# Biology

**Ist year Science(Theory)**

Unit I : Diversity in living world

Unit II: Structural organization in animals and plants

Unit III: Cell structure and function

Unit IV: Plant physiology

Unit V: Human physiology

## Biology

**2nd year Science(Theory)**

Unit I: Reproduction

Unit II: Genetics and Evolution

Unit III: Biology and Human Welfare

Unit IV: Biotechnology and its applications

Unit V: Ecology and Environment

Question Pattern (Section A-Botany; Section B-Zoology)

Time : 1.5 hrs Full Marks : 35

Group: A

1. Multiple choice/ one word answer : 1 mark x 5 = 5 marks
2. Correct sentence/ Fill up blanks : 1 mark x 5 = 5 marks

Group: B

3. Answer within 3 sentences : 2.5 marks x 3 = 7.5 marks
4. Differentiate between : 3.5 marks x 1= 3.5 marks

Group: C

Answer two questions : 7 marks x 2 = 14 marks

**Ist year Science(Theory)**

Therory

**I. Diversity in Living World (Periods 10)**

a. What is living?, Biodiversity; Need for classification; Three domains of life; Taxonomy and Systematics; Concept of species and taxonomical hierarchy; Binomial nomenclature; Tools for study of Taxonomy- Museum, Zoos, herbaria, Botanical gardens.

b. Five Kingdom classification**;** Salient features and classification of Monera, Protista and Fungi into major groups; Lichens; Viruses and Viroids.

c. Salient features and classificatin of plants into major groups-Alagae, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms (three to five salient and distinguishing features and at least two examples of each category); Angiosperms- classification up to class, characteristic features and examples.

d. Salient features and classification of animals- non-chordates up to phyla level and chordates up to classes level (three to five salient features and at least two examples).

**II. Structural Organization in Animals and Plants** (Periods 12)

a. Morphology and modification in plants; Tissues; Anatomy and functions of different parts of flowering plants- Root, stem, Leaf; inflorescence- cymose and racemose; flower, fruit and seed (Tobe dealt along with the relevant practical of the Practical Syllabus).

b. Animal tissues (epithelial, connective, muscular, nervous); Morphology, anatomy and functions of different systems (digestive, circulatory, respiratory, nervous and reproductive) of an insect (cockroach). (Brief account only).

**III.Cell Structure and Function**

a. Cell theory and cell as the basic unit of life; Structure of prokaryotic and eukaryotic cell; Plant cell and animal cell; Cell envelope, cell membrance, cell wall; Cell organelles structure and function; Endomembrance system- endoplasmic reticulum, Golgi bodies, lysosomes, vacuoles; mitochondria, ribosomes, plastids, microbodies; Cytoskeleton,, cilia, flagella, centrioles (ultra structure and function); necleus' neclear membrance, chromatin, necleolus.

b. Chemical constituents of living cells: Biomolecules- structure and function of proteins, carbohydrates, lipid, nucleic acids; Enzymes-types, properties, enzyme action.

Cell division: Cell cycle, mitosis, meiosis and theirsignificance.

**IV. Plant Physiology (Period 16)**

**a. Transport in Plants:** Movement of water, gases and nutrients; Cell to cell transport- Diffusion, facilitated diffusion, active transport; Plant-water relations- Imbibition, water potential, osmosis, plasmolysis; Long distance transport of water- Absorption, apoplast, symplast,transpiration pull, root pressure and guttation; Transpiration Opening and closing of Stomata; Uptake and translocation of mineral nutrients, Transport of food, phloem transport, Mass flow hypothesis; Diffusion of gases (brief mention).

**b. Mineral Nutrition:** Exchange of gases; Cellular respiration- glycolysis, fermentation(anaerobic), TCA cycle and electron transport system (aerobic); Energy relation - Number of ATP molecules generated; Amphibolic pathways; Respiratory quotient.

