

ICSE BIOLOGY-6

CHAPTER 1. The Leaf

Check Point

1. Dicot leaves 2. Stomata 3. Insectivorous plants 4. Iodine solution

TEST YOURSELF

- A. 1. compound 2. sessile 3. lamina 4. Venus flytrap
- B. 1. Veins distribute water and minerals throughout the lamina. They also transport food prepared by the leaf through petiole to different parts of the plants.
2. Petiole connects leaf blade with the stem and helps to transport materials to and from leaf.
3. The pitcher in pitcher plant secretes digestive juices which digest the trapped insect.
4. Spines in cactus prevent loss of water by transpiration and protect the plant from grazing animals.
- C. 1. Transpiration 2. Vegetative propagation 3. Photosynthesis
- D. 1. The process of synthesis of food using water and carbon dioxide with the help of chlorophyll in the presence of sunlight with the release of oxygen by the green plants is called photosynthesis.
2. The loss of excess of water in the form of water vapour from the surface of leaves through stomata is called transpiration.
3. The practice of growing plants from the vegetative parts such as root, stem, bud or leaves of plant is called vegetative propagation.
- E. 1. Monocot and dicot leaves have following differences:

Monocot leaf	Dicot leaf
1. Monocot leaves are sessile, i.e., without petiole.	1. Dicot leaves are stalked, i.e., with a petiole.
2. Their leaf blade or lamina has parallel venation.	2. In dicot leaves, venation is reticulate.

2. Simple and compound leaves have following differences:

Simple leaf	Compound leaf
1. Lamina of leaf is undivided.	1. Lamina is divided into leaflets up to the midrib.
2. Axillary bud is present in the axil of simple leaf.	2. Axillary bud is present in the axil of rachis but not in the axil of leaflets.

3. Reticulate and parallel venations have following differences:

Reticulate venation	Parallel venation
1. Veins and veinlets form a network in the lamina.	1. Veins run parallel to each other.
2. It is found in dicot plants.	2. It is found in monocot plants.

F. 1. A tendril coils around the support and helps in climbing.
Example: Grapevine.

2. Parts of a typical leaf are

(a) Petiole (b) Lamina or leaf blade (c) Midrib (d) Veins

3. Main functions of leaf

(a) **Photosynthesis:** Leaves carry out photosynthesis, i.e., manufacture food with the help of chlorophyll, sunlight, carbon dioxide and water and release oxygen.

(b) **Transpiration:** Leaves expel excess of water in the form of water vapour through stomata present on their surface and cool the plant during summer.

(c) **Respiration:** Leaves breathe in oxygen and breathe out carbon dioxide through stomata.

4. Pitcher plant and Venus flytrap are insectivorous plants.

5. Food is synthesised in leaves in the form of glucose and is stored in the form of starch.

G. 1. –(e) 2.–(f) 3.–(a) 4.–(b) 5.–(d) 6.–(c)

H. 1. True 2. True

3. False; Scale leaves are for **protection of the buds**.

4. False; Rose leaves are **compound** leaves.

5. False; Some leaves in pea form **tendrils**.

I. 1. (b) 2. (b) 3. (d) 4. (a) 5. (c) 6. (b)

J. (a) 1st picture represents a compound leaf and 2nd picture is of a simple leaf.

(b) In a compound leaf, the lamina is incised up to midrib and forms many leaflets, whereas in a simple leaf, lamina is undivided.

(c) Example of a compound leaf: Neem leaf

Example of a simple leaf: Mango leaf

THINK ZONE

- Leaves are called food factories of plant because they produce food with the help of chlorophyll, carbon dioxide and water in the presence of sunlight by the process of photosynthesis.
- Sunlight falling on the plants is the source of energy for the synthesis of food.

- Photosynthesis occurs only in green leaves because green leaves contain chlorophyll which traps energy from the sun to start the process of photosynthesis.
- Pitcher plant and Venus flytrap kill insects because they grow in nitrogen deficient soil. To fulfil their nitrogen requirement, they kill and digest insects.

CHAPTER 2. The Flower

Check Point 1

1. Bisexual flowers 2. Corolla 3. Stamen 4. Thalamus 5. Calyx

Check Point 2

1. cross pollination 2. fertilisation 3. fruit 4. fleshy and false fruit

Check Point 3

1. Seed 2. Seed dispersal 3. Seed germination 4. Cotyledons

TEST YOURSELF

- A. 1. shoot 2. insects 3. shoot 4. ovules 5. Bean/gourd/castor/cotton
6. Male gametes
- B. 1. Cotyledons provide food to the growing embryo. In some seeds, they become green to synthesise food for the growing seedling until new leaves appear and then shrivel off.
2. Fruit stores food, protects seeds from harsh climate and helps in the dispersal of seeds.
3. Endosperm stores food and provides it to the young plant.
4. Stigma traps pollen grains brought by pollination.
5. Stamens produce pollen grains which contain male gametes.
6. Petals attract insects for pollination.
7. Pericarp in fleshy fruits has pulp which is eaten by birds and mammals. This helps in the dispersal of seeds.
- C. 1. Sepals 2. Fruit 3. Fertilisation 4. Complete flower
5. Self pollination
- D. 1. The flowers which have both male and female reproductive organs, i.e., stamens and pistil respectively are called bisexual flowers. On the other hand, flowers which have either male reproductive part or female reproductive part are called unisexual flowers.
2. Androecium is the male reproductive part and the third whorl of flower formed of stamens, whereas gynoecium is the female reproductive part and the fourth whorl of flower formed of pistil or carpel.

3. The seeds having only one cotyledon are called **monocotyledonous** seeds. They have food stored in the endosperm. On the other hand, the seeds having two cotyledons are called **dicotyledonous** seeds. They have food stored in cotyledons.

4. Epigeal germination	Hypogeal germination
1. Cotyledons come out of the soil.	1. Cotyledons remain under the soil.
2. Cotyledons become green and form first leaves of the seedling.	2. Cotyledons do not form leaves.
3. Cotyledons synthesise food for a short while and shrivel off.	3. Cotyledons do not synthesise food.

5. Fruit	Seed
1. A fruit is a ripened ovary.	1. A seed is a fertilised ovule.
2. It encloses seeds.	2. It is enclosed in the fruit.
3. It is formed of pericarp.	3. It is formed of seed coat, embryo and endosperm.

6. Fleshy fruits	Dry fruits
1. Pericarp is soft, pulpy and edible.	1. Pericarp is dry and nonedible.
2. They are adapted for dispersal by birds and mammals.	2. They are adapted for dispersal by the wind.

