BIOLOGY (863)

Aims:

1. To enable candidates to acquire the knowledge and to develop an understanding of biological terms, concepts, facts, principles, formulae, etc.
2. To develop the ability to apply the knowledge of biology in unfamiliar situations.
3. To develop experimental skills required in biology practical work.
4. To create awareness about the problems of the environment and the manner in which these problems can be overcome.
5. To develop the ability to appreciate biological phenomena in nature and the contribution of biology to human welfare.
6. To develop interest in plants and animals and in their respective environments.
7. To develop scientific attitude towards biological phenomena.
8. To create awareness of the fundamentals of human biology, food, health, nutrition and population control.

CLASS XI

There will be two papers in the subject:

Paper I: *Theory: 3 hours ...70 marks*

Paper II: *Practical: 3 hours ... 15 marks*
Project Work … 10 marks
Practical File … 5 marks

PAPER 1- THEORY: 70 Marks

*There will be no overall choice in the paper. Candidates will be required to answer **all** questions. Internal choice will be available in two questions of 2 marks each, two questions of 3 marks each and all the three questions of 5 marks each.*

S.NO.	UNIT	TOTAL WEIGHTAGE
1.	Diversity of Living Organisms	09 Marks
2.	Structural Organisation in Animals and Plants	11 Marks
3.	Cell: Structure and Function	15 Marks
4.	Plant Physiology	17 Marks
5.	Human Physiology	18 Marks
TOTAL		70 Marks

PAPER I –THEORY – 70 Marks

Note: All structures (internal and external) are required to be taught along with diagrams.

1. Diversity of Living Organisms

(i) The Living World

What is living? Need for classification; three domains of life; taxonomy and systematics; concept of species and taxonomical hierarchy; binomial nomenclature; tools for study of taxonomy- museums, zoological parks, herbaria, botanical gardens, key.

Characteristics of living organisms. Need for classification should be discussed. Three domains of life – distinguishing features of (archaea, bacteria, eukarya). Definition and explanation of the terms taxonomy (numerical taxonomy, cytotaxonomy and chemotaxonomy) and systematics. Concept of species. Major taxonomical hierarchies (phylum, class, order, family, genus, species): definition and examples with reference to classification of man, house fly, mango and wheat. Rules of binomial nomenclature and advantages of using scientific names. Aids for study of taxonomy — a very brief idea of museum and herbaria, zoological parks and botanical gardens. Definition of taxonomical keys.

Three systems of classification – artificial, natural and phylogenetic.

(ii) Biological Classification

Five kingdom classification; salient features and classification of Monera, Protista, Fungi, Plantae and Animalia. Lichens, Viruses and Viroids.

(a) Five-kingdom system of classification and characteristics of different kingdoms with examples.

(b) Kingdom Monera: Bacteria - classification of bacteria according to shape, nutrition and mode of respiration; differences between gram +ve and gram –ve bacteria; types of reproduction – definition of fission, conjugation, transduction and transformation (details not required).

A brief idea of the role of different types of archaebacteria (methanogens, halophiles and thermoacidophiles in their extreme environments).

Mycoplasma – three distinctive features.

Economic importance with reference to role of bacteria in sewage treatment, antibiotics, energy production and house hold products (curd and cheese only).

(c) Kingdom Protista – only two general characteristics and two examples of subgroups: (i) Chrysophytes (ii) Dinoflagellates, (iii) Euglenoids, (iv) Slime moulds, (v) Protozoans (to be studied under rhizopods, flagellates, ciliates and sporozoans with two characteristics including modes of locomotion and two examples of each).

(d) Kingdom Fungi: general characteristics and mode of reproduction of each (including types of spores and sexual reproduction – definition of isogamy, anisogamy, oogamy, plasmogamy, karyogamy and dikaryophase). Zygomycetes, Ascomycetes, Basidiomycetes, Deuteromycetes - characteristics with examples. Role of fungi in the field of medicine, bakery and environmental decomposition. Definition of lichens and mycorrhiza (ecto and endo).

Life cycles not required.

(e) Virus (characteristic features – link between living and non-living, structure of TMV and bacteriophage and contribution of the following scientists: D.J. Ivanowsky, M.W. Beijerinck, W.M. Stanley) and Viroid (definition only).