**c. Plant growth and Development:** Seed germination; Phases of plant growth and plant growth rate; Conditions of growth; Differentiation, defifferentiation and redifferentiation; Sequence of developmental process in plant cell; Growth regulators-auxin, gibberellin, cytokinin,ethylene, Abscilic acid (ABA); Seed dormancy; Vernalisation; Photoperiodism.

**V. Human Physiology (Periods 30)**

**a. Digestion and Absorption:** Alimentary canal and digestive glands; Role of digestive enzymes and gastrointestinal hormones; Peristalsis, digestion, absorption and assimilation of proteins, carbohydrates and fats; Calorific value of proteins, carbohydrates and fats (brief account); Egestion; Nutritional and digestive disorders- PEM, indigestion,

constipation, vomiting, jaundice, diarrhea.

**b. Breathing and Respiration:** Respiratory organs in animals (tracheal, brancheal, cutaneous, pulmonary); Respiratory system in humans; Mechanism of respiration (breathing) and its regulation in humans- Exchange of gases, transport of gases, Respiratory volumes; Disorders related to respiration- Asthma, Emphysema, Occupational respiratory disorders.

**c. Body fluids Circulation:** Compositon of blood, blood groups, coagulation of blood; Composition of lymph and its function; Human circulatory system- Structure and working of human heart, blood vessels; Cardiac cycle, cardiac output, ECG; Double circulation; Regulation of cardiac activity. Disorders of circulatory system- Hypertension, Coronary artery diesease, Angina pectoris, Heart failure.

**d. Excretory products and their elimination:** Modes of excretion- Ammonotelism, ureotelism, uriocotelism; Human excretory system- structure and function; Mechanism of Urine formation, Osmoregulation: Regulation of kidney function- Reninangiotensin, Artial Natriuretic Factor, ADH and Diabetes insipidus; Role of other organs in excretion; Disorders- Uraemia, Renal failure, Renal calculi, Nephritis; Dialysis and artificial kidney.

**e. Locomotion and Movement:** Types of movement- ciliary, flagellar, muscular; Skeletal muscle- contractile proteins and muscle contraction; Skeletal system and its functions (To be dealt with the relevant practical of Practical Syllabus); Joints; Disorders of muscular and skeletal system- Myasthenia gravis, Tenany, Muscular dystrophy, Arthritis, Osteoporosis, Gout.

**f. Neural control and Coordination:** Neuron and nerves; Nervous system in humans- central nervous system (brain, spinal cord), peripheral nervous system and visceral nervous system; Generation and conduction of nerve impulse; Reflex action; Sensory perception; Sense organs; Elementary structure and function of eye and ear.

**g. Chemical coordination and Regulation:** Endocrine glands and hormones; Human endocrine system- Hypothalamus, Pitutary, Pineal, Thyroid, Parathyroid, Adrenal, Pancreas, Gonads; Mechanism of hormone action (Elementary Idea); Role of hormones as messengers and regulatror, Hypo- and hyperactivity and related disorders (Common disorders e.g. Dwarfism, acromegaly, cretinism, goiter, exopthlmic goiter, diabetes, Addison's disease).

(NB: Ib, c; IIa; III and IV units are to be taught by Botany Faculty. Ia, d; IIb; V units are to taught by Zoology Faculty.)

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QUESTION PATTERN AND DISTRIBUTION OF MARKS
BIOLOGY- I Theory
+ 2 1st Year Science (For College Level Exam.)
Section A - Botany

Time : 1.5 hrs Full Marks : 35

Group A: (Objective Type - Compulsory)

Q1.- Multiple choice/ one word answer : 1 mark each x 5 = 5 marks

Q2.- Correct the sentences/ Fill up the blanks :1 marks each x 5 = 5 marks

Group B: (Short Answer Type)

Q3.- Answer within three sentences : 2.5 marks each x 3 =7.5 marks
(3 bits to be answered out of 6 bits)

Q4.- Differentiate between (3 important differences)
(1 bit to be answered out of 3 bits) : 3.5 marks = 3.5 marks

