

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 differences between an animal and a plant cell.
- (ii) Tissues: Types of plant and animal tissues.

2. Flowering Plants

- (i) Outline of the external morphology of a simple herbaceous plant e.g. Petunia, Hibiscus.
- (ii) Vegetative Propagation: Natural and artificial methods, advantages and disadvantages. Economic importance of propagation and hybridisation. Micro Propagation. Brief idea of Biotechnology and its role in medicine and industry.
- (iii) Medicinal Plants – their role in Indian system of medicine. Example – Neem, Turmeric, Quinine, Amla and Tulsi.

- (iv) Flower: Structure of a bisexual flower, functions of various parts.
- (v) Pollination: self and cross-pollination.
- (vi) Fertilisation.

3. Plant Physiology

- (i) Germination of seeds, types, and conditions for seed germination.
- (ii) Respiration in plants: nature of the process, gaseous exchange.

4. Flowerless Plants

Economic importance of bacteria and fungi; role in medicine, agriculture and industry; medicine – antibiotics, serums and vaccines; agriculture – nitrogen fixing, nitrifying and denitrifying bacteria; industry - wine, baking, cheese, mushroom cultivation. Methods of preservation of foods.

5. Animal Study

- (i) A brief study of classification of animals - vertebrates and invertebrates. Characteristics of each group of animals with examples (class in case of vertebrates and phylum in case of invertebrates).
- (ii) Adaptation to environment: examples: to air (bird), water (fish), land (mammal), to modes of life.

- (iii) Mammal: the general arrangement of internal organs.
- (iv) Nutrition in animals: the structure of a tooth, different types of teeth.
- (v) Nutrition in man: Classes of food, balanced diet. Malnutrition and deficiency diseases.
- (vi) 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.
- (vii) Structure and functions of skin.
- (viii) Circulatory System: Main features; the structure and working of the heart, blood vessels, structure and functions of blood and circulation of blood (only names of the main blood vessels entering and leaving the heart, liver and kidney will be required).
- (ix) Respiration System: Organs; mechanism of breathing; tissue respiration, heat production.
- (x) Excretory System: Elementary treatment of the structure and function of the kidneys; the kidneys treated as comprising cortex and medulla and consisting of a branched system of tubules well supplied with blood vessels leading to the ureter (details of the courses of the tubules and their blood vessels not required).

6. Health and Hygiene

Cause of diseases:

- (i) Bacteria - types of bacteria, bacterial control, three examples of diseases caused by bacteria e.g. Tuberculosis, Cholera, 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) Hygiene: simple personal hygiene and social conditions affecting this. Disease carriers (vectors) flies, rats and cockroaches, contamination of water, waterborne diseases.

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 x6 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.
- (ii) Specimens of simple flowering plants for morphological study. Identification and drawing of the root, stem, leaf and flower. The parts of the flower to be studied in detail and labelled e.g. hibiscus, petunia.
- (iii) Specimens of different types of underground stems for examination, identification, drawing and labelling e.g. Potato, Onion, Ginger, Corm.
- (iv) A cross-pollinated flower to be examined and identified and the parts to be studied and labelled e.g. Hibiscus.
- (v) Specimens of germinating seeds (e.g. the bean, maize) 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.
- (iii) Examination and identification of specimens belonging to the following groups of animals: Porifera, Coelenterata, Annelida, Platyhelminthes, Arthropoda, Fish, Amphibia, Bird and Mammal.
- (iv) General anatomy of a mammal to be taught with the aid of a model or a chart.
- (v) Identification of the structure of the following organs through specimens/models and charts: Kidney, Lung and Heart.
- (vi) The identification of different types of blood cells under a microscope.
- (vii) Experiments to show the mechanism of breathing.

CLASS X

*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) Cell Division and structure of chromosomes.
- (ii) Genetics: Mendel's laws of inheritance and sex-linked inheritance of diseases.

2. Plant Physiology

(The whole of plant physiology should be treated experimentally with sufficient theory to explain the phenomena and importance to the plant).

- (i) Absorption by roots; diffusion and osmosis; osmotic pressure; turgidity and flaccidity; plasmolysis and deplasmolysis; the absorption of water and minerals; the importance of root hair.
- (ii) The rise of water up to the xylem; a general idea of the causative forces (questions will not be set on causative forces); demonstration by the use of dyes.
- (iii) Transpiration, process and significance; experimental work includes the loss in weight of a potted plant or a leafy shoot in a test tube, the use of cobalt chloride paper and the effect of external conditions on the rate of water loss; potometer and its limitations should be stressed.
- (iv) Photosynthesis: the nature of the process itself and the great importance of photosynthesis to life in general; experiments to show the necessity of light, carbon dioxide & chlorophyll and also the formation of starch and the output of oxygen; carbon cycle.

3. Animal Study (with reference to humans only)

- (i) Nervous system: a simplified account of the brain (only the external structure of the brain is needed but reference should be made to the distribution of white and gray matter), spinal cord, reflex action and how it differs from voluntary action, the sense organs, their position and functions; structure of the eye and ear simply treated, the use of spectacles for the correction of short and long sight; the ear should be treated as consisting of cochlea sensitive to vibrations and semicircular canal sensitive to position.
- (ii) Endocrine System: General study of the following glands: Adrenal, Pancreas, Thyroid and Pituitary.
- (iii) The Reproductive System: Organs, fertilisation and a general outline of nutrition and respiration of the embryo. (Menstrual cycle not to be taught).
- (iv) Population: Problems posed by the increase in population in India; population control.

4. Health: Diseases and Hygiene

- (i) Aids to health: an understanding of the use and action of the following - vaccination; immunisation; antitoxin; serum; antiseptics; disinfectants; penicillin; sulphonamide drugs; First Aid.
- (ii) Health organisations: Red Cross, WHO (reasons for its formation); common health problems in India.

INTERNAL ASSESSMENT OF PRACTICAL WORK

The practical work will be designed to test the ability of the candidates to make accurate observation from specimens of plants and animals. For this, the candidates should be familiar with the use of a hand lens of not less than x6 magnification. Candidates should be trained to make 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.

PLANT LIFE

- (i) Observation of permanent slides of mitosis.
- (ii) Experiments indicating osmosis, diffusion and absorption.
- (iii) Physiological experiments on transpiration to be set up by the teacher and the pupils to identify the products, draw and label the apparatus.
- (iv) Experiments to show the necessity of light, carbon dioxide essential for photosynthesis; release of O₂ during photosynthesis. Candidates to write down their observations and draw and label the apparatus.

ANIMAL LIFE

- (i) Identification of the structure of the Brain through models and charts.
- (ii) The structure of the Ear and Eye (**candidates will be required to identify each structure in the models of these organs**).
- (iii) Identification and location of selected endocrine glands (Adrenal, Pancreas, Thyroid and Pituitary glands) with the help of a model or chart.
- (iv) Compiling material for a First Aid box.

EVALUATION

The practical work/project work are to be evaluated by the subject teacher and by an External Examiner. (The External Examiner may be a teacher nominated by the Principal, who could be from the faculty, **but not teaching the subject in the relevant section/class**. For example, a teacher of Biology of Class VIII may be deputed to be an External Examiner for Class X, Biology projects.)

The Internal Examiner and the External Examiner will assess the practical work/project work independently.

Award of marks (20 Marks)

Subject Teacher (Internal Examiner)	10 marks
External Examiner	10 marks

The total marks obtained out of 20 are to be sent to the Council by the Principal of the school.

The Head of the school will be responsible for the entry of marks on the mark sheets provided by the Council.

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.