Government of Nepal

Teachers' Service Commission

Secondary Level Curriculum of Subjective Examination - 2076

Subject: Biology **Marks: 100** **Time: 3 Hours**

Section A

Unit One: Bimolecular, Cell Biology and Embryology

1.1 Bimolecular: Carbohydrates, proteins, lipids, nucleic acids, minerals, enzymes and water.

1.2 Cell -Biology: Concepts of prokaryotic and eukaryotic cells, detailed structure of eukaryotic cells and significances.

1.3 Plant Anatomy: Types of plant tissues, anatomy of dicot and monocot root, stem and leaf

1.4 Animal Tissues: Types, structure, functions and locations

1.5 Embryology: Asexual and sexual reproductions in angiosperms, pollination, fertilization, development of male and female gametophytes, development of dicot and monocot embryos, concept of endosperm, and gametogenesis

Unit Two: Bio Diversity

2.1 Introduction: Five kingdom classification system (monera, protista, fungi, plantae and animalia).

2.2 Fungi (mucor and yeast) **and Algae** (spirogyra): Structure, reproduction and economic importance

2.3 Morphological structure and reproduction of *marchantia*, *dryopteris and pinus*, economic importance of bryophytes, pteridophytes and gymnosperm.

2.4 Protista: Protozoa **(**diagnostic features and classification up to class)

2.5 Animalia: Systems (digestive, excretory, nervous, reproductive) and economic importance of earthworm and systems (digestive, blood vascular, respiratory and reproductive) of frog

Unit: Three: Genetics and Ecology

3.1 Genetics: Genetic materials (DNA and RNA), Mendelian genetics, linkage and crossing over, mutation and polyploidy.

3.2 Ecology: Ecosystem and ecology, ecological adaptation, ecological imbalances.

3.3 Biota and Environment: Animal adaptations, environmental pollution, pesticides and their effects

3.4 Conservation Biology: Concept of biodiversity, biodiversity conservation, national parks, wildlife reserves, conservation areas, biodiversity hotspots, wetland and Ramsar sites, causes of extinction and conservation strategies

3.5 Vegetation: Types of vegetation in Nepal, concept of *In-situ* (protected areas) and *Ex-situ* (botanical garden, seed bank) conservation.

Unit: Four: Plant Physiology and Human Biology

4.1 Plant Physiology: Water relation, photosynthesis and respiration, plant hormones, plant growth and movement

4.2 Human Biology: Human Systems (digestive, respiratory, circulatory, excretory, nervous and reproductive)

4.3 Sense Organs and Endocrinology

Unit Five: Overview of Science Curriculum and Evaluation of Secondary Level

5.1 Curriculum and Text book: Comparative study of biology curriculum, text books and teacher manual of Grade 11 and 12

5.2 Teaching aids: Development and use of ICT (integrated commutation technology) in teaching biology

5.3 Evaluation: Test items, marking scheme of biology of class 11 and 12 and specification grid

5.4 Assessment: Continuous assessment system, grade and grading system

5.5 Teaching Learning Science: Science process skills, scientific method, approaches of teaching science, science laboratory and safety measures

Section B

Unit Six: Microbiology and Applied Biology

6.1 Monera: Introduction, structure of bacterial cell, mode of nutrition, bacterial growth, cyanobacteria (blue green algae) and virus **(**introduction, structure importance) and bacteriophage

6.2 Impacts of Biotechnology in the Field of Microbiology.

6.3 Applied Biology: Tissue and organs transplantation, *in-vitro* fertilization (IVF), amniocentesis, concept of genetically modified organisms, poultry and fish

farming,

6.4 Aapplication of cross fertilization, self and cross pollination, cryopreservation and mutation.

6.5 Biotechnology: Tissue culture, plant breeding, disease resistance plants, green manure and bio-fertilizer, bio-pesticide, genetic engineering and GMOs and application, bio-engineering, food safety and food security

Unit Seven: Animal Taxonomy and Nomenclature

7.1 **Lower Non Chordata:** Taxonomy (concept, trends, species, keys/diagnostic features), structure and reproduction (porifera, coelenterata, platyhelminthes, aschelminthes and annelida)

