

Biology

Grade XI

Teaching Hours: 150

Full Marks: 75 + 25 = 100

1. Introduction

Biology, being the science of nature, deals the fascinating changes, which continuously takes place in the living world. Every person is expected to understand the nature of which he is a part. One needs to be familiar with the changes taking place in nature. The study of biology equips an individual to understand the living world in the light of new researches. Besides realizing the general objectives of any discipline of science like development of scientific temper and analytical skill, the curriculum in biology has also to be geared to meet the requirement of careers in the field of medicine and related disciplines (wildlife, forestry, agriculture, natural resources, environment, etc). This course is designed for general science (Biological and Physical) students of Grade XI.

2. General Objectives

The general objectives of this course are,

- a. To provide the concept of biology and encourage the learners to use the acquired knowledge in day to day life;
- b. To make the learners aware of the present development in the biological science as well as to develop the knowledge and skill in the wise use of the available natural resources and sustaining them; and
- c. To prepare the students to take up advance studies in biology at university level.

3. Specific Objectives

On completion of the course the students will be able to:

- a. Describe the life components, origin of life and its evolution up to present day;
- b. Explain the cell components, their types and cell division;
- c. Explain diversity of plant and animal;
- d. Discuss functional processes of the typical animal types;
- e. Describe functional concept, ecological imbalances and their consequences; and
- f. Explain importance of natural resources, their conservation and management with reference to national context

Course Content

Section A (Botany)

Teaching Hour: 75

Full Marks: 37.5

Unit 1: Introduction to Biology

5 Teaching hour

- Biochemically important organic and inorganic molecules (general concepts): Carbohydrate, protein, lipid, nucleic acid, minerals and water.

Unit 2: Cell Biology

15 Teaching Hour

- The cell: The cell as a unit of life, structure of prokaryotic and eukaryotic cells, Structure and functions of cell organelles and inclusions.
- Cell Division: Amitosis, mitosis, meiosis.

Unit 3: Biodiversity

40 Teaching Hour

Definition and scope of biodiversity, flora diversity of Nepal, concept of taxonomy: classification, binomial nomenclature, shortcoming of two kingdom classification, hierarchic system in classification, phylogeny. Five kingdom classification: Monera, Protista, Mycota, Plantae and Animalia.

- **Monera:** General account, structure and function of bacterial cells, concept of autotrophic and heterotrophic life styles, economic importance of bacteria.

Cyanobacteria: Nostoc – Structure, reproduction and economic importance.

- **Mycota:** Concept of Zygomycetes (Mucor), Ascomycetes (Yeast). Economic importance of fungi.
- **Plantae:**

Algae: Introduction to green, red and brown algae, structure and reproduction of Spirogyra.

Bryophyta: Marchantia and Funaria (morphology and life cycle).

Pteridophyta: Dryopteris (morphology and life cycle).

Gymnosperm: Brief morphological structure of Cycas and Pinus structure and its distribution.

Angiosperm: Morphology: root, stem, leaf, flower, fruit and seed relevant to the following families. Taxonomy and economic importance of the following families; Cruciferae (Brassicaceae), Solanaceae,

Leguminosae: Papilionoidae only, Compositae (Asteraceae) and Gramineae (Poaceae).

Virus: Structure and economic importance.

Unit 4: Biota and their environment

15 Teaching hour

- Ecology: Definition, abiotic, biotic factors and their interactions.
- Concept of ecosystem, Pond and grassland ecosystem: structural and functional aspects; food chain, trophic level, ecological pyramids, productivity, concept of community and succession.
- Bio-geochemical cycle: carbon cycle and nitrogen cycle.
- Ecological imbalance and its consequences: Green house effects, depletion of ozone layer and acid rain.
- Concept of mountain ecosystem (altitudinal and climatic changes).

- **Conservation:**

Forest conservation: Brief introduction of forests of Nepal, importance of afforestation and hazards of deforestation.

Management of land and water.

