

# NABTEB BIOLOGY SYLLABUS

## INTRODUCTION

### 006 - BIOLOGY

The content of this syllabus has been drawn from the NBTE curriculum. It is divided into broad headings on the conceptual frame work on which the teaching syllabus is organized; the concepts of Biology, Flowering plants and Non-Flowering Plants, Invertebrates and Vertebrates, Basic Concepts of Ecology, Genetics and Evolution. An attempt has been made in this syllabus to make it relevant for candidates offering Biology either as a core science subject or as a trade related course.

### AIMS

**The aims of the syllabus are to:**

- a. Ensure that candidates acquire meaningful and relevant knowledge in Biology;
- b. Develop reasonable and functional scientific attitudes in the candidates;
- c. Develop adequate laboratory and field skills such as observation, precision, classification and interpretation of biological data;
- d. Prepare candidates for professional training in biological sciences;
- e. Create an awareness in the candidates of the application of science principles in everyday

life on matters that affect personal, environmental, community health and socio-economic spheres of life.

### EXAMINATION SCHEME

There will be two papers. Paper 1 (Objective and Essay) and Paper 2 (Practical), both of which must be taken with a total of 200 marks.

06-1 Paper 1 (Objective and Essay)

This paper consists of two sections: A and B.

**Section A** consists of fifty (50) multiple-choice objective questions, for a duration of 50 minutes and it carries 50 marks.

**Section B** consists of six (6) essay questions drawn from the four sections of the syllabus. Candidates will be expected to answer four questions in 1 1/2 hours and the total score is 50 marks.

06-2 Paper 2 (Test of Practical)

This paper will consist of two sections A and B. The total duration is 2 hours.

**Section A:** This section comprises 15 short structured questions based on Biological Principles and Practicals. Candidates are to spend 30 minutes and it carries 30 marks.

**Section B:** This section consists of 4 practical questions. Candidates are expected to spend 1 1/2 hours and it carries 70 marks.

Note: Test of Practical paper will be conducted as an alternative paper to real practical for private candidates during the November/December series. It will consist of two sections: A and B and will last for 2 hours for a total of 100 marks.

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S/N	Topic/Objectives	Contents	Activities/Remarks
1.	<p><b>Concept of Biology</b></p> <p>1.1 Explain Biology as a science.</p>	<p>1. Define science 2. Biology as a branch of science. 3. Importance of Biology to man. 4. Procedures in scientific methods. 5. The contributions of Robert Hooke, Theodore Schwann, Mathias Scheiden, Carl Linnaeus and Gregor Mendel to the growth of Biology.</p>	<p>The teacher should use charts, pictures and possibly films to demonstrate scientific procedures. Pictures to show scientists and possibly films to demonstrate scientific procedures.</p>
2.	<p><b>The Scope of Biology</b></p> <p>1.1 Explain the scope of Biology</p> <p>1.2 Explain the inter-relationship of various branches of Biology.</p>	<p>1. Scope of Biology: • Botany</p> <ul style="list-style-type: none"> <li>• Zoology</li> <li>• Genetics</li> <li>• Ecology</li> <li>• Evolution</li> <li>• Microbiology •</li> </ul> <p>2. The inter-relationship of various branches of Biology.</p>	<p>Take students out on field trips to observe plants and animals in their natural habitat. Lead students to detect relationship and inter-dependence among them.</p>
3.	<p><b>General Characteristics of living and non-living things.</b></p> <p>3.1 Explain the general</p>	<p>1. General characteristics of living, non-living things and dead things. 2. Examples of living, non living and</p>	<p>Classify things in the classroom, school compound and school garden into living, non- living and dead things.</p>

	concept of living and non-living things.	<p>dead things.</p> <p>3. External features and life history of</p> <p>representatives of major groups of plants and animals (Schizophyta) e.g. Bacillus bacterium protozoa e.g. Amoeba</p>	Properties that qualify virus as living and non-living things should be emphasized.
4.	<p><b>Plants and Animals</b></p> <p>1.1 Explain the differences between plants and animals.</p>	<p>1. Characteristics of a named plant and a named animal.</p> <p>2. Distinctions between a named plant and a named animal.</p> <p>3. Euglena as plant and animal.</p>	<p>* Use simple microscope to observe the structure of Euglena.</p> <p>* The teacher should use chart to illustrate the main features of Euglena. * The teacher</p>