**Group C: (LongAnswer Type)**

Answer two questions out of four : 7.0 marks each x 2 = 14 marks

**Section B - Zoology**

**Time : 1.5 hours** **Full Marks : 35**

**Group A: (Objective Type - compulsory)**

Q1.- Multiple choice/ one word answer : 1 mark each x 5 = 5 marks

Q2.- Correct the sentences/ Fill upthe blanks :1 marks each x 5 = 5 marks

**Group B: (Short Answer Type)**

Q3.- Answer within three sentences : 2.5 marks each x 3 = 7.5 marks
(3 bits to be answered out of 6 bits)

Q4.- Differentiate between (3 important differences)
(1 bit to be answered out of 3 bits) : 3.5 marks = 3.5 marks

**Group C: (Long Answer Type)**

Answer two questions out of four : 7 marks each x 2 = 14 marks

N.B: Long answer type questions are to be set only from the portions underlined in the syllabus.

**BIOLOGY-I (Botany Practical**

**+ 2 First year Science**

**Detailed syllabus**

**Study of:**

1. Different parts of the Dissecting and Compound microscopes.
2. A typical Angiospermic plant.

**Major experiment**

3. Study and describe at least one common flowering plant from each of the following families (Malvacae, Solanaceae, Fabaceae and Liliacease) including dissection and display of floral whorls, and and other and ovary to show number of chambers.
4. Preparation and study of T.S. of dicot and monocot roots, and stem and leaf (Primary).
5. Study of mitotis in onion root tips.

**Minor experiment:**

6. Study of cells (Onion scale leaf, *Rhoeo* leaves)
7. Test for presence of starch, proteins and fats.
8. Study of starch grains and raphides.

9. Qualitative test for catalase activity by leaf disc method.
10. Modification of root, stem and leaf.
11. Study of flower and its parts.
12. Types of inflorescence.

**Spotting:**

a. Study of the specimens and identification with reasons - bacteria, Oscillatoria, Spirogyra, Rhizopus, Mushroom, Yeast, Livewort, Moss, Fern, Cycas, one moncotyledonous plant, one dicotyledonous plan and one lichen.
b. Study of tissues and diversity in shapes and sizes in plants (simple tissue, complex tissue) through temporary/permanent slides.

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**BIOLOGY- I (Botany) Practical**
**+ 2 First Year Science (For College Level Exam)**

Time : 2 hours Full Marsk : 15

| | | |
|---|---|---|
| 1. | Major experiment (One) | : 7 marks |
| 2. | Minor experiment (One) | : 3 marks |
| 3. | Spotting (Three - two from bit a and one from bit b) | : 3 marks |
| 4. | Record | : 12 marks |
| | Total | : 15 marks |

**Instruction:**

1. All the above experiments should be conducted by individual students.
2. Questions for major and minor experiments are to be set by drawing lots.
3. For each major and minor experiment, candidates have to write the requirements as per the questions, which may be verified and signed by the external examiner only.
4. One observation for major experiment maybe verified and signed by the external examiner only.

**BIOLOGY - I (Zoology) Practical**
**+2 First year Science**
**Detailed Syllabus**

**A. EXPERIMENTS/ OBSERVATIONS:**

1. To test the presence of carbohydrate, protein and fat in suitable animal materials (qualitative only).
2. To test the presence of urea in urine/ given sample solution.
3. To test the presence of albumin in urine/ given samplesolution.
4. To test the presence of bile salts in urine/ given sample solution.

**B. SPOTTINGS/ IDENTIFICATION:**

a. Study of specimens and identification with reasons- Amoeba, Hydra, Sycon, Liver fluke, Earthworm, Leech, Cockroach, Prawn, silkworm, Honeybee, Snail and Starfish.
b. Study of squamous epithelium, muscle fibres and mammalian blood film; stages of mitosis and meiosis (temporary/ permanent slides).
c. Study and comment on the morphological adaptations of two animals (Tree frog, Bat)

found in terrestrial conditions and two animals (Flying fish, Turtle) found in aquatic conditions.

