



**ICSE**

# 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-6**

# **ANSWER KEY**

# Chapter-1 Plant Life: The Leaf

## Exercise Corner

### MCQs

1. (b) stem
2. (b) petiole
3. (c) veins and veinlets
4. (b) Positively hydrotropic
5. (c) oxygen
6. (c) Bladderwort
7. (d) rachis
8. (b) Only one leaf arises from a node and the next leaf grows from the successive node in the opposite direction.
9. (c) Plants also breathe in oxygen like other living things
10. (b) Some plants grow by vegetative reproduction by their leaves.

### Match the following:

#### Column A

(a) Roots

(b) Shoot

(c) Transpiration

(d) Parallel venation

(e) Reticulate venation

#### Column B

(iii) Negatively phototropic

(iv) Negatively geotropic

(i) Process by which leaves lose water

(ii) Grass

(v) Mango

### State True or False for the following statements and correct the wrong statements.

1. False. Fruits are typically found on the shoot system of plants, not the root system.
2. True
3. False. Fibrous roots are characterized by having many thin, branching roots, not one main thick root.
4. False. The venation in sugarcane is parallel type.
5. True

6. False. The apex is the tip of the leaf, not the part that conducts water. The veins of a leaf are responsible for transporting water and nutrients throughout the plant.
7. True.
8. False. In whorled arrangement of leaves, more than one leaf grows from a node, usually in a circular pattern.
9. True. The axil of leaflets, where the leaflet attaches to the rachis, can have buds.
10. True

**Fill in the blanks:**

1. absorption
2. transpiration
3. venation
4. lamina
5. positively geotropic
6. no petiole
7. undivided
8. leaves
9. node
10. parallel

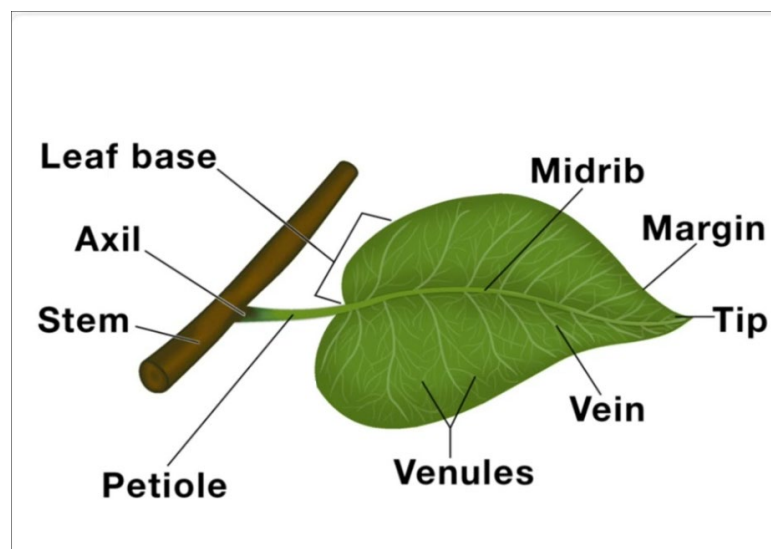
**Short answer type questions**

1. A simple leaf is a leaf that is undivided, consisting of a single, continuous blade. It is not divided into smaller leaflets.
2. An axillary bud is a small bud that develops in the axil of a leaf, which is the angle where the leaf petiole joins the stem. Axillary buds can develop into new branches, leaves, or flowers.
3. Transpiration is the process by which plants lose water through stomata, which are small openings on the surface of leaves. Transpiration helps to cool plants and to transport water and nutrients throughout the plant.
4. A rachis is the central stalk of a compound leaf. The leaflets of a compound leaf are attached to the rachis.
5. Plants are called autotrophs because they can produce their own food from sunlight, water, and carbon dioxide. This process is called photosynthesis. Autotrophs are the primary producers in the food chain, and they provide the food that all other organisms need to survive.

6. Tap roots are characterized by having one main, thick root that grows downward into the soil. Fibrous roots, on the other hand, are characterized by having many thin, branching roots that spread out through the soil.
7. The source of energy for photosynthesis is sunlight. Plants use sunlight to convert water and carbon dioxide into glucose, which is a sugar that they can use for energy.
8. Pitcher plants are carnivorous plants that trap and digest insects. Insects are attracted to pitcher plants by the nectar that the plants produce on the rim of the pitcher. Once an insect falls into the pitcher, it is trapped by the slippery surface of the pitcher walls. The insect is then digested by enzymes that the plant secretes.
9. When plants respire, they take in oxygen and release carbon dioxide. This process is the opposite of photosynthesis. Respiration occurs in all living cells, and it is necessary for plants to produce energy.
10. Scale-leaves are small, thin leaves that are found on some plants. Scale-leaves do not have chloroplasts, and they do not carry out photosynthesis. Instead, scale-leaves are thought to protect the buds and stems of plants from damage.

### Long answer type questions

1.



### Functions:

**Petiole**-It is the stalk of the leaf at the basal end. It attaches the leaf to the stem at a node .

**Lamina:** It is the expanded thin and flat part of leaf . It is exposed to sunlight.

**Midrib :** The petiole extends into the leaf as midrib which branches laterally into veins and venules or veinlets. This network conducts water, minerals and food to and from the leaf.

2.

Feature	Taproot System	Fibrous Root System
Root Type	Single, thick, central root	Multiple, branching roots
Storage	Stores food and water in the main root	Stores food and water in the smaller roots
Stability	Provides strong support for the plant	Provides good anchorage in loose soil
Examples	Carrots, radishes, beets	Grasses, wheat, rice

3. Photosynthesis is the process by which plants produce glucose with the help of sunlight. This process takes place in the chloroplasts of the leaves, which contain chlorophyll, a green pigment that traps sunlight. The energy from the sunlight is used to convert carbon dioxide and water into glucose, a type of sugar, and oxygen. The glucose is used by the plant as food, and the oxygen is released into the atmosphere.

4.

Simple Leaf	Compound Leaf
1. Lamina is undivided.	1. Lamina is divided as leaflets.
2. In some cases lamina appears to be subdivided, but it is not deep enough to reach the midrib.	2. The division of the lamina reach the midrib.
3. An axillary bud is present in the axil.	3. Bud is never present in the axil of the leaflets.
4. Examples: Banana, Peepal, Mango, Guava, Oak, etc.	4. Examples: Rose, Neem, Silk, Cotton, Baobab, etc.

5. Phyllotaxis is the arrangement of leaves on a stem. The different types of phyllotaxis include:

- **Alternate:** Leaves are arranged one at a time, alternating between opposite sides of the stem.
  - **Opposite:** Leaves are arranged in pairs, opposite each other on the stem.
  - **Whorled:** Leaves are arranged in a circle around the stem.
  - **Spiral:** Leaves are arranged in a spiral around the stem.
6. The main functions of leaves are:
- **Photosynthesis:** Leaves use sunlight to produce food through the process of photosynthesis.
  - **Gas Exchange:** Leaves allow for the exchange of gases between the plant and the atmosphere. Carbon dioxide is taken in, and oxygen is released.
  - **Transpiration:** Leaves help regulate the plant's temperature through transpiration.
  - **Storage:** Leaves can store food and water for later use. In some plants leaves help in vegetative propagation.
  - Spines protect the plant from damage. Tendrils provide support. In insectivorous plants leaves help to trap insects.
7. Vegetative propagation is the process of producing new plants from plant parts such as roots, stem and leaves. Leaves of some plants such as Bryophyllum develop small buds on the notches of their leaf margin. These are called **adventitious buds**. These buds also grow roots and develop into independent plants when they fall in the soil.
8. Transpiration is the process by which water evaporates from the leaves of a plant. This process has several important effects, including:
- **Cooling:** Transpiration helps to cool the plant by evaporating water from its leaves.
  - **Water Transport:** Transpiration helps to transport water and nutrients from the roots to the leaves.
  - Plants release 99% of the absorbed water into the atmosphere, which has a great influence on the climate of a place.
9. Leaves of many plants perform specialized functions. Such leaves are modified and have distinct forms.
- **For Support Leaf-tendrils:** In some plants the leaf are modified into thin wiry, coiled structures called tendrils. They serve as climbing organs. As they come in contact with an object they coil around it and help the plant to climb upwards. A leaf may be wholly or partially modified as in case of sweet pea the top leaflets are modified as tendrils.

10. Certain plant species, known as carnivores, have adapted to capture and digest insects as a supplement to their nutrient intake. These plants typically grow in nutrient-deficient soils or habitats where nitrogen and phosphorus are scarce. By capturing and digesting insects, carnivorous plants can obtain these essential nutrients that they would otherwise not obtain from the soil. The mechanisms of insect capture vary among carnivorous plants. Some plants, like Venus flytraps, have modified leaves with hinged traps that snap shut when insects trigger sensitive trigger hairs. Others, like pitcher plants, have funnel-shaped leaves filled with slippery fluid, trapping insects that fall in and eventually digesting them.

### **Questions based on practical skills**

#### **1. Three Plants with Parallel Venation**

- **Banana:** Banana plants have large, broad leaves with parallel veins that run the length of the leaf blade.
  - **Wheat:** Wheat leaves are long and slender, with parallel veins that are close together.
  - **Maize (Corn):** Maize leaves are similar to wheat leaves in their shape and parallel venation.
2. When groundwater levels fall, plants with tap root system have a better chance of survival because they can reach water sources that are deeper underground. Shallow-rooted plants such as those with fibrous roots, on the other hand, may not be able to reach water as easily and may suffer from drought stress.
3. Aeration is the process of exchanging gases between the soil and the atmosphere. Drainage is the process of removing excess water from the soil. Loose soil provides better aeration and drainage, which is essential for seed germination and seedling growth.