(iii) Plant Kingdom

(a) Algae - characteristics (morphology, common name, major pigments, stored food, composition of cell wall, flagellar number and position of insertion, habitat, mode of sexual reproduction) and

examples of Chlorophyceae, Phaeophyceae, Rhodophyceae; Economic importance of algae – any five.

(b) Bryophyta – general characteristics, distinctive features of liverworts and mosses; graphic outline of life cycle of Funaria with reference to alternation of generations. Economic importance of bryophytes.

(c) Pteridophyta: characteristics; classification into classes: psilopsida (Psilotum), lycopsida (Selaginella, Lycopodium), sphenopsida (Equisetum) and pteropsida (Dryopteris, Pteris and Adiantum). Graphic outline of life cycle of a typical pteridophyte (fern). Definition of homospory and heterospory with relevant examples. Economic importance.

(d) Gymnosperms: general characteristics and graphic outline of life cycle of a typical gymnosperm (Pinus). Economic importance.

(e) Angiosperms – general characteristics and classification into monocots and dicots; Graphic outline of life cycle of a typical angiosperm.

(f) Comparison of life cycle patterns of different plant groups (haplontic, diplontic and haplo-diplontic).

(iv) Animal Kingdom

Animal Kingdom: animal construction - body plan (cell aggregate plan, blind-sac plan and tube-within-tube plan), symmetry (spherical, radial and bilateral symmetry), coelom development (diploblastic and triploblastic organisation in animals, acoelomate, pseudocoelomate, coelomate and haemocoelomate), segmentation.

Non-chordata - five distinguishing characters with two examples of Porifera, Cnidaria, Ctenophora, Platyhelminthes, Nematoda (Aschelminthes), Annelida, Mollusca, Arthropoda, Echinodermata, Hemichordata.

Chordata – sub-classification of Chordata with reference to notochord - sub phyla Urochordata, Cephalochordata. Vertebrata (classes – cyclostomata, chondrichthyes, osteichthyes, amphibia, reptilia, aves and mammalia) – three distinguishing characters with two examples of each).

2. Structural Organisation in Animals and Plants

(i) Morphology of Flowering Plants

(a) Morphology and modifications of root, stem, leaf.

Types of roots (tap, fibrous, adventitious), regions, modifications of roots for storage (Tuberous – e.g. Mirabilis and sweet potato; fusiform – e.g. radish; conical – e.g., carrot; napiform – e.g. turnip), respiration (pneumatophores) and support (stilt and prop).

Stems – features (nodes internodes, buds), modifications – underground (tuber, rhizome, corm) aerial (tendril, thorn, Phylloclade, cladode) and sub-aerial (runner, sucker, stolon, offset).

Leaves - parts of a simple leaf, venation, types of leaves (simple and compound – pinnate and palmate), phyllotaxy – alternate, opposite, whorled (with an example of each). Modifications for mechanical support (tendril), protection (spine), storage (bulb), reproduction (Bryophyllum); insectivorous plants (pitcher plant, Venus-fly-trap).

(b) Morphology of flower, fruit and seed. Structure of a typical flower, types of inflorescence (racemose and cymose).

Structure of a typical flower, bracteates/ebracteate, [symmetry (actinomorphic, zygomorphic), trimerous/tetramerous/pentamerous complete/ incomplete, non-essential whorls (calyx: gamosepalous, polysepalous, corolla: gamopetalous, polysepalous, perianth, aestivation: valvate, twisted, imbricate, vexillary), essential whorls (androecium: cohesion - syngenesious, synandrous, monadelphous, diadelphous, polyadelphous; adhesion – epipetalous,

epiphyllous; number of lobes – monothecous, dithecous; Gynoecium: position of ovary – epigynous, hypogynous, perigynous, cohesion – apocarpous, syncarpous, number of locules – unilocular, bilocular, multilocular], types of inflorescence (racemose and cymose – definition and differences; subtypes not required).

(ii) Anatomy of Flowering Plants

(a) Plant Tissues: types of plant tissues: Meristematic tissues: classification of meristematic tissue. Permanent Tissues: structure and function of simple tissues (parenchyma, collenchyma and sclerenchyma) and complex tissues (xylem and phloem), tissue system. Internal structure of root, stem, and leaf.

Characteristics of meristematic tissue; classification of meristems based on origin and location; structure, function and location of permanent tissues; simple and complex tissues; epidermal, ground and vascular tissue systems.
Cellular diagrams of T.S. of roots and stem and V.S. of monocot and dicot leaves are required.