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		should tell the students to observe a named plant and a named animal in the school compound.
5.	<p><b>Diversity Among Living Things.</b></p> <p>Classify plants and animals</p>	<p>1. The principle of classification of both plants and animals into classes and phyla.</p> <p>2. Characteristics/features of each phylum or divisions of plants and animals.</p> <p>3. External features and life history of an animal and a plant from phylum e.g. vertebrate and angiospermae.</p> <p>* Identify different classes of plants e.g. unicellular, non-vascular and vascular and vascular plants and non-flowering plants.</p> <p>* Identify the two main classes of animals e.g. vertebrate and invertebrate animals.</p> <p>* Collect plant and animal specimens from the immediate environment and name them. Classify them.</p>

<p><b>Microscope</b></p> <p>6. 1.1 Identify the parts of a microscope. State its functions and maintenance.</p>	<p>1. Parts of a microscope 2. Functions of each part of the microscope. 3. Maintenance of microscope.</p>	<p>* Students should draw and label a compound microscope.</p> <p>* Prepare wet/temporary mounts. Observe under low power magnification.</p>
<p><b>Cells as Basic Units of Living Things.</b></p> <p>7. 1.1 Outline the differences between plants and animals cells.</p>	<p>1. Plant and animal cells. 2. Distinctions between plant and animal cells. 3. Cell organelles., 4. Components of cells and their functions. 5. Single and free-living organisms e.g. Amoeba, Paramecium, <b>Euglena</b> viridis and chlamydomonas 6. Colonial organisms e.g. <b>volvox</b></p>	<p>* Examine plant and animal cells under microscope. Draw and label the cells as observed.</p> <p>* The teacher should emphasise the cytoplasmic connections that exist in colonial forms.</p>

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	<p>Eudorina.</p> <p>7. Filament e.g. Spirogyra, <b>Oscillatory.</b></p> <p>8. Distinction among single and free- living organisms, colony and filament.</p> <p>9. Differentiate between the groups of cells that form tissues and those that form colonies or filaments.</p>	
<p><b>Cell Organisation</b></p> <p>8. Explain levels of organization and complexity of</p>	<p>1. Single-celled organisms e.g. Amoeba, Euglena, Paramecium, chlamydomonas. 2. Tissue e.g Hydra, Obelia, Sea Anemones.</p>	<p>* These examples from the content should be used to illustrate differentiation and specialization in organism.</p>

organization in higher organisms.	<ol style="list-style-type: none"> <li>3. Organ (storage organ) e.g. bulb (onion) rhizomes and heart as pumping organ.</li> <li>4. System in mammals and flowering plants – e.g. reproductive system, excretory systems, etc.</li> <li>5. Complexity of organization in higher organisms advantages and disadvantages.</li> </ol>	Emphasize transport system in complex organisms.
<p><b>9. Cell and its Environment. (Physical and Biophysical Processes in Cell).</b></p> <p>9.1 Explain the physical and biophysical processes in cell.</p>	<ol style="list-style-type: none"> <li>1. Define <ul style="list-style-type: none"> <li>• diffusion</li> <li>• osmosis</li> <li>• turgidity</li> <li>• plasmolysis</li> </ul> </li> <li>2. Sites of occurrence of diffusion, osmosis, turgidity and plasmolysis and the conditions for occurrence</li> <li>3. Distinction between Osmosis and plasmolysis using specific examples.</li> <li>4. The importance of diffusion and osmosis to life.</li> </ol>	<p>* Use simple experiments to demonstrate diffusion, osmosis, turgidity and plasmolysis.</p> <p>* The teacher should explain the mechanism by which these processes occur.</p> <p>* Also state the significance of diffusion, osmosis, turgidity and plasmolysis and perform simple experiment to show how diffusion, osmosis turgidity and plasmolysis take place.</p> <p>* Explain the roles</p>

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			of diffusion and osmosis to life. * Explain the importance of membrane in living cells.
	<p><b>10. Properties and Functions of the Living Cell</b></p> <p>1. 1.1 Explain Nutrition in living cell.</p>	<ol style="list-style-type: none"> <li>1. Autotrophic (Photosynthesis)</li> <li>2. Heterotrophic (holozoic)</li> </ol> saprophytic, symbiotic parasitic saprozoic and other special methods of nutrition.	* Experiment to show factors affecting photosynthesis * Experiment to show mineral deficiency in plant especially, phosphorus, nitrogen and potassium should be carried out.

