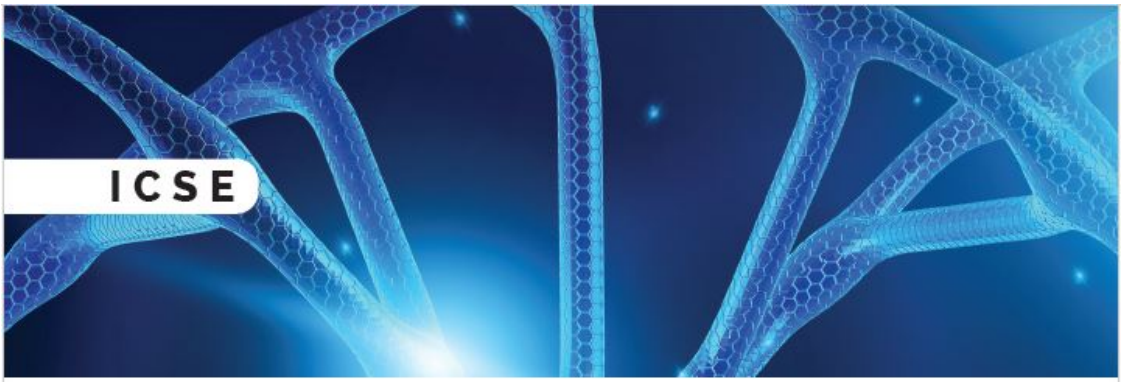

Prodigy BIOLOGY

Based on the latest CISCE Curriculum

SALIENT FEATURES

- NEP 2020 Theme Based Content
- Multi-Disciplinary Based Questions
- Image Based Questions
- Experiential Learning Based Questions
- Application Based Questions
- Practical Skills Based Questions

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PRODIGY BIOLOGY-7

ANSWER KEY

Chapter 1

MCQs

1. Which of the following defines a tissue correctly?

Ans. (c) A tissue is made of one type of cells.

2. Which of the following is not a meristematic tissue?

Ans. (b) Optimal meristem

3. In potatoes, starch is stored in–

Ans. (a) Parenchyma tissue

4. Permanent tissue in plants is made of–

Ans. (c) Cells that do not divide

5. Vascular bundle in plants consists of–

Ans. (b) Xylem and phloem

6. Jute fibers are made of-

Ans. (c) Sclerenchyma

7. Cyton and axon can be found in–

Ans. (d) Nerve cells

8. Which of the following is not a function of adipose tissue?

Ans. (c) They store minerals and proteins in the body

9. A connective tissue with liquid matrix is–

Ans. (b) Blood

10. A tissue that joins two bones in a joint is–

Ans. (c) Ligament

Fill in the blanks:

1. Phloem is responsible for transportation of ____ **sugars** _____

2. A conducting tissue in plants is _____ **xylem** _____

3. A tissue that carries gases and nutrients _____ **blood** _____

4. A tissue that transports food in plants __ **phloem** ___

5. A tissue that conducts messages in animals __ **nervous tissue** _____

6. The fluid matrix of blood __ **plasma** ____

7. Cuboidal epithelial cells are found in ___ **glands** __

8. Lymph is a ___ **straw** __ coloured liquid.

9. Striated muscles have ____ **multiple** _____ nucleus.

10. The thin elongated part of a nerve cell is called ___ **axon** _____

Match the following:

a. Cells of meristematic tissue - v. Thin walled, dense protoplasm, large nucleus

b. Cells of dermal tissue - vi. Cells are loosely spaced and embedded in a matrix. Matrix depends on the role the tissue in the body

c. Cells of parenchyma - vii. Cells are oval or round with thin cell wall. Cells are living have large vacuoles and a conspicuous nucleus. There are abundant inter-cellular spaces.

d. Cells of collenchyma - i. Cells are oval or elongated. They have no intercellular spaces. The cell wall are thick, made of cellulose and pectin.

e. Cells of sclerenchyma - vi. Made of long, narrow dead cells. These are thick walled and closely packed with no intercellular spaces. They are hard and rigid.

Match the following:

a. Cells of epithelial tissue - iv. Cells are made of closely packed cells without intercellular spaces forming a continuous layer.

b. Cells of connective tissue - (vi) Cells are loosely spaced and embedded in a matrix. Matrix depends on the role the tissue in the body

c. Cells of bone – ii. Cells are located in the lacunae. The lacunae are connected by minute canals called canaliculi

d. Cells of areolar tissue – v. Cells are scattered, separated by collagen and elastic fibres. It makes a loose connective tissue

e. Cells in unstriated muscles - vii. Cells have long pointed ends and are uni-nucleate. They have no striations.

Select the odd one from the following groups

1. Parenchyma, collenchyma, xylem, sclerenchyma.

Ans. Xylem

2. Cuboidal cells, columnar cells, leucocytes, ciliated cells.

Ans. Leukocytes

3. Skeletal, areolar, smooth, cardiac.

Ans. Areolar

4. Axon, dendrite, striation, cyton

Ans. Striation

5. Lacunae, canaliculi, bone cells, neurons.

Ans. Neurons

State True or False and correct the false statements

1. In meristematic tissue the cells are living. **True**

2. Xylem is is a permanent tissue. **False**

3. Permanent tissues do not divide. **False**

4. Lateral meristem are responsible for increase in girth of plants. **True**

5. Sclerenchyma is found in seed coat. **True**

6. Phloem has componets made of living cells. **False**

7. Ciliated epithelium are foud in nasal cavity lungs etc. **False**

8. Ligaments join bone to bone. **False**

9. Areolar tissues can be found beneath the skin. **True**

10. Matrix in cartilage is made of widely spaced cells. **False**

Short answer type questions.

1. What is a tissue?

Ans. A tissue is a group of cells that have a similar structure and act together to perform a specific function.

2. Where do we find meristematic tissue?

Ans. Meristematic tissue is found in the growing parts of plants, like the tips of roots and stems.

3. Name a fluid connective tissue and its one function.

Ans. Blood is a fluid connective tissue; one of its functions is to transport oxygen and nutrients to body cells and remove waste products.

4. What is the usefulness of xylem tissue?

Ans. The usefulness of xylem tissue is to transport water and minerals from the roots to the rest of the plant.

5. What is aerenchyma?

Ans. Aerenchyma is a type of plant tissue with large air spaces that allows the exchange of gases and helps aquatic plants to float.

6. What is the function of columnar epithelial cells in the intestine?

Ans. The function of columnar epithelial cells in the intestine is to absorb nutrients from digested food.

7. Explain the movement of materials in phloem tissue.

Ans. In phloem tissue, materials like sugars are moved from where they are made (in the leaves) to other parts of the plant where they are needed or stored.

8. Enumerate two functions of adipose tissue.

Ans. Two functions of adipose tissue are to store energy in the form of fat and to insulate the body from cold.

9. What is an important feature of cardiac muscles?

Ans. An important feature of cardiac muscles is that they can contract rhythmically and continuously without getting tired.

10. What kind of tissue is cartilage?

Ans. Cartilage is a type of connective tissue that is more flexible than bone and provides support, cushioning, and reduces friction between bones.

Long answer type questions

1. What are the important characteristics of meristematic tissue?

Ans. Meristematic tissues are made of actively dividing cells. These cells help in the growth of the plant both in terms of length and girth.

Important Characteristics of the meristematic tissue:

(i) The cells are living, small and closely packed.

(ii) The shape of the cells range from spherical to polygonal.

(iii) The cells have thin wall, dense protoplasm and a large central nucleus.

(iv) The vacuoles are few, small or absent.

(v) They show high metabolic activity however, they do not store nutrients.

2. What are the main characteristics of permanent tissues in plants?

Ans. Large part of the body of plants is made of permanent tissue.

Characteristics of the permanent tissue /cells:

(i) A permanent tissue is a tissue, in which growth has either stopped temporarily or permanently.

(ii) They acquire a definite shape, size and form.

(iii) These tissues/cells may be dead or living.

(iv) They may be thin walled or thick walled. The nucleus when present is placed at the periphery.

3. How is permanent tissue different from meristematic tissue?

Ans.

Meristematic Tissue	Permanent Tissue
1. Group of actively dividing cells They give rise to new cells.	1. Cells do not have the ability to divide. They acquire a definite shape and size.
2. Cells are compact, living, thin walled with dense cytoplasm and a prominent nucleus.	2. Cells may be living or dead, thin or thick walled. They may have a coat of lignin or pectin.
3. These are classified into apical meristem, lateral meristem and intercalary meristem.	3. These are classified into dermal, ground and vascular tissues.

4. Differentiate between parenchyma, collenchyma and sclerenchyma on the basis of their cell wall and location.

Ans.

Parenchyma	Collenchyma	Sclerenchyma
Features	Thin walled, living cells with intercellular spaces.	Elongated or oval living cells with no intercellular space. Walls are thickened at corners with pectin.
Location	In soft parts of the plant	In petiole, veins and young stems.

5. What are the differences between xylem and phloem vessels? Ans.

Xylem	Phloem
1. Xylem usually constitutes large bulk of a plant. It carries water and minerals from the roots to the leaves.	1. Phloem constitutes smaller part of a plant. It carries the food prepared by the leaves to different parts of the plant.
2. Xylem cells are made up of a long chain of dead cells known as vessel elements. The components of xylem tissues are highly lignified.	2. The cells that make up the phloem tissues need to be alive to facilitate the active transport of food produced by photosynthesis.
3. The transport of water is in one direction that is upwards.	3. The transport of food materials is upwards as well as downwards.
4. Xylem is located deeper in the plant and it provides mechanical support to the plant.	4. Phloem is located on the outer side of the plant. They however, do not provide mechanical support to the plants.

6. What is the role of intercellular matrix in case of connective tissue?

Ans. The intercellular matrix in connective tissue plays several roles:

1. It consists of non-living substances such as proteins, collagen, and salts that contribute to the structure and function of the connective tissue.
2. The matrix connects other tissues and organs, providing a supportive framework.
3. It has important supportive functions within the body, helping to maintain the structural integrity of tissues.
4. It contributes to the storage of energy in the form of fat.
5. The matrix is involved in the mending and repair of tissues, aiding in recovery from injuries.
6. It helps keep internal organs in position and protects them from shock by providing a cushioning effect.

7. How can we differentiate between the three types of muscle fibres?

Ans. There are three types of muscular tissues:

(a) Striated (voluntary or skeletal muscle fibres)Under the microscope, these muscles show alternate light and dark bands or striations hence they are also called striated muscles

(b) Unstriated (involuntary or smooth muscle fibres)The cells have long pointed ends (spindle-shaped) and are uni-nucleate (having a single nucleus).

(c) Cardiac muscles - Cardiac muscle cells are cylindrical, branched and uni-nucleate

1. **Skeletal Muscle Fibers**: These are attached to the bones and are responsible for voluntary movements. They appear striated or striped under a microscope due to their well-organized arrangement of contractile proteins. Skeletal muscles tire quickly and require rest.
2. **Smooth Muscle Fibers**: Found in the walls of internal organs such as the stomach, intestines, and blood vessels, these muscles are involuntary

and controlled by the autonomic nervous system. They are not striated and can sustain long periods of contraction.

3. **Cardiac Muscle Fibers**: These are found only in the heart and combine features of both skeletal and smooth muscles. They are striated like skeletal muscles and involuntary like smooth muscles. Cardiac muscles have a unique feature called intercalated discs that allow the heart muscle cells to contract in a wave-like pattern, enabling the heart to pump blood effectively.

The classification is based on the muscle's control (voluntary or involuntary), appearance (striated or non-striated), and location (attached to bones, in the walls of internal organs, or in the heart).

