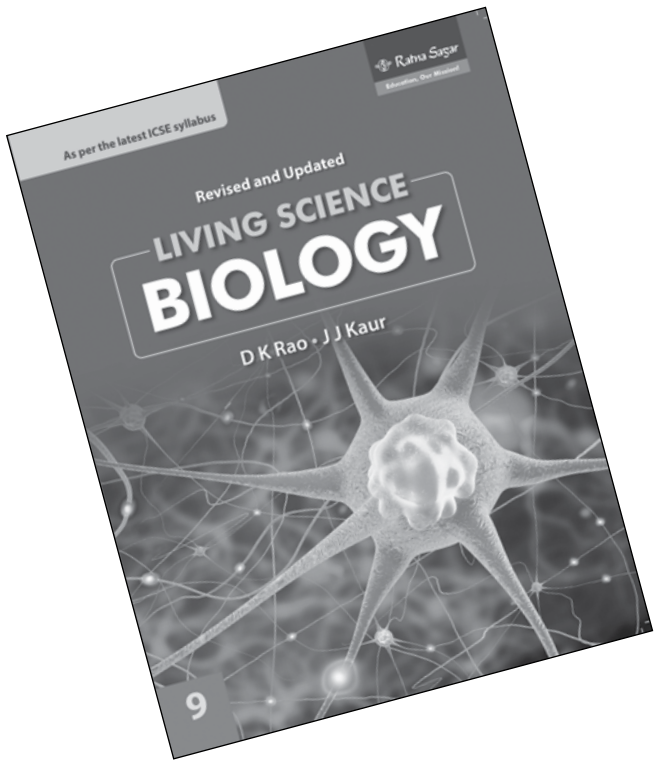
# TEACHER'S HANDBOOK

## ICSE Living Science
## BIOLOGY
### Book 9

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# Contents

## CHAPTER – 1

## CELL – THE STRUCTURAL AND FUNCTIONAL UNIT OF LIFE

### P. 11 Check Your Progress 1

**A. Name the following.**

1. Fungi, algae
2. Germ cell
3. Cell wall
4. Robert Hooke
5. Nerve cells
6. Leucocytes

**B. Name the part of the cell which:**

1. Cell wall
2. Plasma membrane
3. Cytoplasm
4. Cell wall

**C. Answer these questions.**

1. All living organisms are composed of cells. All cells are basically alike in chemical composition and metabolic processes. The function of an organism as a whole is the outcome of the combined activities and interactions of the constituent cells. Hence, cell is considered as structural and functional unit of all living beings.
2. Plasma membrane allows only selective substances to pass in and out of the cell. Hence it is known as selectively permeable.

### P. 17 Check Your Progress 2

**A. Fill in the blanks.**

1. structural, functional
2. plant cells
3. proteins
4. animal
5. Protoplasm, nucleus

**B. Match the following.**

**1.** d **2.** c **3.** e **4.** a **5.** b

**C. Answer these questions.**

1. Proteins are synthesized in ribosomes of the cell.
2. Lysosomes are membranous sacs budded-off from Golgi bodies. The enzymes released by the rupture of lysosomes help in intracellular digestion by destroying and digesting foreign substances around them. Hence, they are called suicide bags of the cell.
3. Mitochondria and chloroplast.

### P. 20 Exercises

#### I. Multiple-Choice Questions

**A. Choose the most appropriate answer.**

**1.** b **2.** c **3.** a **4.** b **5.** a
**6.** c **7.** c **8.** a **9.** d **10.** d

#### II. Very Short Answer Type Questions

**A. Name the following.**

1. Plasma membrane
2. Cytoplasm
3. Nuclear membrane
4. Chromatin network
5. Centromere
6. Endoplasmic reticulum
7. Ribosomes
8. Mitochondria
9. Vacuoles
10. Anthocyanins

**B. Fill in the blanks.**

1. cell wall
2. cellulose, lipid bilayer
3. tonoplast
4. DNA and proteins
5. Lysosomes
6. Genes
7. Leucoplast
8. Plasma membrane

**C. State whether the following statements are True (T) or False (F).**

**1.** False **2.** False
**3.** False **4.** False
**5.** False **6.** False
**7.** True **8.** False
**9.** True **10.** True

**D. Match the items in Column A with those in Column B and write down the matching pairs.**

**1.** e **2.** f **3.** a **4.** b
**5.** c **6.** d

**E. Name the cell organelle connected with the following.**

**1.** Ribosomes **2.** Nucleus
**3.** Golgi bodies **4.** Mitochondria
**5.** Chloroplast **6.** Centrosome

**F. State the relationship between the following and fill in the blanks.**

1. Centrosome
2. Chloroplast
3. Chromoplasts

**G. Give one word for each of the following.**

1. Nucleus
2. Lysosomes
3. Golgi apparatus

**H. Which of the following structures are present (a) in plant and animal cells, (b) in plant cells but not in animal cells?**

a. Structures present in plant and animal cells – Cell membrane, Cytoplasm, Mitochondria, Nucleus, Chromosomes

b. Structures present in plant cells but not in animal cells - Cell wall, Cell sap, Central vacuole

**I. Answer these questions.**

1. Prokaryotic cells are cells having primitive nucleus. The nuclear material in these cells is not enclosed by a nuclear membrane and the genetic material is equivalent to a single molecule of DNA. Bacteria are examples of prokaryotic cells.
2. Eukaryotic cells are cells having a well-defined nuclear membrane. In these cells, the genetic material is made of two or more DNA molecules, which form chromatin fibres and the nuclear material is enclosed in a nuclear membrane. Eukaryotic cells occur in plants.
3. Mitochondria is responsible for the release of energy in the form of ATP.
4. Nucleus is the control centre of the cell. It controls cell metabolism and other activities of the cell. It also regulates and coordinates various life processes of the cell. If the nucleus is removed, the cell will die.
5. 23 pairs

### III. Short Answer Type Questions

**A. Differentiate between the following (one key difference only).**

1. **Cytoplasm and protoplasm**

   Cytoplasm is the living content between the plasma membrane and the nucleus whereas protoplasm is the living content, including cytoplasm and nucleus of a cell.

2. **Nucleus and nucleolus**

   Nucleus is the organelle present mostly at the centre of a cell containing genetic material (DNA) and controls all the activities of the cell including heredity.

   Nucleolus is the structure present inside the nucleus. It is rich in protein and RNA molecules.

3. **Centriole and centrosome**

   Centrosome is a small, naked, protoplasmic structure present near the nucleus.

   Centrosome consists of two small granules called centrioles, which lie at right angles to each other.

4. **Cell wall and cell membrane**

   Cell wall is present only in plant cells whereas cell membrane is present in both plant and animal cells.

5. **Lysosomes and Golgi bodies**

   Lysosomes are concerned with intracellular digestion whereas Golgi bodies are concerned with storage, modification and secretion of substances.

6. **Ribosomes and mitochondria**

   Ribosomes are involved in protein synthesis whereas mitochondria are responsible for energy production by cellular respiration.

7. **Leucoplasts and chloroplasts**

   Leucoplasts help in storage of food whereas chloroplasts help in synthesis of food.

8. **Prokaryotes and eukaryotes**

   Prokaryotes are organisms having cells with primitive nucleus, i.e. the nuclear material in these cells is not enclosed by a nuclear membrane.

   Eukaryotes are organisms having cells with a well-defined nuclear membrane, i.e these cells have their genetic material enclosed in a nuclear membrane.

