

BIOLOGY EDUCATION

Code:.....

Grade XI

Full Marks: 75
Teaching hours: 150

I. Introduction

Biological science is an important branch of natural science which is learnt through theory classes and experienced in laboratories. The rapidly developing understanding in biological sciences needs a periodic and regular up-gradation of the curricula. Biology can not be explained in terms of physical and chemical laws since its properties are special to the system as a whole. No organism can exist without an environment and the human beings are no exception. Therefore, a knowledge / understanding of socio-cultural environment with natural wealth / resource are imperative. It is the need of the time today that the conceptual interpretations for these facts are provided to the citizens of tomorrow through well informed teachers.

It is, therefore, expected that the prospective teachers will understand nature and natural processes of the living world as stated in this course contents. The course is designed to educate prospective teachers to understand the concept of biological sciences for delivering them to the students of primary and lower secondary levels. Basic knowledge of different branches of biological sciences, given at this stage, is a prerequisite for higher secondary level of education. Hence, it is intended that the consolidated knowledge in biology achieved in secondary school will make the student effective in teaching biology to lower secondary school students. Simultaneously, this bulk of knowledge and the skills may be taken appropriate both for those plunging into carrier in biology and also for those who do not continue their education further.

II. General Objectives

After completion of this course, the students will be able to:

- a. implement biology courses at Lower Secondary Level;
- b. develop skills of observations and inquisitiveness and
- c. raise awareness of problems of biological resources conservations of Nepal.

III. Specific Objectives

After studying the course, the student shall be able to:

1. acquaint with the basic concepts of biology, its scope, branches and applications;
2. familiarize with selected living organisms, their nature, physiology, anatomy, functions and biological systems;
3. explain the world of life and importance of conservation and
4. design biological experiments at local level.

COURSE UNITS, TITLES, AND CONTENTS

- Unit I Introduction to Biology** **Teaching hours: 05**
- Nature and Scope
 - Branches of Biology and its relationships with other branches of Science
 - General Concepts of Life processes: Nutrition (Autotrophic and Heterotrophic) Growth, Reproduction
 - Human responsibility for the protection of earth and conservation of diverse life forms
- Unit II Cell Biology-I** **Teaching hours: 10**
- Prokaryotes, Eukaryotes
 - Structures of plant and animal cell, Cell inclusions and Cell organelles,
 - Plant tissues and their function,
 - Animal tissues and their function
- Unit III Cell Biology-II** **Teaching hours: 10**
- Protoplasm, its physical and chemical nature
 - General structure and roles of Carbohydrate, Protein, Amino Acids, Nucleic Acids, and Lipids.
 - The Chromosome
- Unit IV Continuity of Life** **Teaching hours: 05**
- Mitosis , Meiosis and their significance
 - Laws of inheritance (Mendalism), Mono-hybrid cross,
 - Mutation and its significance
 - Concepts of Hybrid and Hybridization, Significance of hybrid seeds for crop production.
- Unit V Evolution** **Teaching hours: 04**
- Theories of origin of life
- Biochemical concept of evolution,
 - Different views on organic evolution
- Unit VI Biodiversity:** **Teaching hours: 30**
- Study of one type form belonging to each group of the Five Kingdoms: Monera, Protista, Plantae, Fungi, and Animalia.
- **Monera:** Structure and function and economic importance of *Nostoc*
 - **Protista :** Habitat, habit, structure, reproduction and life cycle of *Plasmodium vivax*
 - **Plantae:**
 - **Lower Plants:** Morphology, Structure and reproduction of *Spirogyra, Marchantia, Dryopteris, Pinus,*.
 - **Angiosperms:** Monocotyledonous and Dicotyledonous plants, Morphology, Classification, and Economic importance of selected families: Cruciferae, Leguminosae, Solanaceae, Compositae, and Graminae.
- Garden flowers, Scientific, Common English and Nepali names of the garden flowering plants commonly available in the garden / homes.

Mycota: Morphology, Structure and reproduction and economic importance of Mucor, Yeast, Mushroom, *Puccinia*.

Virus: general concept and economic importance (Crop diseases and Health).