(b) Secondary growth in dicot stem and dicot root
Basic idea of how secondary growth takes place in dicot stems and roots (with the help of outline diagrams) and formation of annual rings. Activity of the cambium and cork cambium, formation of secondary tissues, differences between heart wood and sap wood, early wood and late wood. Definition of bark.

(iii) Structural Organisation in Animals

(a) Animal tissues
Epithelial, connective, muscular and nervous tissues to be taught with the help of diagrams.
Location, structure and functions of epithelial tissues (simple, stratified, pseudostratified, specialised – transitional, neurosensory and pigmented) with examples, types of junctions (tight, adhering and gap junctions) location and general structure of areolar tissue - functions of different types of cells (fibroblasts, macrophages, Mast cells, plasma cells, adipocytes); fibrous connective tissue (ligaments and tendon); difference between bone and cartilage; types of cartilage (hyaline, white fibrous, yellow elastic and calcified); T.S. of hyaline cartilage, T.S and L.S. of mammalian bone(to be taught with the help of diagrams); different types of muscles and their functions; structure of a neuron (types – unipolar, bipolar, multipolar, myelinated, non-myelinated). Neuroglial cells.

(b) Cockroach
Morphology, anatomy and functions of different systems (digestive, circulatory, respiratory, nervous and reproductive) of an insect (cockroach) - a brief account only.

3. Cell: Structure and Function

(i) Cell - the Unit of Life
Cell theory and cell as the basic unit of life: Structure of prokaryotic and eukaryotic cells; Plant cell and animal cell; cell envelope; cell membrane, cell wall (including definition of plasmodesmata); cell organelles – ultrastructure and function; endomembrane system (endoplasmic reticulum, Golgi bodies, lysosomes, vacuoles), mitochondria, ribosomes, plastids, microbodies; cytoskeleton, cilia, flagella, centrioles;

nucleus, nuclear membrane, chromatin, nucleolus.

Historical aspects, cell theory, size and shape of cells; *general structure of prokaryotic cell.*
General structure of eukaryotic cell, ultra-structure and function of cell wall, cell membrane (description of fluid mosaic model; functions of the plasma membrane: active and passive transport, brief explanation of facilitated diffusion (uniport, symport and antiport) with one example. Mitochondria, nucleus (structure and types of chromosomes on the basis of the position of centromere, satellite), types of plastids, endomembrane system (endoplasmic reticulum, Golgi complex, lysosomes and vacuoles), ribosomes, microbodies, cytoskeleton, cilia, flagella and centrioles; difference between prokaryotic cell and eukaryotic cell, plant and animal cell, microfilaments and microtubules, flagella and cilia.

(ii) Biomolecules

P roteins, carbohydrates, lipids, nucleic acids, enzymes.

Carbohydrates: general classification and functions of: monosaccharides (glucose, ribose and deoxyribose), disaccharides (maltose, lactose and sucrose), polysaccharides (glycogen, starch, cellulose, inulin, and chitin).

Proteins: amino acids – (structure: glycine, alanine, serine); amino acids as zwitter-ion; examples of acidic, basic, neutral, sulphur containing amino acids; essential and nonessential amino acids; levels of protein structure (primary, secondary, tertiary and quaternary); functions of proteins.

Lipids: classification, structure and functions of fats and oils.

Enzymes: general properties, nomenclature and classification of enzymes according to type of reactions, co-factors (prosthetic groups, coenzymes and metal ions. Factors affecting enzyme activity - temperature, pH, substrate concentration. Competitive inhibitors.

(iii) Cell Cycle and Cell Division

Cell cycle, mitosis, meiosis and their significance.

Definition of C-value, different stages of cell cycle (G_o, G_1, S and G_2 and M).

Different stages of mitosis and prophase – I of meiosis with diagrams. Significance of mitosis and meiosis. Differences between mitosis and meiosis.

4. Plant Physiology

(i) 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.