**B. State the major functions of the following parts in a cell.**

1. **Cell membrane:** It is a selectively permeable membrane that allows only selected substances to pass through it. It protects the cell from injury and provides an outer boundary to the cell.
2. **Nucleus:** Controls and coordinates all the metabolic activities of cell.
3. **Endoplasmic reticulum:** It helps in protein synthesis and intracellular transport of the cell.
4. **Ribosome:** It is the site of protein synthesis.

5. **Mitochondria:** In mitochondria, glucose is oxidized to produce energy.
6. **Golgi body:** Storage, modification and packaging of substances.
7. **Plastids:** Provide pigmentation or colour to the plant cell, help in photosynthesis.
8. **Lysosomes:** Help in intracellular digestion by secreting digestive enzymes.
9. **Chromosomes:** They are the carriers of heredity.
10. **Cell wall:** It provides rigidity and a definite shape to the cell.

**C. Answer these questions.**

1. Cell membrane or plasma membrane bounds the semi-fluid contents of the cell. It protects the cell from injury and provides an outer boundary to the cell. Plasma membrane is selectively permeable as it allows only selective substances to pass in and out of the cell.
2. Mitochondria are the sites where oxidation of food leads to the production of energy in the form of ATP. Hence, these are called powerhouses of the cell.
3. A small cell size means larger surface area. The large surface area ensures greater diffusion of nutrients and respiratory gases into the cell, and the metabolic waste and carbon dioxide out of the cell.
4. Like every organism, cells also need food. The cells require energy to survive and carry out all metabolic processes. This energy is obtained in the form of food by the cell.

## IV. Long Answer Type Questions

**A. Answer these questions.**

1. Cell theory was proposed by two German biologists M.J. Schleiden and T. Schwann. According to them the key points of cell theory are:
   i. All living organisms are composed of one or more cells.
   ii. Cells are the basic unit of structure in all living organisms.
   iii. All new cells arise from pre-existing cells.
2. Plastids are organelles containing coloured pigments found in the plants. These are the different types of plastids:
   - **Leucoplast:** White in colour/colourless
   - **Chloroplast:** Green in colour
   - **Chromoplast:** Different colours like red, yellow, orange

   **Functions:**
   - Leucoplasts store food.
   - Chloroplasts perform photosynthesis.
   - Chromoplasts contain colour pigments which give colour to fruits and leaves.
3. The statement is false. Plant cells have both mitochondria and chloroplasts, since plants are living organisms and they require energy to continue their vital activities.
4. Each cell contains cell organelles which perform specific function like synthesis of new material, removal of wastes, release of energy, etc. If the organization of a cell is destroyed, the function of cell organelles will be disturbed, then the ability of cell to perform all living functions will be affected resulting in death of the cell.

## V. Structured / Application / Skill Type Questions

**A.** 1. Chloroplast
2. Plant cell
3. Centrosome
4. Plant cell
5. Provides shape and rigidity to the cell
6. Plasma membrane
7. Both plant and animal cells
8. Both plant and animal cells
9. Producing and assembling the cell's ribosomes

**B.**

| Characteristic features | Prokaryotic cell | Eukaryotic cell |
|---|---|---|
| Size | Generally small (1–10 μm) | Generally large (5–100 μm) |
| Nuclear region | Not enclosed by nuclear membrane | Well-defined surrounded by nuclear membrane |
| Chromosome | Single circular chromosome | More than one chromosome |
| Membrane-bound cell organelles | Absent | Present and named as, mitochondria, chloroplast, lysosomes, etc. |
| Occurrence (examples) | Bacteria, blue-green algae | Plants, animals, protozoa, fungi |

**C** .

| Drawing number | Name of the organelle | Primary function |
|---|---|---|
| **1** | Endoplasmic reticulum | Helps in protein synthesis and intracellular transport |
| **2** | Nucleus | Controls and coordinates all the metabolic activities |
| **3** | Mitochondrion | Produces energy by oxidation of glucose in the form of ATP |

**D. 1.** It is an animal cell.

**2. a.** Nucleus; **b.** Smooth endoplasmic reticulum; **c.** Mitochondrion; **d.** Ribosomes on rough endoplasmic reticulum; **e.** Golgi apparatus.

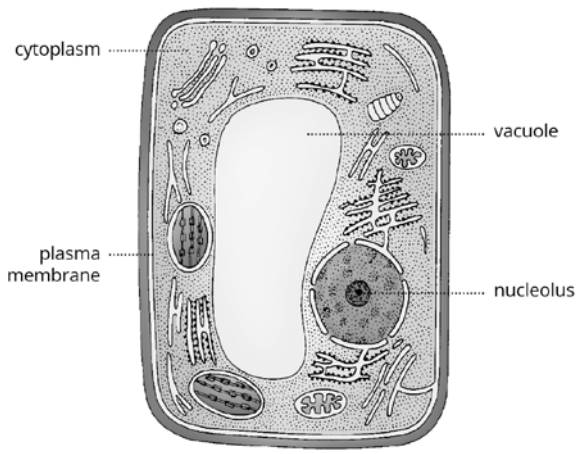
**3.** Ribosomes (d)

**4.** Mitochondrion (c) is known as 'powerhouse of the cell' since oxidation of glucose occurs here and it produces energy in the form of ATP.

**5.** Controls all the metabolic activities of the cell.

**E. 1.** It is a plant cell

**2.**



Plant cell

**3.** Chloroplast and large vacuole

**4.** Cell membrane/plasma membrane

## CHAPTER – 2

## TISSUES – THE BUILDING BLOCKS OF LIFE

### P. 27 Check Your Progress 1

**A. Name the following.**

1. Apical, intercalary and lateral
2. Sieve tube and companion cell
3. Apical meristem
4. Phloem fibres

**B.** Tissues are a group of similar cells performing the same function and having a common origin.

Different types of plant tissues are

**(i)** Meristematic tissue

**(ii)** Permanent tissue

**C. State if the following statements are true or false.**

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

**D. Which of the following pairs are correctly matched? Tick them.**

3 and 5

### P. 34 Check Your Progress 2

**A. Name the following.**

1. Tendon
2. Squamous epithelium

**B. Answer these questions.**

1. Striated muscles – limbs.
   Unstriated muscles – alimentary canal.
2. Functions of connective tissue –
   **(i)** It binds one organ to another, e.g., muscles with skin, muscles with bones.
   **(ii)** It forms a supporting framework of cartilage and bones in the body.

**C. State whether the following statements are True (T) or False (F).**

**1.** T **2.** T **3.** T

### P. 35 Exercises

#### I. Multiple-Choice Questions

**A. Choose the most appropriate answer.**

**1.** a **2.** b **3.** b **4.** c **5.** d

**6.** a **7.** c **8.** b **9.** b **10.** a

#### II. Very Short Answer Type Questions

**A. Name the following.**

1. Tissue
2. Xylem
3. Phloem
4. Meristematic (in plants) epithelial (in animals)
5. Adipose
6. Muscular tissues
7. Ligament

**B. Name the kind of tissue found**

1. Apical meristem
2. Collenchyma
3. Xylem and phloem
4. Nervous tissue
5. Columnar epithelium
6. Cuboidal epithelium
7. Cardiac muscle
8. Cork
9. Connective tissue
10. Stratified squamous epithelium

**C. Give the location of the following tissues in our body.**

1. **Ciliated epithelium:** urinary tubules, oviducts, bronchioles
2. **Tendon:** between bones and muscles in arms, legs, hand, feet, head, torso
3. **Stratified epithelium:** skin, cornea
4. **Striated muscles:** limbs, tongue, body wall, pharynx
5. **Cartilage:** larynx, trachea, at the end of bones and nasal septum
6. **Meristematic tissue:** apices of stem, roots and their branches, in the growing young leaves and tip of axillary buds, sides of roots and stems, bases of leaves, above or below the nodes
7. **Ligament:** between bones (joints)
8. **Columnar epithelium:** stomach, intestine, gall bladder.