- E. 1. Flowers that bloom at night have sweet fragrance to attract insects for pollination.
2. Wind-pollinated flowers are small, inconspicuous and have large and feathery stigma to catch the pollen.
3. Some flowers produce nectar to attract insects for pollination.
4. In wind-pollinated flowers, most of the pollen grains are lost during the pollination. So, they produce pollen grains in large number to ensure that some pollen definitely reach the stigma.
- F. 1. A flower is a part of plant which develops from the floral bud. It is modified shoot which carries out sexual reproduction. Whorls of a typical flower are: (i) Calyx, (ii) Corolla (iii) Androecium (iv) Gynoecium.
2. Functions of flower:
- Flowers produce male and female gametes and help in sexual reproduction.
 - Flowers are used for decoration.
 - The ovary of flower develops into fruit and its ovules form seeds. The seeds grow into new plants.
 - Flowers are used for worship and making garlands.

3. The wall of a fruit is called pericarp. It develops from the ovary wall after fertilisation. Pericarp has following three parts:
 - (a) **Epicarp:** It is the outer thin covering of the fruit.
 - (b) **Mesocarp:** It is the middle layer which is fleshy in fleshy fruits.
 - (c) **Endocarp:** It is the inner hard part of the pericarp.
4. Following conditions are necessary for seed germination:
 - (a) **Moisture:** Water softens the seed coat and makes it burst open for the radicle and plumule to come out.
 - (b) **Air:** Oxygen from air oxidises the food to release energy for the germination of seed.
 - (c) **Warmth:** The favourable temperature for the seeds of summer plants is 25°C – 40°C and for winter plants is 10°C – 20°C .

G. 1. –(d) 2.–(e) 3.–(a) 4.–(b) 5.–(c)

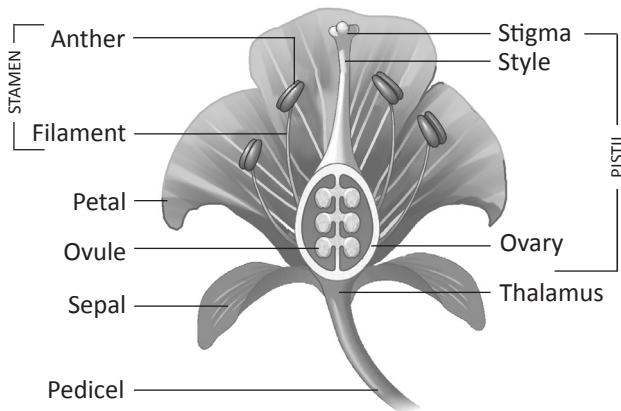
H. 1. True 2. True 3. True

4. False; After fertilisation, ovary forms the **fruit**.
5. False; Seeds with two cotyledons are called **dicot** seeds.
6. True

- I. 1. Stamens; Stamens are male reproductive organs while others are the parts of female reproductive organ.
2. Wheat: Wheat has wind-pollinated flowers while others have insect-pollinated flowers.
 3. Lotus; The seeds of lotus are dispersed by water while that of others are dispersed by wind.
 4. Maize; Maize is a monocot seed while others are dicot seeds.

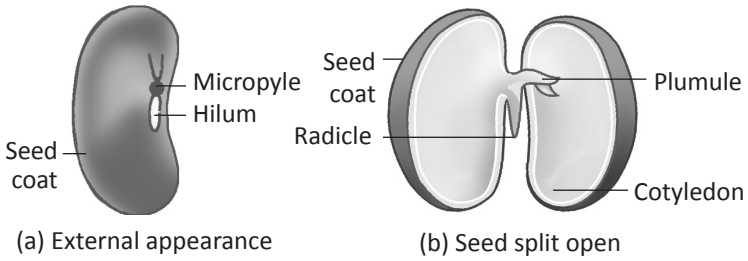
J. 1. (a) 2. (b) 3. (c) 4. (d) 5. (d) 6. (c) 7. (a)

K. 1.



Structure of a complete flower

2.

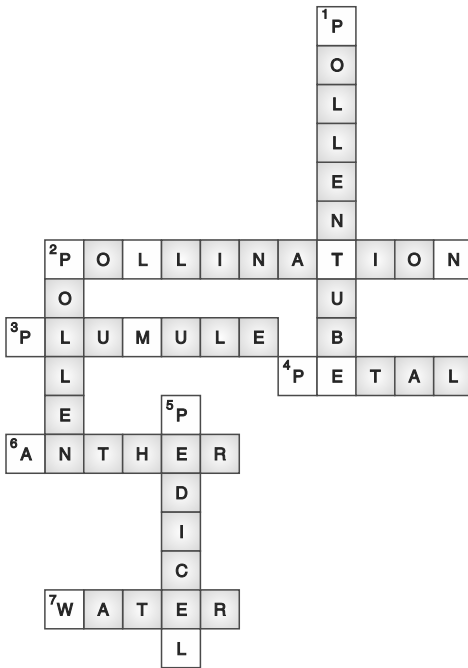


Structure of a bean seed

L. The process of fertilisation is shown in the picture.

1. Germinating pollen grain
2. Pollen tube
3. Ovary
4. Ovule
5. Egg or ovum

M.



THINK ZONE

- Honeybee was sucking nectar. While doing so, it will also help in pollination by carrying pollen stuck to its body parts.
- Androecium and gynoecium are called essential whorls of a flower because they are directly involved in reproduction.
- Seeds and fruits dispersed by water are large and spongy so that they can float to far away places with water currents.
- *Xanthium* seeds have hooks and spines to cling to the skin of

animals or clothes of human beings so as to be carried from one place to other.

- Maize seed is called maize grain because unlike dicot seeds, it has seed coat fused with the pericarp.

CHAPTER 3. The Cell

Check Point 1

1. cell 2. Robert Hooke 3. shape 4. 15–20 cm 5. unicellular

Check Point 2

1. Nucleus 2. Chloroplast 3. Cell wall 4. Leucoplasts
5. Cell division

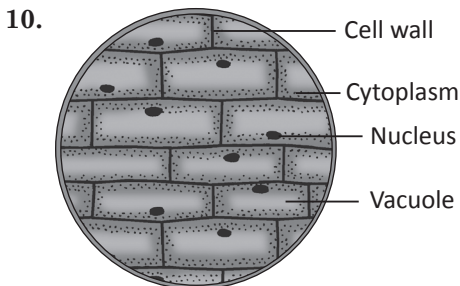
TEST YOURSELF

- A. 1. Blood 2. Microscope 3. cytoplasm 4. cell sap 5. Nucleus
B. 1. Cell wall 2. Robert Hooke 3. Staining 4. Chromoplasts 5. Nucleus
6. Nucleolus 7. Chromatin fibres 8. Chloroplast
C. 1. **Unicellular** organism is formed of just one cell, e.g., *Amoeba*, yeast, etc., while **multicellular** organism is formed of many cells, e.g., neem, fish, etc.
2. **Chloroplast** is a green plastid due to the presence of chlorophyll. It gives green colour to leaves and carries out photosynthesis. **Chromoplast** is a coloured plastid. It gives colour to flowers and fruits.
3. **Nucleus** is the control centre of the cell. It stores hereditary information and passes it to the next generation. **Nucleolus** is a rounded body present in the nucleoplasm. It forms ribonucleic acid for ribosomes.

4.