Evaluation Scheme

Unit wise weightage for Botany Part 1

Unit	Teaching Hour	Marks	Types of questions asked in the Examination		
			Very Short question (1 mark)	Short questions (3 marks)	Long Questions (7.5 or 8 marks)
1. Introduction to Biology	5	3	X	1	X
2. Cell Biology	15	8	2 or 1 opt	2	OR 1*
3. Biodiversity	39	18.5	3 or 1 opt	3 or 1 opt	1 or 1 opt (7.5 Marks)
4. Biota and their environment	16	8	2 or 1 opt	2 or 1 opt	Or 1*
Total	75	37.5	7 ques x 1 mark	5 ques x 3 marks	2 ques x 7.5 marks and 8 marks
			Total 7 marks	Total 15 marks	Total 15.5 Marks

*One full question of 8 marks will be asked either from the unit cell biology or Biota and environment

Course Content

Section B (Zoology)

Teaching Hour: 75

Full Marks: 37.5

Unit 1: Introduction to Biology

5 Teaching Hour

- Nature and scope of Biology
- Branch and relation with other sciences.
- General approach to understand life processes.

Unit 2: Origin and evolution of life

20 Teaching Hour

- Life and origin
- Theories of origin of life
- Oparin and Haldane's Theory
- Miller and Urey's experiment
- Meaning of evolution, structural, anatomical, Paleontological, Embryological and Biochemical
- Lamarckism, Darwinism and concept of Neo Darwinism.

Unit 3: Biodiversity

35 Teaching Hour

Meaning of biodiversity, faunal diversity of Nepal.

- **Protista:** Characteristics and classification of phylum Protozoa upto class with examples; Habit and habitat, structure, reproduction and lifecycle of Paramecium and Plasmodium vivax (a concept of P.Falciparum).
- **Animalia:** General characters and classification of the following phyla (upto class) with examples – Porifera, Coelenterata (Cnidaria), Platyhelminthes, Aschelminthes (Nemathelminthes), Annelida, Arthropoda, Mollusca, Echinodermata and Chordata.

Earthworm (Pheretima Posthuma): Habit and habitat, structure; digestive, excretory, reproductive and nervous systems.

Frog (Rana Tigrina): Habit and habitat, structure; digestive, circulatory, respiratory, reproductive

Unit 4: Biota and their Environment

15 Teaching Hour

- **Environmental pollution:** Air, water and soil. Sources of pollution, their effects and control measures. Hazards of pesticides.
- **Animal Behaviour:** Taxes, reflexes and reflex action, dominance and leadership migratory behavior of fish and bird.
- **Adaptation:** Animal: Aquatic, amphibious and terrestrial (arboreal and volan)
- **Conservation:**
Wildlife Conservation: Meaning of wildlife, importance of wildlife, meaning of rare, threatened, vulnerable and endangered species; few endangered species in Nepal. Conservation practices (National Parks, wildlife reserves and hunting reserves), Ways of conservation and causes of extinction.
- Human responsibility for the protection of earth.

Evaluation Scheme

Unit wise weightage for Zoology Grade XI

Unit	Teaching Hour	Marks	Types of questions asked in the Examination		
			Very Short Question (1 mark)	Short Questions (3 marks)	Long Questions (7.5 or 8 marks)
1. Introduction to Biology	5	2	×	×	×
2. Evolution of Life	20	10	2 or 1 opt	0 or 1 opt	1 (8 marks)
3. Biodiversity	35	17.5	1 or 1 opt	3 or 1 opt	1 or 1 opt (7.5 Marks)
4. Biota and their environment	15	8	2 or 1 opt	2	X *
1			7 ques × 1 mark	5 ques × 3 marks	2 ques × 7.5 marks and 8 marks
Total	75	37.5	Total 7 marks	Total 15 marks	Total 15.5 Marks

**One full question of 8 marks will be asked either from the unit Evolution of life or Biota and environment*

Format for question model for Biology – Part 1

Section B (Zoology)

- | | |
|--|---|
| 1. Answer in very short; any seven
- Total questions to be asked – 10 | 1 mark × 7 ques. = 7 marks |
| 2. Describe in brief; any five
- Total questions to be asked – 7 | 3 marks × 5 ques. = 15 marks |
| 3. Long questions (two questions) | <u>8 marks + 7.5 marks = 15.5 marks</u> |
| 4. One question is given as option as “or” | Total = 37.5 Marks |

Time schedule for questions

- | | |
|--------------------------------|------------------------|
| Very short question – 1 mark | - maximum 1 min |
| Short question – 3 marks | - maximum 7 – 8 min. |
| Long question – 7 or 7.5 marks | - maximum 23 – 24 min. |

Note:

1. There will be separate answer sheets for section A (Botany) and Section B (Zoology).
2. Total exam time period of theory will be of 3 hours for both the sections A and B.
3. Concerned examiners will evaluate both the papers separately.
4. The pass marks is 27. The students must pass in Botany and Zoology jointly.