**D. Note the relationship between the first two words and suggest a suitable word/words for the blanks.**

**1.** Sclerenchyma **2.** Food

**3.** Chondrocytes **4.** Yellow fibre

**5.** Ligaments

**E. Fill in the blanks.**

1. apical meristem
2. permanent tissue
3. Collenchyma
4. osteocytes
5. Tendon
6. Adipose
7. Areolar
8. nerve ending

**F. Answer these questions.**

1. Parenchyma is found in all softer parts of plants like epidermis, cortex, pith of roots and stem and leaf mesophyll. It is also found in xylem and phloem.
2. Supportive connective tissue bone and cartilage.
3. Cardiac muscles are exclusively present in the heart. These muscles are involuntary and work rhythmically tirelessly, contracting and relaxing endlessly from early embryonic stage until death.
4. Nervous tissue
5. Meristematic cells are living cells, compactly packed without intercellular spaces. The vacuoles are almost absent.
6. Skeletal or striated muscles are attached to bones. Their movement is under animals will. These muscles help us to do all the basic and complex movement everyday like walking, picking up things, jumping, talking, etc.
7. Smooth muscles are also called non-striated muscle because they lack transverse striations or bands.

## III. Short Answer Type Questions

**A. Write down two main differences between the following.**

1.

| Cell | Tissue |
|---|---|
| Cell is the structural and functional unit of life. | Tissue is a group of cells that are similar in structure and origin. |
| Cell is microscopic in nature. | Tissue is much larger as it comprises a number of cells. |

2.

| Meristematic tissue | Permanent tissue |
|---|---|
| These are group of actively-dividing cells. | These are group of cells which have lost their ability to divide. |
| These are living, compactly arranged cells with dense cytoplasm, prominent nucleus and thin cell wall. | These may be living or dead cell which are fully differentiated and have conspicuous intercellular spaces. |

3.

| Parenchyma | Collenchyma |
|---|---|
| Cell wall is commonly thin walled without any thickening at the corners. | Cell wall have cellulose thickenings at the corners. |
| It food material stores. | It mainly provides mechanical support in the organ in which it is present. |

4.

| Collenchyma | Sclerenchyma |
|---|---|
| Made up of living cells. | Made up of dead cells. |
| Thickening in the wall is non-uniform due to deposition of cellulose at the corners. | Wall thickening is uniform due to uniform deposition of lignin. |

5.

| Xylem | Phloem |
|---|---|
| It conducts water and minerals from roots to different parts of the plant. | It transports food in soluble form from leaves to different parts of the plants. |
| Transport through xylem is always unidirectional. | Transport through phloem is bidirectional. |

6.

| Cuboidal epithelia | Columnar epithelia |
|---|---|
| Cells are square-shaped or cuboidal with centric and rounded nuclei. | Cells are columnar or pillar-like with oval shaped nuclei. |
| Found in glands and nephrons. | Found in inner lining of stomach and intestine, etc. |

7.

| Cartilage | Bone |
|---|---|
| Cartilage is soft, compact, non-porous and elastic skeletal connective tissue. | Bone is rigid and hard porous connective tissue. |
| It has no nerves and blood vessels. | It has good supply of blood vessels and nerves. |

8.

| Striated muscles | Unstriated muscles |
|---|---|
| These are cylindrical, unbranched multinucleated fibres having alternate dark and light bands. | These are spindle shaped, uninucleate fibres which lack light and dark bands. |
| Present in limbs, body walls, tongue, pharynx, etc. | These are present in oesophagus, urino-genital tract, urinary bladder, vessels, iris, etc. |

9.

| Simple tissue | Complex tissue |
|---|---|
| These tissues are made up of only one type of cells. | These tissues are made up of more than one type of cells. |
| The cells are similar in structure and perform similar functions. | Different type of cells perform different functions. |

**B. Answer these questions.**

1. Two functions of sclerenchyma:
   - **(i)** It provides mechanical strength to the plant parts.
   - **(ii)** It protects the plant from environmental forces like strong winds.

2.

| Sclerenchyma | Parenchyma |
|---|---|
| Sclerenchyma cells are generally dead. | It is made up of living cells. |
| Cell wall is uniformly thickened due to deposition of lignin. | Cell wall is thin made up of cellulose. |
| They provide mechanical support. | Their main function is storage and photosynthesis. |
| Cells are compactly packed without intercellular spaces. | Cells are losely packed with intercellular spaces. |

3. Protective tissues are usually present in the outermost layer of the plant body such as leaves, stem and roots. It is one cell layer thick and covered with cutin and protects the underlying tissues present in the plant body.

   Epidermis is considered as a protective tissue because it forms the outer layer of the plant body. The outer walls of the epidermis are usually thick and covered with organic substances like cutin. The thick cutinized wall greatly reduces loss of water by transpiration.

4. Components of xylem are –
   - **(i)** Xylem vessel
   - **(ii)** Tracheids
   - **(iii)** Xylem fibres
   - **(iv)** Xylem parenchyma

   Of these components, only xylem parenchyma is living, rest all are dead.

5. Functions of xylem parenchyma:
   - **(i)** They store food.
   - **(ii)** Help in the conduction of water and minerals.

6.

| Components of phloem | Function |
|---|---|
| Sieve tube | Transportation of food and nutrients. |
| Companion cells | Help sieve tube perform their function. |
| Phloem parenchyma | Storage food. |
| Phloem fibre | Provides mechanical support. |

7. Blood is considered a connective tissue because it connects the body systems together by transporting nutrients, oxygen, hormones, waste materials, etc from one part of the body to the other.

8. Meristems are classified as apical, intercalary and lateral on the basis of their positions in the plant body.

| Apical meristem | Lateral meristem |
|---|---|
| Located at the growing tips of root, stem and their branches. | Located on the sides of roots and stems. |
| It helps in the increase in length of stems and roots. | It helps in growth in thickness by the addition of secondary tissue. |

## IV. Long Answer Type Questions

**A. Answer these questions.**

**1.** Meristematic tissue is a group of young cells that have the capacity of active cell division. They are living thin walled cells, compactly packed without intercellular spaces. The vacuoles are almost absent. They have dense cytoplasm and large, prominent centrally located nucleus. According to their positions in the plant body, meristems are categorized into three types:

**(i) Apical meristem:** It is located at the growing tips of stem, roots and their branches. It divides to increase the length of stems and roots. It gives rise to primary permanent tissues.

**(ii) Lateral meristem (cambium):** Located on the sides of roots and stems, it is responsible for increase in the diameter of the plant roots and stems. These tissues are also responsible for growth in thickness by addition of secondary tissues and this phenomenon is called secondary growth.

**(iii) Intercalary meristem:** These are the parts of apical meristem which get separated from the apex due to the development of permanent tissue in between. They are mostly present at the base of nodes, internodes and leaves. They help in elongation of the organs.

**2.** Various types of epithelial tissues are –

**(i) Squamous epithelium:** It is formed by flattened, polygonal cells which are closely fitted together like tiles in a mosaic floor.