**Book Recommended :**

Bureau's Higher Secondary (+2) Zoology, Practical, Published by Odisha State Bureau of Text Book Preparation and Production, Bhubaneswar.

**QUESTION PATTERN AND DISTRIBUTION OF MARKS**

**BIOLOGY - I (Zoology) Practical**

**+2 First year Science (For College Level Exam)**

**Time : 2 hours** **Full marks : 15**

1. Experiment (One experiment to be set from A) : 07 marks
   Theory and Procedure - 03 marks
   Experiment, Observation and Results - 04 marks
2. Spotting (Four spots to be set from B) - 1.5 marks x 4 : 06 marks
   (Two from bit a, one from bit b and one from bit c)
3. Practical Record : 02 marks

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**2nd Year Science**

**Theory**

**I. Reproduction**

**a. Reproduction in organism:** Reproduction, a characteristic feature of all organisms for continuation of species; Modes of reproduction - Asexual and sexual; Asexual reproduction; Modes- Binary fission, sporulation, budding, gemmule formation, fragmentation; vegetative propagation in plants.

**Sexual reproduction in flowering plants:** Flower structure; Development of male and female gametophytes; Pollination-types, agencies and examples; Outbreeding devices; Pollen-Pistil interaction; Double fertilization; Post fertilization events Development of endosperm and embryo, Development of seed and formation of fruit; Special modes- apomixis, parthenocarpy, polyembryony; Significance of seed and fruit formation.

**b. Human Reproduction:** Male and female reproductive systems; Microscopic anatomy of testis and ovary; Gametogenesis- spermatogenesis 7 oogenesis; Menstrual cycle; Fertilisation, embryo development upto blastocyst formation, implantation; Pregnancy and placenta formation (Elementary idea); Parturition (Elementary idea); Lactation (Elemntary idea).

**Reproductive health:** Need for reproductive health and prevention of sexually transmitted diseases (STD); Birth control- Need and Methods, Contraception and Medical Termination of Pregnancy (MTP); Amniocentesis; Infertility and assisted reproductive technologies - IVF, ZIFT, GIFT (Elementary idea for general awareness).

**II. Genetics and Evolution (Periods 20)**

a. **Heredity and Variation:** Mendelian Inheritance; Deviations from Mendelism-Incomplete dominane, Co-dominance, Multiple alleles and Inheritance of blood groups, Pleiotropy; Elementary idea of polygenic inheritance; Chromosome theory of inheritance; Chromosomes and genes; Linkage and crossing over.

b. Sex determination- In humans, birds, honey bee; Sex linked inheritance- Haemophilia, Colour blindness; Mendelian disorders in humans- Thalasemia; Chromosomal disorders in humans- Down's syndrome, Turner's and Klinefelter's syndromes.

**c. Molecular Basis of Inheritance:** Search for genetic material and DNA as genetic material; Structure of DNA and RNA; DNA packaging; DNA replication; Central dogma; Transcription, Genetic code, Translation; Gene expression and regulation- Lac Operon; Genome and human genome project; DNA finger printing.

**d. Evolution:** Origin of life; Biological evolution and evidences for biological evolution (Paleontological, comparative anatomy, embryology and molecular evidence); Darwinism, Modern Synthetic theory of Evolution; Mechanism of evolution- Variation (Mutation and Recombination) and Natural Selection with examples, types of natural selection; Gene flow and genetic drift; Hardy-Weinberg's principle; Adaptive Radiation; Human evolution (in brief).

**III. Biology and Human Welfare (Periods 08)**

**a. health and Disease:** Pathogens; parasites causing human diseases (Malaria, Filariasis, Ascariasis, Typhoid, Pneumonia, common cold, amoebiasis, ring worm); Basic concepts of immunology- vaccines; Cancer, HIV and AIDS; Adolescence, drug and alcohol abuse.

**b. Improvement in food production:**

i) Plant breeding, tissue culture, single cell protein, Biofortification;

ii) Apiculture and Animalhusbandary.

