

Biology

Grade XI

Teaching hour: 150

Full marks : 75

Introduction

Biology, being the science of nature, deals the fascinating changes, which continuously take 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 class XI.

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.

Specific Objectives

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

1. describe the life components, origin of life and its evolution up to present day;
2. explain the cell components, their types and cell division;
3. explain diversity of plant and animal;
4. discuss functional processes of the typical animal types;
5. describe the environmental concept, ecological imbalances and their consequences;
6. explain importance of natural resources, their conservation and management with reference to national context.

Biology

Grade XI

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, Ascomycetes, Basidiomycetes and Deuteromycetes. Structure and reproduction 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).

Lichen: Introduction and economic importance.

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 ecosystems: 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	19.5	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 marks	7 ques x 1mark	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

Format for question model of Biology – Grade XI

Section A (Botany)

- | | | |
|---|-------------------------------------|--------------|
| 1. Answer in very short; any seven
Total questions to be asked – 10 | 7 Q x 1 mark | = 7 marks |
| 2. Describe in brief; any five
Total questions to be asked – 7 | 5 Q x 3 marks | = 15 marks |
| 3. Long answer questions (two questions)
one question is given as option as “or” | 1 Q. of 8 marks + 1 Q. of 7.5 marks | = 15.5 marks |

Total 37.5 marks

Time schedule for questions

- | | |
|---------------------------------|------------------------|
| Very short questions – 1 mark | - maximum 1 min. |
| Short questions – 3 marks | - maximum 7 – 8 min. |
| Long questions – 8 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 hrs. 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.

Biology
Grade XI
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 its origin.
- Theories of origin of life.
- Oparin and Haldane's Theory.
- Miller and Urey's experiment.
- Meaning of evolution, organic evolution.
- Evidences of evolution, structural, anatomical, Paleontological, Embryological & Biochemical.
- Lamarckism, Darwinism & concept of Neo Darwinism.
- Human evolution.

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. Economic importance.
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 behaviour of fish and bird.
- **Adaptation:** Animal: Aquatic, amphibious and terrestrial (arboreal and volant).
- **Conservation:**
 1. **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.

..... X

Evaluation Scheme

Unit wise weightage for Zoology Grade XI

Unit	Teaching hour	Total mark asked in exam	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	X	X
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 *
			7 ques x 1 mark	5 ques x 3 marks	2 ques x 7.5 and 8 marks
Total	75	37.5 marks	Total 7 marks	Total 15marks	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 x 7 ques = 7 marks |
| 2. Describe in brief; any five
Total questions to be asked – 7 | 3 marks x 5 ques = 15 marks |
| 3. Long answer questions (two questions)
one question is given as option as “or” | 8 marks + 7.5 marks = 15.5 marks |

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 hrs. 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.

Model question Paper (Theory) Biology Grade XI

Full marks: 75
Pass marks: 27
Time : 3 hrs.

Section A (Botany)

1. Answer any seven questions in very short. [1x7=7]
- Differentiate prokaryotic and eukaryotic cells on the basis of nucleus.
 - Write the functions of chloroplast.
 - What are the components of a nucleotide?
 - Why are cyanobacteria called a blue green algae?
 - Why are ferns called vascular cryptogams?
 - Write the difference between disc and ray floret.
 - Name the primary consumers of pond ecosystem.
 - Define green house effect.
 - Lichen is an example of symbiosis, how?
 - Define plant succession.
2. Answer any five questions in brief. [3x5=15]
- In what ways DNA differ from RNA ?
 - Give the shortcomings of two kingdoms system of classification.
 - Illustrate vegetative structure of Spirogyra with neat & labelled diagram (no description required)
 - Write economic importance of fungi.
 - By means of stamen character only, how will you differentiate the various families which are included in your syllabus.
 - Energy flow in an ecosystem is always unidirectional. Explain.
 - How does the carbon cycle exist in the nature?
3. Describe the prophase I of meiosis cell division. Distinguish it from prophase of mitosis. [8]
4. Give the distinguishing characters of Solanaeaceae with its floral formula and floral diagram. Mention botanical names of three economically important plants of this family. [7.5]

OR

Define alternation of generation discuss it with reference to life cycle of Marchantia.

