

SCIENCE (52)
BIOLOGY
SCIENCE Paper - 3

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, hypothesize, infer, handle equipment accurately and make correct recordings.

There will be one paper of **two 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).
 - Major differences between a prokaryotic and eukaryotic cell.
 - Differences between a plant cell and an animal cell should be mainly discussed with respect to cell wall, centrosome, vacuoles and plastids.
- (ii) Tissues: Types of plant and animal tissues.
 - A brief understanding of their location, basic structure and functions with examples.
 - A brief understanding of their role in different physiological processes in plants and animals.

2. Flowering Plants

- (i) 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.
 - Inflorescence and placentation (meaning only)
- (Charts or actual specimens may be used to help enhance clarity of concepts.)
- (ii) 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 such as insects, wind, and water.
 - A brief idea as to how nature favors cross pollination.
- (iii) Fertilisation.
- Events taking place between pollination and fertilisation leading to the formation of zygote in the embryo sac.
 - A brief explanation of the terms double fertilization and triple fusion.
 - Fruit and Seed - definition and significance.

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 monocot and dicot seeds.
 - Differences between hypogeal and epigeal germination.
 - Conditions for seed germination - To be explained and supported by experiments.
- (ii) Respiration in plants: outline of the process, gaseous exchange.
- A brief outline of the process mentioning the terms Glycolysis, Krebs cycle and their significance.
 - A 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 the five Kingdom classification.
- Main characteristics of each kingdom with suitable examples:
 - Monera, Protista, Fungi.
 - Plantae - Thallophyta, Bryophyta, Pteridophyta and Spermatophyta.
 - Animalia - non-chordates from Porifera to Echinodermata and Chordates - all five Classes.
- (ii) Economic importance of Bacteria.
- (a) Useful role of bacteria:
- Medicine: antibiotics, serums and vaccines

- Agriculture: nitrogen cycle (role of nitrogen fixing, nitrifying and denitrifying bacteria)
 - Industry -curing of tea, tanning of leather.
- (b) Harmful role of bacteria - spoilage of food, diseases in plants and animals, bio-weapons.

(iii) Economic importance of Fungi.

A brief idea of the useful role of Fungi in breweries, bakeries, cheese processing, and mushroom cultivation. (Processes of manufacture are not required).

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.
- Sources of vitamins, their functions and deficiency diseases.
- Meaning and importance of a 'Balanced Diet'.
- Role of cellulose in our diet.
- Causes, symptoms and prevention of 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.
- Dental formula of an adult.

(iii) Digestive System: Organs, digestive glands and their functions (including enzymes and their functions in digestion, absorption and assimilation of digested food).

- Organs and glands of the digestive system and their functions with reference to digestion, absorption and assimilation.
- Brief idea of peristalsis.

(b) Skeleton - Movement and Locomotion.

- Functions of human skeleton
- Axial and Appendicular Skeleton
- Types of joints with reference to their location:
 - immovable joints
 - slightly movable joints
 - 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.
- Special derivatives of the skin with reference to sweat glands, sebaceous glands, hair, nails and mammary glands.

- Heat regulation - vasodilation and vasoconstriction.
- (d) Respiratory System: Organs; mechanism of breathing; tissue respiration, heat production.
- Structures of the respiratory system.
 - Differences between anaerobic respiration in plants and in man.
 - Role of diaphragm and intercostal muscles in breathing to provide a clear idea of the breathing process.
 - Brief idea of gaseous transport and tissue respiration.
 - Brief understanding of respiratory volumes.
 - Effect of altitude on breathing; asphyxiation and hypoxia.

6. Health and Hygiene

- (i) A brief introduction to maintaining good health.
General idea of personal hygiene, public hygiene and sanitation.
- (ii) A brief introduction to communicable, non - communicable, endemic, epidemic, pandemic and sporadic diseases; modes of transmission.
- Meaning of each of the above with examples.
 - Modes of transmission: air borne, water borne; vectors (housefly, mosquito, cockroach).
- (iii) Bacterial, Viral, Protozoan, Helminthic diseases:
- Bacterial: Cholera, typhoid, tuberculosis.
 - Viral: AIDS, Chicken pox, Hepatitis.
 - Protozoan: Malaria, Amoebic Dysentery, Sleeping sickness.
 - Helminthic: Ascariasis, Taeniasis, Filaria.
- (Symptoms and measures to control the above diseases.)
(Scientific names of causative agents not required).
- (iv) Aids to Health: Active and passive immunity.
- Meaning of Active and passive immunity.
 - An understanding of the use and action of the following - vaccination, immunization, antitoxin, serum, antiseptics, disinfectants, antibiotics.
 - An idea of the local defense system and its merits, difference between antiseptics and disinfectants.
- (v) Health Organizations: Red Cross, WHO. *Major activities of the Red Cross and WHO.*

7. Waste generation and management

- (a) Sources of waste - domestic, industrial, agricultural, commercial and other establishments.
- Domestic waste: paper, glass, plastic, rags, kitchen waste, etc.
 - Industrial: mining operations, cement factories, oil refineries, construction units.
 - Agricultural: plant remains, animal waste, processing waste.

- Municipal sewage: Sewage, degradable and non-degradable waste from offices, etc.
- E-waste: brief idea about e-waste.

(b) Methods of safe disposal of waste.

- Segregation, dumping, composting, drainage, treatment of effluents before discharge, incineration, use of scrubbers and electrostatic precipitators.
- Segregation of domestic waste into biodegradable and non-biodegradable by households: garden waste to be converted to compost; *sewage treatment plants*.

INTERNAL ASSESSMENT OF PRACTICAL WORK

The practical work is designed to test the ability of the candidates to make accurate observations from specimens of plants and animals.

PLANT LIFE

- (i) The examination of an onion peel under the microscope to study various parts of the cell.
- (ii) A cross-pollinated flower to be examined and identified and the parts to be studied and labelled e.g. Hibiscus.
- (iii) Specimens of germinating seeds with plumule and radicle (the bean seed and maize grain) for examination, identification, drawing and labelling the parts.

ANIMAL LIFE

- (i) The examination of a human cheek cell under the microscope to study various parts of the cell.
- (ii) Identification of sugar, starch, protein and fat, through conduct of relevant tests.
- (iii) Examination and identification of specimens belonging to the following groups of animals:
Non Chordata - Porifera, Coelenterata, Platyhelminthes, Nematelminthes Annelida, Arthropoda. Mollusca and Echinodermata. Chordata- Pisces, Amphibia, Reptilia, Aves, Mammalia.
Identification of the structure of the following organs through specimens/models and charts: Lung and skin.
- (iv) 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

- (v) Visit a few establishments in the locality such as motor repair workshops, kilns, pottery making units, fish and vegetable markets, restaurants, dyeing units. Find out the types of wastes and methods prevalent for their disposal. On the basis of the information collected prepare a report, suggest measures to improve the environmental conditions.
- (vi) Visit a water treatment plant, sewage treatment plant or garbage dumping or vermin composting sites in the locality and study their working.