Animalia: General characters and classification of the Phyla: Porifera, Coelenterata, Platyhelminthes, Nematelminthes, Annelida, Mollusca, Arthropoda, Echinodermata and Chordata.

Unit VII Sociobiology: Teaching hours: 25

- **Human Biology**
Nutrition, respiration, Blood Circulation, Reproduction, Nervous system, Endocrine glands
- **Human Welfare:**
 - i) Socially Significant Diseases: Alcoholism, Smoking, Drug-abuse and AIDs
 - ii) Communicable Diseases: Typhoid, Tuberculosis, Ascariasis
 - iii) Non-communicable Diseases: Cancer

Unit VII Plants of Economic Importance: Teaching hours: 15

Economic plants, their ecological distribution in Nepal, rural and commercial importance

- **Medicinal Plants:** *Aconitum* spp., *Rauwolfia serpentine*, *Adhatoda vasaka*, *Swertia chirayta*, *Asparagus racemosus*.
- **Fiber Yielding Plants:** Jute, Cotton, and Simal
- **Timber Plants:** Sakhuwa / Agrath (*Shorea robusta*), Sisoo (*Dalbergia sisso*}, Deodar (*Cedrus deodara*), Karma (*Adina cordifolia*), Champ (*Michelia champaca*).
- **Vegetables:** Common vegetable in local condition
- **Cereals:** Rice, Maize, Wheat, Millet
- **Cash Crops:** Sugarcane, *Brassica campestris* var *toria* and *sarson*, Soybean and Spices (Anis, Coriander, Cumin, Cloves, Cardamom)
- **Beverage:** Tea, Coffee
- **Fruits:** Common cultivated and wild fruits at the local level.

Unit VIII Animals of Economic Importance: Teaching hours: 05

Importance of the following animals in human life:
Domestic animals, earthworm, Silkworm, Honey bee,

Unit IX Plant Physiology: Teaching hours: 16

- Water Relation (Absorption of Water, Ascent of sap, Evapo- Transpiration, Osmosis)
- Metabolism (Photosynthesis / Respiration, Mineral Nutrition,
- Introduction to Biological Nitrogen Fixation (by algae and legumes), and its significance in agriculture
- Growth (Concept of growth and differentiation)
- Plant Propagation (Clone, Seed, Graft)
- Flowering (Short-day, Long day and Day Neutral Plants)

Unit X Ecology: Teaching hours:15

-Community, Succession, Adaptation (concept)

- Ecosystem, Food Chain, Trophic Levels, Interactions of biotic and abiotic factors.
- Structural and functional aspects of Pond and Forest Ecosystems
- Productivity, Ecological Pyramids
- Bio-Geo-Chemical Cycles: Carbon and Nitrogen

Unit XI Environment & Conservation:

Teaching hours:10

- Ecological Imbalance and human survival (conceptual)
- Pollution and Pollutants of air, water, soil, and food and their control measures.
- Green House Gases, Climate Change.
- In-situ* and *Ex-situ* Conservation of animals and their significance.
- National Parks of Nepal (area, location, and significance) Environmental governance in Nepal (introductory)

Text Books

1. Seetharam P L and Y Tulajappa 2000. New Expert Biology Vol. I Expert Educational Publishers, Bangalore.
2. Dinesh R Bhujju, Tribikram Bhattari, Indra Prasad Subedi and Achyut Tiwari 2007 A Class Book of Higher Secondary Biology. Hajoorko Prakashan Kathmandu Nepal.

Reference Books:

1. Bajracharya, D., K.K.Shrestha and R.P.Chaudhary 1997. Garden Flowers, KMTNC, Jawalakhel, Kathmandu, Nepal.
2. Burma P S and B P Pandey 2006. Biology for class XI. S Chand AND Co. India.
3. Green, NPO; GW Stout; and DJ Taylor. 1991. Biological Science. (Ed. R.Soper), Cambridge Low Price Editions, IInd Edition, Cambridge Univ. Press.UK
4. Joshi,K.K. and S.D.Joshi 2001. Genetic heritage of medicinal plants of Nepal Himalaya. Budha Acad. Interprizes, Anamnagar, KathmaNDU.
5. Seetharam P L and Y Tulajappa 2000. Text Book of Biology I Expert Educational Publishers, Bangalore.
6. Arvinda K. Khatri, Khaga Raj Sharma, Vijaya Shanker Mishra and Kamal K Adhikari 2001 A text Book for Higher Secondary Biology Vidharthi Pustak Bhandar, Bhotahity

BIOLOGY EDUCATION

PRACTICAL

Full Marks : 25

Teaching hours:2periods/week

This list of practical activities for class eleven (science education) includes those experiments which are to be demonstrated and those which the students themselves are to do. The two categories have not however been separated.