7.2 Higher Non-chordata and Protochordata: Diagnostic features, classification, structure and organ systems (arthopoda, mollusca, echinodermata and protochordata)

7.3 Chordata: diagnostic features, classification, origin, evolution and adaptive radiation of chordata (pisces, amphibia, reptilia, aves and mammalia)

Unit Eight: Plant Taxonomy and Nomenclature

8.1 Plant Taxonomy: Principles, approaches of classification and botanical nomenclature.

8.2 Angiosperm Phylogeny Group (APG): Classification, principles and ranks with major angiosperm clades, with updated version

8.3 **Taxonomic Description of the Families**: Brassicaceae, fabaceae, solanaceae, and liliaceae with economic importance.

Unit Nine: Anatomy, Evolution, Biogeography and Ecology

9.1 Comparative Anatomy of Chordate: Exoskeleton, endoskeleton, digestive organs, respiratory organs, circulatory organs, portal systems, urinogenital organs, gonads, ducts and brain

9.2 Evolution: Life and its origin **(**Oparin-Haldane theory, Miller and Urey's experiment), principles of organic evolution, basic patterns of evolution-sequential and divergent evolution, micro, macro, mega and quantum evolution, modern synthetic theory of evolution, gene pool and gene frequency, Hardy-Weinberg Law

9.3 Biogeography: Biogeography and distribution, biogeographic patterns and

process, zoogeographic realms, theory of island biogeography, zoogeographic affinities of fauna of Nepal

9.4 Ecology: Population growth models, community patterns, measurement and analyses methods of population and communities

Unit Ten: Neuronal, Behavioral Biology, Immunology, Cytogenetic, Biostatistics and Bioinformatics

10.1. Neurobiology: Organization of the nervous system, cells and connection of the nervous system, neurotransmitters and neuropeptides, neural regulation of complex functions, brain Functions, consciousness, biorhythm and its regulatory genes/circadian timekeeping, sleep, dreaming and wakefulness, reward, addiction, andemotion

10.2 Behavioral Biology: Principles, mechanisms and development of animal behavior, stimuli and communication, learning and memory (bees, birds, primates), ecology of feeding behavior and mating systems and ecology of parental care

10.3 Immunology and Microbial Diseases: Immune system, receptors, nature of antigen and antibody, immune effectors mechanisms, major histocompatibility complex (MHC) genes and products, risk and hazard group of microorganisms, causative agents, symptoms, prevention and control measures of selected human diseases (tuberculosis and HIV, SARS, COVID-19, hepatitis) and basic concepts of immunology–vaccines

10.4 Cytogenetic: Cell membrane transport mechanism, cell metabolism, cell adhesion and communication, structural organization of genome, structure, expression and regulation of genes

10.5 Biostatistics & Bioinformatics: Databases, tools and their uses (structure, importance, nucleic acid and protein sequence), evolutionary trees homology and similarity, phylogeny and relationship (approaches used in phylogenetic analysis, phylogenetic trees)

Specification Grid

Subject: Biology **Level:**

Secondary

Unit	Section	Scope of Curriculum	Questions	Marks
1	A	Biomolecules, Cell Biology and Embryology	1	10
2		Biodiversity	1	10
3		Genetics and Biology	1	10
4		Plant Physiology and Human Biology	1	10
5		Curriculum and Evaluation	1	10
6	B	Microbiology and Applied Biology	1	10
7		Animal Taxonomy and Nomenclature	1	10
8		Plant Taxonomy and Nomenclature	1	10
9		Anatomy, Evolution, Biogeography and Ecology	1	10
10		Neuronal, Behavioral Biology, Immunology, Cytogenetic, Biostatistics and Bioinformatics	1	10
Total			**10**	**100**

Notes:

1. This curriculum is divided into sections A & section B.
2. Generally from section A, questions will be asked related to pedagogy.
3. From section B questions will be asked covering cognitive level.
4. Separate answer sheets will be used for each section.
5. The medium of the language in written test will be either Nepali or English or both.
6. This curriculum will be effective from 2077/03/ 09