8. Differentiate between striated, unstriated and cardiac muscles on the basis of their location in the body.

Ans. (i) **Striated Muscles**: Muscles present in our limbs move or stop as and when we want them to. These muscles are under our command and hence called voluntary muscles. These muscles are also called skeletal muscles as they are mostly attached to bones and help in body movement.

(ii) **Unstriated Muscles**: There are many muscles that function on their own. Food moves in our alimentary canal without our will. These muscles are also present in blood vessels, urinary bladder, lungs, etc. These are called involuntary movements and the muscles are called involuntary muscles. The cells have long pointed ends (spindle-shaped) and are uni-nucleate (having a single nucleus). They are also called unstriated muscles, because there are no striations.

(iii) **Cardiac Muscles**: The muscles of the heart show rhythmic contraction and relaxation throughout life. These involuntary muscles are called cardiac muscles. Cardiac muscles are specialised involuntary muscles. These are capable of rhythmic contraction and relaxation. They form a continuous network. Heart is a powerful pump that keeps working right from foetal stage till death.

9. Name the type of tissue in the following: human skin, bark of tree, bone, lining of kidney tubule, root hair.

Ans. **Human Skin**: The main type of tissue found in human skin is epithelial tissue. This tissue forms the outer layer of your body and serves as a protective barrier.

Bark of Tree: The bark of a tree is made of a special type of tissue called protective tissue in plants. The outer layer is known as the cork, which is a type of protective tissue that helps to shield the tree from damage and disease.

Bone: Bones are made of connective tissue, specifically a type called osseous tissue or bone tissue. This tissue gives bones their strength and rigidity, allowing them to support and protect the body's organs.

Lining of Kidney Tubule: The lining of the kidney tubules is made up of epithelial tissue. This type of tissue is specialized to allow the kidney to filter blood, absorb minerals, and produce urine.

Root Hair: Root hairs of plants are made of epidermal tissue, which is a type of epithelial tissue in plants. Root hairs are extensions of the root's epidermal cells and help the plant absorb water and nutrients from the soil.

10. What are the differences between tendons and ligaments?

Ans. **Tendons** – It is a dense connective tissue, that connect the muscles to the bone. These are strong inelastic cord like structures composed of white fibrous tissue and collagen. They are present at the end of skeletal muscles.

Ligaments – A dense connective tissue, they connect two bones at the various joints. Thus the bones are held in place during movement. They are formed of yellow fibrous tissue made of collagen and elastic fibres.

Experiential learning questions

1. Which of the following is not a function of bones?

Ans. (b) They help in the functioning of organs like the heart.

2. How do bone joints work in our body?

Ans. Bone joints work in our body by connecting two bones together to allow movements. Muscles are attached to bones by tendons. The muscles and tendons together allow the bones to move.

Application based questions

1. Why old xylem vessels stop conducting water in trees?

Ans. In trees, the xylem vessels are like pipes that carry water from the roots up to the leaves. As trees grow older, some xylem vessels can stop conducting water. This happens for a few reasons:

Thickening of Cell Walls: Over time, the walls of the xylem vessels can become thicker and impede the flow of water.

Aging of Trees: As trees age, the innermost xylem vessels (called heartwood) become inactive and primarily serve as support, while the outer xylem vessels (called sapwood) continue to transport water.

2. When a plant is placed in red coloured water for few hours; why do certain parts of the stem show red color in a longitudinal section?

Ans. When a plant is placed in red-colored water, certain parts of the stem show red color in a longitudinal section because the red-colored water travels up the plant through the xylem vessels. The xylem vessels act like drinking straws, pulling water up from the roots to the rest of the plant by various processes leading to ascent of sap.

Multi-disciplinary questions

1. In plants xylem vessels are present from the roots to the leaves; what is its significance?

Ans. Xylem vessels are crucial for plant survival because they act as channels for water and minerals from the roots to reach the leaves, where photosynthesis occurs. They also help support the plant structurally, allowing it to stand upright and grow. Essentially, xylem vessels are the plant's lifeline, distributing necessary nutrients and water throughout.

2. What is timber? From which part of the plant do we get it?

Ans. Timber refers to the wood that's been prepared for use in building and carpentry. As the tree grows, this sapwood becomes heartwood, which is the mature, harder wood that gives the tree stability and is commonly used for timber.

3. What can be the role of ciliated epithelium in respiratory tract infection?

Ans. In the respiratory tract, ciliated epithelium serves as a defense mechanism by moving mucus and trapped pathogens out of the lungs, helping to prevent and clear infections by keeping the airways clear of microbes and debris.

STEM Project-

Do your own research. (Hint -Rayon is considered to be half natural and half synthetic)

Values and Life skill :
Use your personal experience and observation. (Hint- Different people doing different kinds of work work together with a goal of common good. This makes a society prosper.)

Harvesting and Preparation of Cellulose: The primary ingredient for rayon is cellulose, usually sourced from wood pulp from trees like pine, spruce, or beech. The wood pulp is prepared by removing lignin and other non-cellulose substances to obtain pure cellulose.

1. **Purification**: The cellulose is then purified and soaked in caustic soda (sodium hydroxide), which causes the cellulose to swell, facilitating its conversion into a viscous solution in later steps.
2. **Aging and Yellow Crumb Formation**: After soaking, the cellulose is aged under controlled conditions, leading to a partial breakdown and making it more amenable to the formation of a viscous solution. This results in a product known as "yellow crumb."
3. **Xanthation**: The aged cellulose is mixed with carbon disulfide under alkaline conditions, converting it into cellulose xanthate, which is soluble in dilute caustic soda. This step is critical for making the cellulose solution spinnable.

4. **Dissolving**: The cellulose xanthate is dissolved in a dilute caustic soda solution to form a viscous solution known as "viscose," which can be easily extruded through spinnerets.
5. **Spinning**: The viscose solution is extruded through spinnerets into an acid bath (usually a mixture of sulfuric acid, sodium sulfate, and zinc sulfate), which regenerates the cellulose xanthate back to cellulose and solidifies the strands into fibers. This process is known as "wet spinning."
6. **Drawing and Cutting**: The continuous filaments are stretched, known as drawing, to align the polymer chains and improve the strength and fineness of the fibers. After drawing, the fibers can be cut into staple lengths if desired.
7. **Washing and Finishing**: The fibers are washed to remove any residual chemicals and then subjected to various finishing processes, such as bleaching and softening, to prepare them for use in textiles.

The resulting rayon fibers are versatile, with properties that can mimic natural fibers like cotton, wool, or silk. Rayon is used in a wide array of products, from clothing to home textiles, due to its softness, absorbency, and drapability.

VALUES AND LIFE SKILLS

Image Based Questions

a. 1-Dendrites

2-Myelin sheath

3-Axon

4-Axon terminal

b. It can be up toa meter long.

c. It connects to dendrites of next nerve cell.

Complete the blank spaces (1 to 7) in the table given below:

1. Ciliated
2. Smooth

3. Skeletal
4. Loose connective
5. Blood
6. Blood plasma
7. Lymph

CHAPTER 2

MCQs

1. Kingdom of organisms which do not have a true nucleus is:

(b) Monera

2. Which of the following statements is true for the organism Yeast?

(d) It is used in the making of cheese.

3. When the plant body is not well defined it is called:

(a) Thallus

4. When the conditions are unfavourable the Amoeba reproduces by:

(b) Multiple fission

5. The organisms that use cilia, flagella, or pseudopodia for locomotion belong to:

(b) Kingdom Protista

6. Fungi are eukaryotic organisms that is why:

(b) They have membrane-bound cell organelles

7. How does respiration in fungi take place?

(b) Exchange of gases happen through the walls of the hyphae

8. Vascular tissue is not well developed in Kingdom–

(c) Monera and Protista

9. An organism that derives nutrition from other organism is called–

(d) Parasite.

10. Which of the following is a cone bearing organism?

(d) Pine.

State True or False and correct the false statements.

1. Bacteria are placed in Kingdom Monera. **False**

2. The bacteria do not have true nucleus. **True**

3. Food vacuole helps in digestion, Contractile vacuole helps in excretion. **False**

4. Amoeba forms a cyst when the conditions turn unfavourable. **True**

5. Green plants are autotrophs. **False**

6. Apart from fungi many bacteria and other animals also are heterotrophs. **False**

7. Seeds of pine tree are found in cones. **False**

8. Aerobic respiration happens in the presence of oxygen. Oxygen is taken in leading to release of carbon dioxide and energy. **False**

9. On the underside of the leaves of ferns there are spores, which produce gametes for reproduction . **False**

10. Pine trees are evergreen trees. **True**

Fill in the blanks:

1. The five kingdom classification was proposed by **Robert Whittaker.**

2. Respiration in Amoeba happens by **diffusion.**

3. Depending on the number of cotyledons **angiosperms** are classified into **Monocots** and Dicots.

4. Nutrition in members of the Kingdom Fungi can be **saprophytic** or **parasitic.**

5. The organism that helps in retting of jute is **bacteria.**

6. Respiration in fungi is **aerobic.**

7. Lichen is an example of **symbiosis.**

8. Bread mould belongs to **Fungi** kingdom.

9. The difference between the seeds of pine and mango is **pine seeds are naked while mango seeds are enclosed within a fruit**.

10. Mosses are called amphibious because **its life cycle happens in water and on land.**

Select the odd one from the following groups :

(i) Amoeba, Euglena, **Penicillium**, Paramecium.

(ii) Acetobacter, Lactobacillus, **Gymnosperm**, Rhizobium.

(iii) Hyphae, sporangiophores, sporangium, **capsule**.

(iv) Spruce, **mango**, pine, fir.

(v) Parasites, saprophytes, symbionts, **autotrophs**

Match the terms to its descriptions:

(a) Fungi -	v. Multicellular heterotrophs, may be saprophytes or parasites
(b) Mosses -	ii. Plants without well-developed vessels
(c) Gymnosperms -	vi. Plants with naked seeds
(d) Autotrophs -	i. Organisms capable of synthesizing its own food
(e) Ferns -	vii. Ferns reproduce by spores

Short answer type questions

1. What are the various modes of nutrition in living things?

Ans. Various modes of nutrition include autotrophic (self-feeding, as in plants), heterotrophic (obtaining nutrients from other organisms), saprotrophic (feeding on dead or decaying matter), parasitic (living on or in another organism and deriving nutrients from it), and symbiotic (living in close association with another organism for mutual benefit).

2. What is the shape of Amoeba?

Ans. Amoeba is a simple microscopic unicellular organism. It has an irregularly shaped body that is bound by a plasma membrane (or cell membrane).

3. What is the difference in cell structure of organisms of the Kingdoms Protista and Monera?

Ans. **Protista**

Cell structure: The cell type of the Protists is eukaryotic. The presence of a nuclear membrane marks this kingdom. They also have other membrane bound cell organelles. Some Protists have cell walls and locomotion structures like cilia or flagella.

Monera

Cell structure: The cell wall is rigid. The nuclear material is not enclosed in a membrane. The nuclear material is organised as nucleoid. Cell organelles are absent.

4. What are autotrophs?

Ans. Autotrophs are the organisms that can make their own food. All plants, algae and some bacteria are autotrophs.

5. How do Amoeba ingest food?

Ans. – Amoeba feeds on microscopic organisms. When the Amoeba senses the presence of food it moves near it by its pseudopodia. Then it surrounds the food by forming two pseudopodia. Finally the two pseudopodia fuse forming a space around the food.

6. How can we distinguish between fungi and green plants?

Ans. Fungi are heterotrophic, multicellular organisms with chitin cell walls, while green plants are autotrophic, typically multicellular organisms with cellulose cell walls, capable of photosynthesis.

7. What is mycelium?

Ans. Mycelium is the vegetative part of a fungus, consisting of a network of fine, thread-like structures called hyphae.

8. What is the difference between the cell wall of a plant cell and a fungal cell?

Ans. The main difference between the cell wall of a plant cell and a fungal cell lies in their composition. Plant cell walls are primarily made of cellulose, while fungal cell walls are primarily made of chitin.