Definition of imbibition; factors affecting imbibition; importance of imbibition, characteristics and significance of diffusion; osmosis - endosmosis and exosmosis; significance of osmosis and turgidity - osmotic pressure, turgor pressure, wall pressure; definition of turgidity, plasmolysis, deplasmolysis, importance of water; active and passive absorption of water; apoplastic and symplastic movements, definition of water potential and its components viz. solute, matrix and pressure potential

***(numerical problems based on this concept are not required**). Root pressure – definition and experiment to demonstrate it. Explanation and definition of transpiration, significance of transpiration. Stomatal mechanism – starch ↔ sugar interconversion and K^+-ion mechanism. Mechanism of ascent of sap by cohesion – tension and transpiration pull theory. Guttation – definition, differences between transpiration and guttation. Function of stomata, lenticel and hydathode. Mineral uptake by active and passive transport.*

Transport of solutes; evidences which indicate that downward movement of organic solutes takes place in phloem (girdling and tracer techniques), mechanism of translocation - mass flow hypothesis.

(ii) Mineral Nutrition

Essential minerals, macro- and micronutrients and their role; deficiency symptoms; mineral toxicity; elementary idea of hydroponics nitrogen metabolism, nitrogen cycle, biological nitrogen fixation.

Criteria for essentiality of minerals, hydroponics, macro and micronutrients; role and deficiency symptoms (hunger signs) of various elements. Mineral toxicity.

Root nodule formation, biological nitrogen fixation, non-symbiotic nitrogen fixation and symbiotic nitrogen fixation. Role of Rhizobium, Azospirillum, Azolla, Anabaena and Nostoc; importance of nitrogenase complex and leghaemoglobin pigment. Nitrogen cycle (graphic outline).

(iii) Photosynthesis in higher plants

Photosynthesis as a mean of autotrophic nutrition; site of photosynthesis, pigments involved in photosynthesis (elementary idea); photochemical and biosynthetic phases of photosynthesis; cyclic and non-cyclic photophosphorylation; chemiosmotic hypothesis; photorespiration; C_3 and C_4 pathways; factors affecting photosynthesis.

Contributions of Priestley, Sachs, Engelmann, van Neil; differences between absorption and action spectra.

Brief idea of photosynthetic pigments (difference between chlorophyll 'a'&'b', carotenoids and xanthophyll), photochemical phase - pigment systems, cyclic and non-cyclic photophosphorylation, chemiosmotic hypothesis; biosynthetic phase - C_3 and C_4 cycles – graphic representation in correct sequence (carboxylation, glycolytic reversal and regeneration of pentose); Differences between C_3 and C_4 plants, C_3 and C_4 cycles, Photosystems I and II, Photorespiration pathway in brief - explanation of how RuBP carboxylase acts as RuBP oxygenase. Kranz anatomy. Blackman's Law of limiting factors, factors affecting photosynthesis.

(iv) Respiration in Plants

Exchange of gases; cellular respiration - glycolysis, fermentation (anaerobic), TCA cycle and electron transport system (aerobic); energy relations - number of ATP molecules generated; amphibolic pathways; respiratory quotient.

Types of respiration; mechanism of respiration: glycolysis, Krebs' cycle, ETS (only flowchart). Oxidative phosphorylation – definition; Brief idea of fermentation and Amphibolic pathway. Definition of respiratory quotient and RQ values of carbohydrates, proteins and fats.

(v) Plant Growth and Development

Seed germination; phases of plant growth; differentiation, dedifferentiation and redifferentiation; sequence of developmental processes in a plant cell; growth regulators - auxin, gibberellin, cytokinin, ethylene, ABA; seed dormancy; vernalisation; photoperiodism.

A brief idea about differentiation, dedifferentiation and redifferentiation. Phases of growth in meristems, growth rate –

definition; measurement of growth by direct method and use of auxanometer, factors affecting growth.

Discovery and physiological role of growth regulators in plants (such as auxins, gibberellins, cytokinins, ethylene and abscisic acid – four effects of each); application of growth regulators, Definition of dormancy and quiescence; causes and methods of breaking seed dormancy.

Photomorphogenesis in plants.

A brief idea of short day, long day and day neutral plants; critical day length, definition and differences between photoperiodism and vernalisation.

5. Human Physiology

(i) Digestion and Absorption.

Alimentary canal and digestive glands, role of digestive enzymes; peristalsis, digestion, absorption and assimilation of proteins, carbohydrates and fats; calorific values of proteins, carbohydrates and fats; egestion; nutritional and digestive disorders.