**Function:** It protects the underlying parts from mechanical injury, germs and drying up.

**(ii) Cuboidal epithelium:** It is made up of cuboidal cells, which are more or less square shaped, that are of equal height and width. In surface view, they look polygonal in shape. The nuclei are round in shape and lie in the centre of the cells.

**Function:** It helps in absorption, excretion, secretion as well as provides mechanical strength.

**(iii) Columnar epithelium:** It is formed of tall pillar-like cylindrical cells, lying side by side. They bear oval nuclei at the basal part of the cell.

**Function:** Helps in absorption through the lining of stomach and intestine and secretion of mucus through the goblet cells.

**(iv) Ciliated epithelium:** Ciliated epithelium may be cuboidal or columnar. These cells have cilia at their free end which keeps lashing and moving the material entering the organs.

**Function:** In respiratory tract, the cilia help to push mucus towards the pharynx; in oviduct, it helps to move an egg towards the uterus; it helps to keep the urine moving in the nephron of the kidney.

**(v) Glandular epithelium:** Glands develop from epithelium tissue which can secrete substances at the epithelial surface. Sometimes there is inward folding of epithelial tissues forming multicellular gland, called glandular epithelium.

**Function:** Cells of glandular epithelium are modified and specialized to secrete certain substances. Glandular epithelium helps in secretion of hormones, sweat, saliva, digestive enzymes, etc.

**3.** Fluid connective tissue is a kind of connective tissue which have fluid matrix. Blood and lymph are fluid connective tissues.

Blood consists of blood corpuscles suspended in blood plasma. Plasma is a straw-coloured fluid which contain water, inorganic salts, organic substances like blood proteins and hormones. RBCs, WBCs and platelets are suspended in the plasma. Blood flows to all parts of the body and connects different parts of the body. They help is transportation of oxygen, vitamins, nutrients and hormones to various cells and tissues and remove $CO_2$ and other waste from the cells.

Lymph is a transparent light yellow coloured fluid lacking RBCs. It contains WBCs called leucocytes. It plays an important role in body's immunity.

## V. Structured/Application/Skill Type Questions

**A. Study the given diagram and answer the following questions.**

**1.** Ciliated columnar epithelium

**2. a.** Cilia; **b.** Nucleus; **c.** Cytoplasm

**3.** This epithelium lines most of the respiratory tract and Fallopian tube. Cilia at their free end keep lashing and moving the material entering the organs e.g. in respiratory tract, it helps to push mucus towards the pharynx; in oviduct, it helps to move the ovum towards the uterus.

**B. Study the diagrams and answer the following questions.**

1. **a.** Squamous epithelium as it is made up of very thin and flat cells, closely fitted like tiles.

   **b.** Involuntary muscles as the cells are spindle shapes, uninucleated and lacks striations.

2. Squamous epithelium lines the blood vessels, mouth, oesophagus, alveoli of lungs and skin. It protects the underlying parts from mechanical injury.

   Involuntary muscles are found in the iris of the eye, in the bronchi of lungs etc. They carry out involuntary movements which are not under the control of one's will.

**C. Given below is the structure of a nerve cell.**

1. A nerve cell is the structural and functional unit of the nervous system.
2. **a.** Nucleus

   **b.** Dendrons

   **c.** Nodes of Ranvier

   **d.** Axon
3. Nerve cells are specialized to respond to stimuli and transmit its response very rapidly from one part of the body to another.

**D. Given below is an incomplete table relating to plant tissues, their location and function. Study the table and fill in the blanks numbered from 1 to 10.**

1. Growing tips of root and shoot
2. Increase in length of stems and roots
3. Parenchyma
4. Intercalary meristem
5. Cambium (lateral meristem)
6. Sides of roots and stems
7. Beneath the epidermis in the stem and petiole or leaf stalk of dicot plants
8. Provides mechanical strength and elasticity to plant organs.
9. Outermost protective layer that covers the entire surface of the plant.
10. Protects all parts of the plant, help in absorption of water and minerals in roots, reduce loss of water in desert plants.

**E. Given below is an incomplete table relating to certain tissues found in animals, its location and function. Study the table and fill in the blanks numbered from 1 to 9.**

1. Lining of blood vessels, mouth, alveoli of lungs
2. Protects the underlying parts from mechanical injury, germs and drying up.
3. Ciliated columnar epithelium
4. Cuboidal epithelium
5. Kidney tubules, sweat glands and salivary glands.
6. Larynx, trachea, at the end of bones and nasal septum.
7. Smoothens bones, prevents wear and tear of long bones, provides support and flexibility to the body parts.
8. Cardiac muscles.
9. Work rapidly, rhythmically and tirelessly contracting and relaxing throughout life.

**F. Given below is a block diagram showing the types of permanent tissues in plants. Complete the diagram by filling the blanks from 1 to 6.**

1. Simple permanent tissue
2. Complex permanent tissue
3. Collenchyma
4. Sclerenchyma
5. Sclereids
6. Phloem

## CHAPTER – 3

## THE FLOWER – STRUCTURE AND FUNCTIONS

### P. 41 CHECK YOUR PROGRESS 1

**A. State if the following statements are true (T) or false (F).**

**1.** T **2.** T **3.** F **4.** T

**5.** F **6.** T **7.** F **8.** F

**B. Answer these questions.**

**1.** Some flowers bear only stamens and are referred to as male flowers or staminate flowers.

**2. Functions of Calyx:**

**(i)** Encloses and protects the inner whorls of a flower.

**(ii)** Along with petals, they attract birds and insects for pollination.

**Functions of Corolla:**

**(i)** Bright coloured corolla attracts insects and birds for pollination.

**(ii)** Encloses and protects the stamens and the pistil.

**3. a. Sessile flower:** Flowers (like saffron) without a stalk are known as sessile flowers.

**b. Gamopetalous:** When the petals in a flower are partly/completely fused as in *Petunia*, the condition is known as gamopetalous.

**c. Polyadelphous androecium:** The stamens may be free and filaments are united, known as polyadelphous androecium. For example, mustard, *Bombax*, etc.

**d.** The parts of a flower are attached to the receptacle in rings. These are called floral whorls. A flower generally consists of four whorls.

### P. 43 CHECK YOUR PROGRESS 2

**A. Match the terms in Column A with their most appropriate description in Column B.**

**1.** c **2.** d **3.** b **4.** a

**B. Why are carpels referred to as the female part of flower?**

The carpels form the gynoecium, which is referred to as the female part of the flower because the carpels produce the female gametes.

**C. Name the following.**

**1.** Stigma **2.** Ovary **3.** Style

**4.** Gynoecium **5.** Carpellate

### P. 44 EXERCISES

#### I. Multiple-Choice Questions

**A. Choose the most appropriate answer.**

**1.** c **2.** c **3.** b **4.** a

#### II. Very Short Answer Type Questions

**A. Match the items in Column A with those in Column B.**

**1.** c **2.** d **3.** a **4.** b

#### III. Short Answer Type Questions

**A. Explain the following terms.**

**1. Epigyny:** A condition in which ovary is below rest of the flower parts. For example, sunflower.

**2. Perigyny:** If the ovary is surrounded by a receptacle which grows to form a cup-shaped structure up to the midway of the ovary and the other three whorls sprout from the receptacle rim, the condition is known as perigyny.

**3. Style:** It is a cylindrical tube-like structure connecting stigma to ovary.

**4. Placentation:** The arrangement of placenta within the ovary is called placentation.

**5. Inflorescence:** It is a group or cluster of flowers on the branch of a plant. It refers to the arrangement of individual flowers on the axis or floral stem.

