and retardation, equations of motion, inertia, Newton's laws of motion, Newton's laws of gravitation, force and momentum and circular motion.
- 4.3 **Pressure:** Pressure and its measurement, atmospheric pressure and pressure in a fluid, density of a body and relative density and application of pressure in daily life.
- 4.4 **Work, Energy and Power:** Work and power, kinetic and potential energy, transformation of energy, alternative sources of energy, principle of conservation of energy.
- 4.5 **Earth, Space and Weather:** Structure of the earth, origin of solar system, Big bang theory, galaxies, phases of moon, weather, climate and climate change, factors affecting climate, climatic condition of Nepal.

5. Teaching Biology and Chemistry

- 5.1 **Plants and Animals:** Classification of plants and animals on the basis of their characteristics, vertebrates and invertebrates, gymnosperm and angiosperm.
- 5.2 **Environment, Ecosystem, Adaptation and Balance:** Biodiversity and sustainable development, ecosystem of pond and forest, adaptation
- 5.3 **Cell Biology:** Structure of plant and animal cells, cell organelles, plant tissue, animal tissue and cell division.
- 5.4 **Life Process and Life Cycle of Plants and Animals:** Respiration and reproduction in animals and plants, introduction to human systems (digestion, respiration, circulation, excretion, reproduction and nervous) and life cycle (mustard plant, mosquito and silk worm)
- 5.5 **Matter and Mixture:** Properties and classification of matter, mixture, process of separation of mixture, solution and its uses.

Section : B

6. Sets, Geometry, Algebra and Trigonometry

- 6.1 **Algebra of Sets:** Idempotent laws, Identity laws, Associative laws, Distributive laws, Commutative laws, De- Morgan's laws.
- 6.2 **Analytic Geometry:** Condition of general equation of second degree, angle between the pair of lines, Circle and tangent to the circle, standard equations of the parabola, ellipse and hyperbola.
- 6.3 **Euclid Geometry and Transformation Geometry:** Euclid's fifth postulates and its substitute, theorems related to triangle, parallelograms and circle, properties of isometric and non-isometric transformation
- 6.4 **Matrix and Linear programming Problem:** Solution of linear equations using Matrix-inversion method, Cramer's rule and Row – equivalent method, Introduction to linear programming and solution of linear programming problems by Simplex method.
- 6.5 **Trigonometry:** Properties of triangle(Laws of sines, cosines and tangents), General values, solution of triangle and inverse circular function

7. Calculus, Statistics and Probability

- 7.1 **Introduction to limit and Continuity:** Indeterminant forms, left hand and right hand limits, graph of continuous functions, discontinuity of a function.
- 7.2 **Derivatives:** Fundamental rules of differentiation, first order and second order derivatives of algebraic functions.
- 7.3 **Antiderivatives:** Integration by substitution and integration by parts of algebraic functions, Solution of ordinary differential equations.
- 7.4 **Statistics:** The coefficient of Skewness, The coefficient of correlations and regression, equation of regression
- 7.5 **Combinatorics and Probability:** Permutation and combination, Conditional probability and Bayes theorem, Binomial distribution

8. Basics of Chemistry

- 8.1 **Atomic Structure:** Discovery and properties of fundamental particles of atom, Bohr's model of atom, electronic theory of valency, octet rule, Aufbau principle, periodic table, electronic configuration of atom and ions, periodic law, classification of elements on the basis of electronic configuration.
- 8.2 **Physical and Chemical Process and Bonding:** Physical change and chemical change, Process involved in chemical change, hardness of water, Methods of removing hardness of water, properties of gas, Boyle's law, Charle's law, kinetic molecular theory of gas, Dalton's law of partial Pressure, Properties of solids, bond (ionic, covalent, co-ordinate Covalent, metallic, hydrogen), Vander Wall's force, ionic and covalent Compounds.

- 8.3 **Acids, Bases and Salts:** Properties of acid, base and salt, mineral acids (HCl, HNO₃ and H₂SO₄) acid base indicators, pH scale, pH and pOH of solution, selection of acid base indicators using titration curve.
- 8.4 **Some Inorganic Compounds:** Laboratory preparation, properties and uses of gases (oxygen, hydrogen, nitrogen), allotropes of carbon, sulphur and phosphorus, chemistry of some important compounds (green vitriol, blue vitriol and white vitriol, horn silver, sodium carbonate, iodine)
- 8.5 **Organic Chemistry:** Hybridization (involving s and p orbitals), tetra covalency and catenation property of carbon, Preparation and properties of aliphatic hydrocarbons, IUPAC naming

9 Basics of Physics and Biology

- 9.1 **Wave, Light and Sound:** Simple harmonic motion of simple pendulum, nature of sound and light waves(longitudinal and transverse waves) laws of reflection, law of refraction, amplitude, frequency, wavelength, velocity of waves, critical angle and total internal reflection, concave and convex lens, real and virtual image, magnification, defects of vision and correction, doppler effect.
- 9.2 **Heat, Temperature and Thermodynamics:** Molecular concept of thermal energy, heat, temperature and thermal equilibrium, Thermal expansion(Linear, superficial, cubical expansion and corresponding coefficients),Heat capacity, specific heat capacity, Newton' law of cooling and latent heat, First and second law of thermodynamics.
- 9.3 **Current Electricity and Magnetism:** Electric circuit, static electricity and current electricity, dry cell, series and parallel combination of cells, e. m. f., potential difference, heating effect of current, Faradays laws of electromagnetic induction, Magnetic lines of force.
- 9.4 **DNA and RNA:** Structure of DNA and RNA, DNA replication and genetic codes.
- 9.5 **Linkage and Mutation:** Concept and types of linkage and mutation, sex linked inheritance.

10 Mechanics and Vector

- 10.1 **Statics:** Parallelogram law of forces, composition of resolution of forces
- 10.2 **Dynamics:** Motion along straight line, motion under gravity.
- 10.3 **Introduction to Vectors:** Scalar and vector quantities, Collinear and coplanar vectors
- 10.4 **Product of Vectors:** Scalar product of Two Vectors, Vector product of two vectors.
- 10.5 **System of Measurement:** Measurement, SI unit, relation between FPS, CGS and MKS system of measurement, fundamental and derived units, local and standard measurement, measurement of solid

Specification Grid

| Unit | Contents | Questions | Marks |
|--------------------|---|-----------|-------|
| Section : A | | 5 | 50 |
| 1 | Instructional Pedagogy | 1 | 10 |
| 2 | Teaching Arithmetic, Algebra and Statistics | 1 | 10 |
| 3 | Teaching geometry, Menstruation and Sets | 1 | 10 |
| 4 | Teaching Mechanics, Earth and Space | 1 | 10 |
| 5 | Teaching Biology and Chemistry | 1 | 10 |
| Section : B | | 5 | 50 |
| 6 | Sets, Geometry, Algebra and Trigonometry | 1 | 10 |
| 7 | Calculus, Statistics and Probability | 1 | 10 |
| 8 | Basics of Chemistry | 1 | 10 |
| 9 | Basics of Physics and Biology | 1 | 10 |
| 10 | Mechanics and Vector | 1 | 10 |
| | Total | 10 | 100 |

1. The curriculum has two sections A and B, where Section A is related to teaching learning skills and section B is related to content knowledge.
2. Different answer sheets will be provided for section A and B.
3. The medium of the script in written test will be either Nepali or English or both.
4. The curriculum will be effective from 2078/ 05/16