9. Which structure in mosses can be called early structures of root?

Ans. In mosses, the structure that can be considered an early structure of a root is the rhizoid. Rhizoids are thread-like structures that anchor the moss to the substrate and absorb water and nutrients.

10. What are flowering plants?

Ans. Flowering plants, also known as angiosperms, are a group of plants that produce flowers as part of their reproductive process.

Long answer type questions

1. What are the advantages of classification in the study of biology?

Ans. In biology we define classification as the process of putting organisms into particular groups based on similarity of characteristics. Classification, in biology allows us to have a hierarchical system of categories.

<u>Advantages</u>:

1. With the help of classification we can study living organisms conveniently. This is because the organisms are easy to identify as they are put in well-defined groups or categories. Hence when we study about one organism of a group we learn about other members of the group as well. 2. In the study of classification when we know details about the categories and subcategories; we already know a lot about the organisms in the respective categories. 3. By studying classification we can decipher about animals and plants in different habitats of the world. 4. Classification tells us about the evolution of the organisms and the developmental trends of organisms from simple to complex in both plants and animals. 5. The study of classification (or taxonomy) helps to

connect the dots as we move to study other streams of science that are related to biology.

2. What are the five kingdoms described according to Whittaker? Give the distinctive features of each kingdom?

Ans. **1. Kingdom Monera**

- **Cell Type:** Prokaryotic, meaning these organisms have cells that lack a true nucleus.
- **Reproduction:** Mainly asexual reproduction through binary fission.

2. Kingdom Protista

- **Cell Type:** Eukaryotic, with cells having a well-defined nucleus.
- **Reproduction:** Both asexual (e.g., binary fission) and sexual reproduction methods are observed.

3. Kingdom Fungi

- **Cell Type:** Eukaryotic.
- **Cell Structure:** Mostly multicellular (with the exception of yeast, which is unicellular). Fungi have a complex cell structure with cell walls made of chitin.

4. Kingdom Plantae

- **Cell Structure:** Multicellular, with cells having cell walls made of cellulose.
- **Nutrition:** Autotrophic; capable of photosynthesis, using sunlight, carbon dioxide, and water to produce food (glucose) and oxygen.

5. Kingdom Animalia

- **Cell Structure:** Multicellular organisms with complex and specialized cells and tissues. No cell walls.
- **Nutrition:** Heterotrophic; animals obtain food by ingesting and digesting other organisms.

3. How are bacteria useful to us? Explain in brief.

Ans. **1. Environmental Recycling and Decomposition**

Bacteria act as natural recyclers. They are crucial in the decomposition process, breaking down dead and decaying organic matter. This decomposition releases nutrients back into the environment, making them available for plants and other organisms, thus maintaining the ecosystem's nutrient cycle.

2. Nitrogen Fixation

Some bacteria, especially those associated with the roots of leguminous plants (like beans and peas), have the ability to convert atmospheric nitrogen into compounds that plants can use to grow. This process, known as nitrogen fixation, is essential for agriculture as it enriches the soil with nitrogen, a critical nutrient for plant growth.

3. Food Production

Bacteria are instrumental in the production of various foods. They are involved in the fermentation process, which is used to make yogurt, cheese, and certain types of bread. Fermentation not only helps in preserving these foods but also enhances their taste and nutritional value.

4. Medical Applications

- **Antibiotics:** Some bacteria produce substances that can kill or inhibit the growth of other harmful bacteria. These substances are the basis for antibiotics, which are crucial in treating bacterial infections.
- **Probiotics:** Certain types of bacteria are beneficial to human health when consumed. Known as probiotics, these bacteria are often added to yogurts and other dietary supplements to support a healthy digestive system.

4. Differentiate between autotrophs and heterotrophs.

Ans. **Autotrophs**

- **Definition:** Autotrophs are organisms that can produce their own food using light, water, carbon dioxide, or other chemicals. Because of this ability, they are often referred to as producers.

- **Energy Source:** Most autotrophs use the energy from sunlight to make food through a process known as photosynthesis. Some, however, can use chemical energy in a process called chemosynthesis.
- **Examples:** This category includes all green plants, algae, and certain bacteria that can perform photosynthesis or chemosynthesis.
- **Role in Ecosystems:** Autotrophs form the base of the food chain and are essential for the survival of most ecosystems, as they provide the energy and organic materials used by heterotrophs.

Heterotrophs

- **Definition:** Heterotrophs are organisms that cannot synthesize their own food and must rely on consuming other organisms or organic substances for energy and nutrients.
- **Energy Source:** Heterotrophs obtain energy by consuming plants, other animals, or decomposing material. They are also known as consumers or decomposers, depending on their role in the food chain.
- **Examples:** Animals, fungi, and most bacteria are heterotrophs. This includes humans, pets, wild animals, and mushrooms.
- **Role in Ecosystems:** Heterotrophs depend on autotrophs directly or indirectly for food. They are crucial for transferring energy throughout the food chain and for breaking down organic matter, contributing to the nutrient cycle.

5. Differentiate between Kingdom Monera and Protista .

Ans. **Kingdom Monera**

- **Cell Type:** Monerans are characterized by having prokaryotic cells, which means their cells lack a well-defined nucleus and other membrane-bound organelles.
- **Organisms:** This kingdom includes all bacteria and cyanobacteria (blue-green algae).
- **Cell Structure:** Organisms in this kingdom are unicellular, with a simpler cell structure compared to eukaryotic cells found in other kingdoms.

- **Nutrition:** Monerans can be autotrophic (capable of producing their own food through photosynthesis or chemosynthesis) or heterotrophic (relying on external sources of organic compounds).
- **Reproduction:** They primarily reproduce asexually through binary fission, although some bacteria can exchange genetic material through processes like conjugation.

Kingdom Protista

- **Cell Type:** Protists have eukaryotic cells, meaning their cells contain a well-defined nucleus and other membrane-bound organelles, which are more complex than those of prokaryotic cells.
- **Organisms:** This kingdom is a diverse group that includes protozoans (like Amoeba and Paramecium), algae, and slime molds.
- **Cell Structure:** While most protists are unicellular, some are colonial, and others are multicellular without being highly specialized.
- **Nutrition:** Protists can be autotrophic (algae, which perform photosynthesis) or heterotrophic (protozoans, which consume bacteria and other microorganisms).
- **Reproduction:** They can reproduce both asexually (through mitosis) and sexually (through processes such as conjugation and alternation of generations in some algae).

6. How do Amoeba reproduce?

Ans. The life span of Amoeba is for two days. However, it keeps reproducing by the process of binary fission. It reproduces in two ways depending on whether the conditions are favourable or not.

<u>Under favourable conditions</u>

When the conditions are favourable the Amoeba reproduces by braking into two cells. First the nucleus elongates and splits into two equal parts. Then rest of the cytoplasm also divides into two equal parts so that each part gets a nucleus. This process is called binary fission. The two daughter Amoebae grow to full size and reproduce again

<u>Under unfavourable conditions</u>

When the environmental conditions are not favourable, such as when the water body goes dry, the Amoeba withdraws its pseudopodia and forms a thick wall around itself. This is called cyst formation. Inside the cyst the nucleus divides several times, leading to the formation of many nuclei. This is followed by division of the cytoplasm. Now each daughter nucleus is surrounded by cytoplasm and many Amoebulae are formed. This process is called multiple fission. On return of favourable conditions the cyst breaks open to release about 500 -600 daughter cells.

7. Differentiate between mosses and ferns.

Ans. Mosses – Mosses grow in moist and damp soil. Mosses do not have true stems, leaves and roots. However, its structures can be called leaf like, stem like and root like. The plants are attached to the soil by root like structures called rhizoids. Mosses also do not have conducting tissues. The mosses are called the 'amphibians amongst plant' because like amphibians (for example; frogs) they also need water for reproduction.

Ferns – Ferns have well-formed leaves, stems and roots. However, ferns do not bear flowers and seeds. On the underside of the leaves they bear spores, which produce gametes for reproduction. Ferns are terrestrial plants and have simple conducting tissues for conducting food and water.

8. How do fungi harm other living organisms? Explain in brief.

Ans. Fungi are also harmful in various ways:

1. Disease:

(i) Fungi attack different crops and cause huge economic harm to farmers. Rust disease in wheat and smut infection in maize is quite common.

(ii) Fungi cause a variety of fungal disease in humans such as ringworm, infection of skin and nails. They also cause dangerous infection of the lungs.

2. Spoilage of Food:

(i) Moulds spoil various food items such as bread, fruits, etc. The toxins they release can cause food poisoning hence food items with fungal growth should not be consumed.

(ii) Fungal growth happens on leather goods, furniture and clothes if they happen to be in a damp environment. Such goods are also damaged and can become a source of infection.

9. Explain the role played by fungi in medicine.

Ans. Fungi useful in Medicine:

(i) Antibiotic penicillin is obtained from fungus Penicillium notatum.

(ii) Griseofulvin an antifungal drug, is derived from a fungus.

(iii) Statins, a group of drug for treatment of cholesterol is derived from a variety of fungus.

(iv) Yeast is a very good source of vitamins of B group.

Application based questions

1. How do organisms like mushrooms and moulds get their food?

Ans. **Nutrition in Mushrooms and Molds:**

- **Heterotrophic Mode:** Unlike plants, mushrooms and molds do not produce their own food through photosynthesis. They are heterotrophs, which means they depend on other organisms for their nutrients.
- **Saprophytic Nutrition:** Mushrooms and molds primarily obtain their nutrients through saprophytic nutrition. This involves absorbing organic material from dead and decaying matter. They release digestive enzymes into their environment, which break down complex organic substances (like dead plants and animals) into simpler forms. These simpler substances are then absorbed through their cell walls.
- **Role in Ecosystems:** This mode of nutrition makes mushrooms and molds important decomposers in ecosystems. They help recycle nutrients back into the soil, making them available for plants and other organisms. This process is vital for the nutrient cycle and the maintenance of ecological balance.

2. Some bacteria live in the root nodules of plants. How do they help the farmer?

Ans. **Nitrogen Fixation**

- **Symbiotic Relationship:** Some bacteria, known as Rhizobium bacteria, form a symbiotic relationship with the roots of leguminous plants (such

as beans, peas, and lentils). They live in special structures called root nodules.

- **Process:** These bacteria have the unique ability to fix atmospheric nitrogen, converting it into a form that plants can use to synthesize proteins and other essential compounds. Atmospheric nitrogen (N_2) is abundant but in a form that plants cannot directly assimilate. The Rhizobium bacteria convert this nitrogen into ammonia (NH_3) or related nitrogenous compounds that plants can readily absorb and utilize.
- **Benefits to Farmers:**
    - **Enhanced Soil Fertility:** By fixing nitrogen in the soil, these bacteria enrich the soil with nitrogenous compounds, reducing the need for chemical fertilizers. This natural process of nitrogen fixation helps maintain soil fertility and can lead to better crop yields.
    - **Sustainable Agriculture:** The use of leguminous plants in crop rotations can improve the nitrogen content of the soil, making agriculture more sustainable. Farmers can reduce the amount of synthetic fertilizers needed, lowering production costs and minimizing environmental impact.
    - **Increased Crop Production:** Plants with adequate nitrogen from natural sources like Rhizobium tend to grow better and produce more. This leads to higher crop yields for farmers, contributing to food security.

3. What is unique about locomotion in Amoeba?

Ans. **Amoeboid Movement in Amoeba:**

- **Pseudopodia Formation:** The key to Amoeba's locomotion is the formation of pseudopodia, which means "false feet." Amoeba extends parts of its cell body to form these temporary projections. This process involves the flow of cytoplasm, the liquid inside the cell, towards the direction of movement, creating a bulge in the cell membrane.
- **Engagement with Surface:** Once a pseudopod is extended forward, the Amoeba anchors it to the surface it is moving on. The rest of the cell body then flows into the pseudopod, propelling the Amoeba forward.