	<p>2. 1.2 Explain cellular respiration.</p> <p>3. 1.3 Explain excretion in living cells.</p> <p>4. 1.4 Explain growth in living cells.</p> <p>1.5 Explain reproduction in living cell.</p>	<p>3. Mineral nutrition. Macro and Micro nutrients.</p> <p>i. Definition and processes of</p> <ul style="list-style-type: none"> <li>• aerobic respiration.</li> <li>• Anaerobic respiration and energy release.</li> </ul> <p>1. Excretion in single-celled aquatic organism.</p> <p>2. Waste product of metabolism in plants and animals.</p> <p>1. Basis of growth; cell division (mitosis) enlargement and differentiation.</p> <p>2. Aspects of growth</p> <p>3. Regions of fastest growth in plants. 4. Influence of growth hormones (auxins) 5. Tropisms</p> <p>1. Definition of reproduction 2. Types of reproduction</p> <ul style="list-style-type: none"> <li>• Asexual and</li> <li>• Sexual</li> </ul> <p>3. Asexual reproduction</p> <ul style="list-style-type: none"> <li>• Fission</li> <li>• Budding and spore formation</li> <li>• Vegetative propagation.</li> </ul> <p>4. Sexual reproduction • Conjugation</p> <ul style="list-style-type: none"> <li>• Formation of male and female</li> </ul>	<p>* Simplified processes involved in glycolysis and krebs cycle and reference to the role of ATP should be made.</p> <p>* Structures for excretion in different organisms should be mentioned.</p> <p>* Excretory products in different organisms should be mentioned.</p> <p>* Mention increase in dry weight, irreversible increase in size and length and increase in the number of cells.</p> <p>* Observation of root tip and shoot tip is required.</p> <p>* Regulation of growth by hormones should be</p>
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		gametes (Meiosis)	
		<ul style="list-style-type: none"> <li>Fusion of gametes (fertilization)</li> </ul>	

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<p>mentioned.</p> <p>* Types of tropisms should be demonstrated. Microscopic examination of the different regions of growth and development, region of cell division, elongation, differentiation and maturation.</p> <p>* prepare slides of a. Fission in paramecium b. budding in yeast and hydra These should be observed and drawn c. Conjugation d. Vegetative propagation should be demonstrated using citrus plants</p>
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### FLOWERING PLANTS

S/N	Topic/Objectives	Contents	Activities/Remarks
11.	<p><b>Flowering plants</b></p> <p>1. 1.1 Explain the external and internal features of dicotyledonous and monocotyledonous plants.</p> <p>2. 1.2 Explain reproduction in plants.</p>	<ol style="list-style-type: none"> <li>External features of a named dicotyledonous flowering plant</li> <li>External features of a named monocotyledonous plant.</li> <li>Function of the different parts of the flowering plant.</li> <li>Internal structure of the root stem and leaf of both monocotyledonous</li> </ol>	<p>* Draw a labeled diagram of a named dicotyledonous and monocotyledonous plant.</p> <p>* Emphasis should be placed on functions of roots, stems and leaves in relation to their internal structural arrangement.</p> <p>* Draw internal structures of different parts of monocotyledonous and a dicotyledonous leaf, stem and root.</p> <p>* Draw and label the parts of flowers e.g. Hibiscus,</p>

		<p>and dicotyledonous plants.</p> <ol style="list-style-type: none"> <li>1. Reproduction in plants.</li> <li>2. Distinction between sexual and asexual reproduction.</li> <li>3. Methods of asexual reproduction in plants e.g. budding, grafting, layering, stem cutting and use of suckers.</li> <li>4. Types of storage organs in plants e.g. rhizomes, bulbs, tuber roots, corns and leaves.</li> <li>5. Parts of flowers.</li> <li>6. The structure and function of the male and female parts of the flower.</li> <li>7. Types of pollination.</li> <li>8. Features of cross-pollinated and self-pollinated flowers.</li> <li>9. Agents of pollination and their adaptive features.</li> <li>10. Fertilization in flowering plants.</li> </ol>	<p>Allamanda, crotalaria/caesacpinia. * Carry out experiments to illustrate asexual method of reproduction in plants.</p> <p>*Draw and label a longitudinal section of a flower.</p>
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		11. Distinction between seed and fruit.	
		12. Classification of fruits	