.....X.....

Section B (Zoology)

1. Answer any seven questions in very short. [1x7=7]
- Define the terms: Parasitogy, Paleontology.
 - How is zoology related with chemistry?
 - What is organic evolution?
 - Define analogous organs.
 - Differentiate oxidizing atmosphere and reducing atmosphere.
 - Write zoological names of (i) wall lizard (ii) liver fluke.
 - Mention the functions of contractile vacuoles in Paramecium.
 - Define conservation.
 - Name two examples of migratory birds.
 - Why is DDT banned?
2. Answer any five questions in brief. [3x5=15]
- "Archeopteryx is a connecting link between reptiles and birds", justify.
 - Give an account of gamogony life cycle of Plasmodium vivax.
 - Classify Pila.
 - How is a cocoon formed in earthworm?
 - Draw labeled diagram of internal structure of frog's heart (No description).
 - Describe the volant adaptational features of birds.
 - Enlist the important measures to protect endangered species.
3. Draw the neat and labelled diagram of male reproductive system of Pheretima. [7.5]

OR

Write describe the alimentary canal of Rana tigrina.

4. Write an essay on the theory of natural selection. [8]

----- X -----

Botany Practical – Grade XI

1. Use and maintenance of compound microscope.
2. Study of museum specimen and slides:
 - i. Types of bacterial cells;
 - ii. Spirogyra filaments;
 - iii. Mucor: Culture to demonstrate mycelium and sporangium; culture of yeast cells.
 - iv. 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 freshwater ecosystem using an aquarium 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), Periplaneta (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), Rhinolophus (Bat) and Funambulus (Squirrel).
2. Preparation of temporary slide and their study:
 - i. Striated muscle fibre (thigh) of frog.
 - ii. Setae and ovary of earthworm.
 - iii. 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), secondarily 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, nervous system and 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 hrs.
Full marks: 12.5 marks
Pass marks: 5 marks

- | | |
|--|-----------|
| 1. Taxonomy – Identification of family and plant - | 3.5 marks |
| 2. Preparation of temporary slide - | 1.5 marks |
| 3. Spotting (6 spotting) - | 3 marks |
| 4. Viva-voce - | 2 marks |
| 5. Class record - | 2.5 marks |

Total 12.5 marks

Model question for practical exam

Section B – Zoology (Grade XI)

Time: 3 hrs.
Full marks: 12.5 marks
Pass marks: 5 marks

- | | |
|-------------------------------------|-----------|
| 1. Dissection of animals - | 3.5 marks |
| 2. Preparation of temporary slide - | 1.5 marks |
| 3. Spotting (6 spotting) - | 3 marks |
| 4. Viva-voce - | 2 marks |
| 5. Class record - | 2.5 marks |

Total 12.5 marks

Note:

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

Biology

Grade XII

1. Introduction

Biology for Grade XII builds on the foundation of Biology and seeks to widen students' knowledge and practical understanding of the life process. It inculcates theoretical understanding, practical work out and analytical thinking. This course is designed to make the students better prepared for further studies in biological sciences.

2. General Objectives

The general objectives of this course are :

- (a) to provide the concept of biology and encourage the learners to use the knowledge in day to day life.
- (b) to make the learners aware of the present development in the biological science with reference to genetics, physiology and human biology, and
- (c) to prepare the students to take up advanced studies in biology at university level and encourage learners to be familiar with elementary knowledge of biotechnology and to work in the filed of health, agriculture and industrial sectors.

3. Specific Objectives

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

- (i) describe the plant and animal tissue types; and anatomical structure of higher plants as well as their functional processes.
- (ii) explain the developmental processes of typical plant and animal types;
- (iii) explain the structure of human body-organs and systems;
- (iv) discuss the role of hormones controlling various organs;
- (iv) describe common and socially significant human diseases;
- (v) explain elementary genetics and its use in some technical fields; and
- (vi) describe the application of biology in health, agriculture and various industrial sectors.

