

SCIENCE (52)

PAPER 3: BIOLOGY

Aims:

1. To acquire the knowledge of the economic importance of plants and animals.
2. To develop an understanding of the inter-relationship between sustainability and environmental adaptations.
3. To develop an understanding of the interdependence of plants and animals so as to enable pupils to acquire a clearer comprehension

of the significance of life and its importance in human welfare.

4. To understand the capacities and limitations of all the biological and economic activities so as to be able to use them for a better quality of life.
5. To acquire the ability to observe, experiment, hypothesise, infer, handle equipment accurately and make correct recordings.

CLASS IX

There will be one paper of one and half-hours duration of 80 Marks and Internal Assessment of Practical Work Carrying 20 Marks.

The paper will be divided into two sections, Section I (40 marks) and Section II (40 marks).

Section I (compulsory) will contain short answer questions on the entire syllabus.

Section II will contain six questions. Candidates will be required to answer any **four** of these six questions.

1. Basic Biology

- (i) The cell, a unit of life, protoplasm, basic difference between prokaryotic and eukaryotic cell; differences between an animal and a plant cell.

A basic understanding of the cell theory, structure of plant and animal cell with functions of various cell organelles. (Protoplasm, Cytoplasm, Cell Wall, Cell Membrane, Nucleus, Nucleolus, Mitochondria, Endoplasmic Reticulum, Ribosome, Golgi bodies, Plastids, Lysosomes, Centrosome and Vacuole). Difference between a plant cell and an animal cell should be mainly discussed with respect to cell wall, centrosome and vacuoles and plastids.

- (ii) Tissues: Types of plant and animal tissues.

To be taught in brief with respect to location, basic structure and function, giving typical

examples of their location so as to enable pupils to understand their role in different physiological processes in plants and animals.

2. Flowering Plants

- (i) Vegetative Propagation: Artificial methods, advantages and disadvantages. Economic importance of artificial propagation, Hybridisation and Micro Propagation. Brief idea of Biotechnology and its applications role in medicine and industry.

The concept in brief with suitable examples.

Artificial methods: cutting, grafting and layering with examples. Advantages and disadvantages of vegetative reproduction to be discussed.

Economic importance of artificial propagation.

Hybridization: Meaning and benefits.

Micro Propagation: meaning, uses and limitations.

Brief idea of biotechnology (example -human insulin from E.coli). Applications of biotechnology: in medicine - penicillin and tetracycline. In industry (example - cheese, vinegar, yogurt, alcoholic beverages; synthesis of vitamins namely vitamin C and enzymes - namely lipase).

- (ii) Flower: Structure of a bisexual flower, functions of various parts.

A brief introduction to complete and incomplete flowers. Essential and non-essential whorls of a bisexual flower; their various parts and functions. Use of charts or actual specimens help enhance clarity of concepts.

Inflorescence and placentation (types are not required in both cases).

- (iii) Pollination: self and cross-pollination.

Explanation, advantages and disadvantages of self and cross-pollination, agents of pollination and the characteristic features of flowers pollinated by various agents to be discussed.

- (iv) Fertilisation.

Events taking place between pollination and fertilisation should be discussed up to fusion of male gamete with egg cell in the embryo sac. Students should be familiar with the terms double fertilization and triple fusion. Fruit and Seed (definition) and significance of Fruit and Seed.

3. Plant Physiology

- (i) Structure of dicot and monocot seeds, Germination of seeds, types, and conditions for seed germination.

Structure and germination of Bean seed and Maize grain. Differences between hypogeal and epigeal germination- Conditions for seed germination should be dealt with by experiments.

- (ii) Respiration in plants: outline of the process, gaseous exchange.

A brief outline of the process mentioning the term Glycolysis, Krebs cycle and their significance. Reference to be made to Aerobic and anaerobic respiration with chemical equations in each case. Experiments on gaseous exchange and on heat production.