- **Flexibility and Direction Change:** This method of movement allows Amoeba to change direction easily. By extending pseudopodia in different directions, Amoeba can navigate through its environment, moving towards food sources or away from unfavorable conditions.
- **Versatility in Environment:** Amoeboid movement is not just used for locomotion; it also aids in capturing food. Amoeba can engulf food particles by wrapping them with pseudopodia, a process known as phagocytosis.

4. What is the harm caused by rust and smut in crops?

Ans. **Smut:**

- **Cause:** Smut is caused by fungi belonging to the order Ustilaginales. These fungi primarily infect grains like wheat, corn, oats, and barley.
- **Harm:** Smut fungi replace the normal tissues of the host plant with their own black, powdery spores. This not only damages the affected parts but can ruin the entire harvest. Infected grains are disfigured and unsellable, leading to direct economic losses. Like rust, smut also weakens the plant and reduces its productivity.

Both rust and smut diseases are harmful because they:

1. **Reduce Crop Quality and Quantity:** The physical damage to the plants leads to decreased agricultural output and lower-quality produce, which is not marketable.
2. **Increase Farming Costs:** Farmers might need to invest in fungicides and other control measures to manage these diseases, which increases the cost of production.

Rust:

Cause: Rust is caused by various fungi belonging to the genus Puccinia. These fungi are highly specialized and can infect a wide range of host plants.

Harm: Rust fungi affect the plant's leaves, stems, and sometimes fruits. They produce reddish or orange blisters that release spores, which can spread to other plants. The infection reduces the plant's ability to conduct photosynthesis, leading to weakened growth, reduced yields, and in severe cases, the death of the plant.

Image based questions

(A)

1. PIli -It helpd in locomotion of the bacteria

2. (a)-Capsule (b) cell wall (c) plasma membrane. It protects the bacteria from dehydration and enhances its disease causing ability.

3. It has the genetic material but there is no nuclear membrane.

(B)

1- Sporangium

2-Rhizoids

3.Sporangiophore

4.Spores grow to become new mould when they have favourable conditions..

(C)

Roots- Monocots have fibrous roots. Dicots have tap root.

Leaves - Veins are parallel in monocots. Veins are reticulate in dicots

Seeds - One cotyledon in monocot. Two cotyledons in dicot plants.

Experiential learning question

1. (b) They breakdown dead and decaying organic matter .

2. Do your reserch (Hint- All organic matter has the element carbon as an important ingredient. So when we burn wood carbon locked as wood is released.

We use nitrogen fertilizers. We have 79% Nirogen in the atmosphere which only leguminous plants can use.

Multi-disciplinary questions

1. Do it yourself.

2. Do your reserch on the early development of antibiotics.

VALUES AND LIFE SKILLS

Classification of plants and animals in our world is useful when we want to study about their characteristics.

However, when ous society is divided in the name of classification it leads to serious consequences.

We begin to expect a particular kind of behaviour from a social category of people..(Elaborate further)

CHAPTER 3

MCQs

1. Animals having an exoskeleton made of chitin are–

Ans. (b) Insects

2. Which of the following feature is specially found in Echinodermata?

Ans. (a) Tube feet

3. Which of the following is not a cold blooded animal?

Ans. (c) Birds

4. A difference between Nematodes and Arthropods is–

Ans. (b) Only arthropods have segmented body

5. Three or more pairs of legs are present in–

Ans. (b) Arthropods

Fill in the blanks:

1. A vase shaped animal that has a lot of pores in its body is known as **sponge.**

2. An animal that breathe though gills is **fish.**

3. A parasite that has a long ribbon like body is **tapeworm.**

4. An animal that lives in water but lays eggs on land is **Crocodiles and turtles.**

5. An animal that gives birth to young ones is **mammal.**

Match the following:

Group of animals	Examples
a) Porifera -	iv. Sponges
(b) Cnidaria -	i. Hydra
(c) Platyhelminthes -	vi. Liver fluke
(d) Nematoda -	ii. Ascaris
(e) Annelida -	vii. Earthworm
(f) Arthropoda -	iii. Prawn
(g) Mollusca -	ix. Snail
(h) Echinodermata -	v. Starfish

Select the odd one from the group of organisms:

(a) Salamander

(b) Tortoise

(c) Earthworm

(d) Bat

(e) Penguin

State True or False and correct the false statements.

1. Animals which have the backbone are called vertebrates. **False**

2. Salamander is an Amphibian. **False**

3. Cockroaches have exoskeleton. **True**

4. Whales are the largest mammals. **False**

5. Temperature of cold blooded animals change. **True**

Short answer type questions

1. What is the use of tentacles in Hydra?

Ans. The mouth of hydra is surrounded by many finger like projections called tentacles. The tentacles help the hydra in catching food.

2. Name a parasite that infests the human intestine.

Ans. A parasite that infests the human intestine is the **roundworm**, also known as *Ascaris.*

3. The body of molluscs can be divided into three parts; what are they?

Their body is divided into head, visceral mass, and foot. The head contains the sense organs and "brain," while the visceral mass contains the internal organs. The "foot" is the muscular lower part of the body which is in contact with the ground

4. Why do the fish have gills?

Ans. Fish have gills primarily for the purpose of breathing under water. Water containing dissolved oxygen enters the fish's mouth and passes over the gills.

5. Which animal has hollow bones and why?

Ans. Birds are the animals that have hollow bones. The primary reason for this adaptation is to reduce weight while maintaining strength and structural integrity.

Long answer type questions

1. Write one/two, point of difference between the following phyla, mention one example of each phyla.

i. Coelenterata and Platyhelminthes

- **Examples**: Coelenterata: Jellyfish, Platyhelminthes: Tapeworm
- **Point of difference**: Coelenterates are aquatic soft bodied, animals found in marine water as well as freshwater. Some of them are free floating and others are attached to the floor of the water body. In contrast, Platyhelminthes includes animals that have a soft and flat leaf

like body such as tapeworms and liver fluke. These flatworms live inside the body of other animals (including humans) as parasites. Their head has special structures called hooks and suckers with which they attach themselves to the host.

-

ii. Nematoda and Annelida

- **Examples**: Nematoda: Roundworm, Annelida: Earthworm
- **Point of difference**: Nematodes are characterized by their elongated, cylindrical bodies that are not segmented, while annelids are known for their segmented bodies.

iii. Arthropoda and Mollusca

- **Examples**: Arthropoda: Spider, Mollusca: Snail
- **Point of difference**: Arthropods have an exoskeleton made of chitin and a segmented body with jointed appendages. Molluscs have a soft unsegmented body, and most have a hard external shell. Many molluscs do not have a hard shell as in the case of octopuses and squids. Their body is divided into head, visceral mass, and foot.

iv. Amphibia and Reptilia

- **Examples**: Amphibia: Frog, Reptilia: Lizard
- **Point of difference**: Amphibians lay their eggs in water whereas reptiles lay their eggs on land (even if they live in water.

v. Aves and Mammals

- **Examples**: Aves: Sparrow, Mammals: Tiger
- **Point of difference**: Aves, or birds, have feathers, a beak without teeth, and lay eggs with hard shells. Mammals have fur or hair, give birth to young ones and possess mammary glands to nourish their young.

2. What are the special features found in Arthropods? Give two examples.

Ans. Arthropods are a diverse group of animals with some distinct and special features that set them apart from other phyla.

1. **Exoskeleton**: Arthropods possess an external skeleton made of chitin, which provides protection and support for the body.
2. **Segmented Bodies**: Their bodies are segmented into different parts such as the head, thorax, and abdomen. They have a pair of antenna and compound eyes.
3. **Jointed Appendages**: Arthropods have three pairs of legs. Some arthopods are more number of legs.

3. Both fish and birds have 'streamlined' body. How does it help them?

Ans. For fish, a streamlined body allows them to swim rapidly and maneuver easily in water. The tapered head and slim body minimize the resistance offered by water as they propel themselves using their fins. This shape is particularly important because water is much denser than air, and moving through it requires more energy; a streamlined body conserves energy and enables fish to be agile predators or to escape from predators themselves.

For birds, having a streamlined body is essential for efficient flight. The shape cuts down on air resistance, making it easier for them to glide and fly through the air. It also helps in reducing the energy expended during long flights.

Thus, for both fish and birds, the streamlined body is a crucial adaptation for their survival, as it enhances their mobility and energy efficiency in their respective mediums.

4. The amphibians were the first to move from water to land. What are their other features?

Ans. Amphibians are known for their ability to live both in water and on land.

However, these animals must come to water for laying eggs.

They have webbed feet and breathe through lungs. They have moist skin and breathe through skin when immersed in water.

Amphibians are cold blooded animals.

5. How can we say that mammals are more developed (or evolved) than other animals?

The theory of evolution is based on the idea that all the species are related. This is also evident from the study of classification of organisms.

While studying classification as we move from Prokaryotes to Eukaryotes we see important developments such as organization of cell organelles such as mitochondria with specialized functions.

The body structure of mammals is more complex and the organs have specialized functions. This makes the mammals very well adjusted to their habitat. Mammals have the most well developed brain and nervous system.

These developments makes mammals the most evolved in the animal kingdom.

Experiential learning questions

1.

A study of fossils in different sedimentary layers indicates the geological period in which they existed. The study showed that life-forms changed from simple to complex forms over geological timespans.

2. When we describe the story of life on Earth, we treat evolution as a process called natural selection. We are still not very clear whether to regard evolution and natural selection as processes or end result of unknown processes.

Application based Questions

1. Parasites living in our intestine are dangerous because they eat up nutrition. Hence very little nutrient is absorbed making the person weak. They are also knowm to clog the intestine making passage of food difficult.This becomes a medical emergency.

2. Reptiles are found in land and water. Some reptiles can walk as in case of tortoise, others can slither as in case of snakes, some can swim as in case of crocodiles.

STEM Project

If we study classification with understanding of the simple and gradual development in living things it will become interesting.

Values and Lifeskills- Use your personal experience as to how you interact with your friends and others in the society. Does class or caste prevent you from mixing with people?

VALUES AND LIFE SKILLS

In social situations it is best to think across barriers of class, caste, etc. Explain with an example.

Ans. Thinking across barriers like class and caste is crucial for fostering a more inclusive and equitable society. For instance, consider the case of educational opportunities. In many parts of the world, children from lower socio-economic backgrounds often have less access to quality education compared to their wealthier counterparts. This disparity creates a cycle where the less privileged remain in lower-income brackets, often excluded from better job opportunities.

Imagine a situation where a community center in a diverse neighborhood decides to offer free tutoring to all children, regardless of their socio-economic background. This center is staffed by volunteers from various classes and castes, providing an inclusive environment where children can learn and interact with a diverse group of role models. This initiative not only helps bridge the educational gap but also breaks down social barriers. Children and volunteers learn from each other's experiences, fostering empathy and understanding between different social groups.

Such programs highlight the shared human experience and the importance of equal opportunities. They also demonstrate how individuals from all backgrounds can contribute to the common good when given an equal chance. By prioritizing unity and cooperation over social divides, communities can create a more harmonious and progressive environment for everyone.

Image based questions

1. Sponge (Porifera), these are mostly found in marine water (very few are found in fresh water).

2. Tape worm (**Platyhelminthes) The hooks help them to attach to the inner walls of the intestine of the host. The suckers help them to suck nutrition.**

3. Frog (Amphibia) The webbed feet help it in swimming.

CHAPTER 4

MCQs

1. The basic process present in all living things can be expressed as–

   (b) Life process

2. Photosynthesis will occur when the plants have–

   (b) Sunlight, water and Carbon dioxide

3. In plants chlorophyll is found in–

   (b) Chloroplast

4. Which among the following is not an autotroph?

   (b) Moulds

5. In photosynthesis

   (b) Light energy is converted into chemical energy.