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<p>1.3 Explain transpiration and mineral requirements in plants.</p> <p>1.4 Explain the importance of photosynthesis and respiration in plants.</p>	<p>and seeds.</p> <p>13. Agents of dispersal of fruits and seeds.</p> <p>14. Germination.</p> <p>*Conditions necessary for germination e.g. adequate moisture, oxygen and suitable temperature.</p> <p>*Types of germination in plants (hypogeal and epigeal).</p> <p>1. Definition of transpiration 2. Mechanism of transpiration.</p> <p>3. Sites in which transpiration takes place in plants (lenticel &amp; stomata).</p> <p>4. Transpiration pull in plants. 5. Factors affecting transpiration. 6. Importance of transpiration to plants. 7. Importance of mineral elements to plants.</p>	<p>*Draw and label whole and a section of drupe, berry, caryopsis, bean seed or groundnut seed, castor oil seed or jatrophia seed.</p> <p>* Carry out experiments to show that water, temperature and oxygen are necessary for germination. Stages of hypogeal and epigeal germination should be observed and drawn.</p> <p>*The students are to observe and draw stomata and guard cells under the microscope.</p> <p>* Display poster of a stomata and its associated guard cells.</p> <p>* Experiments to illustrate transpiration.</p> <p>* Culture experiments to demonstrate the importance of mineral elements to plants.</p> <p>*Carry out simple experiments to illustrate the conditions necessary for photosynthesis e.g. light, oxygen, carbon dioxide, chlorophyll.</p>
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	<ol style="list-style-type: none"> <li>1. Definition of photosynthesis.</li> <li>2. Identification of parts of plants where photosynthesis takes place e.g. leaf, stem.</li> <li>3. Process of photosynthesis.</li> <li>4. Conditions necessary for photosynthesis.</li> <li>5. Importance of photosynthesis (Macro and Micro trace/elements. Effect of mineral deficiency, Nitrogen, carbon, oxygen, and</li> </ol>	
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1.5 Explain tropism in plants.	<p>water cycles (Nutrient cycling).</p> <ol style="list-style-type: none"> <li>6. Definition of respiration.</li> <li>7. Identification of the parts of plants where gaseous exchange takes place.</li> <li>8. Respiration in all living cells (Glycolysis and Krebs' cycle.</li> <li>9. Distinction between</li> </ol>	<p>*Test for starch in green leaf</p> <p>*Water culture effects of experiment. The forms in which minerals are taken up by plants should be noted. Importance of each element to living organism should be emphasized.</p> <p>*Simple experiments to show that a. oxygen is used up. b. carbon dioxide and heat are produced during respiration.</p> <p>* Simple experiments to show that phototropism, geotropism and chemotropism take place in plants.</p>
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	<p>respiration and photosynthesis (catabolism and anabolism).</p> <p>10. Differences between respiration, combustion and fermentation.</p> <p>1. Definition of tropism in plants.</p> <p>2. Forms of tropism in plants.</p> <p>3. Mechanism of tropisms.</p> <p>4. Role of auxins in plants</p> <p>tropisms.</p> <p>5. Role of cytokinins, gibberellin in flowering, fruit ripening and leaf fall.</p> <p>6. Other types of movement in plants e.g. nastic movement and tactic movement.</p>	
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	<p><b>Soil Science</b></p> <p>1.1 Explain the constituents, structure and characteristics of soil.</p> <p>1.2 Explain the various methods of soil and water conservation and improvement</p>	<p>1. Constituents of soil and their importance.</p> <p>2. Types of soil</p> <p>3. Characteristics of each soil type (physical, chemical and biological).</p> <p>4. Processes of soil formation.</p> <p>5. Soil structure and its</p>	<p>* Carry out simple experiments to determine soil profile by both sedimentation and digging methods.</p> <p>*Carry out simple experiments to relate soil structure to water retention capacity. Determine experimentally the amount of air, water and humus in soil samples. Demonstrate with simple experiments the capillarity and porosity of different soil types.</p> <p>* Water carbon and nitrogen cycles should be treated.</p>
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		<p>water retention capacity.</p> <p>6. Capilarity and porosity of soil samples of different types of soil.</p> <p>1. Concept of soil erosion. 2. Various forms of soil erosion e.g. rill, sheet, gully and splash or rain drop.</p> <p>3. Other forms by which soil can loose its fertility e.g. leaching, surface compacting.</p> <p>4. Prevention of soil erosion. 5. Various forms of cultivation e.g. crop rotation, mono-cropping, mixed cropping, etc.</p> <p>6. Economic importance of various forms of cultivation. 7. Roles of micro organisms in maintaining soil fertility. 8. Importance of water conservation (afforestation and wild life conservation).</p>	
<p><b>13.</b></p>	<p><b>Invertebrates (External Features).</b> Explain the</p>	<p>1. General characteristic features of invertebrate animals. 2. Classification of</p>	<p>* The teacher should lead the students to collect identify and classify members of</p>