**c. Microbes in human welfare:** In household food processing, industrial production, sewage treatment, energy generation and as biocontrol agents and biofertilizers.

**IV. Biotechnology and its Applications (Periods 08)**

**a. Principles and process of Biotechnology:** Genetic engineering (Recombinant DNA technology).

**b. Application of Biotechnology in health and agriculture:** Human insulin and vaccine production, gene therapy; Genetically modified organisms- Bt crops; Transgenic Animals; Biosafety issues- Biopiracy and patents.

**V. Ecology and environment (Periods 12)**

**a. Organisms and environemnt:** Habitat and niche; Population and ecological adaptations; population interactions-mutualism, competition, predation, parasitism; Population attributes-growth, birth rate and death rate, age distribution.

**b. Ecosystems:** Patterns, components; productivity and decomposition; Energy flow; Pyramids of number, biomass, energy; Nutrient cycling (carbon and phosphorous); Ecological succession; Ecological Services- Carbon fixation; pollination, oxygen release.

**c. Biodiversity and its conservation:** Concept of Biodiversity; Patterns of Biodiversity; Importance of Biodiversity; Loss of Biodiversity, conservation; Hotspots, endangered organisms, extinction, Red Data Book: Biosphere reserves, National parks and Sanctuaries.

**Environmental issues:** Air pollution and its control; Water pollution and its control; agrochemicals and their effects; Solid waste management; Radioactive waste management; Greenhouse effect and global warming; Ozone depletion; Deforestation; Any three case studies as success stories addressing environmental issues.

(NB: Ia, II a, c; III b (i), c and v units are to be taught by Botany Faculty. I b; II b; III a, b(ii); IV units are to be taught by Zoology Faculty.)

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**QUESTION PATTERN AND DISTRIBUTION OF MARKS**

**BIOLOGY - II Theory**

**+ 2 Second Year Science**

**Section A - Botany**

**Time : 1.5 hours** **Full Marks : 35**

**Group A: (Objective Type- Compulsory)**

| | | |
|---|---|---|
| Q1.- Multiple choice/ one word answer | : 1 mark each x 5 | = 5 marks |
| Q2.- Correct the sentences/ Fill up the blanks | : 1 marks each x 5 | = 5 marks |

**Group B: (Short Answer Type)**

| | | |
|---|---|---|
| Q3.- Answer within three sentences | : 2.5 marks each x 3 | = 7.5 makrs |
| Q4.- Difference between (3 important differences) | | |
| (1 bit to be answered out of 3 bits) | : 3.5 marks | = 3.5 marks |

**Group C: (Long Answer Type)**

| | | |
|---|---|---|
| Answer two questions out of four | : 7 marks x 2 | = 14 marks |

**Section B - Zoology**

**Time : 1.5 hours** **Full Marks : 35**

**Group A: (Objective Type- Compulsory)**

| | | |
|---|---|---|
| Q1.- Multiple choice/ one word answer | : 1 mark each x 5 | = 5 marks |
| Q2.- Correct the sentences/ Fill up the blanks | : 1 marks each x 5 | = 5 marks |

**Group B: (Short Answer Type)**

| | | |
|---|---|---|
| Q3.- Answer within three sentences | : 2.5 marks each x 3 | = 7.5 makrs |
| (3 bits to be answered out of 6 bits) | | |
| Q4.- Difference between (3 important differences) | | |
| (1 bit to be answered out of 3 bits) | : 3.5 marks | = 3.5 marks |

**Group C: (Long Answer Type)**

| | | |
|---|---|---|
| Answer two questions out of four | : 7 marks x 2 | = 14 marks |

N.B: Long answer type questions are to be set only from the portions understand in the syllabus.

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**BIOLOGY - II (Botany) Practical**

**+2 Second Year Science**

**Detailed Syllabus**

**Major Experiment:**

1. Study of the effect of temperature and chemicals (ethanol, acetone, formaldehyde) on leading of pigments in beet root.