### **Experiential learning question**

1. (c) Needles of conifers stay on the trees for three to four years.
2. The passage doesn't explicitly state the mechanism of water and nutrient transport in trees. However, it does mention that the trunk carries water and nutrients up and down the tree. This implies that the trunk serves as a conduit for transporting these essential substances throughout the tree. In reality, water and nutrients travel through specialized tissues within the trunk, namely the xylem and phloem. The xylem transports water and minerals from the roots to the leaves, while the phloem carries food produced by the leaves to the rest of the plant.

### **Multi-disciplinary questions**

1. Leaves droop on hot summer days due to a water imbalance caused by excessive transpiration. This water deficit causes the cells in the leaves to lose turgidity, resulting in the drooping appearance.
2. The shade of a tree is cooler than the shade of a terrace due to several factors:
  - **Evaporation:** Leaves release water vapor through transpiration, which has a cooling effect on the surrounding air. This evaporative cooling contributes to the lower temperature under a tree's shade.

### **Play and Learn**

Plant with no roots wilts immediately and dies in a couple of days. This is because no water is absorbed by the plant.

### **VALUES AND LIFE SKILLS**

1. Cutting down trees on a large scale, also known as deforestation, has a multitude of detrimental effects on the environment, climate, and biodiversity. Here are some of the major consequences of deforestation:
  - **Loss of Biodiversity:** Forests are home to a vast array of plant and animal species.
  - **Soil Erosion:** Trees play a crucial role in stabilizing soil and preventing erosion. Their roots anchor the soil, while their canopy intercepts rainfall, reducing the impact of raindrops on the ground.
2. Lifestyle changes to prevent indiscriminate tree cutting
  - **Reduce Paper Consumption:** Paper production is a major driver of deforestation. We can reduce consumption of paper by using digital documents, and opting for reusable alternatives like cloth napkins instead of paper napkins.
  - **Adopt a Plant-Based Diet:** Animal agriculture is a significant contributor to deforestation, as land is cleared to grow animal feed. Consider reducing meat consumption or adopting a plant-based diet to minimize your impact on forests.

### **Image based questions**

1. Whorled
2. Internode
3. Fibrous root
4. Chlorophyll



## Chapter-2 Plant Life: The Flower

### Exercise Corner

#### MCQs

1. (a) calyx
2. (b) They have calyx, corolla, androecium and gynoecium.
3. (d) anther
4. (c) pollen grain is produced in large quantities
5. (a) Maize
6. (a) radicle
7. (b) the seed (we should differentiate between dry fruits and dried fruits)
8. (d) pollination
9. (c) Apple

#### Fill in the blanks:

1. fruit
2. root
3. seeds
4. seed leaves
5. two
6. above the soil
7. apple
8. 15-35 degrees Celsius
9. fruit
10. bisexual

#### Match the following (i)

##### Column A

- (a) Female reproductive part in a flower
- (b) Male reproductive part in a flower
- (c) Collective name for petals
- (d) Collective name for sepals
- (e) Flower part that develops as fruit

##### Column B

- (ii) Gynoecium
- (iv) Androecium
- (v) Corolla
- (i) Calyx
- (iii) Ovary

#### Match the following (ii)

##### Column A

- (a) Thalamus

##### Column B

- (iii) Swollen structure below the flower

- |                              |  |
|------------------------------|--|
| (b) Pedicel                  | (i) It attaches the flower to the stem |
| (c) Style                    | (iv) Middle part of a carpel           |
| (d) Flower with only carpel  | (v) Unisexual female flower            |
| (e) Flower with only stamens | (ii) Unisexual male flower             |

**State True or False for the following and correct the wrong statements.**

1. False: The floral whorls are seated on the thalamus, the swollen base of the flower, not on the anther.
2. True:
3. False: Vallisneria is pollinated by water, not wind.
4. True
5. True
6. False: Oxygen is essential for seed germination, as it is required for the cellular respiration processes that provide energy for growth.
7. False: The endocarp is not always soft and fleshy in fleshy fruits. In some fruits, the endocarp is hard and protective, such as in the coconut.
8. True
9. True
10. False. Self pollination can happen between two flowers on the same plant.

**Short answer type questions**

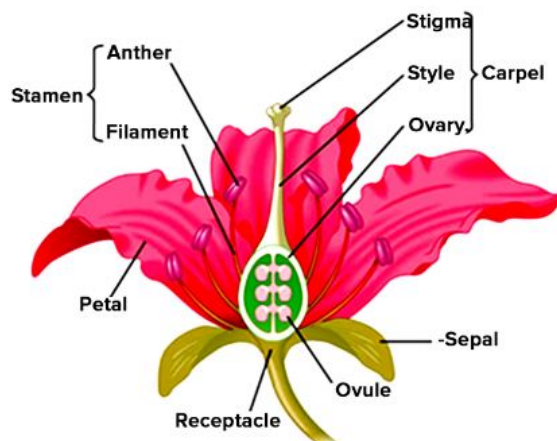
1. The reproductive whorls in a flower are the androecium (male reproductive whorl) and the gynoecium (female reproductive whorl).
2. The functions of the calyx are to protect the developing flower bud.
3. A large number of white flowers are Ultraviolet ray absorbing hence they do not appear white to insects who have ultraviolet receptors. They appear colourful to insects.
4. Wind-pollinated flowers produce large quantities of pollen grains to increase the chances of some of the pollen reaching the stigma of a compatible flower. Wind pollination is less efficient than insect pollination, so producing more pollen helps to ensure successful reproduction.
5. One difference between dry fruit and fleshy fruit is the texture of the pericarp. In dry fruits, the pericarp is thin and dry, while in fleshy fruits, the pericarp is thick and fleshy.
6. Some flowers have colorful corollas to attract pollinators, such as insects or birds.
7. The parts of a carpel are the stigma, style, and ovary. The stigma is the receptive surface where pollen grains land, the style is the slender stalk that

connects the stigma to the ovary, and the ovary is the enlarged part that contains the ovules.

8. In epigeal germination the cotyledons emerge above the soil surface. In case of hypogeal germination the cotyledons remain below the soil surface.
9. Function of pericarp in a dry fruit: Protects the seed from damage and desiccation.
10. Oxygen for seed germination: Seeds require oxygen to break down stored food reserves and generate energy for growth.

### Long answer type questions

1.



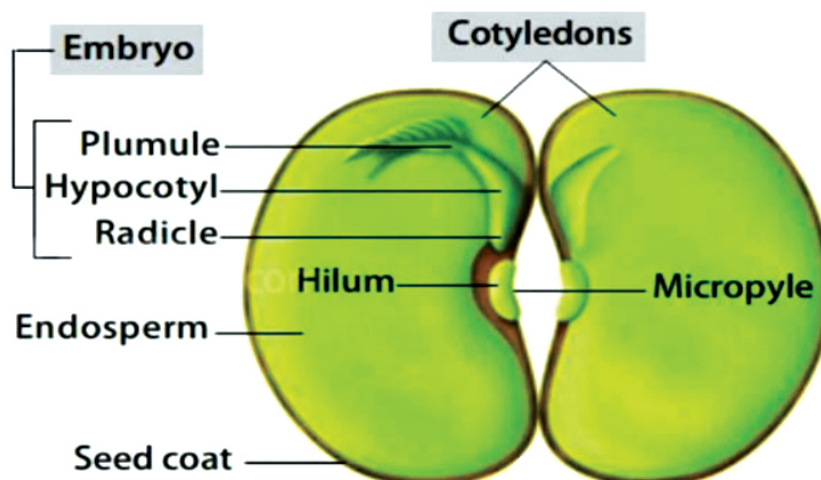
2. Pollination by an insect involves the transfer of pollen from the male part (stamen) of a flower to the female part (stigma) of the same or another flower of the same species. The insect is attracted to the flower by its bright colors, sweet scent, or nectar. As the insect lands on the flower to collect nectar or pollen, it brushes against the stamens, picking up pollen grains on its body. When the insect visits another flower of the same species, the pollen grains are transferred to the stigma of the new flower, leading to pollination.

3.

Self-pollination	Cross-pollination
Self-pollination is the transfer of pollen from the stamen of a flower to the stigma of the same flower or another flower on the same plant.	Cross-pollination is the transfer of pollen from the stamen of one flower to the stigma of another flower on an another plant of the same species.

4. Agents of pollination are the animals or other organisms that help to transfer pollen from one flower to another. Pollination by wind: Flowers that are pollinated by wind are small. They are not coloured or showy. They do not emit any smell or secrete nectar. The anthers produce very large amount of pollen. The pollen are very light and dry. Some pollens also have wings so that they can fly long distances for pollination. The stigmas are relatively large, protruding and feathery to catch the pollen from the wind. Plants like maize, palm and pine are wind pollinated.
5. Germination is the process by which a seed develops into a new plant. It involves the activation of the embryo within the seed, leading to the emergence of a young seedling. Example: Consider the germination of a bean seed. When a bean seed is provided with adequate moisture, warmth, and oxygen, it absorbs water and swells. This activates enzymes that break down stored nutrients in the seed. The embryo then elongates, and the radicle (embryonic root) emerges first, followed by the shoot. The cotyledons (seed leaves) provide nutrients for the initial growth until the seedling can produce its own food through photosynthesis.
6. Submerged aquatic plants often rely on water currents to transport their pollen. The male flowers release pollen into the water, and the currents carry the pollen to the female flowers for fertilization. Some aquatic plants also have adaptations like long, feathery stigmas to increase the chances of capturing floating pollen.
7. Fertilization is the process of fusion of male and female gamete to form a zygote. In plants, fertilization occurs inside the ovary of the flower, following pollination. Once fertilization occurs, the zygote starts to divide and develop into an embryo. The ovary wall, along with other accessory structures, enlarges and transforms into a fruit, protecting the developing embryo and providing it with nutrients.
8. **Functions of a fruit:**
  - It provides physical protection to the seeds till it is dispersed.
  - One of the main functions of a fruit is to help in dispersal of seeds by making the fruit attractive/edible for an animal.
  - The store of food in the fruit and seed is for the embryo to survive up to the period of germination.