**6. Essential whorls:** The parts of a flower that are directly concerned with reproduction are known as essential whorls. Pistils or carpels (gynoe cium) and stamens (androecium) are called essential whorls.

**B. State the location and functions of the following parts in a flower.**

| S.No. | Structure | Location | Functions |
|---|---|---|---|
| 1. | Placenta | Ovary | Bears ovules |
| 2. | Anther | Stamen head | Produces pollen grains |
| 3. | Thalamus | Base of the flower | Bears flower |
| 4. | Stigma | Terminal part of the carpel | Receives pollen grains |
| 5. | Ovules | Inside ovary | Forms zygote after fusion with male nuclei |
| 6. | Androecium | Third whorl on inside of corolla | Act as male reproductive organs of flowers |

| | | | |
|---|---|---|---|
| 7. | Gynoecium | Fourth and innermost whorl of flower | Act as female reproductive organs of flowers |

**C. Differentiate between the following.**

**1.**

| Flower | Inflorescence |
|---|---|
| The reproductive shoot of a plant. | It is the arrangement of flowers on the floral stem. |

**2.**

| Inflorescence | Placentation |
|---|---|
| It is the arrangement of flowers on the floral stem. | It is the arrangement of ovules in the ovary. |

**3.**

| Placenta | Placentation |
|---|---|
| The area of the ovary where ovules are attached. | The arrangement of placenta within the ovary. |

**4.**

| Complete flower | Incomplete flower |
|---|---|
| A flower with all the four whorls is called complete flower. | A flower in which any one or more of the floral parts are missing. |

**5.**

| Stigma | Style |
|---|---|
| Terminal part of a carpel which receives pollen grains. | A slender tube-like structure connecting ovary with stigma. |

**6.**

| Monoecious plants | Dioecious plants |
|---|---|
| When both male and female flowers are present on the same plant, it is called monoecious plant. Example: Maize | When male and female flowers are produced on different plants, the species is called dioecious. Example: Mulberry |

**7.**

| Essential whorls | Non-essential whorls |
|---|---|
| Those parts of a flower which are directly concerned with reproduction. | Those parts of a flower which do not directly take part in reproduction. |

## IV. Long Answer Type Questions

**A. Answer these questions.**

**1.** Types of androecium on the basis of stamens being fused or free.: Polyadelphous, Monadelphous, Diadelphous, Syngenesious

Monadelphous: *Hibiscus*

Diadelphous: Pea, gram

Syngenesious: Sunflower

Polyadelphous: *Bombax*

**2.** Those parts of the flower which are directly concerned with reproduction are known as essential parts of a flower, i.e., stamens and carpels.

Those parts of the flower which do not take part in reproduction but are there simply for protection or for making the flower attractive for pollination are the non-essential parts, i.e., sepals and petals.

**3.** Functions of various parts of the female reproductive parts of a bisexual flower.

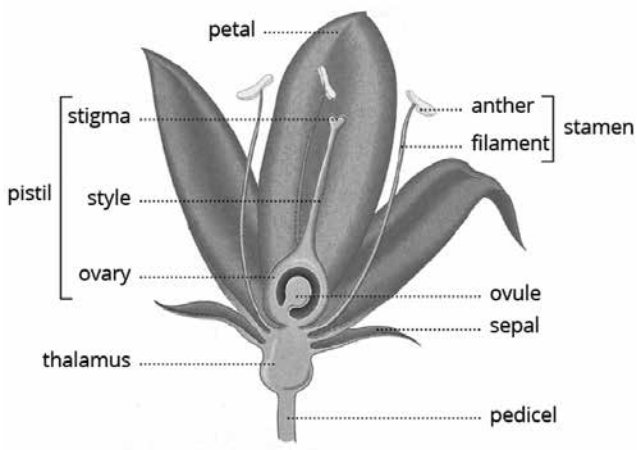
**(i) Stigma:** The receptive part of the female reproductive organ on which pollen grains germinate.

**(ii) Style:** Often the stigma may be borne on a slender stalk-like structure called style. Style connects stigma to the ovary.

**(iii) Ovary:** The basal region of a carpel, containing one or more ovules. The female gametes develop in the ovules.

**(iv) Ovules:** The structures in an ovary containing the egg cell, within the embryo sac. The ovule develops into the seed after fertilization.

**4.** Longitudinal section of a flower




Structure of a flower

## V. Structured/Application/Skill Type Questions

**A. Given below are various types of androecium. Name these types and give one example of each.**

| Figure number | Name of type of androecium | Example |
|---|---|---|
| 1 | Polyadelphous | Mustard |
| 2 | Monadelphous | China rose |
| 3 | Diadelphous | Peas |
| 4 | Syngenesious | Sunflower |

**B. The diagram given below illustrates the structure of a flower.**

1. **a.** Petal; **b.** Stigma; **c.** Sepal; **d.** Ovary; **e.** Anther
2. Part labelled **e** – the anther produces pollen grain.
3. Part labelled **b** – the stigma receives the pollen grain.
4. After fertilization, part **a** (petal) withers away and part **d** (ovary) is converted into fruit.

## CHAPTER – 4

## POLLINATION AND FERTILIZATION

### P. 50 Check Your Progress 1

**A. Fill in the blanks.**

1. pollen grains, anther, stigma
2. self-pollination, cross-pollination
3. self
4. cross
5. anther, stigma
6. stigma, anther
7. anther, stigma

**B. Answer these questions.**

1. Pollination is the transfer of pollen grains from the anther to the stigma. Pollination is essential for the process of fertilization. Fertilization results in the formation of fruits and seeds. Without pollination there would be no fruit and seed formation, therefore no plants.
2. Self-pollination and cross-pollination are two types of pollination.

   **(i) Self-pollination**

   ***Advantage:*** It preserves the parental characters indefinitely because the gametes of the same flower or flowers of the same plant are involved.

   ***Disadvantage:*** As self-pollination occurs regularly generation after generation, it leads to loss of vigour and vitality of the plant variety. Repeated self-pollination produces poor quality seeds that produce weak offsprings.

   **(ii) Cross-pollination**

   ***Advantage:*** Seeds produced contain another source of genetic material which may contain genes which are advantageous for survival of the seedling.

   ***Disadvantage:*** Pollination is uncertain because plants have to depend on external agents for pollination, which may or may not be available at the right time.
3. Pollination in maize usually takes place through wind. Large quantity of pollen grains are produced in maize so that some of it may land on a receptive stigma of the flower to be pollinated.

### P. 52 Check Your Progress 2

**A. Given below is a description of events during fertilization of the egg. Complete the description by filling the blanks numbered from 1 to 16.**

1. male
2. female
3. pollen
4. stigma
5. cytoplasm of the pollen grain
6. pollen tube
7. stigma and style
8. ovary
9. generative nucleus
10. mitosis
11. egg cell
12. embryo sac
13. micropyle
14. embryo Sac
15. zygote
16. fertilization

### P. 53 Exercises

#### I. Multiple-Choice Questions

**A. Choose the most appropriate answer.**

**1.** b **2.** d **3.** a **4.** a **5.** d

#### II. Very Short Answer Type Questions

**A. Name the part of the ovary in a flower that gives rise to:**

**1.** Ovary **2.** Ovule **3.** Ovary wall

**B. Give one term for each of the following.**

1. Homogamy
2. Cleistogamy
3. Bisexual
4. Protandry
5. Self-sterility
6. Honey guides
7. Ornithophily
8. Endosperm

#### III. Short Answer Type Questions

**A. Explain the following terms.**

1. **Anemophily:** The pollination by wind is called anemophily.
2. **Ornithophily:** The pollination by birds is called ornithophily.
3. **Dichogamy:** The different timing of maturity in male and female whorl is called dichogamy.