Plant cell	Animal cell
1. A rigid cell wall formed of cellulose is present.	1. Cell wall is absent.
2. Chloroplasts are present.	2. Chloroplasts are absent.
3. Vacuole or vacuoles are present.	3. Vacuoles are absent.
4. Centrosome is absent.	4. Centrosome is present near the nucleus.
5. Nucleus is shifted to one side.	5. Nucleus is centrally placed.
6. Units of Golgi complex are scattered in the cytoplasm and are called dictyosomes.	6. Golgi complex is prominent and forms one complex unit.

- D. 1. Our body needs new cells for growth, replacement and repair of old and worn out cells, and for reproduction.
2. A cell is the smallest part of the body and carries out all the life activities. Therefore, cell is called the basic unit of structure and function of living organisms.
3. The salient features of cell theory are as follows:
 - (a) Every living organism is made up one or many cells.
 - (b) Cell is the structural and functional unit of living organisms.
 - (c) New cells arise by the division of pre-existing cells.
4. The liquid filled in the cavity of a vacuole is called cell sap. It contains stored food, water, pigments, etc.
5. Plastids are coloured bodies found in plant cells. They are of following types:
 - (a) **Chloroplasts:** They contain chlorophyll and give green colour to leaves and carry out photosynthesis.
 - (b) **Chromoplasts:** They are coloured plastids and give colour to flowers and fruits.
 - (c) **Leucoplasts:** They are colourless plastids and store food in the form of starch, proteins or fats.
6. Chloroplasts are found only in plant cells because they carry out the process of photosynthesis.
7. Nucleus is called the control centre of the cell because it controls all the activities of the cells.
8. Vacuole in plant cell stores water, food, pigments, etc., and keeps the cell stiff.
9. Cell division is essential because new cells are formed from pre-existing cells by cell division. New cells are needed for growth, reproduction, repair and replacement of old and worn out cells.



Cells of onion peel

Features:

- (a) The cells of onion peel are brick-shaped lying side-by-side.

(b) They have a cell wall, a nucleus, a central vacuole, and a thin layer of cytoplasm between cell wall and vacuole.

E. 1.–(b) 2.–(c) 3.–(a) 4.–(e) 5.–(d)

F. 1. True

2. False; The cells observed by Robert Hooke in a slice of cork were **dead** cells.

3. False; The cheek cells are **polygonal** in shape.

4. False; **Schleiden** and **Schwann** gave the cell theory.

5. False; Cell wall is found in **plant** cells only.

6. False; **Chromoplasts** give colour to the fruits.

G. 1. **Chromatin**; It is found in nucleoplasm, others are plastids found in cytoplasm.

2. **Cytoplasm**; It is found outside the nucleus, others are found inside the nucleus.

3. **Fish**; It is multicellular organism, others are unicellular organisms.

4. **Guard cells**; It is found in plants, others are found in animals.

H. 1. Cells have different shapes because they have to perform different types of functions. For example, nerve cells are long and branched because they have to pass messages from one end to other end of body parts and have to spread messages in all directions.

2. Plasma membrane is described as selectively permeable because it allows only some substances such as oxygen, water, nutrients, etc., to enter the cell and only wastes to leave the cell.

I. 1. (b) 2. (b) 3. (c) 4. (a) 5. (b) 6. (c)

J. 1. (a) A– Golgi body B– Cell membrane C– Nucleolus

D– Endoplasmic reticulum E– Nucleus F– Mitochondria

(b) Animal cell, because vacuole and cell wall are absent

(c) Nucleus

K.

A	A	B	C	E	F	M	N	R	S	C	T	P
T	C	R	F	M	O	C	T	O	N	H	I	L
G	M	I	T	O	C	H	O	N	D	R	I	A
F	O	B	O	S	N	X	Y	U	P	O	N	S
N	P	O	G	H	T	O	P	C	F	M	E	T
G	C	S	F	G	C	C	E	L	L	O	N	I
E	M	O	S	O	S	Y	L	E	O	S	O	D
T	P	M	B	B	T	P	C	U	G	O	Q	R
N	G	E	P	C	T	R	A	S	F	M	G	H
S	A	P	L	Y	S	O	S	O	M	E	F	N

THINK ZONE

- A cell is so tiny that it cannot be seen with the naked eye. Therefore, it was discovered only after the invention of microscope.
- As the nucleus controls all the activities of the cell, so, if the nucleus of a cell is taken out, the functioning of the cell would be disturbed and no vital reaction would take place.

CHAPTER 4. Human Digestive System

Check Point 1

1. Glucose
2. more
3. amino acids
4. D; K
5. Ingestion
6. assimilation

Check Point 2

1. Incisors
2. milk; permanent
3. Teeth
4. taste buds
5. gullet
6. digestion

Check Point 3

1. Stomach
2. Villi
3. Anus
4. Small intestine
5. Salivary glands
6. Liver

Check Point 4

1. Hydrochloric acid
2. Salivary amylase
3. Egestion or Defecation
4. Amino acids
5. Large intestine
6. Bile

Check Point 5

1. Obesity
2. Kwashiorkor
3. Balanced diet
4. Marasmus

TEST YOURSELF

- A. 1. glucose 2. cardiac sphincter 3. Tongue 4. gall bladder 5. Wisdom teeth 6. villi 7. energy-giving
- B. 1. Dentition 2. Salivary amylase 3. Canines 4. Peristaltic movements 5. Chyme
- C. 1. Chewing is the process of breaking down of solid food into small pieces with the help of premolar and molar teeth.
2. Assimilation is the utilisation of absorbed nutrients by the body cells for energy, growth, repair and replacement of damaged tissue.
3. Ingestion is the process of intake of food from outside into the alimentary canal through mouth.
4. Faeces is the undigested semisolid remains of food that enters the rectum from large intestine.

5. Kwashiorkor is a disease caused due to malnutrition of protein in children which leads to stunted growth, large pot-like belly, mental retardation and swollen face.
 6. Emulsification is the process of making a film of bile around fat molecules so that intestinal juice can act upon them.
- D. 1. Ingestion** is the process of intake of food from outside into alimentary canal through mouth, whereas **egestion** is pushing out undigested semisolid part of food left after digestion and absorption as faeces from rectum through anus.
2. The food which provides nutrients to the body and leads to good health is called **healthy food**, whereas the food which does not provide nutrients to the body and leads to poor health is called **junk food**.
 3. **Pepsin** is secreted by gastric glands in the stomach and it acts on proteins in acidic medium, whereas **Trypsin** is secreted by pancreas and it also acts on proteins but in alkaline medium.
 4. **Bile juice** is secreted by liver cells and is stored in gall bladder. It does not contain any enzyme, but makes the medium alkaline and helps in the digestion of fat by emulsifying it.
Pancreatic juice is secreted by pancreas. It contains pancreatic amylase, trypsin and pancreatic lipase enzymes which help in the digestion of carbohydrates, proteins and fats respectively.
- E. 1.** Nutrition is the process by which living organisms obtain or synthesize their food and convert it into simple absorbable substances that can be utilised by the body cells.
The process involves following steps:
- (a) **Ingestion:** It is the process of intake of food.
 - (b) **Digestion:** It is the breaking down of complex insoluble organic compounds into simple soluble molecules by the action of digestive enzymes.
 - (c) **Absorption:** It is the process by which simple molecules of digested food are taken into the blood through intestinal wall.
 - (d) **Assimilation:** It is the utilisation of absorbed nutrients by the body cells for energy and synthesis of new protoplasm.
 - (e) **Egestion (or defecation):** It is the removal of undigested solid part of the food in the form of faeces.
2. Alimentary canal is a long, coiled tube where digestion of food takes place. It begins at the mouth and ends with anus. Its different parts are buccal cavity, oesophagus (foodpipe), stomach, small intestine and large intestine.