9.



10. Germination is the process by which a seed begins to grow and develop into a seedling. Several factors are essential for successful germination: **Adequate liquid water:** Seeds require adequate quantity of water right from the beginning. Seeds absorb water and swell, the seed coat becomes soft. This facilitates the emergence of radicle and plumule from the seed. The chemical reactions of the various life processes happen in the presence of water.

**Suitable temperature :** The optimum temperature at which most seeds grow well is between 15<sup>0</sup> C to 35<sup>0</sup> C. Optimum temperature is required for proper enzymatic action so that the energy stores in the cotyledons are properly utilized for growth.

**Oxygen from air :** Seeds need oxygen for respiration, which is necessary for the utilization of stored food in the cotyledons. This ensures proper growth of the embryo.

#### Experiential learning question

1. (b) Weight gain
2. Two reasons for eating fruits and vegetables regularly are:
  - **They provide essential vitamins and minerals.** Fruits and vegetables are packed with essential vitamins and minerals.
  - **They promote good intestinal health.** The fiber in fruits and vegetables helps to keep our digestive systems healthy by promoting regular bowel

movements and preventing constipation fruits are low in calorie hence they do not cause weight gain.

### **Application based questions**

1. The bright color of a flower is an adaptation that helps to attract pollinators, such as insects and birds. Pollinators are essential for plant reproduction, as they transfer pollen from the male anthers of a flower to the female stigma of the flower. This process allows for the fertilization of the egg cell and the development of seeds.
2. Seeds are packed with nutrients because they provide the nutrition necessary for a seedling to germinate and grow into a new plant.

### **Image based questions**

1. (i) Anther  
(ii) Filament  
(iii) Stigma  
(iv) Style  
(v) Ovary

2. (i) Epicarp  
(ii) Mesocarp  
(iii) Endocarp

In **fleshy fruits** the pericarp develops as pulpy, soft and fleshy and is edible. In dry fruits most often the seed is edible.

### **Multi-disciplinary question**

Do it yourself

### **Play and Learn**

Hemiparasites are plants that derive some of their nutrients from other plants, but they also have the ability to photosynthesize and produce their own food. Hemiparasites have a special organ called a haustorium that attaches to the roots of other plants and absorbs water and nutrients from them.

### **VALUES AND LIFE SKILLS**

1. Fresh fruits and vegetables have a healthy look. The tissues feel turgid and not shrunk. Their skin should be smooth and not broken.

2. Whole fruits are always healthy because they contain natural fibres. Its sugar content is optimal. Packed juices do not have any fibre and mostly have added sugar which in the long run is proven to be unhealthy.

## **Chapter-3 Cell: The Basic Unit of Life**

### **Exercise Corner**

#### **MCQs**

1. (c) cell wall
2. (b) spindle shaped
3. (b) Pseudopodia
4. (b) selectively permeable
5. (d) genes
6. (c) vacuoles
7. (c) in every living cell
8. (b) vacuole
9. (a) chloroplast
- 10.(c) In both plant and animal cells

#### **Fill in the blanks:**

1. cork
2. objective lenses
3. movement in narrow vessels
4. Elephant bird
5. chromoplast
6. plastid
7. freely
8. selectively
9. lysosome
- 10.leucoplast

#### **Match the cell structures with their functions:**

- (a) Cell membrane (v) Allows entry of essential nutrients in the cell
- (b) Cytoplasm (vii) Site of many chemical reactions

- (c) Nucleus (ii) Carries the hereditary information
- (d) Vacuoles (viii) It isolates harmful materials from the cytoplasm
- (e) Cell wall (iv) It is made of cellulose
- (f) Plastid (i) It gives color to the flowers

**State True or False for the following and correct the false statements.**

1. True
2. True
3. False: The life span of a unicellular organism is usually very short.
4. True
5. False: These small sack like structures called suicide bags are called lysosomes.
6. True
7. True
8. True
9. False: The cytoplasm in plant cells is not denser than animal cell.
10. True

**Short answer type questions**

1. Protoplasm is the living matter that makes up all cells. It is a jelly-like substance that contains the cytoplasm, nucleus, and other organelles.
2. Amoeba, Bacteria
3. The cell membrane is a selectively permeable that controls the passage of substances in and out of the cell. Its functions include:
  - Protecting the cell from its surroundings
  - Regulating the movement of substances into and out of the cell
  - Providing a surface for cell-to-cell communication
4. Red blood cells (RBCs) are disc-shaped bi-concave structures. White blood cells (WBCs) have irregular shapes like an amoeba.
5. Chromatin is the DNA and protein material that makes up chromosomes. During cell division, chromatin condenses to form chromosomes.
6. The cell wall is a rigid layer that surrounds plant cells. Its functions include:
  - Providing support and protection for the cell
  - Maintaining the shape of the cell
  - Protecting the cell from harmful substances



7. The cell theory was first proposed in 1838 by two German biologists Matthias Schleiden and Theodor Schwann.
8. Amoeba is an animal cell that has an irregular shape. It can change its shape by extending and retracting its pseudopodia, which are finger-like projections. Spirogyra is a plant cell that has a filamentous shape. It is made up of long, thin cells that are arranged in a spiral pattern.
9. The nucleus is a membrane-bound organelle which has pores. It is filled with jelly like nucleoplasm. Nucleoplasm contains one or more nucleolus. It also contains chromatin which has the genes. The genes contain the hereditary information.
10. In animal cells vacuoles are of small size, it helps to isolate materials that might be harmful to the cell. In plant cells vacuoles are of large size, it helps to maintain internal fluid pressure.

**Long answer type questions**

1.

<b>Unicellular Organism</b>	<b>Multicellular organism</b>
1. The body of the organism is made of one cell only.	1. They are made up of many cells.
2. They have a simple body organization, the organisms are mostly microscopic.	2. They are large (macroscopic) and have complex body organization.
3. All the life processes are performed by the single cell.	3. Particular kind of cells form a tissue to perform a particular function.
4. The cell (body) is exposed to the environment.	4. The outer cells are exposed to the environment.
5. The division of labour happens at the level of organelles.	5. Division of labour is at the tissue and organ level.
6. The lifespan of unicellular organisms is usually short.	6. Lifespan of multicellular organisms is longer.

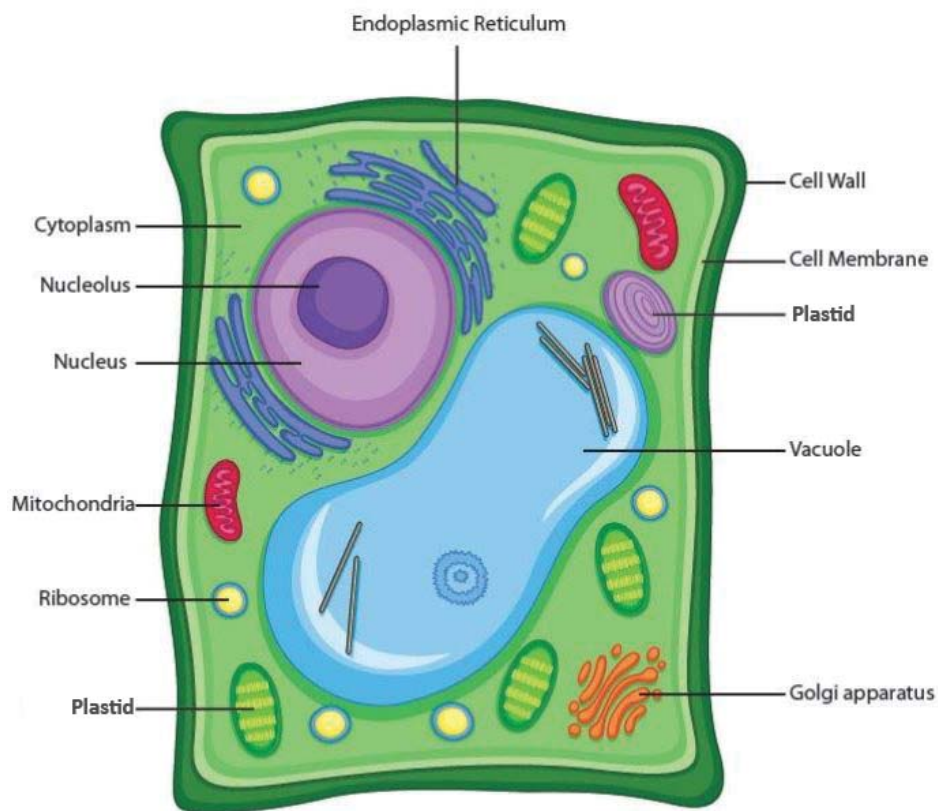
2. In 1838, two German biologists Matthias Schleiden and Theodor Schwann put forward the **cell theory of life**. According to this theory:

All animals and plants are made up of cells.

Cells are the basic **structural and functional** units all living things.

In 1868, Rudolf Virchow (a German pathologist) extended the theory by adding that new cells are produced from pre-existing cells i.e. they arise from other cells by division

3.



4.

Plant cell	Animal cell
Cell walls is present.	No cell wall is present.
Nucleus is present on the margin.	Nucleus is present centrally.
Cytoplasm is less dense.	Denser and granular cytoplasm.
Plastids occur in cytoplasm.	No plastids are found.

Lysosomes not usually evident.	Lysosomes occur in cytoplasm.
Centrosomes are absent.	Centrosomes are present.
Large vacuoles filled with cell sap is present.	Vacuoles, if present, are small .