external features and characteristics of		
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	invertebrate animals.	<p>invertebrate to their phylum e.g. amoeba, paramecium, hydra, tapeworm etc.</p> <ol style="list-style-type: none"> <li>Worms.</li> <li>Life history of invertebrate e.g. Amoeba etc.</li> <li>Economic importance of invertebrate.</li> </ol>	<p>Antropoda, Mollusca, Annelida, Nematoda and Plathyhelminthes. * Darw the external features of invertebrates e.g. earthworm, spider, millipede, centipede, cockroach, roundworm, tapeworm.</p>
<b>14.</b>	<p><b>Vertebrata</b></p> <p>14.1 Explain the external features and characteristics of vertebrate animals.</p>	<ol style="list-style-type: none"> <li>General characteristic features of vertebrate animals.</li> <li>Specific characteristic features of vertebrates pisces (fishes), amphibians reptilia, aves and mammals.</li> <li>Classification of vertebrates.</li> <li>External features, life history and adaptation to environment of each of the vertebrate groups.</li> </ol>	<p>* Observe live fish, toad, lizard, bird and rate.</p> <p>* Draw and lable the examples named above to show external features.</p> <p>* Write similarities of one group with another.</p> <p>* Discuss differences between one group and another.</p>
<b>15.</b>	<p><b>Supporting Systems in Animals</b></p> <p>15.1 Explain the different types of skeletons and supporting systems in animals.</p>	<ol style="list-style-type: none"> <li>Biological significance of skeleton and supporting system of animals (protection, support locomotion/movement and respiratory movement).</li> <li>Skeletal material e.g. chitin cartilage and bones.</li> <li>Distinction between types of skeleton.</li> </ol>	<p>* The teacher should use the assembled complete skeleton of man, rat or rabbit to demonstrate supporting system in animals.</p> <p>* Draw and label the different bones of the skeleton of man.</p>
<b>16.</b>		<ol style="list-style-type: none"> <li>General plan of the mammalian skeleton.</li> </ol>	<p>* Draw and label the specified bones of axial and appendicular skeleton.</p>

<p><b>Bones of the Skeleton</b></p> <p>15.1 Explain the different types of bones that make up the mammalian skeleton.</p>	<p>2. Components of the axial and appendicular skeleton.</p>	
<p><b>Types of Joints in Animals</b></p> <p>Describe the types of joints in mammals, their locations</p>	<p>1. Types of joints in mammals e.g. movable and immovable joints,</p>	<p>* Demonstrate the mechanism whereby the bending and</p>

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<p>and functions.</p>	<p>ball and socket joints etc.</p> <p>2. Location and functions of each joint.</p> <p>3. Role of muscles in movement.</p> <p>4. The function of articular cartilage.</p>	<p>straightening movements of the arm is brought about in man.</p> <p>* Draw a large and well labeled diagram of ball and socket joint.</p>
<p><b>Animal Nutrition</b></p> <p>18.1 Identify the mode of feeding in animals and explain the digestive system in man.</p>	<p>1. Types of heterotrophic nutrition in animals (holozoic, parasitic symbiotic, saprophytic).</p> <p>2. Classes and sources of food substances in man.</p>	<p>* Examine the dentition of carnivores, herbivores and omnivores and relate the dentition to their diet.</p> <p>* Carry out simple experiments on food test.</p>

		<ol style="list-style-type: none"> <li>3. Importance of the classes of food in human diet.</li> <li>4. Importance of balanced diet to good health.</li> <li>5. The diseases of man associated with deficiencies of protein, vitamins and minerals.</li> <li>6. Symptoms associated with diseases mentioned above.</li> <li>7. Methods of curing the diseases.</li> <li>8. Digestive system in man.</li> <li>9. The mechanism involved  in, ingestion, digestion, absorption, assimilation and egestion.</li> <li>10. Functions of liver and pancreas.</li> <li>11. Distinction between autotrophic modes of nutrition.</li> </ol>	<p>* Identify proteins, carbohydrates and fats.</p> <p>Draw and label a large diagram of digestive system of man and use it to explain the different organs that take part in digestion.</p> <p>Carry out simple experiments on the action of ptyalin, rennin and pepsin.</p>
19.	<p><b>Mammalian Dentition</b></p> <p>18.1 Explain the structure of mammalian teeth, types, functions and diseases.</p>	<ol style="list-style-type: none"> <li>1. Structure of a mammalian tooth.</li> <li>2. Types of teeth and their functions.</li> <li>3. Mammalian dentition as related to the types of food they feed on.</li> <li>4. Dental care.</li> </ol>	<p>* teachers should instruct students to count their teeth, observe their shapes with the aid of mirror. * Examine the jaw of carnivores and omnivores dentition</p>