4. **Heterostyly:** Flowers in which position of the anther and length of style is different.
5. **Artificial pollination:** The transfer of pollen grains on stigma by man manually is called artificial pollination.
6. **Triple fusion:** Since three nuclei are involved during double fertilization, it is called triple fusion.
7. **Double fertilization:** The process of fertilization in flowers involves the fusion of two male gametes separately, one with the egg and the other with the secondary nucleus. This process of fertilization is called double fertilization.

**B. What happens to following after fertilization?**

1. Ovules develop into seed.
2. Sepals degenerate and fall-off.
3. Petals degenerate and fall-off.
4. Style degenerate and fall-off.
5. Ovary develops into fruit.

**C. Differentiate between the following.**

**1.**

| Protandry | Protogyny |
|---|---|
| A condition in which androecium matures earlier than gynoecium. | A condition in which gynoecium matures earlier than androecium. |

**2.**

| Self-pollination | Cross-pollination |
|---|---|
| When pollens of the same flower are transferred to the stigma of the same flower, the method is termed as self-pollination. | When pollens of a flower get transferred to the stigma of different flowers of different plants, the method is termed as cross-pollination. |

**3.**

| Herkogamy | Heterostyly |
|---|---|
| A condition in which pollens are unable to reach the stigma of the same flower due to mechanical barriers. | A condition in which length of style and position of anthers are different. |

**4.**

| Homogamy | Cleistogamy |
|---|---|
| A condition in which anthers and stigma mature at the same time. | A condition in which bisexual flower remains closed lifelong for self-pollination. |

**5.**

| Wind-pollinated flowers | Insect-pollinated flowers |
|---|---|
| The flowers are usually small having long stalk or are above the leaves, so that they are clearly exposed to air. Flowers have no petals or have very small inconspicuous petals which are often white or green, i.e. not brightly-coloured. | The flowers are large and often brightly coloured. The petals are scented with nectaries. They produce nectar which is food for the insects. |

## IV. Long Answer Type Questions

**A. What is the advantage of the following in the flower to the concerned plant?**

1. Cross-pollination is facilitated so that there is genetic variation in the next generation.
2. Cross-pollination is possible by wind. Pollen grains can be dispersed to a long distance through wind.
3. Attract insects for cross-pollination.
4. Self-pollination.
5. Attract insects for cross-pollination.
6. To be carried away by wind for cross-pollination.
7. To receive pollen grains by blow of the wind for cross-pollination.

**B. Answer these questions.**

**1. a. Advantages of self-pollination.**

- Easy and most likely to occur as stamen and carpel mature at the same time.
- Preserves parental characters.
- Small quantity of pollen is required and the flowers also need not be showy.

**Disadvantages of self-pollination**

- It leads to loss of vigour and vitality.
- The genetic defects cannot be eliminated.
- New varieties cannot be obtained.

**b. Advantages of cross-pollination**

- The plants of new generation have great genetic variation.
- Seeds produced are viable and healthy.

**Disadvantages of cross-pollination**

- Pollination is uncertain as there is dependency on external agents for pollination.
- Pollen grains are to be produced in large quantity.
- Flowers have to be showy, secrete nectar and are brightly coloured.

2. The two features that favour cross-pollination:
   (i) **Dichogamy:** The timing of maturation of androecium and gynoecium are different. This difference in timing of maturation acts as a barrier in self-pollination.
   (ii) **Heterostyly:** Length of style and position of anther is different.
3. Four adaptations in flowers pollinated by insects:
   (i) The flowers are large and often brightly coloured.
   (ii) The petals are scented with nectaries. They produce nectar which is food for the insects.
   (iii) Many flowers have markings which are visible in ultraviolet light. Bees can see in ultraviolet light and thus, can recognize and pollinate flowers.
   (iv) The stigma is sticky, flat or knob-like and secretes a sugary fluid where pollen grains become attached.

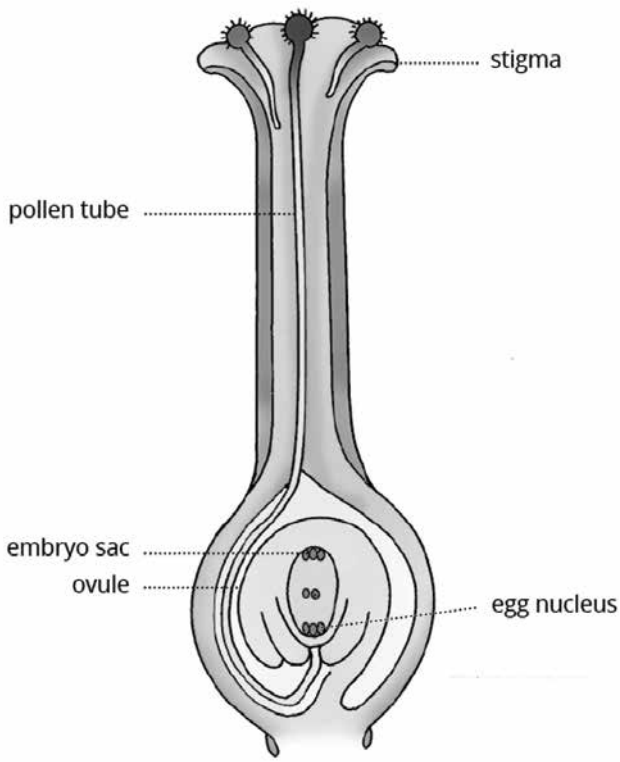
### V. Structured/Application/Skill Type Questions

**A. Given below are names of certain plants. Categorize them as per their pollinating agent and complete the table.**

| Wind pollinated | Water pollinated | Insect pollinated | Pollination by animals |
|---|---|---|---|
| Maize | *Vallisneria* | Dandelion | *Begonia* |
| Grass | | Sweet pea | *Canna* |
| | | Buttercup | *Rafflesia* |

**B. Given below is the L.S. of a pistil.**

1.




2. Pollen tube carries male gametes to the ovule.
3. Ovule after fertilization is converted into seed.
4. Stigma receives pollens during pollination.

## CHAPTER – 5

## GERMINATION OF SEEDS

### P. 57 Check Your Progress 1

**A. Fill in the blanks.**

1. ovule
2. epicotyl
3. cotyledons; radicle
4. Endosperm
5. radicle; plumule.

### P. 61 Check Your Progress 2

**A. State whether the following statements are true or false. Rewrite the incorrect statements correctly.**

1. True
2. False

   **Correct statement:** Water is absorbed mainly through micropyle.
3. False

   **Correct statement:** The region of axis above the cotyledons is epicotyl.
4. True
5. False

   **Correct statement:** In bean seeds, germination is epigeal.

### P. 61 Exercises

#### I. Multiple-Choice Questions

**A. Choose the most appropriate answer.**

**1.** c **2.** a **3.** a **4.** c

#### II. Very Short Answer Type Questions

**A. Give two examples each of**

1. **Monocotyledonous seed:** Maize, wheat
2. **Albuminous seed:** Custard apple, millets
3. **Exalbuminous seed:** Mustard seeds, orchids

**B. Explain the following terms.**

1. **Epicotyl:** The part of the plant embryo that lies above cotyledon and forms stem and leaves.
2. **Plumule:** The epicotyl along with the embryonic leaf that forms future stem.
3. **Radicle:** The tip of the hypocotyl of plant embryo that forms root.
4. **Hilum:** A scar on seed that marks the position where the seed remains attached with ovary wall.
5. **Coleoptile:** In monocot seeds, the sheath that protects the plumule is coleoptile.
6. **Aleurone layer:** The part of embryo in monocot seeds which is lined by a protein-rich layer is called an aleurone layer.
7. **Testa:** The outer covering of seed that is also called seed coat protects seeds from damage.
8. **Germination:** Formation of seedling from embryo is called germination.