6. The coloured leaves of croton show a positive test for starch as–

   (b) Chlorophyll is masked by the coloured pigments of leaves

7. Which of the following statements describe the stomata correctly?

   (d) All of the above

8. The presence of starch in leaves is confirmed by adding a few drops of –

(d) iodine which turns the leaf blue-black

9. Which of the following statements is correct?

   (b) Ethanol is produced in anaerobic respiration.

10. The word equation: Glucose → Carbon dioxide + Alcohol + Energy (2 ATP) represents

    (c) Anaerobic respiration

Fill in the blanks:

1. Of the total water absorbed by plants percentage used in photosynthesis is **less than one percent**.
2. When the intensity of light is low, the rate of photosynthesis **decreases**.
3. Carbon dioxide enters the leaves through **stomata**.
4. Respiration in the absence of oxygen is called **anaerobic respiration**.
5. Carotenoid and xanthophyll give the plant **yellow to orange** colour.
6. A liquid produced in anaerobic respiration is **ethanol (alcohol)**.
7. The stomata open when the guard cells are **turgid**.
8. The best range of temperature for photosynthesis is **25°C to 35°C**.
9. The main products of photosynthesis are **glucose** and **oxygen**.
10. Anaerobic respiration happens in the **absence** of oxygen.

Select the odd one from the following groups:

(a) **ethanol**

(b) **sunlight**

(c) **mitochondria**

(d) **oxygen**

Match the two columns:

(a) Site of photosynthesis:	**iii. Chloroplast**
(b) Stomata:	**v. Guard cells**
(c) Site of respiration:	**iv. Mitochondria**
(d) Lenticels:	**i. Bark of tree**
(e) Anaerobic respiration:	**vi. Yeast**

State True or False and correct the false statements.

1. Chemical used in starch test is iodine solution. **False**

2. Autotrophs are also called producers. **False**

3. A food chain always begins with an autotroph. **True**

4. Stomata in most plants remain closed during the night. **False**

5. A croton plant can prepare its food because chlorophyll is masked by other pigments. **False**

6. Stomata can be found on stems of young plants. **True**

7. A product of photosynthesis is oxygen. **False**

8. In aerobic respiration ethanol is not produced. **False**

9. Green light is least helpful in photosynthesis. **False**

10. When a plant wilts its stomata closes. **True**

Short answer type questions

1. What do you understand by autotrophic nutrition?

Ans. Autotrophs are the organisms that can make their own food. All plants, algae and some bacteria are autotrophs. The mode of nutrition in which organisms make food for themselves from simple raw materials present in the environment is called **autotrophic nutrition**

2. What is the word equation of photosynthesis?

The word equation for photosynthesis is --

Carbon dioxide + water (in the presence of Sunlight and chlorophyll) ----> Glucose + Oxygen

3. How does water reach the cells of the leaves for photosynthesis?

Ans. Water reaches the cells of the leaves for photosynthesis through the xylem vessels, which transport it from the roots up the stem and into the leaf tissues.

4. How do the stomata open?

Ans. Stomata open when the guard cells around them swell with water, becoming turgid, which causes the stomatal pore to open between them.

5. How photosynthesis reduces the carbon content of air?

Ans. Photosynthesis reduces the carbon content of the air by using carbon dioxide to produce glucose, thereby decreasing the amount of CO_2 in the atmosphere.

6. Why are the leaves of most plants flat?

Ans. Leaves are typically flat to maximize the surface area exposed to sunlight, facilitating efficient absorption of light for photosynthesis.

7. Where are the lenticels located?

Ans. Lenticels are located on the stems and sometimes the fruit of plants, visible as small pores on the bark.

8. What roles does chlorophyll play in photosynthesis?

Ans. Chlorophyll absorbs sunlight, providing the energy needed to convert carbon dioxide and water into glucose and oxygen during photosynthesis.

9. What is the word equation for aerobic respiration?

Ans. The word equation for aerobic respiration is: Glucose + Oxygen → Carbon Dioxide + Water + 38 ATP of energy.

10. In which cells does respiration occur?

Ans. Respiration occurs in all living cells, including plant and animal cells, to produce energy from glucose.

Long answer type questions

1. What are the products of photosynthesis and how are they useful to us?

Ans. Photosynthesis, a critical biological process, yields two primary products: oxygen and glucose.

(a) Photosynthesis is the basic food producing process amongst all living things on the Earth that produces food and oxygen.

(b) The glucose produce is the primary food produced on the Earth upon which all other living things depend.

(c) The oxygen produced is used by all living things including plants for respiration that helps to release energy from food.

2. How can you prove that light is needed for photosynthesis?

Ans. A de-starched leaf of a plant is covered with black paper. The plant is then kept inder the Sun for few hours.

After few hours if we test the leaf (covered with black paper) for starch with iodine solution it does not turn black. It proves that no photosynthesis happened in the part of the leaf that was covered with black paper.

3. What is the importance of photosynthesis for our world?

1. Photosynthesis is the basic process on the Earth that produces food and oxygen. This food and oxygen is used not only by the plants but also by all the living organisms.
2. The utilization of carbon dioxide and release of oxygen helps to keep the ratio of these two gases in the air stable.
3. Because of photosynthesis the plants form the primary tropic level in every food chain. Without the presence of plants none of the exiting food-chains would exist.
4. When plants utilize carbon dioxide in the process of photosynthesis; it leads to ‘carbon capture’ and that much of carbon is taken away from the environment. This is a major benefit of large scale forestation programmes.

5. Photosynthesis also captures solar energy by converting it into chemical energy of glucose. This energy is released by respiration.

4. How are processes of photosynthesis and respiration connected in plants?

Plants like all living organisms carry out respiration at all times. However, during the day photosynthesis and respiration happen simultaneously.

During the day plants produce food as well as consume food.

Photosynthesis uses carbon dioxide and releases oxygen. It

occurs in chloroplast (cells containing chlorophyll). It happens in the presence of sunlight. Respiration process uses oxygen and releases carbon dioxide. It occurs in all living cells. It happens at all time in presence and absence of sunlight.

5. Explain the steps involved in the starch test experiment.

Ans. The starch test experiment is a practical demonstration used to detect the presence of starch in a leaf, indicating whether photosynthesis has occurred. Below are the steps involved in conducting this experiment:

1. **Selecting the Leaf**: Choose a healthy leaf from a plant that has been exposed to light to ensure that photosynthesis has taken place.
2. **Boiling the Leaf**: Place the selected leaf in boiling water for a few minutes. This step is done to kill the leaf and soften its tissues, making it easier to handle and permeable to subsequent chemicals.
3. **Boiling in Ethanol**: Transfer the boiled leaf into a test tube containing ethanol (alcohol). Boil the leaf in ethanol for a few minutes to remove the green chlorophyll pigment. This process decolorizes the leaf, leaving it pale in color.
4. **Rinsing the Leaf**: Rinse the decolorized leaf with warm water to soften it further and remove any residual ethanol.
5. **Testing for Starch**: Place the rinsed leaf on a white tile or dish. Apply a few drops of iodine solution to the leaf. Iodine reacts with starch, turning it a blue-black which proves the presence of starch.

6. What are the differences between photosynthesis and respiration?

Photosynthesis is the process of production of food. The process uses carbon dioxide and releases oxygen It occurs in chloroplast (cells containing chlorophyll). It happens in the presence of sunlight. Solar energy of sunlight is converted to chemical energy of food. Respiration It is the process by which food is consumed in all living organisms. The process uses oxygen and releases energy and carbon dioxide. It occurs in all living cells. It happens at all time in presence and absence of sunlight. The chemical energy of food is released in the form of ATP.

7. What are the differences between aerobic and anaerobic respiration?

1. Ans. **Requirement for Oxygen**:
    - Aerobic respiration: Requires oxygen.
    - Anaerobic respiration: Does not require oxygen; it occurs in the absence of oxygen.
2. **Efficiency of Energy Production**:
    - Aerobic respiration: Yields a high amount of energy (36-38 ATP molecules per glucose molecule).
    - Anaerobic respiration: Yields a lower amount of energy compared to aerobic respiration (2 ATP molecules per glucose molecule in animal cells; varies in other organisms).
3. **End Products**:
    - Aerobic respiration: Produces carbon dioxide energy and water as end products.
    - Anaerobic respiration: Produces alcohol and lower amounts of energy.

8. When we burn a piece of wood we get heat energy. Did this energy actually come from sunlight?

Ans. Yes, the energy obtained when burning a piece of wood ultimately originated from sunlight. Wood is primarily composed of cellulose, which is a

complex carbohydrate synthesized by plants through photosynthesis. During photosynthesis, plants use sunlight to convert carbon dioxide and water into glucose (a simpler sugar), which is then used to build cellulose and other organic compounds found in wood.

When wood is burned it actually releases energy by burning carbon (that was captured from the carnon dioxide of theair during photosynthesis).

Application Based Questions

1. Plants provide surfaces on which dust settles. Leaves of many plants are hairy which trap fine dust from wind.

2. Plants do not need a digestive sytem because the food they prepare is simple glucose.

3. Plants kept in the dark do not photosynthesise because light is essential for photosynthesis.

Multi-disciplinary Questions

1. Use your imagination. Plan for food, oxyen and clothes.

2. Plants need protein for production of enzymes and to produce compounds that build their immunity. It is also needed for nutritional needs fo seedlings.

STEM Project– Attempt bothe the questions yourself. Learn about greenhouse effect.

Image based questions

1. Glucouse +Oxygen

2. Carbon dioxide +water

3. Aerobic respiration

4. 38 ATP

B.

1. Anaerobic respiratio

1. Ballon infales because of production of carbon dioxide gas

Experiential learning question

1. During the autumn (or fall) season in certain parts of the world photosynthesis no longer takes place. When this happens the leaves begin to change colours. The leaves turn yellow, orange or even red. As the temperature falls in the leaves of trees, (other than evergreens trees) they stop making the chlorophyll. The chlorophyll begins to vanish and the leaves begin to change colours.

2. (a) Leaves lack chlorophyll

Our Culture

THIS IS A STUDENT APPROPRIATE ANSWER.

CHAPTER 5

MCQs

1. In the human body, urea is produced in the–

Ans. (b) Liver

2. Excretion by the skin has the following effects–

Ans. (d) Both (a) and (b)

3. What is produced in the liver and stored in the gallbladder?

Ans. (c) Bile

4. The excretory products of lungs are–

Ans. (b) Water and carbon dioxide

5. The main nitrogenous waste in the body is–

Ans. (a) Urea

6. The urethra controls elimination of urine by means of–

Ans. (d) Sphincter muscles

7. In humans the right kidney is placed slightly lower to make space for–

Ans. (d) Liver

8. A precautionary measures for prevention of kidney stone formation is–

Ans. (b) Drinking optimum quantity of water.

9. Which of the following statements is correct?

Ans. (c) Fat soluble vitamins are stored with the fat tissue.

10. Which of the following statement is true for osmoregulation?

Ans. (b) Maintenance of an internal balance between water and dissolved materials in the body.

Fill in the blanks:

1. Carbon dioxide is formed in the body by **cellular respiration**.
2. The filtering unit of kidney is called **nephron**.
3. The position of the right kidney is slightly **lower**.
4. Urine is stored temporarily in the **bladder**.
5. Urea is produced from **amino acids** in the **liver**.