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	5. Dental diseases associated with food habits and their prevention.	and relate them to their mode of feeding. * Emphasize teeth care;
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			cleaning , good diet and visit to dentist etc.
20.	<p><b>Circulatory System in Mammals</b></p> <p>20.1 Explain circulatory system in mammals.</p> <p>20.2 Describe the mechanism of blood clotting and first-aid treatment.</p>	<ol style="list-style-type: none"> <li>1. Circulatory system in mammals.</li> <li>2. Heart structure and function</li> <li>3. Components of circulatory systems and their functions.</li> <li>4. Blood vessels structure and functions</li> <li>5. Processes of blood circulation in mammals.</li> <li>6. Types of circulatory systems.</li> <li>7. Components of blood.</li> <li>8. Functions of blood.</li> <li>9. Distinction among single, double, open and closed systems of circulation.</li> </ol> <ol style="list-style-type: none"> <li>1. Bleeding (external and internal).</li> <li>2. The mechanism of blood clotting.</li> <li>3. First-aid treatment of bleeding and snake bites.</li> </ol>	<p>* Draw and label the major components of circulatory system in mammals.</p> <p>Use a small mammal (Rat), dissected to demonstrate the circulatory system. Draw and label the vertical section of the mammalian heart.</p> <p>* Use chart of blood circulatory system of man to demonstrate systematic circulation and pulmonary circulation.</p> <p>* Demonstrate how cotton wool or bandage can be used to stop bleeding. Demonstrate how you can stop snake venom from being carried to the brain by the blood.</p>
21	<p><b>Respiration in Mammals.</b></p> <p>21.1 Explain the process of respiration and the respiratory organs in mammals</p>	<ol style="list-style-type: none"> <li>1. Definition of respiration.</li> <li>2. Types of respiration.</li> <li>3. Distinction between aerobic and anaerobic respiration.</li> <li>4. Respiratory organs in</li> </ol>	<p>*Draw and label the respiratory system of dissected small mammals.</p> <p>* Carry out experiments to show</p>



		<p>animals.</p> <ol style="list-style-type: none"> <li>5. Components of the respiratory system in mammals.</li> <li>6. Mechanisms of gaseous exchange in fish, toad, and mammals.</li> <li>7. Distinction between inhalation and exhalation.</li> <li>8. Role of oxygen in tissue respiration</li> <li>9. Kreb's cycle: Glycolysis in cytoplasm and kreb's cycle in mitochondrion.</li> <li>10. Compare respiration, combustion, fermentation and glycolysis.</li> </ol>	<p>gaseous exchange and heat production in respiration. (Biochemical details not required).</p>
22.	<p><b>Excretion in Mammals</b></p> <p>22.1 Explain the different excretory organs and excretory products of mammals.</p>	<ol style="list-style-type: none"> <li>1. Excretory organs of mammals and their products.</li> <li>2. Structure of the kidney.</li> <li>3. The processes of excretion as carried out by the kidney.</li> <li>4. Disease of the kidney</li> </ol>	<p>* Emphasis should be excretory organs and waste products, minerals, salt, heat, water from skin urea, uric acid, etc from the kidney and CO<sub>2</sub> heat and H<sub>2</sub>O from lung.</p> <p>* Draw and label the cross-section of the kidney.</p> <p>* Mention the waste products.</p>

		(causes, symptoms & precautions/control).  5. Mammalian skin. 6. Process of excretion by the skin.	* Draw and label a cross-section of the mammalian skin. * Draw and label the nephron.
<b>23.</b>	<b>Coordination In Mammals</b>  23.1 Explain the component of the central and peripheral nervous system in mammals.	1. The component of the central and peripheral nervous system. 2. External structure of the brain and spinal cord and their functions. 3. Structure and functions of somatic and automatic nervous systems. 4. Structure and functions of the neurons.	Draw and label a large diagram of a named mammalian brain (man)

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		5. Classification of the neurons. 6. The transmission of nerve impulses by a change in electrical potential. 7. Distinction between reflex and voluntary actions. 8. Paths of reflex arc. 9. Principal sense organs (eye, ear, nose, skin, etc) and their locations.  10. The structure of the eye, ear and skin.  11. Eye defects and their methods of correction.  12. The functions and the	*Draw and label reflex arc. Candidates should perform experiments to illustrate reflex actions such as blinking of the eyes, knee jerk, etc.  *Longitudinal section of the mammalian eye and ear should be drawn and discussed. Charts of the eye and ear of man should be used.
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		<p>effects of over and under-secretion of hormones, e.g. thyroxin, insulin, adrenalin, and sex hormone.</p> <p>13. Maintenance of constant body temperature in mammals.</p>	
24.	<p><b>Basic Concepts of Genetics</b></p> <p>24.1 Explain the basic terms used in genetics, the Mendelian laws of inheritance and the applications of genetics.</p>	<ol style="list-style-type: none"> <li>1. Terminologies used in genetics e.g. gene, chromozones, dominance, recessive, hybrid, genotype, phenotype, filial, generation, back- cross, complete &amp; incomplete dominance, allele or allelomorphic pairs, etc.</li> <li>2. Mendelian laws of inheritance.</li> <li>3. Simple monohybrid crosses by the use of punnet square.</li> <li>4. Genetic studies as applied to agriculture and health.</li> <li>5. The principle of back- crossing e.g. red and white flowers where red</li> </ol>	<p>* Illustrate diagrammatically, types of crosses. Carry out the following: dihybrid cross, Rryy – round yellow, X-wrinkled green rryy.</p> <p>* <b>Note</b> Round is dominant over wrinkled while yellow is dominant over green.</p>