3. There are four types of teeth in the permanent set of teeth in man. They are 32 in all.

The names of different types of teeth and their functions are as follows:

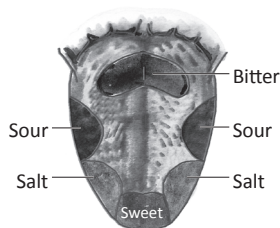
- (a) **Incisors:** There are 4 incisors in each jaw. They are used for biting food.
 - (b) **Canines:** There are 2 canines in each jaw. They are used for tearing food.
 - (c) **Premolars:** There are 4 premolars in each jaw. They are used for chewing and grinding the food.
 - (d) **Molars:** There are 6 molars in each jaw. They are used for chewing and grinding the food.
4. Enzymes are biocatalysts. They are made up of proteins. They speed up chemical reactions occurring within the body.

Following enzymes are present in pancreatic juice:

- (a) **Trypsin and Chymotrypsin:** They break proteins into polypeptides.
 - (b) **Carboxypeptidase:** It breaks polypeptides into tripeptides, dipeptides and amino acids.
 - (c) **Pancreatic amylase or Amylopsin:** It hydrolyses starch and glycogen into maltose.
 - (d) **Pancreatic lipase or Steapsin:** It acts on emulsified fats and hydrolyses them into fatty acids and glycerol.
5. Lacteal is a lymph vessel in the villi of small intestine. It absorbs fat molecules from the digested food.
6. Villi are finger-like projections from the inner wall of small intestine into its cavity. They help in the absorption of food by increasing the surface area of inner wall of the small intestine.

7. The tongue has following functions:

- (a) It helps in tasting the food.
- (b) It helps in mixing saliva with food during chewing.
- (c) It helps in turning food in the buccal cavity between the teeth for chewing.
- (d) It helps in swallowing the food.
- (e) It helps in cleaning the teeth.
- (f) It helps in speaking.



- F. 1.–(c) 2.–(a) 3.–(b) 4.–(e) 5.–(d)

- G.** 1. True
 2. True
 3. False; Bile is produced by **liver**.
 4. False; Digestion is completed in **small** intestine.
 5. False; The **milk** teeth are without **premolars**.
- H.** 1. The food nutrients are formed of macromolecules which cannot be absorbed in the blood and transported to the cells directly. Digestion breaks these macromolecules into simple soluble molecules to be used by the cells. Therefore, digestion is essential.
 2. Oesophagus is merely a passage, through which food slides down to the stomach by peristaltic movements. Because no digestive juice is secreted in the oesophagus and food does not stay here for long, so, no digestion occurs in oesophagus.
 3. Stomach wall is thick and muscular because it churns the food into a fine paste and causes thorough mixing of gastric juice with it.
 4. We cannot digest cellulose because cellulose-digesting bacteria are not found in our alimentary canal.
 5. Hydrochloric acid secreted by gastric glands does not damage the stomach wall because stomach wall is protected by a layer of mucus which is secreted by mucous glands present in stomach.
- I.** 1. Salivary glands secrete saliva which
 (a) moistens the food.
 (b) helps in chewing and swallowing the food.
 (c) makes chewed food slippery.
 (d) contains the enzyme salivary amylase which converts starch into sugar.
 2. Teeth help in biting, tearing, grinding and chewing the food.
 3. Oesophagus acts as a passage for sliding the food down to the stomach by its peristaltic movements.
 4. Lacteal absorbs fat molecules from the digested food in small intestine.
 5. Gall bladder stores bile juice secreted by liver.
 6. Rectum helps in egestion or defecation of undigested part of food through anus.
- J.** 1. (d) 2. (a) 3. (b) 4. (b) 5. (a) 6. (d) 7. (a) 8. (a)
- K.** 1. Salivary gland 2. Tongue 3. Oesophagus 4. Liver 5. Stomach
 6. Pancreas 7. Large intestine 8. Small intestine 9. Rectum
 10. Anus

THINK ZONE

- Stomach is specialised for churning the food. It ensures proper mixing of digestive juices with food. The food which reaches the stomach is not completely digested to be absorbed. Moreover, no structure for absorption is found in stomach. So, no food is absorbed in stomach.
- Food in digested form is available only in intestine. For complete absorption of digested food, intestine is so long. It also has villi that increase surface area for the absorption of food.
- Bile contains no digestive enzymes but it is helpful in digestion in following ways:
 - (a) It neutralises the acidity of chyme and makes it alkaline for the action of pancreatic and intestinal enzymes on it.
 - (b) It emulsifies the fats by breaking large fat molecules into small droplets and making a film around them, thus, preparing them for the action of fat-digesting enzymes.

CHAPTER 5. Human Respiratory System

Check Point 1

1. Respiration 2. nose 3. thoracic 4. Alveoli

Check Point 2

1. Carbon dioxide 2. 16–18 breaths 3. Inhalation 4. Blood (Haemoglobin) 5. Cell respiration

Check Point 3

1. False 2. True 3. True 4. True 5. False

TEST YOURSELF

- A.** 1. Cell 2. upwards; outwards 3. carbon dioxide; water
4. inhalation; exhalation 5. epiglottis
- B.** 1. Alveoli 2. Diaphragm 3. Carbon dioxide 4. Oxyhaemoglobin
5. Ribs and diaphragm 6. Glucose
- C.** 1. Nasal passages filter, warm and moisten the inhaled air. This allows clean air to enter the lungs.
2. Alveoli of lungs present a large surface area for the exchange of respiratory gases.
3. Ribs along with diaphragm help in increasing and decreasing the volume of thoracic cavity and lungs during breathing by moving outwards, upwards and inwards, downwards respectively.

4. Haemoglobin, which is a respiratory pigment in blood, carries oxygen to the cells in the form of oxyhaemoglobin.
5. Epiglottis guards the opening of trachea, i.e., glottis into the pharynx by closing the glottis while swallowing the food.