Biology

Grade XII

Course Content

Section A (Botany)

Teaching hour: 75
Full marks : 37.5

Unit – 1: Anatomy and Physiology of Organisms 27 Teaching hour

- **Plant anatomy:** Types of tissues, meristematic and permanent tissues; Internal structure of dicot and monocot root, stem and leaf; Secondary growth of dicot stem.
- **Plant physiology:**
 - (i) **Water relation:** Osmosis, diffusion, ascent of sap and transpiration.
 - (ii) **Photosynthesis:** Site of photosynthesis, mechanism and factors affecting photosynthesis.
 - (iii) **Respiration :** Types of respiration, mechanism and factors affecting respiration.
 - (iv) **Growth :** Plant growth hormones: Auxins, Gibberellin, Cytokinin.
 - (v) **Plant movement:** Concept of growth and turgor movement.

Unit – 2: Genetics 32 Teaching hour

Elements of heredity and variation; Genetic material (DNA and RNA), Genetic code, Gene pool, Genetic expression and its regulation; Basis of Mendelian genetics, Mendel's laws of inheritance, Concept of incomplete dominance and co-dominance, Multiple gene, Linkages, Crossing over, Mutation and its types and polyploidy. Sex-linked inheritance (X-linked gene for eye colour of *Drosophila* and colour-blindness in man)

Unit - 3: Developmental Biology 10 Teaching hour

Reproduction and development of angiosperms - Asexual reproduction, Pollination, Development of male and female gametophyte, Fertilization and development of embryo (dicot and monocot).

Unit – 4: Application of Biology 6 Teaching hour

- Introduction to biotechnology, tissue culture, concept of breeding technique, Disease resistant plants, green manures.
- Genetic engineering and its application
- Fermentation technology: alcoholic and antibiotic fermentation.

-----x-----

Unit wise weightage for Botany Grade XII

Title	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. Anatomy and Physiology of Organisms	27	13.5	3	1 or 1 opt	1 or 1 opt (7.5 marks)
2. Genetics	32	16	1 or 1 opt	2 or 1 opt	1 (8 marks)
3. Developmental Biology	10	5	2 or 1 opt	1	X
4. Application of Biology	8	4	1 or 1 opt	1	X
	75	37.5	7 ques x 1 mark	5 ques x 3 marks	2 ques - 7.5 marks & 8 marks
			Total 7 marks	Total 15marks	Total 15.5 marks

Format of question model for Biology Grade XII

Section A (Botany)

- Answer in very short; any seven
Total questions to be asked – 10
1 mark x 7 ques = 7 marks
- Describe in brief; any five
Total questions to be asked – 7
3 marks x 5 ques = 15 marks
- Long answer questions (two questions)
one question is given as option as “or”
8 marks + 7.5 marks = 15.5 marks

Total 37.5 marks

Note:

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

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.

Course Content
Section A (Zoology) Grade XII

Teaching hour: 75
Full marks : 37.5

Unit – 1: Animal tissues

8 Teaching hour

Epithelial, connective, muscular and nervous tissues.

Unit - 2: Developmental Biology

6 Teaching hour

- (i) **Development of frog:** Fertilization, cleavage, morulation, blastulation, gastrulation, formation of germinal layers, coelom and tissue formation.
- (ii) Gametogenesis in animal.

Unit – 3: Human Biology and Health

50 Teaching hour

- Nutrition; digestive organs and digestion of food.
- Respiratory organs and mechanism.
- Circulation: Blood, heart and its action, arterial and venous systems (Major arteries and veins), Blood groups, Rh-factor, Blood pressure and lymph (definition).
- Excretion: Excretory organs, mechanism of urine formation, osmoregulation and homeostatic mechanism (temperature regulation, kidney and liver control system).
- Nervous co-ordination: Types of nervous system, structure and function of brain, Transmission of nerve impulse.
- Endocrinology: Structures, functions and disorders of pituitary, thyroid, parathyroid, pancreas and adrenal glands.
- Sense organs: Structure and function of eye and ear.
- Reproduction: Reproductive organs.
- Human population: Growth, problem and control strategies.
- Human Diseases:
 - (a) Socially significant: Drug abuse, alcoholism and smoking
 - (b) Communicable: Typhoid, Tuberculosis, Ascariasis and AIDS.
 - (c) Non - communicable: Cancer.
 - (d) Concept of kalazar and hepatitis.