Select the odd one from the following groups:

1. limbs

2. roughage

3. skin

4. Aorta

Match the two columns:

(a) Renal artery -	ii. Brings blood to the kidney
(b) Micturition -	iv. Expulsion of urine out of the body
(c) Kidney failure -	v. Dialysis
(d) Renal vein -	vii. Takes blood away from the kidney
(e) Urethra -	i. Sphincter muscles

State True or False and correct the false statements

1. The filtration in kidneys is done by Nephrons. **False**

2. Proteins are usually not filtered because of their being large molecules. **False**

3. Urine does not contain any blood cells. **True**

4. The outer dark part of the kidney is called cortex. **True**

5. Ureters are apair of narrow tubes. **False**

Short answer type questions

1. What is the difference in function of ureter and urethra?

Ans. The ureter functions to transport urine from the kidneys to the urinary bladder, whereas the urethra functions to expel urine from the urinary bladder out of the body

2. What are glands on the skin that do excretion?

– The sweat glands in the skin filter water, urea and salts from the blood. These substances come up on the surface of the skin in the form of sweat and are removed. Drying of seat also regulates our body temperature. The sebaceous glands present on the skin, eliminate certain substances like chemicals and waxes through sebum. This secretion provides a protective oily covering for the skin.

3. Where can we find Bowmen's capsule?

Ans. Bowman's capsule, also known as the renal corpuscle, is located in the kidney's nephron. Each nephron starts as cup called **Bowman's capsule** and elongates as along tubule ending in a **collecting duct**.

4. How is bile pigment produced in the liver?

In the liver iron compounds and bile are produced by the breakdown of haemoglobin of the RBC. The iron is reused and the bile is stored in the gallbladder.

5. Which metabolic wastes are excreted by the skin?

Ans. The metabolic wastes excreted by the skin primarily include urea, and salts . These are secreted by thesweat glands. The sebaceous glands present on the skin, eliminate certain chemicals and waxes through sebum. This secretion provides a protective oily covering for the skin.

6. What happens to the excess amino acid in the liver?

Excess amino acids that enter the liver is broken down into amino group which is converted to less toxic urea and passed to kidney.

7. What is the importance of reabsorption of substances in nephrons?

Ans. Reabsorption in nephrons ensures that essential substances such as water, glucose, salts, and amino acids are retained in the body, maintaining the body's internal balance and preventing their loss through urine.

8. In urinary tract infection, where does the infection happen?

UTI, is an infection in any part of the urinary system; the kidneys, ureters, bladder or urethra. Most infections involve the lower urinary tract — the bladder and the urethra. When the infection reaches the kidney it becomes very serious.

The most common causative bacteria is *E.coli.* Other bacteria include *Pseudomonas sp., Staphylococcus aureus etc.*

9. What is the location of kidney in the human anatomy?

The kidneys are bean-shaped reddish brown organs, located towards the back of the abdominal cavity. They are situated below the diaphragm, one on either side of the spine, below the rib cage. The right kidney is approximately one cm lower than the left to make space for the liver.

In an adult each kidney is approximately 3 cm thick, 6 cm wide, and 12 cm long.

10. Which materials are reabsorbed in the kidney?

Ans. In the kidney, essential materials such as water, glucose, salts (sodium, potassium, chloride), amino acids, and other nutrients are reabsorbed from the filtrate back into the bloodstream, ensuring their retention within the body.

Long answer type questions

1. How are the lungs and the skin, different in their excretory functions?

Ans. Both the lungs and the skin play roles in excretion, but they differ in their mechanisms and the substances they eliminate. Lungs primarily excrete carbon dioxide, a waste product of cellular respiration, during exhalation. Conversely, the skin excretes metabolic waste products such as urea, and other salts through sweat glands. Sweat also helps regulate body temperature by evaporative cooling. Unlike the lungs, which primarily excrete gases, the skin excretes water and solutes dissolved in it, aiding in the removal of excess salts.

2. What is the role of liver in excretion?

Ans. The liver plays a vital role in the excretory system by processing and eliminating waste products from the body. **-** In the liver iron compounds and bile are produced by the breakdown of haemoglobin of the RBC. The iron is reused and the bile is stored in the gallbladder. The bile is secreted in the intestine.

Excess amino acids that enter the liver is broken down into amino group which is converted to less toxic urea and passed to kidney.

The liver removes other harmful substances, such as bacteria, certain drugs, cholesterol etc. from the blood. In the liver, these substances are changed into

inactive or less toxic forms. Thus, the liver detoxifies, the blood abd keeps us healthy.

3. What are the parts of human urinary system?

Ans. The human urinary system consists of several interconnected organs that work together to remove waste products from the body and maintain fluid balance. The main components of the urinary system include the kidneys, ureters, urinary bladder, and urethra.

1. **Kidneys**: The kidneys are bean-shaped organs located on either side of the spine, just below the rib cage.
2. **Ureters**: These are narrow tubes that connect the kidneys to the urinary bladder. They transport urine from the kidneys to the bladder using peristaltic contractions of smooth muscle in their walls.
3. **Urinary Bladder**: The bladder is a hollow, muscular organ located in the pelvis. It stores urine until it is expelled from the urethra.
4. **Urethra**: It is a muscular tube originating from the lower part of the urinary bladder. It opens on the outside**.** This tube is longer in males and shorter in females. The sphincter muscles present in the urethra control the flow of urine. The expulsion of urine is controlled by Central nervous system (CNS) and the process is called **micturition** or urination

4. Where are the metabolic wastes produced in the body?

Ans. Metabolic wastes are produced as byproducts of various physiological processes that occur in the body's cells. These processes include cellular respiration, digestion, and metabolism of proteins, fats, and carbohydrates. The routine metabolic wastes include nitrogenous wastes like urea, carbon dioxide, water and salts of sodium, potassium etc. These substances have no use in our body and become harmful if they are allowed to accumulate. Hence they have to be removed out of our body.

5. How is urine formed in the kidney?

Ans. Urine formation in the kidney involves a complex process of filtration, reabsorption, and secretion within the nephrons, the functional units of the kidney. The renal artery enters the kidney on the concave side. It brings in blood that is full of metabolic wastes. The blood also contains many useful substances such as amino acids, glucose, water and useful salts. The renal artery branches into smaller blood vessels so that the blood reaches the microscopic filtering units the nephrons.

Glomerulus is a tuft of blood capillaries nestled inside a cup like sac **Bowman's capsule** that is one end of a nephron. Blood that is about to be filtered enters the glomerulus. The nephrons are surrounded by blood capillaries.

Urine formation happens in three, steps : glomerular filtration, reabsorption and secretion, happening in different parts of the nephron.

1.The first step is the filtration of blood, carried out by the glomerulus and is called glomerular filtration. About 1100-1200 ml of blood is filtered by the kidneys every minute which is 20% of the blood pumped by each ventricle of the heart in one minute.

2.Bowman's capsule. Here almost all the constituents of the plasma except the proteins are filtered. Almost 99% of the filtrate is reabsorbed by the renal tubules. This process is called **reabsorption**. The tubular epithelial cells in different segments of nephron perform this.

3.The long collecting duct extends from the cortex of the kidney to the medulla. Large amounts of water is reabsorbed from this region. The leftover filtrate containing wastes such as urea, minerals and water forms the straw colored urine. The urine is collected at the renal pelvis and it is carried to the urinary bladder by the ureters.

The blood that leaves the kidney through the renal veins is devoid of metabolic wastes. It contains the right percentage of water along with useful nutritional ingredients.

6. Differentiate between metabolic products and excretory products.

Defecation, is the removal of waste products from the digestive tract. It includes unabsorbed and undigested food in the form of faeces. Since these materials never entered the body cells, they are not metabolic wastes. Plants

do not accumulate waste products as they do not have a digestive system but they do have metabolic wastes.

Certain products are metabolic wastes of the body. These include substances such as carbon dioxide, urea etc. These waste products are excreted through nose, skin and kidney. Waste products accumulate both in plants and animals before excretion.

Excretory products are undigested waste products from the body. These include undigested food, roughage etc. The excretion usually happens as faeces. Excretory products accumulate only in case of animals.

7. What role do the kidneys play in osmoregulation?

Ans. The kidneys play a crucial role in osmoregulation, which involves regulating the balance of water and salts in the body. This process is vital for maintaining a stable internal environment, allowing the body's cells to function properly. The kidneys achieve this by filtering the blood to remove waste products and excess substances, including water and electrolytes, thus ensuring that the right balance of these substances is maintained.

The kidneys perform several key functions in osmoregulation:

1. **Filtration:** Blood is filtered through the nephrons in the kidneys, removing waste and excess substances, including salts and water.
2. **Reabsorption and Secretion:** The kidneys selectively reabsorb water and essential ions back into the bloodstream while secreting unwanted substances and excess ions into the urine. This selective reabsorption and secretion help maintain the correct balance of electrolytes and water in the body.

8. What are the substances in the human body that need to be excreted?

The key substances that need to be excreted from the human body include:

Carbon dioxide – It is formed by cellular respiration and expelled in gaseous form.

Water – It is formed by cellular respiration. We also drink large quantities of water, the excess water has to be excreted. Water also helps in the dilution and removal of nitrogenous waste from the body.

Nitrogenous compounds – The main nitrogenous wastes produced in the human body are urea and ammonium (NH_4) ions. These are produced by the breakdown of extra protein in the liver. They are quite harmful if they accumulate in the body.

Salts – Salts of sodium and potassium are needed only in small quantities and the excess build up during metabolism have to be removed.

Bile pigments – These are formed in the liver by the breakdown of destroyed red blood cells (RBC).

Supplements and medicines – Extra amounts of water soluble vitamins such as B-vitamins and many medicines are excreted as they have no further use in the body.

9. How are kidney stones formed?

    1. Kidney stones form when there is constantly high concentration of mineral content in the blood. Consequently the urine contains large amounts of crystal-forming substances — such as calcium, oxalate and uric acid.

    The formation of kidney stones can be influenced by several factors:

Kidney stones can be of different types:

(a) Calcium stones - Most kidney stones are calcium stones, in the form of calcium oxalate. Oxalate is a substance made by liver or absorbed from the diet. Taking large amounts of certain fruits and vegetables, as well as nuts and chocolate, having high oxalate content can lead to stone formation.

(b) Struvite stones - Struvite stones form in response to a urinary tract infection. These stones can grow quickly and become quite large, sometimes with few symptoms or little warning.

(c) Uric acid stones - Uric acid stones form in people who lose too much fluid because of chronic diarrhoea or those who eat a high-protein diet, and those with diabetes or metabolic syndrome. Certain genetic factors also may increase your risk of uric acid stones.

10. What harm can happen if the kidneys stops functioning?

Ans. If the kidneys stop functioning properly, several harmful effects can occur, impacting the body's ability to maintain homeostasis:

1. **Accumulation of Waste:** The primary function of the kidneys is to filter and remove waste products and excess fluids from the blood. If the kidneys fail, waste products like urea accumulate in the body, leading to toxic conditions.
2. **Fluid Imbalance:** Kidneys help regulate the body's fluid balance. Kidney failure can lead to fluid overload, causing swelling in the extremities and organs, and potentially leading to hypertension (high blood pressure) and pulmonary edema (fluid in the lungs).
3. **Electrolyte Imbalance:** The kidneys play a crucial role in balancing electrolytes, such as potassium, sodium, and calcium. Kidney failure can cause imbalances, leading to serious conditions like hyperkalemia (high potassium levels), which can affect heart function.
4. **Experiential learning questions**
5. **1. (a)**
6. **2.**The urinary system is a part of the excretory system. The urinary system controls the balance of water and chemicals in the body for it to function properly. The system works with the lungs, kidneys, and the intestines. The urinary system produces, stores, and eliminates urine, which is the fluid released by the kidneys.
7. **Application based Questions**
8. 1. It is true that people can live on one kidney and lead a fairly normal life. (Also research for your answer)
9. 2. We cannot live with metabolic wastes because they become toxic to the body tissues and garm the functioning of vital organs.