Objectives:

After completing the practical course students will have skill in:

1. developing skills of making careful observations, collecting data and analyzing the results of activity /experiments;
2. developing the abilities to interpret the results of the activity /experiments and understand implications of the results;
3. developing skills of setting up appropriate apparatus for activity/ experiments and
4. identifying the process and physiology of human and natural environment.

List of activities /experiments:

1. Study of compound microscope.
2. Study of museum specimens and slides
 - A. i) Types of bacterial cells
 - ii) Spirogyra filaments
 - iii) Mucor: Culture, mycelium and sporangium, yeast cells and mushroom, puccinia, lichen.
Nostoc, Marchantia, Dryopteris, Pinus, Cycas.
 - B. Amoeba, Paramecium, Plasmodium, Sycon, Hyedra, Tapeworm, Fasciola, Ascaris, Earthworm, Leech, Prawn, Crab, Cockroach, butterfly, Moth, Spider, Scorpion, Centipede, Millipede, Fish (Carp), Frog, Toad, Wall lizard, Turtle, Pigeon, Parrot, Bat and Squirrel.
3. Study of different types of mitotic and meiotic cell divisions through permanent slides.
4. Preparation of temporary slides and their study
 - a. i) Onion scales
 - ii) Geranium or Zebrina or any other suitable leaf.
 - b. Squamous epithelial cells of human cheek.
5. Description of following plants in semi-technical terms with their floral diagrams and formulae, identification of at least one plant from each of the following families and economical importance: (a) Cruciferae, (b) Papilionaceae, (c) Solanaceae, (d) Compositae and (e) Gramineae.
6. i) Study of fresh water ecosystem using an aquarium or pond showing a food chain
ii) Pollution.
7. Study of histological structures through permanent slides of rabbit: skin, oesophagus, stomach, intestine, rectum, liver, pancreas, lung, kidney, testis, and ovary.

8. Dissection of animal (any mammal) so as to expose its:
 - a. General anatomy,
 - b. Alimentary canal,
 - c. Arterial and venous system
 - d. Reproductive organs
 - e. Central nervous system (brain)
9.
 - i) Demonstrate the action of saliva on starch.
 - ii) Detect the presence of starch in a given solution.
 - iii) Detect the presence of sugar in Urine.
 - iv) Detect the presence of protein in a given solution (hen's albumen).
 - v) Determine
 - a) The human blood pressure with sphygmomanometer
 - b) Blood groups in man.
10.
 - i) Experiment on Osmosis.
 - ii) Experiment on ascent of sap.
 - iii) Study on:
 - a) Unequal transpiration from two surfaces of dorsiventral leaf.
 - b) Rate of transpiration by Ganong's Potometer.
 - c) Chlorophyll is essential for Photosynthesis.
 - d) Carbon dioxide is essential for Photosynthesis.
 - e) Evolution of oxygen during Photosynthesis.
 - iv) Experiment on aerobic and anaerobic respiration.
 - v) Observation of different types of animal tissues on permanent slides:
Squamous, Columnar, Areolar, Adipose, Hyaline and Bone.
11. Anatomy of the following materials:
Preparation of T.S. of dicot stem, leaf and root and of monocot stems, leaf and roots.
12. Study of bones of rabbit (complete).
13. Field Study: Collection, identification of plants and animals and their preservation from the local area and maintain a record.

Textbooks for practical

1. H.D.Ranjitkar, A Hand book of Biology practical – Arun K Ranjitkar, Kalanki
2. Sarita Aggrawal, Biology Laboratory manual – Vikash Publishing House Pvt. Ltd.