5. Cells are the functional units of life because they carry out all the functions necessary for life. These functions include:

**Reproduction:** Cells reproduce by dividing, creating new cells that are identical to themselves.

**Metabolism:** Cells break down food molecules to release energy, which they use to carry out other life processes.

**Growth:** Cells can grow and divide to create new tissue and repair damaged tissue.

**Homeostasis:** Cells can maintain a stable internal environment, even when the external environment changes.

6. Plant cells possess a rigid cell wall that provides several benefits:

**Support:** The cell wall provides structural support, allowing plants to stand upright and resist external forces.

**Protection:** The cell wall acts as a protective barrier, shielding the cell from mechanical damage and harmful substances.

**Shape Maintenance:** The cell wall helps maintain the plant's shape and prevents cells from bursting due to internal pressure.

Porous Medium - It provides a porous medium for movement of water and minerals.

7. **(i) Slide of an Onion Peel:**

- Onion peel cells are rectangular or brick-shaped with a distinct cell wall and the cytoplasm is relatively less dense.

- They have a large central vacuole that occupies most of the cell space.

- The nucleus is pushed to one side of the cell due to the large vacuole.

**(ii) Slide of Cheek Cells:**

- Cheek cells are irregular in shape, and their cytoplasm is granular.

- They lack a cell wall but have a thin, transparent cell membrane.

- The nucleus is centrally located and clearly visible.

8.

<b>Cell membrane:</b>	<b>Cell wall:</b>
A thin, flexible layer surrounding the cell, made up of phospholipids and proteins.	A rigid, supportive layer surrounding the plant cell, made up of cellulose.
Controls the passage of substances into and out of the cell.	Provides shape and support to the plant cell.
Found in both plant and animal cells.	Not found in animal cells.

9. Cells are considered the basic structural units of living organisms because they carry out essential life processes. They are capable of independent existence and collectively form tissues, organs, and entire organisms. The diversity of life arises from the variety of cells and their functions.

10. Common structures include the cell membrane, nucleus, cytoplasm, endoplasmic reticulum, Golgi apparatus, mitochondria, and ribosomes.

1. Cytoplasm is a semifluid substance in the cell which fills the space between the cell wall and the nucleus. There are many other membrane bound organelles in the cytoplasm, which have definite shape and function.
2. Nucleus is found in all cells except in organisms like bacteria. It is bound by nuclear membrane which is filled with jelly like nucleoplasm. Nucleoplasm contains one or more nucleolus. It also contains chromatin which has the genes. The genes contain the hereditary information.
3. **Endoplasmic Reticulum** – It is a network of channel that extends from the nuclear membrane. It makes for the supportive frame of the cell and helps in the transportation of substances throughout the cell.
4. **Mitochondria** – These are double walled rod like structures. Internally they have finger like projections. These are called “the powerhouse of the cell.” It is called so because they release energy from food by the process of cellular respiration.

### **Experiential learning question**

1. (c) They don't have nuclear membrane.
2. The nucleus is considered the brain of the cell because it houses the genetic material (DNA) responsible for cellular functions and inheritance. DNA contains the instructions for building and maintaining all the cell's

structures and carrying out its various functions. Just as the brain controls the body's activities, the nucleus controls the cell's activities.

#### **Application based question**

- Hemoglobin is a protein found in red blood cells (RBCs) that carries oxygen from the lungs to the rest of the body. It is an essential component of RBCs and plays a crucial role in oxygen delivery. When people suffer from anemia, their hemoglobin count drops, indicating a reduced ability to transport oxygen effectively. People with low haemoglobin are likely to have low RBC count and /or unhealthy RBC.
  1. (i) Cell wall  
(ii) Cell membrane  
(iii) Vacuole  
(iv)Plastid
  2. Cell membrane instead of cell wall, Central nucleus instead of marginal nucleus, Neucleoplasm is present inside the nucleus. Mitochondria instead of plastid.

#### **Multi-disciplinary question**

- A virus is a tiny infectious agent that replicates only inside the living cells of an organism. Viruses can infect all types of life forms, from animals and plants to microorganisms, including bacteria and archaea. They are found in almost every ecosystem on Earth and are the most numerous type of biological entity. Viruses are much smaller than bacteria and can only be seen with an electron microscope.

#### **VALUES AND LIFE SKILLS**

- Ensuring proper waste management is crucial for maintaining a clean and healthy environment, both at home and in society. Here are some steps that can be taken to ensure effective waste treatment and disposal:

##### **At Home:**

1. **Segregate waste:** Separate waste into different categories, such as recyclable, compostable, and non-recyclable. This simplifies waste management.
2. **Reduce consumption:** Minimize the generation of waste by opting for reusable items instead of disposables, buying products with minimal packaging, and avoiding unnecessary purchases.

3. **Compost organic waste:** Set up a compost bin or vermicomposting system to convert organic waste, such as food scraps, yard trimmings, and coffee grounds, into nutrient-rich compost for gardening.

**In Society:**

1. **Advocate for waste management awareness:** Raise awareness about proper waste management practices among community members through educational campaigns and workshops.
2. **Support waste management initiatives:** Encourage local authorities to implement effective waste collection, recycling, and composting programs.
3. **Volunteer for waste management projects:** Participate in community clean-up drives, recycling collection events, and composting initiatives.

## Chapter-4 Human Body: The Digestive System

### Exercise Corner

#### MCQs

1. (d) Epiglottis
2. (c) There are four incisors in each jaw.
3. (c) Zinc
4. (d) molars
5. (b) windpipe
6. (b) duodenum
7. (d) Amylase
8. (b) They are responsible for absorption of digested nutrients.
9. (b) large intestine
10. (c) Helps in the absorption of water.

#### Fill in the blanks:

1. roughage
2. maximum
3. mouth
4. esophagus
5. three
6. enamel
7. fatty acids, glycerol
8. absorption of water

- 9. proteins
- 10. acidity and heartburn

**Match the following:**

- |                     |                               |
|---------------------|-------------------------------|
| (a) Canine          | (iii) Tearing of food         |
| (b) Epiglottis      | (v) Flap-shaped               |
| (c) Gastric juice   | (i) Pepsin                    |
| (d) Lacteal         | (vi) Fat absorption           |
| (e) Pyloric valve   | (vii) Opens into the duodenum |
| (f) Acts on protein | (ii) Trypsin                  |
| (g) Bile            | (iv) Gall bladder             |

**State True or False for the following and correct the wrong statements.**

1. False. Saliva is an alkaline solution.
2. True
3. False. Enamel comes above dentine
4. False. Protein digestion begins in the stomach.
5. True
6. True
7. False. The small intestine has greater concentration of villi.
8. False. Fat digestion leads to fatty acids and glycerol
9. False. Absorption of minerals begins in duodenum.
10. False. Balanced diet has optimal amount of all nutrients.

**Short answer type questions**

1. Milk teeth, also known as deciduous teeth, are temporary and fall out as the child grows older. Permanent teeth, on the other hand, are meant to last a lifetime. A full set of milk teeth consists of 20 teeth. A full set of permanent teeth has 32 teeth.
2. Plaque is a sticky film of bacteria that forms on the teeth. It can lead to cavities and gum disease if not removed regularly.
3. Glands associated with human digestion include salivary glands, gastric glands in the stomach, liver and pancreas.

4. Chyme is a semi-fluid mass of partially digested food that enters the duodenum from the stomach. It is acidic due to the presence of hydrochloric acid from the stomach.
5. Emulsification is the process of breaking down fats into smaller droplets so that they can be easily digested and absorbed. Bile, produced by the liver, helps to emulsify fats in the small intestine.
6. The three regions of the small intestine are the duodenum, jejunum, and ileum.
7. In the large intestine certain bacteria produce some “B vitamins” ( such as B12, B1, B6 and vitamin K). An important function of the large intestine, however, is absorption of remaining water and electrolytes from the digestive residue. In the rectum the undigested food residue accumulate in a semi-solid form. The rectum opens through a sphincter muscle structure called anus.
8. The parts of the large intestine are the cecum, colon (ascending, transverse, descending, and sigmoid), and rectum.
9. Excessive consumption of sugary products can lead to dental issues such as cavity formation. It can also lead to weight gain and obesity.
10. Assimilation is the process by which nutrients from digested food are absorbed into the bloodstream and utilized by cells for various physiological functions.

#### **Long answer type questions**

1. Humans have four types of teeth: incisors, canines, premolars, and molars. Each type of tooth has a specific role in the process of eating.
  - **Incisors:** The four sharp, chisel-like teeth in the front of the upper and lower jaws are used for cutting and biting food.
  - **Canines:** The single, pointed teeth located next to the incisors are used for tearing food.
  - **Premolars:** The two bicuspid teeth located behind the canines are used for grinding and crushing food.
  - **Molars:** The flat, grinding teeth located at the back of the mouth are used for chewing food.
2. The alimentary canal, is the long, tube-like organ that extends from the mouth to the anus. It is responsible for breaking down food into nutrients that the body can absorb and use for energy, growth, and repair. The alimentary canal consists of the following organs:



- **Mouth:** The first part of the digestive tract, where food is mechanically broken down by chewing and moistened by saliva.
  - **Pharynx:** The muscular tube that connects the mouth to the esophagus.  
**Esophagus:** The muscular tube that transports food from the pharynx to the stomach.
  - **Stomach:** A J-shaped sac that stores and digests food with the help of gastric juices.
  - **Small intestine:** The longest part of the digestive tract, where most of the absorption of nutrients takes place.
  - **Large intestine:** Absorbs remaining water from the undigested food and eliminates waste products from the body.
  - **Rectum:** The final part of the large intestine, where waste products are stored before being eliminated from the body through the anus.
3. Gastric juice, a mixture of hydrochloric acid and pepsin, is secreted by the stomach glands. It plays a crucial role in the digestion of food in the stomach.

Hydrochloric acid kills many harmful bacteria in the food and makes the medium in stomach acidic for digestive **enzymes** to be active.