Multi-disciplinary Questions:
Kidney is a vital organ for us. It needs to function nornally throughout our lives. WE can take care of our kidneys by drinking clean water. Eat simple cooked food and avoid preservative laden packed food as much as possible. (Do your research to find more on the topic).

Image based questions

1. Kidneys are located towards the back of the abdominal cavity. They are situated below the diaphragm, one on either side of the spine, below the

rib cage. The right kidney is approximately one cm lower than the left to make space for the liver.

2. (a) Water urea and other salts
   (b) Carbon dioxide and water vapour
   (c) Bile salts
   (d) Urea and excess water

3. 1. Renal arteries-The renal artery enters the kidney on the concave side. It brings in blood that is full of metabolic wastes.
   2. Ureter -It carries the urine from the kidneys to Urinary bladder.

   3. Urinary bladder- is a muscular bag, placed at in the lower abdomen. It stores the urine for some time which is released later through the urethra.

4. **Urethra –**It is a muscular tube originating from the lower part of the urinary bladder. It opens on the outside**.** The sphincter muscles present in the urethra control the flow of urine.

CHAPTER 6

MCQs

1. Formation of synapse happens–

Ans. (c) Between dendrites and axon terminals

2. Medulla oblongata extends downwards into–

Ans. (a) Spinal cord.

3. Sensory neurons –

Ans. (b) Receive sensory inputs that can be physical or chemical.

4. The Central Nervous System (CNS) is made of–

Ans. (b) Spinal cord and brain.

5. From where do the spinal nerves originate?

Ans. (c) From the 31 segments of the spinal cord.

6. The membranous covering of the brain is /are called–

Ans. (a) Meninges.

7. Which of the following statements describes the cerebrum correctly?

Ans. (d) It is divided into left and right hemisphere by a longitudinal fissure.

8. The transmission of message between neurons in the synapses happens with the help of–

Ans. (b) Neurotransmitters.

9. Which of the following is not a part of a neuron?

Ans. (d) Pons.

10. The Peripheral Nervous System–

Ans. (b) Connects all the parts of the body with the CNS.

Fill in the blanks:

1. Beating of the heart is controlled by **the autonomic nervous system**.
2. Body posture is maintained by **the cerebellum**.
3. Grey matter is found in **the brain and spinal cord**.
4. Axons in neurons are covered with **myelin sheath**.
5. Humans are intelligent because of well developed **cerebrum**.

Select the odd one from the following groups:

1. **cyton**
2. **vertebra**
3. **pons**
4. **mixed action**

Match the terms with their descriptions correctly:

(a) Cerebrum - iii. The largest part of the human brain

(b) Meninges - vi. Protects the brain

(c) Cerebellum - i. Coordinates muscle movement

(d) Medulla Oblongata - vii. Connects the brain with the spinal cord

(e) Synapse - ii. Junction of two neurons

State True or False and correct the false statements.

1. Respiration by the lungs is controlled by Medulla oblongata. **False**

2. Reflex action is an involutary action and does not require thought. **False**

3. Meninges protect the brain. **True**

4. An example of involuntary action is the heartbeat. **False**

5. The pons join the hemispheres of the cerebellum. **False**

Short answer type questions

1. In a 'fight or flight' situation the adrenaline glands secrete a hormone. How does it help?

Ans. In a 'fight or flight' situation, the adrenal glands secrete adrenaline, a hormone that prepares the body to respond by increasing heart rate, elevating blood pressure, boosting energy supplies, and enhancing alertness. These physiological changes enable an immediate physical response to danger or stress.

2. What are the main receptors in our sense organs?

Ans. The main receptors in our sense organs are we have taste (gustatory) receptors in our taste buds on the tongue, we have vision receptors (photoreceptors) as rods and cones on the retina of the eye, and we have smell (olfactory) receptors in our nose and so on.

3. Name the three main parts of the human brain.

Ans. The three main parts of the human brain are the cerebrum, which is responsible for higher brain functions; the cerebellum, which coordinates movement and balance; and the Medulla oblongata, which controls basic life functions.

4. What is the role of glia cells in the nervous system?

Ans. Glia cells support and protect the neurons in the nervous system. They provide nourishment, remove waste, and insulate nerve fibers to enhance signal transmission.

5. What is the significance of myelin sheath?

Ans. The myelin sheath insulates and protects the nerve fibers, speeding up the transmission of electrical impulses along the axon, and ensures efficient communication between neurons in the nervous system.

6. What is cerebrum?

Cerebrum is the largest part of the brain. It accounts for about 85% of the brain's weight.

It has a characteristic deeply wrinkled outer surface . The cerebrum is the seat of intelligence and controls functions such as : memory, reasoning, planning and the voluntary actions.

The cerebrum is divided by a longitudinal fissure into left hemisphere (LH) and right hemisphere (RH) . These two hemispheres are connected by a thick band of nerve fibres called the corpus callosum.

7. Where would you find cerebrospinal fluid?

Ans. Cerebrospinal fluid (CSF) is a clear, colorless body fluid found within the tissue that surrounds the brain and spinal cord of all vertebrates.

8. What role does cerebrum have in a reflex action?

Ans. In a reflex action, the cerebrum does not play a direct role. Instead, the reflex arc bypasses the cerebrum, involving the spinal cord and lower brain centers, allowing for a quick and automatic response to stimuli.

9. Why injury to the medulla oblongata can be fatal?

Ans. Injury to the medulla oblongata can be fatal because it controls vital functions such as heartbeat, breathing, and blood pressure regulation. Damage

to this region can disrupt these essential bodily functions, leading to immediate or eventual cessation of life.

10. What is blood brain barrier?

Ans. The blood-brain barrier is a specialized barrier formed by the tightly packed cells of capillary walls in the brain. It regulates the passage of substances from the bloodstream into the brain tissue, protecting the brain from harmful agents while allowing essential nutrients and molecules to enter.

Long answer type questions

1. How can we say that the brain is very well protected?

The human brain is encased in a bony structure the skull (or the **cranium**), and three tough membranes called m**eninges**. The spaces between the meninges are filled with **cerebrospinal fluid** that acts as a cushion for the brain .

In addition there is a **blood-brain barrier.**

This barrier is made up of tightly bound cells that function as a semi-permeable entrance. It keeps the brain (and the spinal cord) safe from pathogens, toxins and harmful substances that may be present in the blood. It however, allows entry to oxygen and vital nutrients. The blood-spinal cord barrier (BSCB) is the functional equivalent of the blood-brain barrier in the spinal cord.

2. What are the main functions of neurons?

Ans. neurons are highlighted as the fundamental units of the nervous system, responsible for transmitting signals and facilitating communication between different parts of the body. The main functions of neurons can be categorized into sensory, motor, and interneuron functions.

Sensory neurons, also known as afferent neurons, transmit signals from sensory organs or receptors to the central nervous system (CNS). These neurons enable the perception of external stimuli such as touch, smell, taste, sight, and sound.

Motor neurons, or efferent neurons, convey signals from the CNS to muscles, glands, and other effector organs. They facilitate voluntary movements,

involuntary reflexes, and glandular secretion, thus allowing the body to respond to stimuli.

Interneurons, found exclusively in the CNS, serve as connectors and integrators within neural circuits. They process and interpret incoming sensory information, relay signals between sensory and motor neurons, and facilitate complex cognitive functions such as memory, learning, and decision-making.

Overall, neurons play crucial roles in transmitting sensory information, coordinating motor responses, and integrating neural signals for higher cognitive functions.

3. What are the three types of nerves? Give example of each.

1. Ans. Sensory nerves, also known as afferent nerves, transmit sensory information from sensory organs or receptors to the central nervous system (CNS). An example of a sensory nerve is the optic nerve, which carries visual information from the eyes to the brain, enabling the perception of sight.
2. Motor nerves, or efferent nerves, convey signals from the central nervous system (CNS) to muscles, glands, and other effector organs, facilitating voluntary movements and involuntary responses. An example of a motor nerve is the sciatic nerve, which controls muscle movement in the lower limbs and enables activities such as walking and running.
3. Mixed nerves contain both sensory and motor fibers, allowing them to transmit signals in both directions—between the CNS and peripheral tissues. An example of a mixed nerve is the trigeminal nerve, which carries sensory information from the face to the brain and controls the movement of muscles involved in chewing.

4. What are grey matter and white matter?

Ans. Grey matter and white matter are two distinct types of nervous tissue found in the brain and spinal cord.

1. Grey matter consists primarily of cell bodies of neurons, along with dendrites, unmyelinated axons, and glial cells. It appears greyish in color due to the lack of myelin, and it is responsible for processing and integrating neural signals. Grey matter is densely packed in the outer regions of the brain (cerebral cortex) and in clusters called nuclei within the brain and spinal cord.

2. White matter consists mainly of myelinated axons, which are surrounded by fatty myelin sheaths produced by specialized glial cells called oligodendrocytes in the central nervous system. The myelin sheath gives white matter its whitish appearance. White matter serves as a conduit for transmitting signals between different regions of the brain, as well as between the brain and spinal cord. It facilitates rapid transmission of neural impulses over long distances.

Together, grey matter and white matter form the intricate neural networks that enable various sensory, motor, and cognitive functions. Their distinct structures and functions are essential for the proper functioning of the nervous system

5. Describe the structure of a nerve with a rough sketch.

Ans. Nerves are composed of bundles of nerve fibers (axons) enclosed within connective tissue sheaths. The structure of a nerve can be described as follows:

A neuron cell is made up of two main parts.

(i) An elongated cell body called cyton. It contains cytoplasm, a nucleus and many elongated hair like extension called dendrites. The dendrites are receive signals from axon terminals of other nerve cells.

Dendrites are cytoplasmic extensions that contain the important cell organelles. These are the impulse receiving part of the neuron. It receive synaptic inputs from axons of other neurons also.

(ii) Axon – It is the thin elongated structure extending up to a metre from the cyton. It is the conducting unit of a neuron. It conducts nerve impulse away from the cell body. The axon is covered by a protective, fatty, insulating layer called myelin sheath. An individual nerve cell may be up to a metre long. Many nerve fibres bound by connective tissue make up a nerve.

The end away from cyton (distal end) is branched as axon terminals that forms a connection with the dendrite of the next neuron by forming a synapse.

6. Why neurons are considered as functional units of the nervous system?

Ans. Neurons are regarded as the functional units of the nervous system due to several key reasons:

(a) They are the fundamental units of the brain and the nervous system. Glia cells have supportive function.

(b) Neurons are capable of converting various forms of stimuli into electrical impulses. They can receive, conduct and transmit information in the form of electrochemical signals.

(c) Neurons collect information from sense organs or from the adjacent neurons, carry the information to the central nervous system (brain and spinal cord), and bring motor information from the central nervous system to the motor organs (muscles and glands) for taking action.

(d) When the impulse is to be conducted to far end of the body, a number of neurons participate in the process. One neuron accurately relays the information to the next neuron. The axon tip of a preceding neuron makes a synaptic connection with dendrites of the next neuron.

7. What is 'reflex action'?

Ans. A reflex action is an involuntary and automatic response to a stimulus, occurring rapidly without conscious thought or decision-making. Reflex actions serve to protect the body from harm, maintain homeostasis, and facilitate quick responses to potential threats in the environment.

The process of a reflex action involves a specific neural pathway called the reflex arc, which bypasses the brain's conscious processing centers and allows for a rapid response. It typically includes five components:

1. **Receptor:** The sensory organ or receptor detects the stimulus, such as pain, heat, or pressure.
2. **Sensory Neuron:** The sensory neuron transmits the sensory information from the receptor to the central nervous system (CNS), usually via the spinal cord.
3. **Interneuron (optional):** In some reflex arcs, an interneuron within the CNS may relay the signal to motor neurons.
4. **Motor Neuron:** The motor neuron carries the response signal from the CNS to the effector organ, such as a muscle or gland.