Botany Practical

Grade XI

1. Use and maintenance of compound microscope.
2. Study of museum specimen and slides:
 - a. Types of bacterial cells;
 - b. Spirogyra filaments;
 - c. Mucor: Culture to demonstrate mycelium and sporangium; culture of yeast cells.
 - d. Study of vegetative and reproductive structure of Marchantia, Funaria, Dryopteris, Pinus.
3. Study of different stages of mitotic and meiotic cell division through permanent slides and chart.
4. Preparation of temporary slide to study cell structure:
Onion scale leaf, Leaf of Geranium or Zebrina or Tradescantia or any other locally available leaf.
5. Description of following plants in semi-technical terms with their floral diagrams and formulae and identification and economic importance of at least one plant from each of the following families
 - a. Cruciferae (Brassicaceae)
 - b. Solanaceae
 - c. Leguminosae – Papilionoidae only
 - d. Compositae (Asteraceae)
 - e. Gramineae (Poaceae)
6. Study of morphological adaptations of the hydrophytes or pond showing a food chain.
7. Study of morphological adaptations of the hydrophytes, mesophytes and Xerophytes.
8. Field Study: Collection, identification of plants and animals from local area; Preservation of collected organisms in suitable preservatives and maintain a record. The students are also advised to observe different types of environmental pollution during their field study (Jointly with zoology Dept.)

Zoology Practical – Grade XI

1. Study of permanent slide and museum specimen:
Paramecium, Plasmodium, Sycon, Hydra, Fasciola (Liver fluke), taenia (Tape worm), Ascaris (Round Worm), Pheretima (Earthworm), Hirudinaria (Leech) Palaemon (Prawn), Cancer (Crab), Preplanteta (Cockroach), Pieris (Butterfly), Bombyx (Moth), Aranea (Spider), Palamnaeus (Scorpion), Scolopendra (Centipede), Julus (Millipede), Helix (Garden Snail), Asterias (Starfish), Labeo (Rohu Fish), Rana (Frog), Bufo (Toad), Hemidactylus (Wall-lizard), Chelone (Turtle), Columba (Pigeon) Rhinophus (Bat) and Funambulus (Squirrel).
2. Preparation of temporary slide and their study:
 - a. Striated muscle fibre (thigh) of frog.
 - b. Setae and ovary of earthworm.
 - c. Squamous epithelial cell of human cheek.
3. Study of histological structure through permanent slides of skin, oesophagus, stomach, intestine, rectum, liver, pancreas, lung, kidney, testis and ovary of frog.
4. Study of adaptational features of a primary aquatic animal (Labeo), secondary aquatic animal (Turtle), arboreal (Calotes, Tree frog), primary Volant (Pigeon or other birds) and secondary Volant (Flying fish, Bat)
5. Dissection of animal provided so as to expose their:
 - a. Earthworm: General anatomy, alimentary canal, arterial and venous systems, reproductive organs.
 - b. Frog: General anatomy, alimentary canal, arterial and venous systems, reproductive organs and brain.

Format of model question for practical exam

Section A – Botany (Grade XI)

Time : 3 hours

Full marks : 12.5 marks

Pass Marks : 5 marks

1. Taxonomy – Identification of family and plant	–	3 marks
2. Preparation of temporary slide	–	1.5 marks
3. Spotting (6 spotting)	–	3 marks
4. Viva voce	–	2 marks
5. Class Record	–	<u>2.5 marks</u>
Total		12.5 marks

Section B – Zoology (Grade XI)

Time: 3 hours

Full marks : 12.5 marks

Pass Marks : 5 marks

1. Dissection of animals	–	3 marks
2. Preparation of temporary slide	–	1.5 marks
3. Spotting (6 spotting)	–	3 marks
4. Viva voce	–	<u>2 marks</u>
5. Class Record	Total	12.5 marks

Note:

1. There will be separate practical exam for Botany and Zoology.
2. Practical exam time will be of 3 hours for each practical exam.
3. Students must pass both the practical exams separately.

References Books

Mahato, Ras Bihari, Advance Level Biology – XI, Ekata Books and Distributors, Ktm.