The protein digesting enzyme pepsin breaks down proteins into smaller **peptones** which is a soluble form.

4. Pancreatic juice, a mixture of enzymes, is secreted by the pancreas and The important enzymes in the pancreatic juice are
- Trypsin** – Acts on proteins and peptones converting them to peptides which are compounds of two or more amino acids.
- Amylase** – Acts on starch converting it to maltose sugar.
- Lipase** – Acts on fat converting it to fatty acids and glycerol.
5. The small intestine is the longest part of the digestive tract and is responsible for absorbing most of the nutrients from digested food. It is divided into three regions: duodenum, jejunum, and ileum.
- (a) The duodenum is the first part of the small intestine measuring about 20 -25 cm. The chime from the stomach move into the duodenum, where it mixes with **bile from the liver, that is stored in the gallbladder and digestive juices from the pancreas**, through a common duct. The absorption of vitamins, and minerals begin in the duodenum.

- (b) Jejunum is the second part of the small intestine. It measures about 3.0 m. Here absorption of sugar, fatty acids, and amino acids along with water takes place.
- (c) Ileum is the third part of the small intestine. It is about 3.5 m long. The main function of ileum is to absorb the remaining water, vitamin B 12, other nutrients and the bile salts.
6. Enzymes are made of proteins that act as biological catalysts. They accelerating the chemical reactions. These are required in small amounts and stay unchanged at the end of the reaction. A particular enzyme has a very specific function and do not influence other reactions. Enzymes that act on carbohydrates are called **Amylolytic** enzymes. Those acting on proteins are called **Proteolytic** enzymes and those acting on fats are called **Lipolytic** enzymes.
7. **End products of digestion** Carbohydrates are converted to glucose and fructose Proteins are converted to peptides and amino acids Fats are converted to fatty acid and glycerol Vitamins and minerals are released from complex molecules so that they can be absorbed.
8. Some of the enzymes secreted in the small intestine are :
- Erepsin** – which acts on peptides to convert it into amino acids  
**Maltase** – acts on maltose to convert it into glucose  
**Sucrase** – acts on sucrose to convert it into glucose and fructose  
**Lactase** – acts on lactose to convert it into glucose and galactose
9. Absorption of various nutrients takes place in the small intestine in liquid form hence a lot of water is also absorbed through the numerous villi present in the walls. Each villus is richly supplied with blood vessels which absorb glucose and amino acids by the process of diffusion. The lymph vessels called lacteal absorb fatty acids.  
 In general assimilation happens as follows:  
 Glucose derived from carbohydrates is used to release energy at the cellular level. Amino acids derived from protein is used for growth and repair of tissues. Fatty acids are used as energy store and to build new cells and tissues. Vitamins and minerals boost the immune system.
10. A balanced diet includes a variety of foods that provide essential nutrients in the right proportions. However, individual nutritional needs vary based on factors like age, gender, activity level, and health conditions. Therefore, there isn't a standard balanced diet for everyone. Customization is necessary to meet the specific requirements of individuals, ensuring optimal health and well-being.

**Experiential learning question**

1. (a) with secretion of saliva
2. Yes the process of digestion is a well coordinated team work.  
The team work begins with the secretions of saliva and chewing of food and secretions from other glands later on.  
Timely opening of the food pipe by the epiglottis and correct peristalsis keeps the food moving forwards.  
Acidic content of gastric juice kills bacteria and thus prevents infection.  
Finally absorptions of digested nutrients happens through the villi placed at the right places in the intestine. Elimination of undigested matter happens as and when needed.

### **Application based questions**

1. Bread tastes sweet on chewing because the enzyme amylase present in saliva breaks down the starch in the bread into maltose, a type of sugar. Maltose is a simple sugar that has a sweet taste. As we chew the bread, the amylase has more time to work on the starch, and more maltose is produced. This is why the bread tastes sweeter after chewing it for a while.
2. Saliva helps in keeping the teeth healthy by:
  - **Neutralizing acids:** Saliva is alkaline and hence it neutralize acids produced by bacteria in the mouth, preventing tooth enamel erosion.
3. Parboiled rice retains more vitamins and minerals compared to regular rice due to a process called diffusion. During parboiling, the rice grains are soaked in hot water, allowing nutrients to diffuse from the outer layers towards the center of the grains. As a result, washing parboiled rice before cooking removes fewer nutrients compared to regular rice, where nutrients are concentrated closer to the surface.
4. People with a removed gallbladder are advised to eat non-fatty meals because the gallbladder stores and concentrates bile, a substance that helps to emulsify fats, making them easier to digest. When the gall bladder is removed consuming a low-fat diet reduces the burden on the digestive system and helps to prevent digestive problems, such as diarrhea and bloating.

### **Multi-disciplinary questions**

1. Intermittent fasting is an eating pattern that cycles between periods of eating and fasting. Intermittent fasting has been shown to have a number of health benefits, weight management leading to better life functions.

2. Obesity is a complex condition with multiple causes, including:
  - **Diet:** A diet high in processed foods, sugary drinks, and unhealthy fats can contribute to weight gain.
  - **Physical activity:** Lack of physical activity can lead to an accumulation of body fat.

Preventive measures to avoid obesity:

  - **Eat a healthy diet:** Focus on consuming whole, unprocessed foods, such as fruits, vegetables, whole grains, and lean protein sources. Limit consumption of processed foods, sugary drinks, and unhealthy fats.
  - **Engage in regular physical activity:** Aim for at least 30 minutes of moderate-intensity exercise most days of the week.
3. Munching on snacks while doing work or watching TV can be unhealthy for several reasons:
  - **Mindless eating:** When we're distracted by work or TV, we're less likely to pay attention to our hunger cues and may overeat.
  - **Calorie overload:** Snacks are often high in calories, and munching on them can easily lead to a calorie surplus, which can contribute to weight gain.
  - **Nutrient-poor choices:** Snacks are often processed foods that are low in nutrients and high in unhealthy fats, sugar, and sodium.
4. Humans lack the enzymes necessary to digest cellulose, a complex carbohydrate found in the cell walls of plant cells. However, raw fruits and salads are healthy for us because they provide essential nutrients, fiber, and water. While we may not digest cellulose, it increases the bulk and ensures proper movement of the eaten food along the alimentary canal.

### Image based questions

1. The missing tooth is canine. There are four canines in total.
2.
  - (i) Starch is acted upon by enzyme amylase to produce sugar.
  - (ii) It conducts food to the stomach.
  - (iii) Hydrochloric acid
  - (iv) By bile juice
  - (v) The remaining water and some nutrients are absorbed.

### VALUES AND LIFE SKILLS

1. One should not try to eat from every stall. Instead one should make choices and try to eat a balanced diet.

2. Do your own research. Focus on reasons of sedentary life styles such as computer games or prolonged television watching .  
Find out about fast foods and sugary drinks that are poor in nutrients and cause overload of calories.

## **Chapter-5 Human Body: The Respiratory System**

### **Exercise Corner**

#### **MCQs**

1. (c) larynx, trachea, bronchi, bronchioles, alveoli
2. (d) larynx
3. (a) trachea
4. (c) lactic acid
5. (c) It releases energy.
6. (d) 16% oxygen
7. (b) between the ribs
8. (b) Below the epiglottis
9. (d) Because of low pressure air from the lungs is forced out.

#### **Fill in the blanks:**

1. Increases
2. Hemoglobin
3. Carbon dioxide and water vapour
4. Ethanol
5. Three
6. outer and inner pleura
7. Lactic acid
8. Downwards
9. 4
10. Carbon dioxide + Water

#### **State True or False for the following and correct the wrong statements.**

1. True
2. False. Air gets warmed as it passes through the nose.
3. False. The exhaled air is only about 4% carbon dioxide and 16% oxygen. The remaining is nitrogen.

4. False. Alveoli are not supported by cartilaginous rings. They are surrounded by a network of capillaries, which allows for the exchange of gases between the blood and the lungs.
5. True
6. True
7. True

**Match the following:**

- (a) Aerobic respiration (iii) Food is oxidized  
 (b) Breathing (v) Inhalation and exhalation  
 (c) Diaphragm (i) Dome shaped  
 (d) Alveoli (ii) Single-celled wall  
 (e) ATP (iv) Energy-rich molecule

**Short answer type questions**

1. The process by which a food molecule is broken down in all the living cells to release energy is called respiration. Aerobic respiration occurs in the presence of oxygen. Anaerobic respiration occurs without oxygen .
2. The alveolus is the basic unit of the lungs where gas exchange occurs. Here, oxygen diffuses from the air into the blood, and carbon dioxide diffuses from the blood into the air. Hence it is the site of gas exchange.
3. Before entering the trachea, the inhaled air passes through the nasal cavity. The hairs in the nasal chamber clean the inhaled air of dust and germs. The rich supply of blood vessels help to warm the air closer to the body temperature. The sticky mucous lining moistens the air helps to further clean the incoming air. The inner lining of the nostrils help us to distinguish various kinds of smell.
4. The epiglottis is a small, flexible flap of cartilage that sits at the top of the trachea. During swallowing, the epiglottis folds down to cover the opening to the trachea, preventing food from entering the lungs. When not swallowing, the epiglottis remains open, allowing air to pass into the trachea and lungs.
5. **Physical Activity:** Increased physical activity leads to an increased breathing rate to supply more oxygen to the to support increased metabolism. It can become more than 50 times per minuite. Breathing rate decreases to 20 to 25 times per minute when we are not doing any physical activity.
6. The diaphragm is a thin dome-shaped muscle which separates the thoracic cavity (lungs and heart) from the abdominal cavity (intestines, stomach,

liver, etc.). It is involved in respiration (along with the ribcage) drawing downward in the chest on inhalation, and pushing upward in exhalation.