D. 1. Differences between breathing and respiration are as follows:

Breathing	Respiration
1. Breathing is a mechanical process.	1. Respiration is a biochemical process.
2. It is pumping of air into and out of the lungs.	2. It involves splitting of foodstuff to release energy.
3. It provides oxygen to the body cells for cell respiration.	3. It provides energy to the body cells for various life activities.
4. It occurs in lungs outside the cells.	4. It occurs within the cells.
5. Enzymes are not needed.	5. Enzymes are needed.
6. Energy is used in breathing movements.	6. Energy is released during respiration.

2. **External respiration** is the exchange of gases between air and blood which takes place in the lungs. Oxygen from alveolar air diffuses into blood. It combines with haemoglobin and forms a temporary compound, oxyhaemoglobin which is carried by blood to different body cells.

Internal respiration is the exchange of gases between blood and body cells. On reaching tissue cells, oxyhaemoglobin releases oxygen. The released oxygen diffuses into the cells.

3. **Exhalation** is the process of giving out air rich in carbon dioxide. During exhalation, ribs are moved downwards and inwards and the diaphragm moves upwards by the relaxation of rib muscles and diaphragm muscles. This reduces the volume of chest cavity and lungs which pushes the used air from lungs to outside.

Inhalation is the process of taking air rich in oxygen into the lungs. During inhalation, ribs are raised upwards and outwards and the diaphragm is pulled down by the contraction of rib muscles and diaphragm muscles. This increases the volume of chest cavity and lungs to make the air from outside to enter the lungs.

- E. 1. Breathing involves inhalation and exhalation with the help of rib muscles and diaphragm.

During inhalation, the ribs move upwards and outwards, and the diaphragm is pulled down by the contraction of rib muscles and the muscles of diaphragm respectively. This increases the volume of thoracic cavity and lungs, decreasing air pressure inside the lungs. Due to this, fresh air from atmosphere having higher pressure rushes into the lungs.

During exhalation, the ribs move downwards and inwards, and the diaphragm moves up to return to its normal shape by the relaxation of rib muscles and muscles of diaphragm respectively. This decreases the volume of thoracic cavity and the lungs. Due to this, air pressure inside the lungs increases and air from the lungs is pushed out.

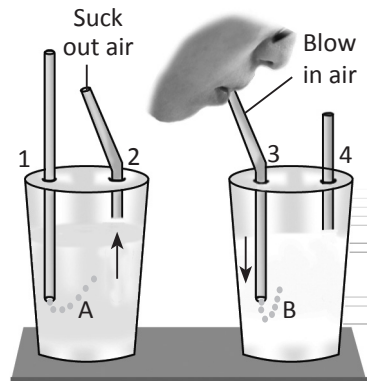
2. Exchange of gases in human body occurs at two places:
 - (a) **In lungs:** It is between alveolar air and blood of capillaries in the wall of alveoli. Oxygen from the fresh air of alveoli diffuses into the blood of capillaries and CO_2 from blood diffuses out into the alveolar air.
 - (b) **In tissues:** It is between oxygenated blood and body cells. Oxygen from the blood diffuses into the body cells while carbon dioxide from body cells diffuses into the blood. This CO_2 is transported to the lungs by blood.
3. The exhaled air contains carbon dioxide can be shown by following experiment:

Procedure: Take two glasses and mark them A and B. Pour some freshly prepared limewater in each glass. Cover each glass with a cardboard cover. Seal the cover with cellotape. Make two holes in each cardboard. Insert a straw in each hole. One of the two straws in each glass should dip in limewater and the other should remain out of limewater.

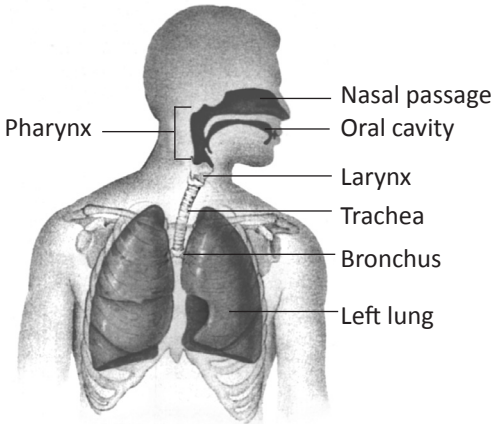
In glass A, suck out air and in glass B, blow the air in. Do it 2–3 times and then observe the colour of water in both the glasses.

Observation: Limewater in glass B turns milky but not in glass A.

Conclusion: This shows that the exhaled air contains CO_2 produced during respiration.

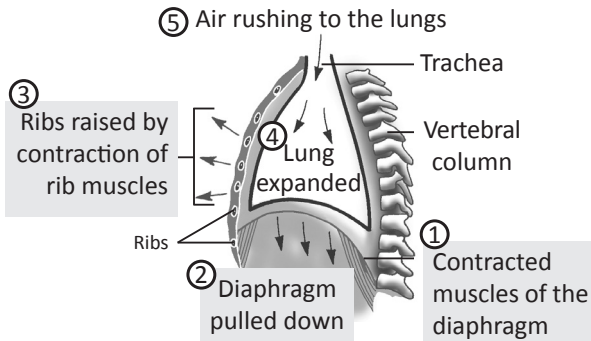


- F. 1. We need to breathe for taking oxygen in, which is used for break down of glucose to release energy during respiration. Thus, we breathe to get energy.
2. During fast physical activities, muscles need more energy. To meet this extra demand of energy, we need more oxygen to burn more glucose which we get by faster and deeper breathing. This increases the breathing rate.
3. Sometimes, during inhalation when foreign substances are not trapped by nasal hair, they start irritating the nasal lining and cause sneezing. Sneezing throws these particles out of the nasal passage.
- G. 1.-(c) 2.-(e) 3.-(b) 4.-(a) 5.-(d)
- H. 1. False; The air we breathe out is rich in **carbon dioxide** and moisture.
2. True
3. False; **Alveoli** have large surface area for gaseous exchange.
- I. 1. Abdominal cavity; It does not help in breathing, all others help in breathing movements.
2. Skin; Skin is not a respiratory organ, others are respiratory organs.
3. Ammonia; It is a waste product related to excretion, others are related to respiration.
- J. 1. (d) 2. (b) 3. (a) 4. (c)
- K. 1.

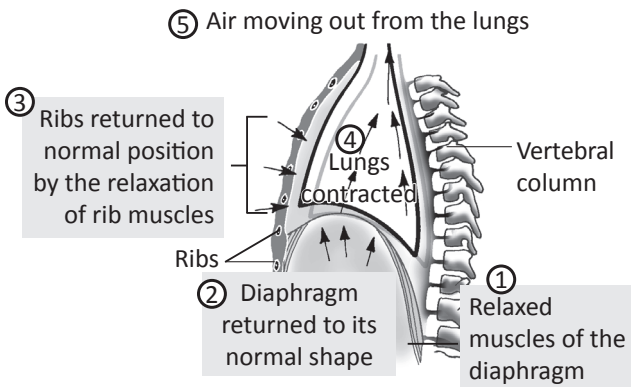


Human respiratory organs

2. Process of inhalation in humans:



Process of exhalation in humans:



1. Pulmonary vein 2. Bronchiole 3. Alveolar duct
4. Alveolar cavity
- (a) 1. Air rushing to the lungs 2. Ribs 3. Vertebral column
4. Lung 5. Diaphragm 6. Muscles of diaphragm
- (b) (i) Ribs are pulled inward and downward.
(ii) Diaphragm muscles relax making diaphragm dome-shaped.
(iii) Lungs get deflated and the air is pushed out.