4. Diversity in living organisms

- (i) A brief outline of five Kingdom classification:

Main characteristics of each kingdom with suitable examples Monera, Protista, Fungi, Plantae (Thallophyta, Bryophyta, Pteridophyta and Spermatophyta) and Animalia (Non-chordates from Porifera to Echinodermata and Chordates - all five Classes)

- (ii) Economic importance of Bacteria:-

Economic importance of bacteria:

Useful role of bacteria - medicine (antibiotics, serums and vaccines); agriculture; (nitrogen fixing, nitrifying and denitrifying bacteria) and industry (curing of tea, tanning of leather)

Harmful role of bacteria in spoilage of food, disease in plants and animals, bio-weapons, denitrification.

- (iii) Economic importance of Fungi:

Economic importance of Fungi:

Useful role of Fungi in breweries, bakeries, cheese processing, mushroom cultivation (Processes of manufacture not required in each case).

5. Human Anatomy and Physiology

- (a) Nutrition:

- (i): Classes of food: balanced diet. Malnutrition and deficiency diseases.

Functions of carbohydrates, fats, proteins, mineral salts (calcium, iodine, iron and sodium), vitamins and water in proper functioning of the body to be discussed. Sources of vitamins, their functions and deficiency diseases to be discussed. Students should be familiar with the term 'Balanced Diet'. Importance of cellulose in our diet should be discussed. Students should be taught about Kwashiorkor and Marasmus.

- (ii) the structure of a tooth, different types of teeth.

Structure of a tooth to be discussed with the help of a diagram. Functions of different types of teeth must also be taught.

- (iii) Digestive System: Organs and digestive glands and their functions (including enzymes and their functions in digestion; absorption,

utilisation of digested food); tests for reducing sugar, starch, protein and fats.

Organs and their functions; functions of saliva; brief idea of peristalsis; digestion in various parts of alimentary canal. Tests for sugar, starch, protein and fats.

(b) Movement and Locomotion:

(i) *Functions of human skeleton*

(ii) *Axial and Appendicular Skeleton*

(iii) *Types of joints – immovable, slightly movable and freely movable (hinge joint, ball and socket joint, gliding joint, pivot joint.)*

(c) Structure and functions of skin.

Various parts of the skin and their functions to be taught with the help of diagrams; heat regulation, vasodilation, vasoconstriction to be explained.

(d) Respiratory System: Organs; mechanism of breathing; tissue respiration, heat production.

Differences between anaerobic respiration in plants and in man. Brief idea of respiratory volumes, effect of altitude on breathing and asphyxiation should be taught. Role of diaphragm and intercostals muscles in breathing must be explained to provide a clear idea of breathing process. Brief idea of gaseous transport and tissue respiration to be given.

6. Health and Hygiene

Cause of diseases:

(i) *Bacteria - types of bacteria, bacterial control, three examples of diseases caused by bacteria e.g. Tuberculosis, Tetanus, Syphilis (Venereal disease).*

(ii) *Virus - nature of viruses, three examples of viral diseases e.g. Poliomyelitis, Mumps, Rabies, etc. Introduction to HIV, its outline structure and spread.*

(iii) *Parasites - two examples, roundworm, tapeworm and their control.*

(iv) *Brief idea of endemic, epidemic, pandemic, and sporadic.*

(v) *Hygiene: simple personal hygiene and social conditions affecting this. Disease carriers (vectors) flies, rats and cockroaches, contamination of water, waterborne diseases.*

General idea of personal hygiene, public hygiene and sanitation, control of housefly, mosquitoes, cockroaches and rats (life history not required). Water borne diseases like cholera, dysentery and Hepatitis.

INTERNAL ASSESSMENT OF PRACTICAL WORK

The practical work will be designed to test the ability of the candidates to make accurate observations from specimens of plants and animals. For this, candidates should be familiar with the use of a hand lens of not less than x 6 magnification. They should be trained to make both simple and accurate drawings and brief notes as a means of recording their observations.

The practical examiners will assume that candidates would have carried out the practical work outlined below.

NOTE: Candidates are expected to have a basic idea of plant morphology.

PLANT LIFE

(i) The examination of an onion peel under the microscope to study various parts of the cell.

Students should be given an idea of removal of onion peel, staining, mounting the specimen and handling the microscope. They should observe the structures and draw labelled diagrams.