**C. State the function of following parts in a seed.**

1. **Endosperm:** Provides nourishment to the developing embryo and the seed.
2. **Seed Coat:** Protects the embryo and its food supply.
3. **Micropyle:** It is responsible for absorption of water as well as exchange of gases that take place during germination.
4. **Coleoptile:** In monocot seeds, the sheath that protects the plumule is coleoptile.

#### III. Short Answer Type Questions

**A. Answer these questions.**

1. If the hypocotyl elongates rapidly, comes above the soil and cotyledons are pushed above the soil, it is called epigeal germination.

   Examples – Castor and bean
2.

| | Monocotyledonous seeds | Dicotyledonous seeds |
|---|---|---|
| **a.** No. of cotyledons | One | Two |
| **b.** Thickness of cotyledons | Thin | Thick and fleshy |
| **c.** Endosperm | Present | Absent |
| **d.** Plumule and Plumule leaves | Plumule is very small and plumule leaves are rolled. | Plumule is large and plumule leaves are folded. |

3. The food is stored in cotyledons of the non-endospermic seeds.

#### IV. Long Answer Type Questions

**A. Answer these questions.**

1.

| Hypogeal germination | Epigeal germination |
|---|---|
| Cotyledons remain underground. | Cotyledons are pushed above the ground. |
| Epicotyl elongates | Hypocotyl elongates |

| | |
|---|---|
| Can be seen in seeds of pea, gram, maize, etc. | Can be seen in seeds of castor, bean, cotton etc. |

**Maize and pea:** Hypogeal germination

**Castor and bean seeds:** Epigeal germination

2. **Albuminous seed** also known as endospermic seed, i.e., endosperm is present, and cotyledons are thin and membranous.

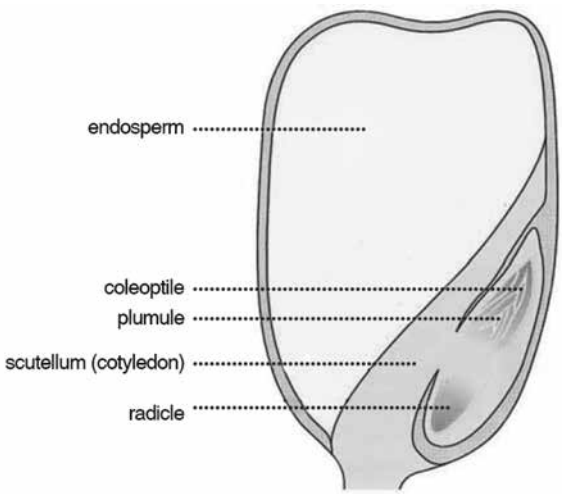
   **Exalbuminous seed** also known as non-albuminous seed, i.e., endosperms are absent and the cotyledons are fleshy and thick.

   On the basis of presence or absence of special food storing tissue called endosperm, seeds are classified as albuminous and exalbuminous.

3. Please refer to Activity 1 on page 59 of textbook.

### V. Structured/Application/Skill Type Questions

**A. 1.**




2. **Coleoptile:** In monocot seeds, the sheath that protects the plumule is coleoptile.

   **Endosperm:** Provides nourishment to the developing embryo and the seed.

3. In maize, hypogeal germination occurs.

**B. 1.** To show that oxygen is necessary for seed germination.

2. **Flask A:** Contains gram seeds and pyrogallic acid solution to absorb oxygen.

   **Flask B:** Contains gram seeds and water. The test tube in flask does not contain pyrogallic acid solution but contains water so that oxygen is available.

3. Flask B has water; therefore oxygen was available in the flask and the seeds germinated.

   But, in flask A, since there was pyrogallic acid solution that absorbs oxygen, therefore oxygen was not freely available and the seeds did not germinate.

**C.** The diagram has three bean seeds.

**(i)** The bean seed in air does not germinate since it turns dry.

**(ii)** The bean seed partially submerged in water germinated as it gets sufficient moisture, oxygen and temperature.

**(iii)** The bean seed submerged in water does not germinate much as it cannot respire due to very little oxygen in water.

**D. 1.** The three factors required for germination are—moisture, air, suitable temperature.

2. No, since for germination seedlings require light for photosynthesis and suitable temperature.

## CHAPTER – 6

## RESPIRATION IN PLANTS

### P. 69 CHECK YOUR PROGRESS 1

**A. Fill in the blanks.**

1. organic molecules (glucose)
2. cytoplasm, mitochondria
3. hydrolyzed
4. Mitochondria

**B. Answer these questions.**

1. Two
2. Cytoplasm
3. 38 ATP molecules
4. **a.** Chloroplasts **b.** Mitochondria
5. Stomata, cuticle and lenticels

### P. 70 EXERCISES

#### I. Multiple-Choice Questions

**A. Choose the most appropriate answer.**

**1.** b **2.** c **3.** d **4.** b **5.** b

#### II. Very Short Answer Type Questions

**A. Write the full name of the following.**

1. Adenosine triphosphate
2. Tricarboxylic acid cycle

**B. State whether the following statements are True or False. Correct and rewrite the false statements by changing either the first word or the last word only.**

1. True
2. False

   **Correct statement:** During pyruvate oxidation, pyruvate is converted into acetyl CoA.
3. True
4. False

   **Correct statement:** Anaerobic respiration in plants produces ethanol.
5. False

   **Correct statement:** Anaerobic respiration in plants yields ethanol.

**C. Name the following.**

1. ATP
2. Respiration
3. Aerobic respiration
4. 38 molecules of ATP, $CO_2$ and $H_2O$
5. 2 molecules
6. Ethyl alcohol + $CO_2$ + ATP (2 molecules)
7. Aerobic respiration
8. Cytoplasm

#### III. Short Answer Type Questions

**A. Answer the following.**

1. Respiration is essentially the release of energy in the form of ATP when glucose molecules are broken down to carbon dioxide and $H_2O$. It is initiated in the cytoplasm and completed in the mitochondria. The two types of respiration are aerobic and anaerobic respiration.
2. The process of respiration takes place all day and night (24 hours a day) in plants.
3. Respiration is a catabolic process. 38 ATP molecules are produced on complete oxidation of one molecule of glucose.
4. **a. Stomata:** Gases generally enter and leave the plants through the stomata present on leaves during respiration. In most plants, stomata are closed at night.

   **b. Lenticels:** To facilitate gaseous exchange, special structures called lenticels are present on the plant cuticle. These structures remain open during the day and night, irrespective of the intensity of light falling on them.

   **c. Cuticle:** Respiration at night by the plants takes place through the cuticle.
5. Aerobic respiration releases more energy (38 ATP).
6. The energy released during respiration is immediately stored in the form of ATP in the cells of the body. This energy is used for carrying out biological functions necessary for survival and maintenance of an organism.