Reference books for practical

1. A.P.Aggrawal and B.S.Aggrawal, A Handbook of Practical Biology For Class XI And XII – S. Chand Co. Ltd.
2. Krishna Das Manandhar and Ramesh Kaji Shakya, A Handbook of Practical Zoology – Ratna Pustak Bhandar
3. Subha Ratna Shakya, Zoology Laboratory Manual Part I and Part II –Kusum Shakya

Teaching Instructions

The following will be the teaching instructions regarding the prescribed course contents of all above course units:

Lecture, Demonstrations, Experimentation, Project work, Group Work, Pair Work, Question Answer.

Teaching/Instructional Materials

Teaching materials could be either of the following or in combination or more than the mentioned ones for all above course units.

Charts, Models, Improvised apparatus, Over Head Projector, Power Point, Specimen etc.

Evaluation Scheme:

Out of the total coverage Theory portion will cover 75% and rest 25% will be covered by practical.

In theory portion Questions will be of three groups

Long questions each carrying 10 marks 2 to be attempted out of 4 choices.

Short questions each carrying 5 marks 5 to be attempted out of 7 choices.

Very short questions each carrying 2 marks 15 to be attempted out of 20 choices.

Theory 75

Unit	Course	Very short (2)*15		Short (5)*5		Long (10)*2	
		To be attempted	Choices	To be attempted	Choices	To be attempted	Choices
I	Introduction to Biology	15	1	5	2	2	1
II	Cell Biology-I		2				
III	Cell Biology-II		2				
IV	Continuity of Life		1		1		
V	Evolution		1				
VI	Biodiversity		3		1		
VII	Sociobiology		2		1		
VIII	Animals of Economic Importance		2		1		
IX	Plant Physiology		2				
X	Ecology		2		1		
XI	Environment & Conservation		2		1		
	Total	15	20	5	7	2	4

Practical Marks

1)	Experiment (Dissection or description of experiment)	10
2)	Spotting or Activity, item preparation-	8
3)	Oral /Viva –	3
4)	Note book –	4

Biology EDUCATION

Grade XI

(Sample Model Questions)

F.M – 75

P.M – 27

Time – 3 hrs

Candidates are required to give their answers in their own words as far as practicable.

Group A

Very short answers questions

Attempt any fifteen questions only

(2x15= 30)

1. Why do people study biology as a choice of career?
2. Show the differences between prokaryotic and eucaryotic cells.
3. Why are mitochondria considered as a power house of the cell?
4. Mention Watson and Crick model.
5. What are the differences between fat and oil?
6. How does crop improve through hybridization?
7. What are coacervates? Discuss their importance.
8. Explain the defects of the two kingdom classification.
9. Mention economic importance of yeast.
10. Give two important phylum characters of the following animals :

(i) Neries (ii) Spider (iii) Torpedo (iy) Parrot

11. Discuss the modes of nutrition in man.
12. Draw a neatly labeled diagram of human brain (No description required).
13. Write a note on Smoking.
14. Write the botanical name of sugar cane, its habit and distribution.
15. Discuss the factors affecting photosynthesis.
16. What are auxins? Explain their functions.
17. Explain the energy flow in an ecosystem.
18. Write briefly note on ecological pyramid.
19. Why should wild life be conserved? Discuss.
20. List a few endangered bird species of Nepal.

Group B

Short answer questions

Attempt any five only

5x5= 25

21. Give an account of the structure and function of lysosomes.
22. State and explain Mendal's law of independent assortment.
23. Explain the theory of "Inheritance of acquired characters".
24. Give general characters of Phylum Porifera with suitable example (up to classes only).
25. Write what you know about alcoholism.
26. Describe an experiment to demonstrate the path of ascent of sap in xylem.
27. Describe the mechanism of opening and closing of stomata.

28. What is ecosystem? Describe briefly the pond ecosystem.

Group C

Long questions

Attempt any two.

10x2 = 20

29. What is meiosis? Describe the prophase 1 of meiotic cell division.
30. Explain how homologous, analogous and vestigial organs provide the evidences in support of organic evolution by giving examples of each.
31. Give an account of the alimentary canal of man.
32. What is transpiration? Discuss the factors affecting it.