(ii) A cross-pollinated flower to be examined and identified and the parts to be studied and labelled e.g. Hibiscus.

Specimens should be provided to the students from which they should be asked to draw diagrams showing the various parts.

The flower to be discussed in order of the four whorls with diagrams of the complete flower, reproductive parts and T.S of ovary to show the arrangement of ovules. Students should draw directly from the specimen provided so that they have a clear idea of the whorls and their location.

(iii) Specimens of germinating seeds with plumule and radicle (the bean seed and maize grain) for

examination, identification, drawing and labelling the parts.

Seeds soaked in water should be provided. The students themselves should see the external and internal structure so that they can identify the various parts and draw and label them.

ANIMAL LIFE

- (i) The examination of a human cheek cell under the microscope to study various parts of the cell.
Students should be given an idea of staining, mounting the specimen and handling the microscope. They should observe the structures and draw labelled diagrams
- (ii) Identification of sugar, starch, protein and fat.
Students should perform different tests for identification and write down their observations and inference in tabular form.
- (iii) Examination and identification of specimens belonging to the following groups of animals: Porifera, Coelenterata, Annelida, Platyhelminthes, Nematelminthes, Arthropoda, Mollusca and Echinodermata.
The specimens or models of the given groups of animals should be shown to the students and reasons for their identification in that particular group should be given. Diagrams should be drawn as observed in the specimens and not from the books. Only those structures that are observed should be drawn and labelled.
- (iv) Study of different types of movable joints in human beings.
- (v) Identification of the structure of the following organs through specimens/models and charts; Lung and skin.
- (vi) Experiments to show the mechanism of breathing.
Bell jar experiment should be discussed. Comparison should be made with the human lungs and respiratory tract to show the mechanism of breathing.

INTERNAL ASSESSMENT IN SCIENCE - GUIDELINES FOR MARKING WITH GRADES

Criteria	Preparation	Procedure/ Testing	Observation	Inference/ Results	Presentation
Grade I (4 marks)	Follows instructions (written, oral, diagrammatic) with understanding; modifies if needed. Familiarity with and safe use of apparatus, materials, techniques.	Analyses problem systematically. Recognises a number of variables and attempts to control them to build a logical plan of investigation.	Records data/observations without being given a format. Comments upon, recognises use of instruments, degree of accuracy. Recording is systematic.	Processes data without format. Recognises and comments upon sources of error. Can deal with unexpected results, suggesting modifications.	Presentation is accurate and good. Appropriate techniques are well used.
Grade II (3 marks)	Follows instructions to perform experiment with step-by-step operations. Awareness of safety. Familiarity with apparatus, materials and techniques.	Specifies sequence of operation; gives reasons for any change in procedure. Can deal with two variables, controlling one.	Makes relevant observations. No assistance is needed for recording format that is appropriate.	Processes data appropriately as per a given format. Draws qualitative conclusions consistent with required results.	Presentation is adequate. Appropriate techniques are used.
Grade III (2 marks)	Follows instructions to perform a single operation at a time. Safety awareness. Familiarity with apparatus & materials.	Develops simple experimental strategy. Trial and error modifications made to proceed with the experiment.	Detailed instructions needed to record observations. Format required to record results.	Processes data approximately with a detailed format provided. Draws observations qualitative conclusions as required.	Presentation is reasonable, but disorganised in some places. Overwriting ; rough work is untidy.
Grade IV (1 mark)	Follows some instructions to perform a single practical operation . Casual about safety. Manages to use apparatus & materials.	Struggles through the experiment. Follows very obvious experimental strategy.	Format required to record observations/ readings, but tends to make mistakes in recording.	Even when detailed format is provided, struggles or makes errors while processing data. Reaches conclusions with help.	Presentation is poor and disorganised but follows an acceptable sequence. Rough work missing or untidy.
Grade V (0 marks)	Not able to follow instructions or proceed with practical work without full assistance. Unaware of safety.	Cannot proceed with the experiment without help from time to time.	Even when format is given, recording is faulty or irrelevant.	Cannot process results, nor draw conclusions, even with considerable help.	Presentation unacceptable; disorganised, untidy/ poor. Rough work missing.