5. **Effector Organ:** The effector organ executes the response, which could be a muscle contraction, glandular secretion, or other physiological change, producing the reflex action.

Common examples of reflex actions include the knee-jerk reflex, withdrawal reflex, and pupillary reflex. Reflex actions are crucial for survival and are often protective in nature, as they allow organisms to respond rapidly to potentially harmful stimuli.

8. Describe the structure and function of cerebellum.

Cerebellum - It is the second-largest part of the brain. It is located under the back of the cerebrum. The cerebellum has two hemispheres that are joined by **pons**.

Cerebellum plays an important role in coordinating muscular movement, posture, and balance of the body. Cerebellum is quickly affected by alcohol that is why an intoxicated person finds it difficult to maintain body balance.

9. What is voluntary and involuntary action?

Voluntary action: When the action is produced after a thought it is called voluntary action. For example walking, eating, jumping, reading etc. These actions are produced consciously.

Involuntary action: There are many actions which take place without c our thought, these are called involuntary actions. For example digestion, heartbeat, etc. are involuntary actions.

10. What are the major parts of human brain? Explain briefly.

Ans. The human brain comprises several major parts, each with distinct functions:

1. **Cerebrum:** The largest part of the brain, divided into two hemispheres (left and right). The cerebrum is responsible for higher cognitive functions such as thinking, memory, perception, and voluntary movement. The cerebrum is divided by a longitudinal fissure into left hemisphere (LH) and right hemisphere (RH) . These two hemispheres are connected by a thick band of nerve fibres called the corpus callosum

ensuring smooth transfer of information. The outer part of the cerebrum is called **cortex** and the inner part is called **medulla.**

2. **Cerebellum:** Located beneath the cerebrum, the cerebellum is involved in coordinating and regulating voluntary movements, balance, and posture. The cerebellum has two hemispheres that are joined by **pons**.

   Cerebellum plays an important role in coordinating muscular movement, posture, and balance of the body. Cerebellum is quickly affected by alcohol that is why an intoxicated person finds it difficult to maintain body balance.

3. **Medulla oblongata –** It is the lowest part of the brain. It controls the involuntary primary life functions such as breathing, heart rate, digestion etc. that is why any injury to the medulla, can be fatal. Medulla oblongata continues further down into the spinal cord. It connects the cerebrum and cerebellum to the spinal cord

Experiential learning questions

1.(b)

2 The cerebrum allows a person to think and control voluntary muscles. Thus it also helps in playing games.

Application based Questions

(Answer yourself)

Multi-disciplinary Questions:

(Answer yourself)

STEM Project-

(Answer yourself)

Values and Lifeskills

(Hint-If you pay full attention to your friend on the phone and stop driving)

Image based Questions

1. Cerebrum

a) Grey matter b) White matter

2. (a) dendrite b) Axon c)Myelin sheath d)Axon terminal

3. It protects the nerve

4. Itconnects to the dendrites of the next nerve.

Our culture

(Answer yourself)

CHAPTER 7

MCQs

1. Allergies that occur throughout the year is called–

Ans. (b) Perennial allergy

2. Which of the following is not an allergic condition?

Ans. (b) Scabies

3. A common symptom of skin allergy is–

Ans. (d) Hives

4. The best precaution against milk allergy is–

Ans. (c) Avoid milk and milk products

5. A substance that can make us sensitive to sunlight is–

Ans. (a) Tetracycline

Fill in the blanks

1. An example of seasonal allergy is **hay fever**.
2. A delayed type allergy can be caused by **nickel in jewellery**.
3. A cause of pet allergy is **pet dander**.
4. A chemical that causes allergy is **histamine**.
5. The purpose of the immune system is **to defend the body against harmful pathogens and foreign substances**.

Match the two columns

(a) Dust allergy -	ii. Runny nose, red eyes
(b) Food allergy -	iv. Vomiting, vi. Peanuts
(c) Allergy in rainy season -	i. Mould allergy
(d) Life-threatening allergies -	v. Anaphylaxis
(e) Hay fever -	ii. Runny nose, red eyes

State True or False and correct the false statements

1. Allergies are caused by histamines. **False**
2. Seasonal allergy can be caused by pollen grains. **False**
3. Pollen grains cause seasonal allergy. **True**
4. Food allergens are usually proteins. **True**
5. Washable stuffed toys are less likely to cause allergy. **False**

Short answer type questions

1. What do you understand from the term allergy?

Ans. An allergy is explained as an abnormal immune response to a harmless substance known as an allergen. When individuals with allergies encounter allergens, their immune system reacts excessively, leading to symptoms such as sneezing, itching, swelling, or difficulty breathing. Managing allergies involves identifying triggers and avoiding allergen exposure.

2. What are allergens?

Ans. Allergens are described as harmless substances that trigger allergic reactions in sensitive individuals. Common allergens include pollen, dust mites, pet dander, certain foods, insect venom, and medications. These substances can elicit an abnormal immune response, leading to symptoms such as sneezing, itching, or swelling.

3. Name two food items that cause allergy in many people.

Ans. Two common food items known to cause allergies in many people are peanuts and shellfish. These foods contain allergenic proteins that can trigger allergic reactions ranging from mild itching or hives to severe anaphylaxis in sensitive individuals.

4. How can we avoid Sun allergy?

Ans. Avoiding sun allergy involves taking precautions such as wearing protective clothing, using sunscreen with a high SPF, seeking shade during peak sunlight hours, and wearing sunglasses to protect the eyes. Additionally, staying hydrated and avoiding prolonged exposure to the sun can help prevent sun allergy symptoms like rashes or sunburns.

5. What is perennial allergy?

Ans. Perennial allergy refers to allergic reactions that occur year-round, regardless of the season. Perennial allergies are often caused by indoor allergens such as dust mites, pet dander, mold, or certain foods. These allergens persist throughout the year, leading to ongoing allergic symptoms in sensitive individuals.

Long answer type questions

1. Name the three routes through which allergens enter our body. Give examples of each.

Ans. Allergens can enter our body through three main routes:

1. **Inhalation:** Allergens can be inhaled through the respiratory system, leading to respiratory allergies such as hay fever or asthma. Common examples include pollen from trees, grasses, or weeds; dust mites found

in bedding or upholstered furniture; and pet dander from cats, dogs, or other animals.

2. **Ingestion:** Allergens can be ingested through the digestive system by consuming certain foods or beverages. Food allergies can result from the ingestion of allergenic proteins found in foods such as peanuts, tree nuts, shellfish, eggs, milk, soy, wheat, or fish. Ingesting medications or food additives can also trigger allergic reactions in sensitive individuals.
3. **Contact:** Allergens can enter the body through direct contact with the skin or mucous membranes, leading to contact dermatitis or localized allergic reactions. Examples include allergens such as latex found in gloves or certain medical products, metals like nickel in jewelry or clothing accessories, and plant substances like poison ivy or poison oak.

2. What are the examples of seasonal allergies?

Seasonal allergies typically occur with weather changes that lead to changes in the environment with growth of plants, moulds, or increased pollen content in the air. The symptoms of seasonal allergy come and go with the season.

(a) Hay fever – It occurs only during certain times of the year—particularly the spring, summer, or autumn depending on the allergen a person is sensitive to. It mainly affects lining of the nose leading to allergic rhinitis or the white of the eyes causing allergic conjunctivitis.

(b) Some people suffer from asthma in a particular season, usually winter. This may be because cold air is dry and can irritate the airways. It also leads to production of more mucous in the bronchi making the asthma worse. In such cases wrapping a lightweight scarf loosely around the nose and mouth when going out can be helpful.

(c) In the rainy season with the rise in humidity moulds grow all around us. The spores of moulds also cause allergic reaction in many people. It may be noted that when it is damp mould –spore count is usually high at night.

3. How wearing a mask is a good precaution against allergy?

Ans. Wearing a mask can serve as a good precaution against allergies, particularly those triggered by airborne allergens. Masks act as a physical barrier that can help prevent allergens from entering the respiratory system,

thus reducing the risk of allergic reactions. Here's how wearing a mask can be beneficial:

1. **Filtering Airborne Allergens:** Masks, especially those designed to filter particles like pollen or dust, can trap allergens before they are inhaled, preventing them from reaching the respiratory passages and triggering allergic symptoms.
2. **Reducing Exposure:** Masks can limit exposure to outdoor allergens such as pollen or mold spores, especially during peak allergy seasons. By covering the nose and mouth, masks help reduce the inhalation of allergens present in the air, thereby decreasing the likelihood of allergic reactions.
3. **Preventing Irritants:** Masks can also help protect against irritants like smoke, pollution, or strong odors, which can exacerbate existing allergies or trigger allergic reactions in sensitive individuals.

4. How can we prevent allergic reactions from dust mites?

Ans. Several preventive measures can help prevent allergic reactions caused by dust mites:

(a) Avoiding exposure to dust mites is the best strategy for controlling dust mite allergy.Avoid carpets on the floor or vacuum clean the carpets regularly.

(b) Keep your mattress and pillows in dustproof or allergen-blocking covers. These covers are made of tightly woven fabric. Wash the sheets regularly in warm water.

(c) Avoid humid environment inside the house by keeping the windows open during the day. Reduce clutter at home as it can trap moisture and dust.

(d) Have washable stuffed toys and use damp clothes to clean dust, thus preventing it to become airborne

5. What precautions an asthmatic should take to avoid an asthma attack?

Ans. Asthmatics can take several precautions to avoid asthma attacks and manage their condition effectively:

(a) We know that asthma is an allergic reaction to dust, pollen or even stress. Identification and avoidance of the allergens can be very helpful.

(b) In asthma the bronchioles constrict because of excessive mucous secretion or inflammation making breathing difficult, this often leads to wheezing. The constriction of bronchiole can be prevented or reduced by medication

(c) Some people suffer from asthma in a particular season, usually winter. This may be because cold air is dry and can irritate the airways. It also leads to production of more mucous in the bronchi making the asthma worse. In such cases wrapping a lightweight scarf loosely around the nose and mouth when going out can be helpful.

Experiential learning question

1. (b)
2. The more intense and repetitive the exposure to an allergen and the earlier in life it occurs, the more likely it is that an allergy will develop.

Application based Questions

1. Loss of consciousness, drop in blood pressure, shortness of breath, skin rash

Light-headedness. A rapid, weak pulse, nausea and vomiting. Anaphylaxis can lead to a shock. (*Shock is a critical condition in which there is a sudden drop in blood flow through the body so the tissues of the brain and heart don't get enough oxygen)*

2.

If someone knows about the allergy tell about it to your friends, relatives and teachers at the school. Tell them about the medication that you use and what to do if there is an emergency such as an anaphylactic reaction.

One should avoid an identified allergen in all situations.

Multi-disciplinary Questions:

1. We can avoid an allergic reaction by preventing the contact with the allergen.

Food allergies can be avoided by knowing the allergen and then avoiding it.

While buying packaged food on should carefully read the food labels to see if there is an allergen in the composition.

While eating in a restaurant one should specifically ask if a particular ingredient such as egg, spices, cheese or any food ingredient that may be an allergen, is present in the preparation.

2. If you know about your allergy tell about it to your friends, relatives and teachers at the school. Tell them about the medication that you use and what to do if there is an emergency such as an anaphylactic reaction.

3. Avoiding exposure to dust mites is the best strategy for controlling dust mite allergy.

Avoid carpets on the floor or vacuum clean the carpets regularly.

STEM Project-

(Do it your self)

VALUE AND LIFE SKILLS

It is true that some cleaning products can cause severe allergy. Make your own report about over use of chemicals at home.

Image based Questions

1.Other symptoms of hay fever are -

Sneezing, itching of the nose, eyes or roof of the mouth. Runny, stuffy nose watery, red and swollen eyes.

2.They can cause food allergy