7. The nasal chamber is the part of the respiratory system that is located inside the nose. It has several important functions, including:
  - **Filtering:** The nasal chamber contains hairs and mucus that trap dust, pollen, and other airborne particles. This helps to protect the lungs from damage.
  - **Warming:** The blood vessels in the nasal chamber warm the air as it passes through the nose. This is important because cold air can irritate the lungs.

**Long answer type questions**

1. Respiration is called a biochemical process in which the cells of an organism obtain energy by reacting oxygen with glucose, resulting in the release of carbon dioxide, water, and ATP. The organism utilizes the energy in conducting various life processes.
2. **Inhalation (Inspiration):** During inhalation, the diaphragm contracts and moves downward, while the intercostal muscles expand the ribcage. This increases the volume of the thoracic cavity, causing a decrease in air pressure, and air rushes into the lungs.

**Exhalation (Expiration):** During exhalation, the diaphragm relaxes and moves upward, while the intercostal muscles relax, reducing the thoracic cavity volume. This increases air pressure, and air is pushed out of the lungs.

3.

<b>Breathing</b>	<b>Respiration</b>
It is a physical process in which oxygen rich air is inhaled and carbon dioxide rich air is exhaled.	It is a biochemical process in which oxygen combines with food.
It takes place outside the cell.	It takes place inside all living cells.
No energy is released from the food. The process actually consumes energy and enzymes are not involved.	Food is broken down with the help of enzymes. In this process glucose reacts with oxygen releasing carbon dioxide, water and energy.
The process of breathing is different in different living things.	The process of respiration is similar in all living organisms.

4. Gas exchange occurs in the alveoli, the tiny air sacs at the end of the bronchial tree. The alveolar walls are lined with capillaries, which are tiny blood vessels. Gas exchange occurs through diffusion, the movement of molecules from an area of high concentration to an area of low concentration.

**Oxygen Exchange:** Oxygen from the inhaled air diffuses across the thin walls of the alveoli and into the capillaries. This oxygen is then carried by hemoglobin, a protein in red blood cells, throughout the body.

**Carbon Dioxide Exchange:** Carbon dioxide, a waste product of cellular respiration, diffuses from the blood to the air, this happens in the alveoli. This carbon dioxide is then expelled from the body during exhalation.

5. **Aerobic Respiration:** Aerobic respiration occurs in the presence of oxygen and produces a large amount of energy in the form of ATP. It is a more efficient process than anaerobic respiration.

Word Equation: Glucose + Oxygen → Carbon Dioxide + Water more energy.

**Anaerobic Respiration:** Anaerobic respiration occurs in the absence of oxygen and produces a relatively small amount of energy in the form of ATP. It is a less efficient process than aerobic respiration.

Word Equation: Glucose → Lactic acid less energy

6. The lungs are a pair of respiratory organs that are spongy bag-like structures, lying in the chest cavity on either side of the heart. It is very well protected by the ribcage. The left lung is two lobed and slightly smaller than the right lung which is three lobed. The smaller left lung creates space for accommodating the heart. The lungs rests on a dome shaped **diaphragm**.

**Pleura:** The lungs are covered by a two-layered membrane called the pleura, which allows for smooth lung movement during breathing.

7. When we pass exhaled air through lime water it turns milky. Whereas when we pass normal air (that we inhale) through lime water the lime water does not turn milky. This happens because as we know normal air has very little carbon dioxide (only 0.04%) However the exhale air has over 4% carbon dioxide.

#### **Experiential learning question**

1. (c) Eye blinking rate
2. Normal respiratory rate represents the number of breaths a person takes per minute in a healthy, resting state. It is an indicator of the body's ability to exchange oxygen and carbon dioxide effectively. A normal respiratory rate varies depending on age, but it generally falls within the range of 12 to 20 breaths per minute for adults.



### **Application based questions**

1. Muscular cramps are involuntary contractions of a muscle or group of muscles that can be very painful. When one does intense exercise without proper warmup the oxygen supply (by breathing) is unable to cope with the sudden rise in oxygen demand from the body tissues. This reduced oxygen supply leads to anaerobic respiration which produces lactic acid. The lactic acid leads to painful spasm and cramps.
2. Hand washing is a simple yet effective way to prevent the spread of disease. Hands can easily come into contact with germs, such as bacteria and viruses, from a variety of sources, such as doorknobs, countertops, and people who are sick. When you wash your hands with soap and water, you remove these germs from your skin and reduce the risk of transferring them to others. Hand washing is especially important before eating, after using the toilet, after blowing your nose, after coughing or sneezing, and after touching animals or animal waste.

### **Multi-disciplinary questions**

1. Proning is a medical technique that involves positioning a patient on their stomach, typically with their head turned to one side. This position can be helpful for improving oxygenation in patients with severe respiratory illnesses, including COVID-19. When a patient is lying on their back, their lungs are compressed by the weight of their body, making it more difficult for them to take in oxygen. Proning helps to open up the airways and allows the lungs to expand more fully, which can improve oxygenation.
2. COVID-19 is a respiratory illness caused by the SARS-CoV-2 virus. It is a type of coronavirus, a large family of viruses that can cause illnesses ranging from the common cold to severe respiratory infections. COVID-19 can cause a wide range of symptoms, from mild to severe. In some cases, COVID-19 can be fatal. COVID-19 is considered to be a zoonotic disease, meaning that it was originally transmitted from animals to humans.

### **VALUES AND LIFE SKILLS**

#### **Gobar Gas Plant**

Gobar gas plants are an excellent solution for utilizing cow dung to produce biogas, a clean and renewable energy source. These plants utilize the anaerobic digestion process to decompose cow dung, generating biogas as a byproduct.

## Chapter-6 Human Body: The Circulatory System

### Exercise Corner

#### MCQs

1. (b) WBCs
2. (a) the haemoglobin in the RBCs
3. (d) Both (a) and (c)
4. (b) hemoglobin
5. (c) blood group AB
6. (a) The rhythmic contraction and relaxation of the ventricle.
7. (d) the septum

#### Fill in the blanks:

1. Capillaries
2. the wrist
3. Dengue
4. less
5. the pulmonary artery
6. 120/80 mmHg
7. straw-colored

#### Match the following:

- (a) RBC (iv) Have a lifecycle of 120 days
- (b) Plasma (i) 55% of the blood
- (c) WBC (ii) Neutrophil
- (d) Platelets (v) Responsible for blood clotting
- (e) Arteries (iii) Thick-walled

#### State True or False for the following and correct the wrong statements.

1. False. RBCs, not WBCs, contain hemoglobin, which is an oxygen carrier.
2. True
3. False. The heartbeat decreases when we rest after exercising. This is because the body no longer needs as much oxygen, so the heart doesn't need to pump as hard.

4. True
5. False. Capillaries join veins and arteries, not arteries and arteries.
6. False. The normal pulse rate for an adult at rest is about 70-72 per minute.
7. True

### Short answer type questions

1. The four chambers of the human heart are the left atrium, left ventricle, right atrium, and right ventricle.
2. The main components of blood are red blood cells (RBCs), white blood cells (WBCs), platelets, and plasma.
3. Blood is an important medium of transport because it carries oxygen, nutrients, hormones, and waste products throughout the body. It plays a crucial role in maintaining homeostasis and supporting various physiological functions.
4. The main functions of white blood cells (WBCs) include defending the body against infections and participating in the immune response.
5. Blood cells develop from hematopoietic stem cells and are formed in the **bone marrow**. The process is called haematopoiesis. The stem cells are capable of transforming into red blood cells, white blood cells, and platelets.
6. The pulmonary artery is the only artery that carries deoxygenated blood. It carries blood from the right ventricle of the heart to the lungs.
7. There is a valve at the junction of the right ventricle and the pulmonary artery called pulmonary semi-lunar valve. Another valve between the left ventricle and the aorta called aortic semi-lunar valve.

### Long answer type questions

1. The heart is made of specialized muscles called the **cardiac muscles**. These muscles are characterised by their rhythmic contractions. The heart is divided into four chambers: two upper chambers called atria and two lower chambers called ventricles.
  - (a) Valve between the right atrium and the right ventricle is a tricuspid valve (having three cusps or flaps).  
Valve between left atrium and left ventricle is a bicuspid valve (having two cusps or flaps, it is also called the mitral valve).
  - (b) In addition to the above there is a valve at the junction of the right ventricle and the pulmonary artery called pulmonary semi-lunar valve. Another valve between the left ventricle and the aorta called aortic semi-lunar valve.

## 2. Movements of blood through the heart:

- The right atrium receives deoxygenated blood from different parts of the body.
- The blood moves to the right ventricle through the tricuspid valve.
- The pulmonary arteries takes the blood to the lungs for oxygenation.
- The pulmonary vein brings the oxygenated blood from lungs to the left atrium.
- Oxygenated blood moves from left atrium to left ventricle.

As the oxygenated blood carrying nutrients, hormones etc. moves through the body the blood collects waste products and carbon dioxide and drops off oxygen, nutrients, hormones etc. The veins carry deoxygenated blood, carbon dioxide and other wastes products back to the heart at the right auricle. While the lungs get rid of the carbon dioxide as we exhale, other waste products are dropped at the kidney and liver.

3.

Veins	Arteries
Veins have thin non-elastic walls.	Arteries have thick elastic walls.
Have valves in their inner linings to prevent back flow.	There are no valves inside the artery.
They carry blood from the body parts to the heart.	They carry blood away from the heart to different organs of the body.
They carry deoxygenated blood except the pulmonary vein.	They carry oxygenated blood except the pulmonary artery.

4. Plasma is the liquid component of blood that makes up about 55% of its volume. It is a clear, straw-colored fluid that contains water, proteins, salts, hormones, and other essential substances. Plasma plays a crucial role in transporting nutrients, hormones, and waste products throughout the body. Blood, on the other hand, is a mixture of plasma and blood cells. It contains erythrocytes (red blood cells), leukocytes (white blood cells), and platelets. Red blood cells carry oxygen, leukocytes fight infections, and platelets aid in blood clotting.