THINK ZONE

- Breathing through nose makes the air filtered, warm and moist. This lets the clean air reach the lungs.
- During vigorous muscular activities, we need more energy. To get this extra amount of energy, we need more oxygen to burn more glucose. We get this extra oxygen by faster and deeper breathing. As athletes perform various vigorous muscular activities, they breathe faster and deeper.

CHAPTER 6. Human Circulatory System

Check Point 1

1. Haemoglobin
2. White blood corpuscles
3. Red blood corpuscles
4. Plasma
5. Arteries
6. Veins

Check Point 2

1. Auricles
2. Pulse
3. Tricuspid valve
4. Stethoscope
5. Aorta

Check Point 3

1. RBCs; plasma
2. antigen; A
3. salt
4. Fruits; vegetables

TEST YOURSELF

- A.**
1. haemoglobin
 2. White blood corpuscles or Leucocytes
 3. Pulmonary
 4. Arteries
 5. capillaries
- B.**
1. Cuspid valves
 2. Cardiac muscles
 3. Left auricle
 4. AB
- C.**
1. Events that occur during one heartbeat from a cardiac cycle.
 2. The rhythmic contraction and relaxation of auricles and ventricles is termed as heartbeat.
 3. A special type of protein present on the surface of RBC is called antigen.
 4. Special type of proteins found in blood plasma are called antibodies.
- D.**
1. **Artery** is a thick-walled, narrow-lumened blood vessel which carries oxygenated blood from the heart to other parts of the body, whereas **vein** is a thin-walled, wide-lumened blood vessel which carries deoxygenated blood from body organs to the heart.
 2. **RBC** is the red blood corpuscle which transports oxygen to all the body cells with the help of an oxygen-carrying pigment called haemoglobin contained in it, whereas **WBC** is the white blood corpuscle which defends the body by fighting germs and providing immunity against infections.
 3. **Lub** sound of the heart is caused by the contraction of ventricles and closure of cuspid valves, whereas **dub** sound is caused by shutting down of semilunar valves.
 4. **Systole** is one of the phases of heartbeat in which heart muscles contract and heart pumps blood into blood vessels, whereas **diastole** is the phase in which heart muscles relax and heart receives blood from the body parts.
- E.**
1. Blood, blood vessels and heart are the main parts of human circulatory system.
 2. Blood supplies digested food and oxygen to all the body cells. It removes wastes from the cells, helps in regulating body

temperature and protects body against infections. It also transports hormones to all the body parts.

3. Two types of antigens, antigen A and antigen B are found on human RBCs. Based on the presence or absence of these antigens, human blood falls into four groups, i.e., blood group A, B, AB and O. This forms ABO system of blood group. It was discovered by Karl Landsteiner.
4. The rhythmic contraction and relaxation of auricles and ventricles is known as heartbeat. One heartbeat includes
 - (a) a phase of contraction of heart muscles called systole and
 - (b) a phase of relaxation of heart muscles or general pause called diastole.

The heart makes lub sound due to the contraction of ventricles and closure of cuspid valves and the dub sound due to shutting down of semilunar (pulmonary and aortic) valves.

5. The haemoglobin of RBCs, in blood, combines with oxygen and forms oxyhaemoglobin which is transported to all parts of the body.
6. Following are the ways for keeping the heart healthy:
 - (a) Give up smoking and alcohol.
 - (b) Cut down sugary and fried food.
 - (c) Eat fruits and vegetables to get more fibres.
 - (d) Manage weight and stick to balanced diet.
 - (e) Cut on salt to maintain normal blood pressure.
 - (f) Avoid food with high cholesterol.
 - (g) Take plenty of water.
 - (h) Do regular physical exercises.

F. 1. True

2. False; Capillary wall is formed of **single layer** of cells.

3. True 4. True

5. False; Antigens are present **on the RBCs** and antibodies **in the plasma**.

Or

Antibodies are present in the plasma and **antigens** on the RBCs.

6. True

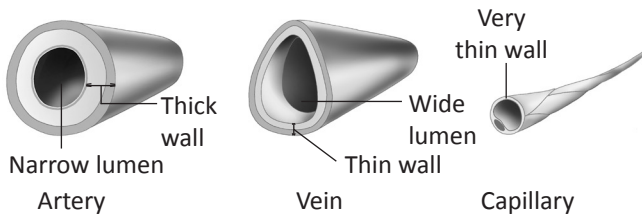
G. 1.-(b) 2.-(c) 3.-(d) 4.-(e) 5.-(a)

H. 1. Ureters; Part of excretory system, others are parts of circulatory system.

2. Blood pressure; It develops in blood vessels, others develop due to rhythmic contraction and relaxation of heart muscles.

3. Antibodies; Antibodies are the proteins found in blood plasma, others are blood corpuscles.

- I. 1. As ventricles pump blood into blood vessels with force so that it reaches the lungs and rest parts of the body, they have thick walls. On the other hand, auricles just pump blood into ventricles adjacent to them, hence, they have thin walls.
2. To prevent backflow of blood from ventricles into the auricles when ventricles contract to pump blood into aortas, the openings of auricles into ventricles are guarded by valves.
3. Arteries have thick walls to withstand high blood pressure with which the blood flows through them.
4. Just like soldiers, leucocytes defend the body and fight against disease-causing microbes that enter the body. Hence, they are called soldiers of our body.
5. In arteries, blood flows under pressure but in veins, it flows passively from body to heart. So, to prevent backward flow of blood valves are present in veins.
- J. 1. (c) 2. (b) 3. (c) 4. (a) 5. (c) 6. (a)
- K. 1. The diagrams of three types of blood vessels showing difference between their lumens are as follows:



THINK ZONE

- Blood is bright-red in arteries because it is oxygenated while darker in veins because it is impure without oxygen and contains many types of wastes.
- During fast physical activities, muscles need more energy. To meet this extra demand of energy, we need more oxygen to burn more glucose which we get by faster and deeper breathing. This increases the rate of heartbeat.
- When there is any infection in the body, the WBC count goes up to fight the germs and save the body from infection.
- Arteries are distributing vessels supplying blood to all the body parts. Blood in them flows with jerk and great pressure. Therefore, they are deep seated. On the other hand, veins are receiving vessels and collect blood from all the body parts. The flow of blood in them is neither jerky nor under pressure. So, the veins are found on the surface in the body.