Unit – 4: Application of Biology

11 Teaching hour

- Antibiotics Vaccines (Type and application)
- Tissue and organs transplantation
- Test-tube baby
- Amniocentesis
- Introduction to poultry farming and fish farming.

-----x-----

Unit wise weightage for Zoology Grade XII

Title	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. Anatomy and Physiology of Organisms	8	4	1	1	X
2. Developmental Biology	6	3	X or 1 opt	1	X
3. Human Biology and Health	50	24.5	3 or 2 opt	2 or 1 opt	1 (8 marks) or 1 (7.5 marks) or 1 opt
4. Application of Biology	11	6	3	1	X
	75	37.5 marks	7 ques x 1 mark	5 ques x 3 marks	2 ques x 8 marks & 7.5 marks
			Total 7 marks	Total 15marks	Total 15.5 marks

Note: Long question from Developmental Biology can be asked by reducing the marks from the unit of Human Biology and Health.

Format of question model for Biology Grade XII

Section B (Zoology)

- | | |
|--|----------------------------------|
| 1. Answer in very short; any seven
Total questions to be asked – 10 | 1 mark x 7 ques = 7 marks |
| 2. Describe in brief; any five
Total questions to be asked – 7 | 3 x 5 ques = 15 marks |
| 3. Long answer questions
One question is given as option as “or” | 8 marks + 7.5 marks = 14.5 marks |

Total 37.5 marks

Note:

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

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. |

Model question Paper (Theory) Biology Grade XII

Full marks: 75
Pass marks: 27

Time : 3 hrs.

Section A (Botany)

1. Answer any seven questions in very short.

[1x7=7]

- Write the function of xylem?
- Name the components of a nucleotide?
- Give one example of polygenic inheritance.
- Define genetic code.
- What is polyploidy ?
- Mention two importance of vegetative propagation.
- Give two examples of entomophilus plants.
- Define genetic engineering.
- Define tissue culture.
- What is the main source of green manures?

2. Answer any five questions in brief.

[3x5=15]

- Give the well-labelled diagram of monocot embryo (Description is not required).
- What are the differences between dicot stem and monocot stem?
- Explain the types of transpiration in plants.
- Differentiate between phenotype and genotype.
- What did you understand by Mendel's 9:3:3:1 ratio?
- Differentiate between self and cross fertilization.
- Show with the diagrams the development of dicot embryo (no description).
- Mention the applications of genetic engineering.

3. What is secondary growth ? Discuss the activity of cambium in secondary growth of dicot stem. [7.5]

OR

Describe the light dependent steps of photosynthesis.

4. "DNA is the hereditary material", explain it with an experiment. [8]

.....X.....

Section B (Zoology)

1. Answer any seven questions in very short.

[1x7=7]

- In which kind of animal tissue you find the mast cells ?
- Name the two sex linked diseases in human.
- Define gametogenesis.
- Name any two enzymes which are responsible for protein digestion.
- Define the term 'deamination'.
- Which part of human brain is the centre of intelligence?
- Name the causative agent of typhoid fever.
- What does LSD cause ?
- What is the role of surrogate mother in test tube baby?
- Differentiate heterograft and autograft.

2. Answer any five questions in brief.

[3x5=15]

- Describe the structure of aerenchyma.
- If a red-eyed male Drosophila is mated with a white-eyed female, what will be the phenotype of male and female in F₁ progeny?
- How is the notochord formed in the embryo of frog?
- What is vitamin? Mention functions of fat - soluble vitamins.
- Draw a labeled sketch of internal structure of human kidney.
- What will be the problems of over human population? Suggest some measures to control over population.
- Define amniocentesis. Mention its negative & positive effects?