## 5. Functions of Blood

- Blood is a fluid connective tissue and is the transport system in the body.
  - Blood provides the body cells with oxygen and removes carbon dioxide.
  - Plasma in blood transports nutrients and hormones.
  - Blood regulates body temperature by distributing heat and constricting vessels.
  - Platelets in the blood clot blood, at the site of injury and prevent bleeding.
  - Blood brings waste products to the kidneys and liver and maintains water and salt balance.
  - Blood carries WBCs and antibodies that protect our body from pathogens.
6. Blood groups are a genetic classification of blood based on the presence or absence of specific antigens on the surface of red blood cells. There are four main blood groups: A, B, AB, and O. Each group has a unique combination of antigens and antibodies.
- Antigens: Antigens are proteins or carbohydrates on the surface of red blood cells that can trigger an immune response.
  - Antibodies: Antibodies are proteins produced by the immune system in response to antigens. They can bind to antigens and mark cells for destruction.
7. The veins have valves to ensure that the blood flow is maintained in one direction, by preventing back-flow. There are valves placed at important junctions in the heart as well to serve the same purpose of maintaining blood flow in a particular direction.
- (i) Valve between the right atrium and the right ventricle. It is a tricuspid valve (having three cusps or flaps).
  - (ii) Valve between left atrium and left ventricle. It is a bicuspid valve (having two cusps or flaps, it is also called the mitral valve).
- In addition to the above there is a valve at the junction of the right ventricle and the pulmonary artery called pulmonary semi-lunar valve. Another valve is placed between the left ventricle and the aorta called aortic semi-lunar valve.

### **Experiential learning question**

1. (b) The plasma carries wastes absorbed from the intestine.
2. The passage says that blood does not flow at the same speed through all of the body. As it gets farther away from the heart, it slows down. It goes slowly when the red blood cells squeeze through the capillaries. Every time the heart pumps out a stream of blood, it forms a pulse that can be felt on the inside of the wrist. The pulse rate in an adult is around 70 beats per minute. Children usually have higher pulse rates.

### **Application based questions**

1. Blood pressure is the force of circulating blood on the walls of the arteries. Blood pressure is taken in two measurements:
  - **Systolic**-measured at the time heart beats, when blood pressure is at its highest.
  - **Diastolic**-measured between heart beats, when the **heart rests between beats**. When blood pressure is at its lowest.  
Normal blood pressure is written as **120 /80 mm of mercury**.
2. At higher altitudes, the air is thinner and there is less oxygen available. This can put a strain on the heart, especially for elderly people who may already have heart problems. The heart has to work harder to pump enough oxygenated blood to the body, and this can lead to problems such as angina (chest pain) and heart failure.
3. In certain emergencies, people may be transfused only plasma and not whole blood. This is done to save time as there may not be enough time available for blood grouping . Also the matching blood of the desired blood group may not be available at short notice. AB plasma type can be given to any blood group patient.

### **VALUES AND LIFE SKILLS**

#### **First Aid for Heart-Related Problems**

- **Call for Emergency Help Immediately**  
The first and most crucial step in providing first aid for heart-related problems is to call for emergency medical assistance. This could involve dialing 112 (in India). Prompt medical attention is essential for improving the chances of a positive outcome.
- **Ensure a Comfortable Position**  
While waiting for emergency personnel to arrive, help the person find a comfortable position to rest. This may involve assisting them in sitting down or lying down, depending on their preference. Loosen any tight clothing around their neck or chest to facilitate easy breathing.

## Chapter-7 Health and Hygiene

### Exercise Corner

#### MCQs

1. (c) metabolic disorders
2. (b) in a dirty neighbourhood.
3. (c) lack of vitamin C, in the diet.
4. (c) by the bite of a mosquito
5. (a) Tuberculosis
6. (a) Beriberi
7. (b) eyes

#### Fill in the blanks:

1. Prevention
2. Waterborne
3. Health
4. Personal
5. Fats and oils
6. Green
7. Night blindness

#### Match the following:

Communicable disease	Pathogen
Ringworm	Fungus
Diphtheria	Bacteria
Dengue	Virus
Ascariasis	Worm
Malaria	Protozoa

#### State True or false for the following and correct the wrong statements.

1. True
2. False. The common cold is a respiratory infection caused by a virus, not a vector-borne disease.
3. True
4. False. Goitre is caused by a deficiency of iodine, not vitamin D.
5. True
6. True
7. True

#### Short answer type questions

1. Health is defined as a state of complete physical, mental and social well-being. When diseases occur, the normal functioning of the body is disturbed.
2. Diseases that are spread from a sick person to a healthy person by microorganisms are known as communicable disease. The causative germs are called pathogens.
3. Sewage contains a variety of pollutants, including pathogens, chemicals, and nutrients. If sewage is released into water bodies without treatment, it can contaminate the water and make it unsafe for drinking, swimming, and fishing. It can also harm aquatic life.
4. Two mineral deficiency diseases are: Goitre, Anaemia
5. A food pyramid is a graphic representation of the recommended daily intake of different food groups. The pyramid is divided into sections, with each section representing a different food group.
6. Three diseases caused by bacterial infection are: Cholera, Typhoid, Tuberculosis.
7. Anaemia is a condition in which the body does not have enough red blood cells or enough hemoglobin. Hemoglobin is a protein in red blood cells that carries oxygen from the lungs to different parts of the body.

#### **Long answer type questions**

1. Wearing a mask can help prevent the spread of respiratory illnesses, such as the flu, by reducing the transmission of airborne droplets that contain the pathogens. When an infected person coughs, sneezes, or talks, they release these droplets into the air. If someone else inhales these droplets, they can become infected. Masks can help block these droplets from reaching the wearer's nose and mouth, reducing their risk of getting sick.
  2. **Three features of personal hygiene:**
    - **Regular handwashing:** Hands are the primary means of transmitting germs, so regular handwashing with soap and water is essential for preventing the spread of disease.
    - **Maintaining clean and healthy skin:** Regular bathing or showering helps remove dirt, sweat, and bacteria from the skin, reducing the risk of infections.
    - **Proper oral hygiene:** Brushing and flossing teeth regularly helps prevent cavities, gum disease, and bad breath.
- Three features of community hygiene:**
- **Proper waste disposal:** Proper disposal of solid waste, sewage, and other waste materials helps prevent the spread of disease and protects the environment.



- **Clean water supply:** Access to clean and safe drinking water is essential for maintaining good health and preventing waterborne diseases.
  - **Vector control:** Controlling the population of disease-carrying insects, such as mosquitoes, ticks, and fleas, can help reduce the transmission of vector-borne diseases.
3. **Vaccination:** Vaccination is one of the most effective ways to prevent communicable diseases. Vaccines work by exposing the body to a weakened or inactive form of a virus or bacteria, which helps the body develop immunity to the disease.
- **Hand hygiene:** Regular handwashing with soap and water is one of the most important things you can do to prevent the spread of germs. Germs can be spread from person to person through contact with contaminated hands.
  - **Respiratory hygiene:** Covering your mouth and nose with a tissue or your elbow when you cough or sneeze can help prevent the spread of airborne germs.
  - **Safe food and water:** Eating safe food and drinking safe water can help prevent foodborne and waterborne diseases.
4. Vectors are organisms that carry and transmit infectious pathogens between hosts. Pathogens are disease-causing agents, such as viruses, bacteria, protozoa, and parasites. Vectors play a crucial role in the transmission of many communicable diseases, including malaria, dengue fever, Lyme disease, and Zika virus. A common example of the relationship between vectors and pathogens is the transmission of malaria by the Anopheles mosquito. The Anopheles mosquito serves as a vector for the Plasmodium parasite, which causes malaria. When an infected mosquito bites a person, it transmits the parasite into the person's bloodstream. The parasite then travels to the liver and red blood cells, where it multiplies and causes the symptoms of malaria.

5.

Kwashiorkor	Marasmus
Fat under the skin is present.	Fat under the skin is lost.
Fluid retention leads to swelling.	Fluid retention is absent.
Ribs are not very prominent.	Ribs become prominent.
Appetite is poor.	They have strong appetite.
Happens to children between 6 months to 3 years.	Common in infants below one year.

6. Editor

7. The different modes of transfer of communicable diseases are :
- **Consuming contaminated food and water** – The food we eat can be contaminated if it is handled by dirty hands or is left uncovered. That is why eating food from roadside vendors is often dangerous. The common germ spreading agents are houseflies, cockroaches and rats. These organisms sit on dirty garbage, dung, faecal matter, etc. carry germs on their body parts and contaminate uncovered food items at homes. Our drinking water can get contaminated if it mixes with untreated sewage. Diseases like jaundice, cholera, diarrhoea spread through contaminated food and water.
  - **Direct contact** – Many diseases spread through physical contact. In many cases the articles used by the sick person also can spread the disease. That is why one is advised not to share objects like towels, combs or clothes of a sick person. This is particularly important for diseases like scabies, ringworm and other fungal diseases, conjunctivitis, influenza, etc.
  - **Infection from airborne, droplets and surface contamination** – Pathogens of various diseases are airborne as in the case of tuberculosis, chicken pox, etc. Airborne infections travel longer distances. Naturally produced droplets such as those produced by breathing, talking, sneezing and coughing also carry infectious agents like bacteria, fungi and viruses. When other people inhale these droplets infection spreads. Droplet infections travel up to 2 m.