CHAPTER 7. Health and Hygiene

Check Point 1

1. Hydrophobia 2. Tsetse fly 3. Scabies
4. Female *Anopheles* mosquito 5. *Wuchereria bancrofti*; *Culex*

Check Point 2

1. False 2. True 3. True 4. False 5. True

Check Point 3

1. Personal hygiene 2. Compostable waste 3. Blue bin 4. Landfill
5. Composting

TEST YOURSELF

- A. 1. Scurvy 2. Germs or pathogens 3. Iron, B₆ 4. Bones; teeth
5. Protein 6. Rabies (hydrophobia)
- B. 1. Personal hygiene 2. Congenital disease 3. Degenerative disease
- C. 1. A disease is an abnormal functioning of any organ or any part of the body.
2. Pathogens are disease-causing microorganisms.
3. Immunisation is the vaccination at community level (large-scale vaccination) to eradicate a certain disease.
4. The waste which decays easily is called compostable waste.
5. Antibodies are a type of proteins made by the body to kill pathogens.
6. The dumping of solid waste outside the city on a piece of low-lying land is called landfilling.

D. 1.

Communicable diseases	Noncommunicable diseases
1. Communicable diseases spread from diseased persons to healthy ones.	1. Noncommunicable diseases do not spread from patient to healthy person.
2. They are also called infectious diseases.	2. They are called noninfectious diseases.
3. They are caused due to infection with microorganisms (viruses, bacteria, fungi, protozoa and worms).	3. They may be caused due to nutritional deficiency, old age, malfunctioning of an organ, allergy, pollution or genetic disorders.
4. An agent is needed to spread the pathogens.	4. An agent is not needed.
Examples: Smallpox, chickenpox, pneumonia, common cold, influenza, dysentery, cholera, typhoid, tuberculosis, etc.	Examples: Marasmus, kwashiorkor, anaemia, rickets, scurvy, goitre, haemophilia, thalassaemia, blood pressure, heart disease, arthritis, allergy, etc.

2. **Malnutrition** is a condition caused due to lack of one or more nutrients in diet. It may be due to faulty food habits, poverty or ignorance about balanced diet.

Undernutrition is a condition in which people or children get insufficient food due to poverty.

3. In **haemophilia**, blood clotting becomes very slow due to lack of some blood-clotting factors in the blood.

In **thalassaemia**, the haemoglobin of RBCs becomes defective.

E. 1. Following are the causes of diseases:

(a) Diseases may be caused by viruses, bacteria, fungi, protozoa and helminthes.

(b) Some diseases are caused by nutritional deficiency, genetic disorders, allergy, pollution and malfunctioning of some body organ.

2. Communicable diseases are transmitted by:

(a) Direct contact, e.g., smallpox, mumps, measles, etc.

(b) Contaminated air, e.g., influenza, pneumonia, polio, tuberculosis, etc.

(c) Contaminated water, e.g., cholera, jaundice, hepatitis., etc.

(d) Contaminated food, e.g., cholera, diarrhoea, etc.

(e) Vectors, e.g., malaria, typhoid, sleeping sickness, dengue, etc.

(f) Animal bite, e.g., rabies.

(g) Unhygienic habits, e.g., typhoid, diarrhoea, dysentery, etc.

(h) Contact with soil, e.g., tetanus.

3. Health is a state of complete physical, mental and social well-being.

To lead a healthy life, we should

(a) eat a balanced diet.

(b) do physical exercise regularly.

(c) take adequate sleep.

(d) take care of personal and domestic hygiene.

(e) drink clean and purified water and eat fresh food.

(f) breathe in fresh and clean air.

(g) keep away from tobacco, alcohol and drugs.

(h) take proper care of sense organs.

(i) visit a doctor regularly to follow regular check ups.

(j) get regular vaccinations.

4. Diseases caused due to unbalanced diet are called deficiency diseases.

Deficiency diseases can be placed under the following three categories:

- (a) Protein malnutrition and Protein-energy malnutrition (PEM)
- (b) Vitamin deficiency malnutrition
- (c) Mineral deficiency malnutrition

Some deficiency diseases are kwashiorkor, marasmus, rickets, anaemia, goitre, scurvy, beri-beri, etc.

5. PEM stands for protein-energy malnutrition. It is caused due to deficiency of proteins, carbohydrates and fats in food. It leads to marasmus.
6. Infectious diseases can be prevented by:
- (a) taking care of personal and domestic hygiene.
 - (b) drinking clean and purified water and eating fresh food.
 - (c) breathing in fresh and clean air.
 - (d) preventing contamination of food and water.
7. Sources of vitamins A, B and D, and the diseases caused by their deficiencies are as follows:

Vitamin	Sources	Deficiency disease
A (Retinol)	Carrot, mango, papaya, milk, fish	Night blindness
B ₁ (Thiamine)	Egg, meat, cereals, cabbage, yeast	Beri-beri
B ₂ (Riboflavin)	Cheese, milk, green leafy vegetables, egg	Dermatitis
B ₃ (Niacin)	Whole grain cereals, green leafy vegetables	Pellagra
B ₆ (Pyridoxine)	Liver, green leafy vegetables, whole grain cereals	Anaemia
B ₁₂ (Cyanocobalamin)	Fish, egg, meat, liver, fruits	Pernicious anaemia
D (Calciferol)	Milk, yolk, ghee, oil, butter	Rickets in children; deformed bones, stunted growth, poor development of teeth; osteomalacia in adults

8. Heart diseases are degenerative diseases which are caused due to malfunctioning of heart and blood vessels. They are as follows:

- (a) **Arteriosclerosis:** It is hardening of the wall of arteries and arterioles due to thickening of fibrous tissue in them.
- (b) **Atherosclerosis:** It is narrowing of arteries and arterioles due to cholesterol deposition in their lumen.
- (c) Hypertension: It is due to regular increased blood pressure.
- (d) **Coronary heart disease:** It is the narrowing of coronary artery due to cholesterol deposition. This results in heart attack or angina.

9. We keep our surroundings clean by following ways:

- (a) Providing sewage pipes for colonies (good sanitation).
- (b) Providing clean, filtered, chlorinated and germ-free drinking water.
- (c) Not allowing dirty water to stagnate to prevent breeding sites of mosquitoes and houseflies.
- (d) Prohibiting defecation and urination at open and public places.
- (e) It should be made mandatory to use public toilets.
- (f) Prohibiting the open dumping of garbage, but dumping it at proper places.

10. Following methods are used for disposal of waste:

- (a) **Landfilling:** It is the dumping of solid waste outside the city on a piece of low-lying land. This method prevents open rotting of garbage and spread of scavengers.
- (b) **Composting:** It is the conversion of wet waste into manure by the action of microorganisms.

11. Blue bins are used for dumping dry waste, whereas green bins are used for dumping wet waste.

F. 1.-(e) 2.-(d) 3.-(a) 4.-(b) 5.-(c)

G. 1. False; Osteomalacia is a **calcium** deficiency disease.

2. False; Allergy is caused by **allergens**.

3. False; Polio is a **viral** disease.

4. False; Blue bin is used for **dry** waste.

Or

Green bin is used for wet waste.