Calorific value of carbohydrates, proteins and fats per gram; Structure and functions of the digestive organs and their associated glands, types of dentition (thecodont, heterodont, diphyodont) and dental formula of human; diagram of the digestive system with correct position of the organs and the associated glands; diagrammatic representation of T.S. of gut showing the four layers - histology of individual organs not required; physiology of digestion and absorption of food; definition of bolus, peristalsis, deglutition, emulsification; assimilation of digested food; disorders of the digestive system – Protein Energy Malnutrition (PEM), indigestion, constipation, vomiting, jaundice, diarrhoea.

(ii) Breathing and exchange of gases.

Respiratory organs in animals (recall only); Respiratory system in humans; mechanism of breathing and its regulation - exchange of gases, transport of gases and regulation of respiration, respiratory volumes; disorders related to respiration.

Organs involved in respiration; mechanism of pulmonary gas exchange; breathing process should be explained showing the action of diaphragm and intercostal muscles, regulation of respiration; transport of oxygen in the blood, oxyhaemoglobin dissociation curve; transport of CO_2; chloride shift, pulmonary air volumes and lung capacities; disorders of respiratory system such as - asthma, emphysema, occupational respiratory disorders.

(iii) Body fluids and circulation.

Composition of blood, blood groups, coagulation of blood; composition of lymph and its function; human circulatory system - structure of human heart and blood vessels; cardiac cycle, cardiac output, ECG; double circulation; regulation of cardiac activity; disorders of circulatory system.

Composition of blood plasma, functions of plasma proteins, blood corpuscles. Difference between closed and open vascular system; external and internal structure of heart; working of the heart and blood flow through the heart during different phases should be described under the following headings - auricular systole, auricular diastole, ventricular systole, ventricular diastole and joint diastole; definition of stroke volume and cardiac output, regulation of heart beat, ECG; arterial blood pressure (systolic and diastolic), double circulation. The internal structure of artery, vein and capillary. Importance of ABO groups in blood transfusion, Rh factor and its importance in transfusion and pregnancy; clotting of blood to be taught briefly; lymphatic system – a brief idea of lymph (composition and function), lymphatic capillaries and lymph nodes; disorders of the circulatory system such as hypertension, coronary artery disease, angina pectoris and heart failure.

(iv) Excretory products and their elimination.

Modes of excretion - ammonotelism, ureotelism, uricotelism; human excretory system - structure and function; urine formation, osmoregulation; regulation of kidney function, renin - angiotensin, atrial natriuretic factor, ADH and diabetes insipidus; role of erythropoietin; role of other organs in excretion; disorders of the excretory system - uraemia, renal failure, renal calculi, nephritis; dialysis and artificial kidney.

Define, differentiate and explain the terms ammonotelism, ureotelism and uricotelism; external and internal structure of the kidney (L.S.); structure of nephron; physiology of urine formation - ultra filtration, selective reabsorption and active (tubular) secretion. Counter current system, regulation of urine formation, definition of micturition, renin-angiotensin system, role of atrial natriuretic factor, ADH and erythropoietin.

Role of skin, liver and lungs in excretion. Homeostasis – definition. Disorders of the excretory system - uraemia, renal failure, renal calculi, nephritis.

Haemodialysis and artificial kidney.

(v) Locomotion and Movement

Types of movement - ciliary, flagellar, muscular; skeletal muscles - contractile proteins and muscle contraction; skeletal system and its functions; joints; disorders of muscular and skeletal system.

Locomotion: Basic aspects of human skeleton (number and names of the bones of axial and appendicular skeleton).

Functions of human skeleton; different types of joints - their location and function; general properties of muscles; structure of skeletal muscle - sliding filament theory of muscle contraction; chemical events during muscle contraction; definition of summation, tetanus, rigor mortis, differences between red and white muscles.

Disorders of muscular and skeletal system: (i) Myasthenia gravis, (ii) Tetany, (iii Muscular dystrophy, (iv) Arthritis, (v) Osteoporosis, (vi) gout.

(vi) Neural Control and Coordination

Neuron and nerves; nervous system in humans - central nervous system; peripheral nervous system and visceral nervous system; generation and conduction of nerve impulse; reflex action; sensory perception; sense organs; elementary structure and functions of eye and ear.

Structure and functions of various parts of the brain and spinal cord; conduction of nerve impulses through nerve fibre (non-myelinated and myelinated) and through synapse; physiology of reflex action, natural reflex and conditioned reflex - definition, examples and differences; reflex arc to be taught with diagram showing the pathway by means of arrows; eye and ear: structure and working to be done along with the help of – diagrams. Elementary idea of nose (olfactory receptor) and tongue (gustato receptor).