2. Study of plants pigments by paper chromatography.
3. Study of transpiration by Ganong's or Farmer's potometer.
4. Study of relation between transpiration and absorption by T/A apparatus.
5. Effect of different wave length of light on photosynthesis by Wilmott's bubbler.
6. Study of effect of dissolved carbondioxide on photosynthesis by Wilmott's bubbler.
7. Comparative study of rate of transpiration from upper and lower surface of dicot leaf.
8. Collect and study soil from at least two different sites and study them for texture, moisture content, pH and water holding capacity of soil. Correlate with the kinds of plants found in them.
9. Collect water from two different water bodies around you and study them for pH, clarity and presence of any living organisms.
10. Study the presence of suspended particulate matter in air at the two widely different sites.
11. Study of plant population density by quadrate method.
12. Study of plant population frequency by quadrate method.

**Minor Experiments:**

13. Study of pollen germination on a slide.
14. Study of distribution of stomata on upper and lower surface of a dicot and a monocot leaf.
15. Study of osmosis by potato osmometer.
16. Analysis of samples for verification of Mendelian ratio using Pea seeds or colour beads.
17. Study of plasmolysis.

**Spotting:**

18. Conditions necessary for seed germination.
19. Types of germination.
20. Phototropism/ Geotropism.
21. Morphological adaptation of hydrophyte and Xerophyte.

**QUESTION PATTERN AND DISTRIBUTION OF MARKS**

**BIOLOGY - II (Botany) Practical**

**+ 2 Second Year Science**

| | | |
|---|---|---|
| 1. | Major experiment (One) | : 7 marks |
| 2. | Minor experiment (One) | : 3 marks |
| 3. | Spotting (Three) | : 3 marks |
| 4. | Record | : 2 marks |
| | Total | : 15 Marks |

**Instruction:**

5. All the above experiments should be conducted by individual student.
6. Questions for major and minor experiments are to be set by drawing lots.
7. For each major and minor experiments, candidates have to write the requirements as per their questions which may be verified and signed by the external examiner only.
8. One observation for major experiment may be verified and signed by the external examiner only.

## BIOLOGY - II (Zoology) Practical
## +2 Second year Science
## Detailed Syllabus

**A. EXPERIMENTS/ OBSERVATIONS:**

1. To test the action of salivary amylase on starch; study the effects of pH and temperature on it.
2. To test the presence of urea sugar in urine/ given sample solution.
3. To determine the pH of three water samples collected from water bodies (using pH paper).
4. To study the prepared pedigree charts of genetic traits in man such as rolling of tongue, blood groups, widow's peak and colour blindness.

**B. SPOTTINGS/ IDENTIFICATION:**

a. Study of specimens and identification with reasons- Shark, Rohu, Frog, Garden lizard, Cobra, Krait, Pigeon and Rat.
b. TS/ VS through spinal cord, ovary, testis, artery, vein, kidney, stomach and blastula of frog.
c. Axial and appendicular skeleton of rabbit (excluding skull).
d. Identification of common disease causing organisms- Entamoeba, Plasmodium, Taenia, Ascaris and Ringworm (permanent slides/ specimens). Commenton the symptoms of the diseases they cause.

**Book Recommended :**

Bureau's Higher Secondary (+2) Zoology, Practical, Published by Odisha State Bureau of Text Book Preparation and Production, Bhubaneswar.

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## QUESTIONS PATTERN AND DISTRIBUTION OF MARKS
## BIOLOGY - II (Zoology) Practical
## + 2 Second Year Science

**Time : 2 hours** **Full Marks : 15**

| | | | |
|---|---|---|---|
| 1. | Experiment (One experiment to be set from A) | | : 07 marks |
| | Theory and procedure | - 03 marks | |
| | Experiment, Observation and Results | - 04 marks | |
| 2. | Spotting (Four spots to be set from B) | -1.5 marks each x 4 | : 06 marks |
| 3. | Practical Record | | :02 marks |

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