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		<p>is dominant over white.</p> <ol style="list-style-type: none"> <li>6. Sex determination in mammals.</li> <li>7. Distinction between monohybrid and dihybrid cross.</li> <li>8. Methods of carrying out grafting in a named plant.</li> </ol>	<p>* Carry out random assortment of genes using assorted seeds.</p> <p>* Characteristics of peas and drosophyllia melanogaster should be emphasized.</p> <p>* Examples and explanations are required.</p>
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		<p>9. Types of local plant</p> <p>which can be propagated by grafting e.g. oranges, mangoes, rubber, etc.</p> <p>10. Applications of genetics to health e.g. sickle cell anaemia, blood grouping, haemophilia etc.</p>	
<p>25.</p>	<p><b>Basic Ecological Concepts</b></p> <p>25.1 Explain the ecosystem, ecological factors and its measurement.</p>	<p>1. Components of ecosystem and sizes.</p> <ul style="list-style-type: none"> <li>• Ecological components, biosphere, habitat, population, biotic community, ecosystem.</li> <li>• Biotic and abiotic as a component of the ecosystem.</li> </ul> <p>2. Ecological factors in aquatic and terrestrial ecosystem * Ecological succession</p> <p>3. Simple measurement of ecological factors.</p> <ul style="list-style-type: none"> <li>• Physical factors: climate, topography.</li> <li>• Edaphic factors: chemical and physical composition, moisture content and soil texture.</li> </ul> <p>1. Definition of marine habitat.</p> <p>2. Characteristics of Marine habitat.</p> <p>3. Major ecological zone of</p>	<p>* The concept of ecological factors common to all habitats should be mentioned. Candidates should be able to mention some of the ecological factors including humidity, temperature, wind speed, rainfall and light intensity.</p> <p>* Simple measurement of ecological factors should be carried out</p> <p>* Testing of soil pH using litmus paper.</p> <p>Soil profile – sedimentation method.</p>