(vii) Chemical Co-ordination and Integration

Endocrine glands and hormones; human endocrine system - hypothalamus, pituitary, pineal, thyroid, parathyroid, adrenal, pancreas, gonads; mechanism of hormone action (elementary idea); role of hormones as messengers and regulators, hypo - and hyperactivity and related disorders; dwarfism, acromegaly, cretinism, goitre, exophthalmic goitre, diabetes mellitus and diabetes insipidus, Grave's disease, Addison's disease.

Brief idea of location of endocrine glands; role of hypothalamus; hormones secreted by different lobes of pituitary and their functions; feedback control of tropic hormones to be discussed giving examples; hormones of pineal, thymus, thyroid, parathyroid, pancreas, adrenal glands, GI tract (gastrin, secretin, GIP, CCK-PZ) and gonads; mechanism of hormone action (through cAMP and steroid hormones only); effects of hypo secretion and hyper secretion of various hormones of the above mentioned glands.

Note: Diseases related to all the human physiological systems to be taught in brief.

PAPER II

PRACTICAL WORK – 15 Marks

1. Scientific Techniques

To study parts of a dissecting microscope and compound microscope.

The students should know all parts of dissecting and compound microscope and be able to handle the microscope independently.

2. Physiology

(i) Food tests: test for starch, glucose, sucrose, proteins and fats.

Food tests: tests should be reported in tabular form. Both positive and negative tests should be reported.

(ii) To study the effect of thawing, heat and alcohol on permeability of beet root cells.

To study the effect of heat on permeability of cell membrane of beet root cells: students should record the observations at very low temperature, room temperature and higher temperature to see the degree of leaching and conclude accordingly. Experiment on effect of alcohol on the permeability with regard to leaching.

(iii) Separation of plant pigments from leaves by chromatography.

(iv) Effect of different carbon dioxide concentrations on the rate of photosynthesis.

(v) Demonstration of plasmolysis (using *Rhoeo* leaf / onion bulb).

(vi) Demonstration of osmosis in living plant cells (potato osmoscope).

3. Morphology

(i) Morphology and modification of roots, stems and leaves.

Teachers can show examples of roots, stems and leaves modified for mechanical support, storage, reproduction or perennation – students should learn to identify and draw the specimens.

Leaves: phyllotaxy – alternate, opposite whorled (with an example of each), shape, venation, simple and compound.

(ii) Preparation of temporary slides of *Mucor* / *Rhizopus*.

The teacher should guide the students on the technique of culture, staining and mounting the material and then observing under the microscope. The students should also be able to make labelled diagrams and record observations.

4. Cytology

Preparation of temporary slides of -

(i) Onion peel (to study the plant cell)

(ii) Stages of mitosis in onion root tips.

Correct method of selecting the root tip, fixing, staining and mounting should be taught. Different stages should be observed first in low power and after locating the area, the students should see it under high power. Various stages should be drawn and labelled.

(iii) T.S of monocot and dicot stem.

(iv) T.S. of monocot and dicot root.

After staining and mounting the tissue students should be able to draw the diagram and label all the parts as seen under the low power of microscope.

5. Spotting: (Three minutes to be given for each spot which includes identification, drawing a labelled diagram and writing at least two characteristics).

(a) Identification of stained preparations of the following:

(i) Stages of meiosis.

(ii) Identification of mammalian blood cells.

(iii) Bacteria

(iv) *Spirogyra*

(v) *Amoeba*

(vi) Yeast

(b) Identification of the following specimens -

(i) Liverworts

(ii) Moss

(iii) Fern

(iv) *Pinus*

(v) Mushroom

(vi) One monocot plant – bamboo

(vii) One dicot plant – *Petunia*

(viii) Sponge

(ix) *Hydra*

(x) Tape worm

(xi) Leech

(xii) Silk Worm

(xiii) Rohu fish

*Students should be taught how to identify, draw, label and give **at least two** significantly visible characteristics, as observed, of each spot, in a given time of three minutes.*

(c) Comment on experimental set up studied in physiology.

(a) Osmosis

(b) Transpiration

(c) Photosynthesis

(d) Transpiration pull.

Students should identify (aim of the experiment), draw a labelled diagram of the physiological set-up and write observation and inference of the experiment within the allotted time i.e., 3 minutes.