### **Application based questions**

#### **1. The benefits of composting are:**

- **Reduces food waste:** Composting helps to reduce food waste, which is a major contributor to greenhouse gas emissions.
- **Improves soil health:** Compost can improve soil structure by adding organic matter, which helps to break up clay soils and improve drainage in sandy soils.
- **Reduces the need for chemical fertilizers:** Compost is a natural fertilizer that can help to reduce the need for chemical fertilizers. This can save money and reduce the environmental impact of agriculture.
- **Suppresses plant diseases:** Compost can help to suppress plant diseases by promoting the growth of beneficial microbes in the soil.

#### **2. There are several reasons why we should avoid taking food from road-side vendors:**

- **Food safety:** Road-side vendors may not have access to proper sanitation and hygiene practices, which can put food at risk of contamination. Food that is not properly handled or stored can be contaminated with harmful bacteria, which can cause food poisoning.
- **Quality of ingredients:** Road-side vendors may not use the highest quality ingredients, which can affect the taste and nutritional value of the food.

- **Health risks:** Some types of street food, such as deep-fried foods or those with high sugar content, can be unhealthy and increase the risk of developing chronic diseases such as obesity, heart disease, and diabetes.

**Multi-disciplinary questions:**

1. When we are not in good health our disease fighting capacity is much reduced. This makes us prone to illness.
2. Vaccines are important because they can prevent a disease for an individual as well as for the community. Diseases like small pox and Covid-19, have been managed because of mass vaccination.

**VALUES AND LIFE SKILLS**

Attempt yourself

## Chapter-8 Habitats and Adaptations

### Exercise Corner

**MCQs**

1. Aquatics habitat
2. 25 cm or less
3. Fish
4. An aquatic plant
5. Streamlined
6. Spines
7. Mountain habitat

**Fill in the blanks:**

1. solid
2. dissolved
3. bony fish
4. stem
5. Epiphytic orchids
6. Floating
7. Wide

**Match the following:**

**Adaptation**

- (a) Bulbous stem in water hyacinth
- (b) Flower above the surface in water lily
- (c) Fleshy stem in cactus
- (d) Spines in babul
- (e) Long legs in camel

**Benefit to the organism**

- iii. Helps in floating
- iv. Pollination by insects
- v. Store water
- i. Protect the leaves from being eaten
- ii. Keeps the body away from hot sand

**State True or false for the following and correct the wrong statements.**

1. True
2. False. Aquatic plants have leaves modified for floatation.
3. False. Water enters through the mouth and goes out over the gills.
4. False. Leaves of cactus and pines may look needle like but they serve different purpose in the desert and snowy mountains.
5. False. Flight muscles are found in birds.
6. True
7. True.

**Short answer type questions**

1. An aquatic habitat is a natural environment that is covered by water for a large part of the year, such as oceans, lakes, rivers, and ponds. It supports a
2. One function of scales in fish is to provide protection by covering and shielding the fish's body.
3. Sand does not get into the eyes of camels due to their long, protective eyelashes and a slit-like structure of their eyelids that helps prevent the entry of sand.
4. Mountains are large bodies of high altitude that rise above the surrounding land. (600 m or more). Mountains can be rocky, forest covered or snow laden. Mountainous regions have colder climate. It becomes icy cold at higher altitudes. In India mountainous regions exist in the Himalayas which stretches from the north till the North-Eastern states.
5. Aerenchyma (a type of parenchyma) is the spongy tissue that has air spaces. It is present in aquatic plants -particularly in the stem making the plant buoyant. The stems are hollow and bulbous. This makes the plant float on the surface of the water. Aerenchyma also helps in the respiration of the plant.
6. The stalk of a water lily has large air holes extending all the way to their roots. This acts as storage for carbon dioxide and oxygen. This makes the plant float easily and allow its movement in water without breaking.
7. Two adaptations of pine trees are:  
**Pine** trees are cone shaped with sloping branches, thus rain and snow slide off the tree quickly.  
They have thin needles with a waxy coating, which reduces water loss in dry climate.  
The bark of the trees contains many air pockets, which form an insulating layer against cold wind.

**Long answer type questions:**

1. A habitat is where an organism makes its home. For an organism its habitat meets all the environmental conditions required by it to thrive.

For an animal the habitat should provide everything it needs to find food and breed.

For a plant, the habitat must provide the suitable combination of light, air, water, and soil.

**Aquatic Habitat**

Water bodies such as ponds, rivers, lakes, oceans and coastal areas are examples of aquatic habitat.

As evident aquatic habitat can be fresh water or saline water.

**Forests habitat**

A forest habitat is a place to live for a large variety of plants and animals.

There are various levels or strata in a forest habitat. The strata are the forest floor, the understory, the canopy and the emergent layer.

2. Adaptation is the biological mechanism which can be a modification of the organism or its parts. The changes makes the organism a better fit to survive in the particular habitat or to the changes happening in the habitat. An adaptation is passed from generation to generation. Organisms can adapt to an environment in different ways. They can adapt biologically, meaning they alter body structure or adapt by changing their behaviour. An example of biological adaptation can be seen in the bodies of birds with heavy bones as in the case of penguins. This is because they don't have to fly instead they have to dive under water for food.
3. Fish exhibit several adaptations that make them well-suited to their aquatic habitat. Examples include streamlined bodies for efficient swimming, gills for extracting oxygen from water, scales for protection, and a swim bladder for buoyancy control. These adaptations collectively enable fish to thrive in water environments.
4. Camels can drink up to 46 litres of water at a time; and then they can go without water for few days. They can raise their body temperature close the surroundings they perspire much less than other animals. Thus saving on precious water in the body. Camels pass out almost dry faeces and thick urine. Thus conserving water. Camels have specialized nostrils. They can cool down incoming air to the point that moisture in its outgoing breath is condensed to moisture which is swallowed. When the camel uses its stored fat (in the hump) water is produced as a by-product which is used by the camel by absorbing it

5. Hydrilla are submerged type of aquatic plants.
  - (i) They have long and spongy stems that move freely along with the movement of water.
  - (ii) Their body is mostly built of aerenchyma tissues having air pockets. It helps the plant to float. The cuts on the leaves allow the flow of water and prevent braking of leaves.
  - (iii) The cells secrete mucilage that covers the plant body which protects it from rotting.
  - (iv) Hydrilla can absorb nutrients from water and can photosynthesize and grow even under low light under water.
6. Submerged aquatic plants like hydrilla grow entirely underwater, with their leaves and stems submerged below the water surface. They often have adaptations for efficient nutrient uptake and photosynthesis in low-light conditions. In contrast, floating aquatic plants have leaves that rest on the water surface, allowing them to access sunlight easily.
7. Examples of floating aquatic plants include water lilies and lotus.
  1. In desert plants leaves are reduced to **spines** to reduce water loss through transpiration. Further a very high density of spines also form a shade for the stem that helps to reduce water loss.
  2. When the nights are cold the moisture in the air between the spines condense and fall at the base of the plant which is absorbed by the plant.
  3. Cacti have superficial roots to collect any surface water from light rain. Many species also have deep tap roots to reach out to the underground deep water. The roots can grow root hairs very quickly. The root hair have higher salt content which seeds up water absorption.
  4. Some cacti species, can store water in their roots
  5. Fleshy and thick stems store water. The thick waxy coat prevent water loss. They perform photosynthesis. Sunken stomata also prevents water loss.
  6. Cylindrical and spherical **shapes** are adapted to bring about a low surface area to volume ratio which reduces water loss to the atmosphere. These shapes also reduce the heating effects of the Sun.
  7. Most cacti have **short growing seasons** and long periods of dormancy. This reduces their water requirement considerably.

8. Night Photosynthesis: A behavioural adaptation. It **ensures the plant loses very little water** as its stomata are only open at night when temperatures are at the minimum.

### **Image Based Question**

1. The **nose of a camel** has fine slits and appears closed. It also is lined with hairs to protect the camel from sand. Their nose can cool down incoming air to the point that moisture in its outgoing breath is condensed to drops of water which is swallowed.
2. The **lips** of camels are thick which enables the camel to eat even the thorny bushes .

### **Application based questions**

1. The thick coat of hair on the upper body of camels serves as insulation, providing protection against the intense heat of the desert environment. This hair reflects sunlight and helps to reduce the absorption of heat by the camel's body. Additionally, the insulation prevents the direct exposure of the skin to the sun, enabling camels to maintain a more stable body temperature and avoid overheating in the harsh desert conditions.
2. Birds have several weight-reducing features that contribute to their ability to fly. These features include hollow bones, which provide structural support while minimizing overall weight. Additionally, birds have a unique respiratory system with air sacs that allow for a continuous flow of oxygen, enhancing the efficiency of respiration. The reduction in unnecessary structures, such as the absence of teeth in most birds, also contributes to a lighter body, facilitating flight. The combination of these adaptations enables birds to achieve and maintain the lift necessary for flight.

### **Multi-disciplinary questions**

- In nature, the apparent harmony observed today is the result of thousands of years of adaptation and ecological interactions among organisms. For example, the coevolutionary relationship between flowering plants and pollinators, such as bees and butterflies, highlights this harmony. Over time, plants have developed specific floral traits, like vibrant colors and sweet nectar, to attract pollinators. In turn, pollinators have evolved specialized body structures and behaviors to efficiently collect pollen and nectar. This mutualistic adaptation has not only ensured the reproductive success of both plants and pollinators but has also contributed to the overall biodiversity and balance within ecosystems.

### **VALUES AND LIFE SKILLS**

1. Ritual practices passed down through generations can be considered cultural adaptations rather than strictly behavioral adaptations in the

biological sense. Rituals often serve cultural, social, or religious functions and contribute to the cohesion and identity of a community, showcasing the adaptability of human societies to their environments.

2. Coping with a difficult opposition in a game involves a combination of psychological strategies and life skills. One effective approach is to focus on one's own performance and skills rather than fixating on the strengths of the opposition. Additionally, effective communication and teamwork play crucial roles in adapting to the situation. Learning from mistakes, staying motivated, and managing emotions contribute to a well-rounded approach to coping with challenges in a game.