3. Explain the structure and function of human brain. [8]

Or

Explain the respiratory organs of human being.

4. What are communicable diseases? Discuss the causative agents, symptoms, effects and control measures of any one communicable disease you have studied. [7.5]

Zoology Practical Grade XII

1. Experiments of biochemistry

- a. Experiment to demonstrate the action of saliva on starch.
 - b. Experiment to detect the presence of starch in a given solution.
 - c. Experiment to detect the presence of sugar in urine.
 - d. Experiment to detect the presence of protein in a given solution (hen's albumen).
 - e. Study the effect of temperature, ethyl alcohol, and pH on enzymatic action of saliva.
 - f. Measurement of human blood-pressure with sphygmomanometer.
2. Study the permanent slides of different types of animal tissues:
Squamous, columnar, cuboidal, areolar, adipose, hyaline and bone.
3. Study the permanent slides of following histological organs of mammal:
Skin, stomach, intestine, liver, pancreas, kidney, lung, testis and ovary.
4. Study of embryological permanent slides of frog: Cleavage, blastula and gastrula.
5. Study the bones of rabbit (articulate and disarticulate) or models of human bones.
6. Dissection of a mammal so as to expose its:
- i. General anatomy;
 - ii. Alimentary canal;
 - iii. Arterial and venous systems;
 - iv. Brain;
 - v. Reproductive organs.

Botany Practical Grade XII

1. Experiments on plant physiology

- a. Experiment to demonstrate the process of osmosis.
 - B. Experiment to demonstrate the process of ascent of sap.
 - c. Experiment to demonstrate the unequal transpiration from two surfaces of dorsiventral leaf .
 - d. Experiment to demonstrate the rate of transpiration by Ganong's potometer .
 - e. Experiment to demonstrate that the chlorophyll is essential for photosynthesis.
 - f. Experiment to demonstrate that the carbon dioxide is essential for photosynthesis.
 - g. Experiment to demonstrate the process of evolution of Oxygen during photosynthesis.
 - h. Experiment to demonstrate the aerobic and anaerobic respiration.
 - i. Study on effect of growth hormones on germination and shoot elongation.
 - j. Demonstration of plant tissue culture.
 - k. Demonstration of yeast culture.
 - l. Preparation of DNA model.
2. Demonstration of Mendalian genetics using maize cob:
- (i) To demonstrate segregation of characters in a monohybrid cross.
 - (ii) To demonstrate independent assortment of characters in a dihyrid cross.
3. Study the permanent slides of different types of simple, permanent and complex plant tissues.
4. Demonstration of vegetative propagation.
5. Study the permanent slides of: (i) T.S of anther, (ii) L.S of ovule of dicot plant, (iii) Structure of embryo.
5. Preparation of temporary slide of following plant materials:
- (i) T.S of dicot root, stem and leaf,
 - (ii) T.S. of monocot root, stem and leaf.

Format of model question for practical exam Grade XII

Section B (Botany)

Time: 3 hrs.
Full marks: 12.5 marks
Pass marks: 5 marks

1.	Preparation of temporary slide of plant anatomy -	.....	3.5 marks
2.	Study on the physiological experiment -	.....	1.5 marks
3.	Spotting (6 spotting) -	.....	3 marks
4.	Viva-voce -	.....	2 marks
5.	Class record -	.....	2.5 marks

			Total 12.5 marks

Model question for practical exam

Section B (Zoology)

Time: 3 hrs.
Full marks: 12.5 marks
Pass marks: 5 marks

1.	Dissection of animals -	.....	3.5 marks
2.	Biochemical experiment -	.....	1.5 marks
3.	Spotting (6 spotting) -	.....	3 marks
4.	Viva-voce -	.....	2 marks
5.	Class record -	.....	2.5 marks

			Total 12.5 marks

Note:

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