<p>2. 25.2 Explain marine habitat.</p> <p>3. 25.3 Explain food webs and trophic levels.</p> <p>25.4 Explain energy transformation in nature and ecological management.</p>	<p>Marine habitat and their characteristics.</p> <p>1. Autotrophs and heterotrophs.</p> <ul style="list-style-type: none"> <li>• Producers – autotrophs</li> <li>• Consumers – heterotrophs.</li> <li>• Decomposers</li> </ul> <p>2. Trophic levels:</p> <ul style="list-style-type: none"> <li>• Energy relationships: food chain and food web.</li> <li>• Pyramid of number</li> <li>• Pyramid of energy.</li> </ul> <p>Ecological succession A. Primary succession</p> <ol style="list-style-type: none"> <li>1. Succession in lakes, ponds estuaries.</li> <li>2. Problems of survival.</li> </ol> <p>B. Secondary Succession</p> <p>3. Energy flow:</p> <ul style="list-style-type: none"> <li>• Food/energy relationship in aquatic and terrestrial habitat. • Pyramid of energy and pyramid of numbers.</li> <li>• Distinction between pyramid of numbers and pyramid of energy.</li> </ul> <p>1. Energy loss in ecosystem.</p> <ul style="list-style-type: none"> <li>• Solar radiation: Its</li> </ul>	<p>Visit sea shore.</p> <p>Candidates should be able to classify organisms as producers, consumers and decomposers in aquatic and terrestrial habitat.</p> <p>Illustrate food relationship in food chain and food web using specific examples.</p> <p>Drawing pyramid of number and of energy.</p> <p>Candidates should study succession of an abandoned farmland, lawn pond or moistened bread in</p>
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	<p>intake and loss at earth's surface. • Biosphere.</p> <p>2. Decomposition in nature. • Decomposers (micro and macro decomposers).</p>	
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<ul style="list-style-type: none"> <li>• Gaseous products.</li> <li>• Role of decomposers.</li> </ul> <p>3. Associations.</p> <ul style="list-style-type: none"> <li>• Types of associations e.g. parasitism, symbiosis, saprophytism.</li> </ul> <p>4. Adaptation of organisms.</p> <p>5. Pollution of the atmosphere.</p> <ul style="list-style-type: none"> <li>• Nature, names, sources and effects of pollutants.</li> <li>• Effect of noise as a pollutant.</li> </ul> <p>6. Water and soil pollution</p> <ul style="list-style-type: none"> <li>• Types and composition</li> <li>• Effects of the pollutant</li> </ul> <p>7. Control measures for the various forms of pollution with emphasis on regulatory bodies e.g. FEPA, United States Environmental Protection Agency, UNICEF, UNDP, WHO etc.</p> <p>1. Structure of bacteria and virus.</p> <p>2. Distinction between bacteria and viral cells.</p>	<p>the laboratory over a period of time.</p> <p>Colonizers should be identified by their scientific names.</p> <p>Adaptive behaviour such as territorialism and dispersal mechanisms to avoid overcrowding should be noted.</p> <p>Non-cyclic nature of energy transfer should be mentioned.</p> <p>The students should be able to construct and explain pyramid of numbers and of energy.</p> <p>Energy as a limiting factor in primary production i.e. autotrophs production should be taught.</p> <p>The students should observe demonstrations to</p>
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3. Mode of transmission, symptoms control and causative organisms of cholera, tuberculosis, leprosy, bacillary – dysentery, typhoid fever,	
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25.5 Explain the various diseases of man and their causative agents.	<p>gonorrhoea, syphilis, poliomeelities, small pox and AIDS.</p> <p>4. Vaccination and inoculation in disease control and prevention.</p> <p>5. Sources of food poisoning and food contamination.</p> <p>6. Ways of preventing food poisoning.</p> <p>7. Food preservation.</p> <p>8. Methods of investigation of food poisoning and food contamination.</p> <p>9. Symptoms of various types of food contamination and food poisoning..</p> <p>A. Classification of plants 1. Botanical classification 2. Agricultural classification 3. on the basis of life cycles.</p>	<p>show that carbon dioxide, hydrogen sulphide, heat energy are released during decomposition.</p> <p>Explain briefly, the first and second laws of thermodynamics.</p> <p>Adaptation of plants and animals to environmental conditions with particular reference to differences in habitat, should be discussed. Teacher should take students out to appreciate the effect of environmental pollution – smoke, dust, cellophare,</p> <p>Discuss the harmful effects of noise pollution from generators and sound gadgets.</p> <p>Draw and label the structure of a virus and a bacterium.</p> <p>A visit to any hospital to observe how vaccination and inoculation are performed is required.</p> <p>Lead students to identify food contamination and posons.</p>
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	<p>B. Effects of Agricultural activities on ecological systems.</p> <p>C. Pests and Diseases of Agricultural importance.</p> <p>1. Plants 2. Animals.</p> <p>Variation in population 1. Morphological e.g. (size, height, weight etc).</p>	
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25.6 Relevance of Biology to Agriculture.	<p>Colour, skin, eye, hair coat of animals.</p> <p>2. Physical e.g. behaviour, ability to roll the tongue, ability to taste phenyl thio carbanide PTC, Blood groups.</p> <p>3. Application of variations in crime detection blood transfusion and determination of paternity.</p>	<p>Emphasize disease controlled and eradication by immunization and vaccination.</p> <p>Common plants and crops should be classified.</p> <p>Candidates should be able to explain how these activities of man affect natural ecosystems.</p> <p>Candidates should be able to identify and describe the life cycle of some common pest of crops and livestock noting their economic importance and method of control.</p>
25.7 Variations and variability.	<p>i. Adaptation of survival A. Competition including intra and inter species competition</p> <p>B. Relationship between competition and succession.</p> <p>ii. Structural Adaptation to:</p>	<p>The effect of diseases on crops and livestock, the causative organism as well as control measures should be noted.</p> <p>Candidates should be able to plot histograms and interpret data based on distribution of these finger prints traits in a population.</p>



	<p>A. obtain food  B. Protectanddefend. C.  Securemates.  D. Regulatebody  temperature  E. Conserve water.</p>	
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<p>25.8  Evolution</p>	<p>Candidates should study the relationship of a mixed population of organisms to space sources of food and other materials, which are necessary for life.</p> <p>Candidates should observe examples of organisms that show structural adaptation for obtaining food (e.g. legs and beaks of different birds, mouth parts of insects especially mosquitoes, butterfly escape enemies; secure mates) regulates body temperature and conserve water.</p>
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