PROJECT WORK AND PRACTICAL FILE –

15 Marks

Project Work – 10 Marks

Candidate is to creatively execute one project/assignment on any aspect of Biology. Preference is to be given to investigatory projects. Following is only a suggestive list of projects. Teachers may assign or students may choose any one project of their choice.

(i) Project related to experiment on any aspect of plant life/animal life.

(ii) Project related to any aspect of environment.

(iii) Diabetes.

(iv) Endocrine disorders.

(v) Yeast fermentation and production of alcohol or any other commercial industry dependant on plants and/or animals or their products.

In addition, students may be taught how to culture:

- Earthworms.
- Protozoans.
- Moulds.
- Setting up of an aquarium.

Suggested Evaluation Criteria for Project Work:

Format of the Project:

- Content
- Introduction
- Presentation (graphs, tables, charts, newspaper cuttings, handmade diagrams, photographs, statistical analysis if relevant)
- Conclusion/ Summary
- Bibliography

Projects should be handwritten by the candidate. The written pages should not exceed 15-20 pages.

Practical File – 5 Marks

Each practical done during the year, needs to be recorded by the student in the Practical file and the same must be checked, signed and dated by the teacher.

Teachers are required to assess students on the basis of the Biology Practical file maintained by them during the academic year.

SCIENTISTS AND THEIR CONTRIBUTIONS

1. Beijerinck – *Contagium vivum fluidum*
2. Carl Woese – Three domains of life
3. Curtis – Transpiration is a necessary evil
4. Engelmann – Action spectrum of photosynthesis
5. Ernst Mayr – Biological species concept
6. F.F. Blackman – Law of limiting factor
7. F W Went – Isolated Auxins
8. Farmer and Moore – Discovered meiosis
9. G.N. Ramachandran – Analysis of Protein structure
10. Garner and Allard – Photoperiodism
11. George Palade – Discovered ribosomes
12. Huxley and Niedergerke – Sliding filament theory
13. Ivanowsky – Discovered Tobacco Mosaic Virus
14. Karl Landsteiner – Blood groups
15. Katherine Esau – Anatomy of plants
16. Levitt – Active K^+ transport theory of stomatal movement
17. Munch – Proposed mass flow hypothesis
18. Peter Mitchell – Chemiosmotic coupling hypothesis
19. Priestley – Plants restore oxygen in the air
20. Renner – Coined the terms active and passive absorption of water
21. Robert Brown – Discovered nucleus
22. Singer and Nicolson – Proposed fluid mosaic model of plasma membrane
23. Sutherland – cyclic AMP as second messenger
24. T. O. Diener – Discovered viroids
25. Thomas Addison – Father of endocrinology
26. Van Neil – Oxygen released during photosynthesis comes from water
27. W. M. Stanley – Crystallised TMV
28. Waldeyer – Coined the term chromosome
29. Whittaker – Five kingdoms of life
30. William Harvey – Discovered circulatory system

LIST OF ABBREVIATIONS TO BE STUDIED

1. 2,4-D – 2, 4-Dichlorophenoxy acetic acid
2. ABA – Abscisic Acid
3. ANF – Atrial Natriuretic Factor
4. CCK –Cholecystokinin
5. DPD – Diffusion Pressure Deficit
6. ECG – Electrocardiogram
7. ERV – Expiratory Reserve Volume
8. ETS – Electron Transport System
9. FAD – Flavin Adenine Dinucleotide
10. FRC – Functional Residual Capacity
11. GA – Gibberellic acid
12. GFR – Glomerular Filtration Rate
13. GIP – Gastric Inhibitory Peptide
14. IBA – Indole Butyric Acid
15. IRV – Inspiratory Reserve Volume
16. LHC – Light Harvesting Complex
17. NAA – Naphthalene Acetic Acid
18. NADPH – Nicotinamide Adenine Dinucleotide Phosphate (reduced)
19. OAA – Oxaloacetic Acid
20. PEM – Protein Energy Malnutrition
21. PGA – Phosphoglyceric Acid
22. PGRs – Plant Growth Regulators
23. PPLO – Pleuro Pneumonia Like Organism
24. PZ – Pancreozymin
25. RQ – Respiratory Quotient
26. RUBISCO – Ribulose Bisphosphate Carboxylase oxygenase
27. RuBP – Ribulose Bisphosphate
28. TMV – Tobacco Mosaic Virus