H. 1. Cancer; It is a disease, others are food nutrients.

2. Typhoid; It is a bacterial disease, others are viral diseases.
 3. Fever; It is an abnormal rise in body temperature, others are diseases.
 4. Cotton; It is a compostable waste, others are recyclable waste.
- I.
1. Cut fruits from roadside vendors are exposed to dust and flies which carry disease-causing germs. So, they are contaminated and should not be eaten.
 2. Cold and influenza are air-borne diseases. Their viruses spread by sneezing and coughing. In public places, the air is contaminated with such viruses and causes infection when inhaled.
 3. Smoking is injurious to health because it causes inflammation and irritation of the mucous lining of nose, throat, trachea and lungs. It increases chances of cancer, heart attack and increased blood pressure due to hardening of the wall of blood vessels.
 4. Taking alcohol slows down the response, reduces self-control, impairs judgement and affects neuromuscular coordination. These cause poor manipulation leading to accidents.
- J.
1. (d) 2. (a) 3. (b) 4. (d) 5. (a) 6. (d) 7. (a) 8. (d) 9. (d) 10. (d)
- K.
1. Scurvy
 2. Deficiency of vitamin C
 3. Vitamin C-rich food

THINK ZONE

- To prevent droplet infection of viral diseases such as cold, flu, chickenpox and smallpox, we should cover our nose and mouth while sneezing.
- Simple goitre is more common in persons living on hills because water on hills has deficiency of iodine. This leads to iodine deficiency in the body and reduces secretion of thyroxine hormone which leads to enlargement of thyroid gland causing goitre.
- Scurvy is more common in infants because milk is the only diet of infants and it does not contain vitamin C.
- Dumping on open land is not advisable because it spreads germs, creates foul smell in the area, invites rodents, scavengers and birds which may become a cause of accidents. It gives breeding ground to mosquitoes and houseflies.

CHAPTER 8. Adaptation

Check Point 1

1. Habitat
2. Abiotic or physical components
3. Brackish water, estuaries, bays, seas and oceans
4. Air bladder
5. Spines
6. Nocturnal animals

Check Point 2

1. wings
2. needle
3. mountain
4. rudder

TEST YOURSELF

- A. 1. biotic or living 2. Water hyacinth (*Eichhornia*) 3. spines
4. Camel 5. mountain
- B. 1. Aerial animals 2. Habitat 3. Fins 4. Gills 5. Mountain habitat
6. Xerophytes (Cacti) 7. Aquatic plants 8. Evergreen trees
9. Conifers
- C. 1. The waxy covering on the surface of leaves of hydrophytes prevents them from rotting in water.
2. Caudal fin in fishes functions like a rudder and helps in changing the direction during swimming.
3. Feathers on the body of birds keep them warm and light.
4. The padded feet of camel help it walk on hot and slippery sand without sinking in it.
- D. 1. The place where an organism lives is called its habitat.
The types of habitat are as follows:
(a) Aquatic habitat
(b) Terrestrial habitat
(c) Aerial habitat
2. (a) Fish and whale have streamlined body shape.
(b) They have fins to swim.
3. (a) In desert plants such as cacti, leaves are modified into spines to prevent water loss from their surface.
(b) Stem becomes spongy and succulent to store water.
4. The main adaptations in fir and pine trees for mountain life are as follows:
(a) They are evergreen trees and can photosynthesise whenever there is sufficient light.
(b) Their trunk is covered with thick bark to protect against extreme cold and draught.

- (c) Their leaves are needle-shaped for protection against water loss and to help snow slide down easily.
 - (d) They have cone shape to bear harsh wind and to cope with heavy snowfall.
 - (e) They bear cones instead of flowers. Cones have seeds and protect them during harsh winter.
5. Desert habitat, mountain habitat, polar habitat, and forest and grassland habitat are the types of terrestrial habitat.
 6. **Desert habitat:** Desert habitats are hot and dry during daytime but cold at night. They have scarcity of food and water.
Mountain habitat: Mountain habitats are extremely cold with varying temperature, high wind speed, high wind pressure, thin atmosphere with low amount of oxygen. They have scarcity of food during long chilly winter.
 7. Wings, tail feathers, flight muscles, air sacs, pneumatic bones and streamlined body shape help birds to fly.
 8. The lateral line system in fish possesses sense organs which can detect changes in the pressure of water currents.
- E.** 1.-(b) 2.-(e) 3.-(d) 4.-(a) 5.-(c)
- F.** 1. Hollow bones; Hollow bones are aerial adaptation in birds, others are aquatic adaptations in fish.
2. *Eichhornia*; It is a free-floating aquatic plant, others are fixed aquatic plants.
 3. Needle-like leaves; Needle-like leaves is a mountain adaptation in mountain plants, others are aquatic adaptations in aquatic plants.
 4. Fur on the body; Fur on the body is a mountain adaptation in mountain animals, others are aerial adaptations in birds.
- G.** 1. Cactus is a desert plant. By storing water, its stem becomes thick and spongy.
2. The parachute-like structure in the seeds of Maple and Drumstick is an aerial adaptation which helps them float in air to cover long distances for their dispersal.
 3. In floating plants, roots are reduced as they do not reach the soil of waterbed. This feature makes these plants light and helps them float freely.
 4. In birds, bones are light and hollow, filled with air to make their body light to fly in the air.

5. The double layers of woolly coat in mountain goats protects them against chilly winter and high speed winds on mountains.

H. 1. (b) 2. (b) 3. (c) 4. (c) 5. (c) 6. (c) 7. (b)

I. 1. 1. **Hump:** For storing food as fat.

2. **Long eyelashes:** For protecting eyes from dust and sand.

3. **Long feet:** To protect the body from heat of sand.

4. **Absence of sweat glands in skin:** To prevent water loss from the body by perspiration.

5. **Flaps on nostrils:** To close the nostrils during a dust or sand storm.

2. 1. Streamlined body shape; To offer least resistance while swimming.

2. Gill filaments with capillary network; For exchange of gases in water.

3. Presence of fins; For changing direction during swimming.

4. Covering of scales on the body; To protect the body from decay in water.

THINK ZONE

- Peepal tree is adapted to live in terrestrial habitat, therefore, its leaf decays in water, whereas the leaves of aquatic plants have waxy coating on them which saves them from rotting in water and thus, they remain healthy.
- Whale has streamlined body shape and limbs modified into flippers for swimming. It is a mammal and not a fish because it has lungs for respiration and gives birth to young ones.
- We are adapted to live terrestrial mode of life. We have lungs to respire in air and not in water, hence, we feel suffocated inside water. On the other hand, fish is adapted to live aquatic mode of life. It has gills for respiration in water. Therefore, it cannot live outside water.
- The thick fur or woolly-hair over the body of animals living in colder regions protects them from extreme cold and high speed chilly winds.
- Cacti are desert plants. To save water, their leaves modify into spines and to perform the function of leaves, i.e., photosynthesis, their stem becomes green and by storing water, it becomes thick and fleshy.