**B. Differentiate between the following.**

**1.**

| Catabolism | Anabolism |
|---|---|
| Breakdown process in which energy is produced. | Constructive process in which energy is used. |
| Respiration is a catabolic process by which glucose is oxidized to produce energy. | Photosynthesis is an anabolic process in which food material is synthesized and energy is stored. |

**2.**

| Aerobic respiration | Anaerobic respiration |
|---|---|
| Takes place in the presence of oxygen. | Takes place in the absence of oxygen. |
| Glycolysis takes place in the cytoplasm and the Krebs cycle takes place in the mitochondria. Complete oxidation of food takes place. | The whole process of respiration takes place in the cytoplasm. Incomplete oxidation of food takes place. |
| 38 molecules of ATP are produced by oxidation of one molecule of glucose. | 2 ATP molecules are produced by oxidation of one molecule of glucose. |
| The end products are $CO_2$ and $H_2O$. | The end products formed are ethyl alcohol ($C_2H_5OH$) and $CO_2$. |

**3.**

| Respiration | Photosynthesis |
|---|---|
| Catabolic process during which food material is broken down and energy is released. | Anabolic process in which food material is synthesized and energy is stored. |
| Occurs both in the presence and absence of sunlight. | Occurs only in the presence of light. |
| Occurs in all types of tissues, irrespective of the presence or absence of chlorophyll. | It occurs only in those tissues which have chlorophyll. |
| The raw materials required for this process are $C_6H_{12}O_6$ and water. | The raw materials required for this process are $CO_2$ and $H_2O$. |
| The end products are $CO_2$ and $H_2O$. | The end products are $C_6H_{12}O_6$ (glucose) and $O_2$. |
| In respiration, due to utilization of food materials, the dry weight of the plant decreases. | During photosynthesis, due to synthesis of food materials, the dry weight of the plant increases. |

**4.**

| Respiration | Combustion |
|---|---|
| Metabolic process that takes place in living beings. | Non-metabolic process that takes place in non-living objects. |
| Carried out with the help of several enzymes. | No enzymes are required in this process. |
| Energy is released step by step. | Energy is released at once. |
| Energy released can be stored in the form of ATP. | Energy released cannot be stored in the form of ATP. |
| Heat energy is evolved, it is not accompanied by the evolution of light. | Heat energy is evolved and it is usually accompanied by the light energy. |
| Occurs at body temperature. | Occurs at high temperature (ignition temperature). |

## IV. Long Answer Type Questions

**A. Answer these questions.**

**1.** Respiration is a process which takes place 24 hours a day. The end products of respiration in plants are $CO_2$ and $H_2O$ which are released day and night but as plants prepare their food only during day time in the presence of sunlight, they utilize the released $CO_2$ during day time in food preparation. Therefore, it is advisable not to sleep under the tree at night as the $CO_2$ released at night is not utilized by the plant for photosynthesis and is harmful for the human body.

**2.** Photosynthesis takes place in daytime. In this process, plants take in $CO_2$ and give out $O_2$. However, at night, photosynthesis does not occur. Therefore, no release of $O_2$ takes place. Respiration is a continuous process in which plants take in $O_2$ and give out $CO_2$. Hence, there is a continuous release of $CO_2$ in entire day and night. During daytime, this $CO_2$ is utilized by the plant for photosynthesis. The balance of $O_2$ and $CO_2$ remains constant because plants take in more $CO_2$ and also give out large amount of $O_2$. During respiration they take very less $O_2$ as compared to when they give out $O_2$ in photosynthesis.

**B.** **1.** Aerobic respiration

**2.** Glycolysis in cytoplasm and Krebs cycle in mitochondria.

**3.** $C_6H_{12}O_6 \xrightarrow[\text{no } O_2]{\text{glycolysis}} 2CH_3COCOOH$

$\xrightarrow[6\ O_2]{\text{Krebs cycle}} 6CO_2 + 6H_2O + 38ATP$

**C.** **1.** $6CO_2$, 38

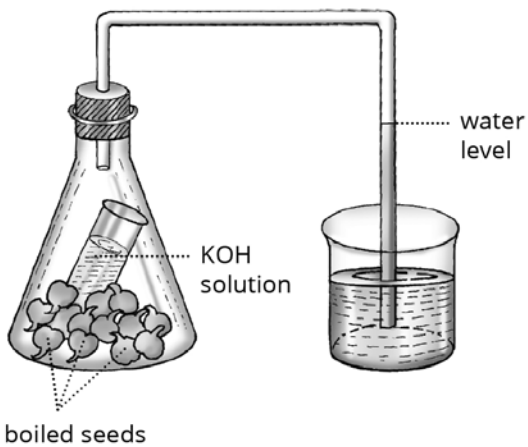
**2.** Respiration

### V. Structured/Application/Skill Type Questions

**A.** **1.** KOH absorbs $CO_2$

**2.** Level of water rises as $CO_2$ is absorbed by KOH.

**3.** In the experimental set-up, the flask will contain boiled seeds and water will not rise from the beaker because boiled seeds are not germinating and respiring.




**4.** $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + 38ATP$

**B.** **1.** To absorb $CO_2$

**2.** Tube Y is the control set-up. To prevent any bacterial growth on boiled(dead) seeds disinfectant is used.

**3.** Because there is no oxygen in tube 1 as oxygen has been consumed by germinating peas.

**4.** Respiration

**5.** Respiration is a catabolic process during which food material is broken down and energy is released.

**C.** **1.** Respiration of germinating seeds.

**2.** Soda lime absorbs $CO_2$ if released by seeds. Lime water turns milky if $CO_2$ is present.

**3.** Lime water turns milky in flask D.

**4.** $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + 38$ ATP

**5.** To prevent photosynthesis, so that any $CO_2$ produced during respiration is not used up for photosynthesis.

**6.** High rise in temperature because germinating seeds give out heat during respiration.

**D.** **1.** Respiration

**2.** To show that green plants produce $CO_2$ during respiration.

**3.** Absorbs $CO_2$

**4.** Air pumped into the apparatus passes through soda lime which absorbs $CO_2$ and the air that passes over to flask A is $CO_2$ free air. So lime water does not turn milky when $CO_2$ free air passes through it. Flask B has lime water which turns milky because air in the bell jar has $CO_2$ which passes on to flask B.

**5.** Seal all connections with vaseline to make them air-tight.

**6.** $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + 38ATP$

**E.** **1.** To show that heat is evolved during respiration.

**2.** In flask A moist germinating seeds gave out heat during respiration.

**3.** 5% formalin disinfects the boiled seeds. If bacterial growth was allowed (by not using formalin), temperature would have risen considerably.

**4.** Hot air rises up and will not leak through plugged cotton wool.

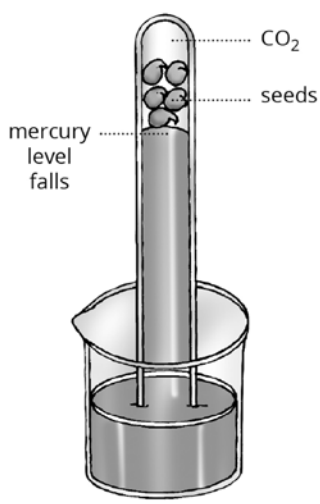
**F.** **1.** To demonstrate anaerobic respiration.

**2.** $C_6H_{12}O_6 \xrightarrow[\text{no } O_2]{\text{glucose}} CH_3COCOOH \xrightarrow{\text{no } O_2}$

$2C_2H_5OH + 2CO_2 + 2ATP$

(ethyl alcohol)

**3.**




**4.** It will increase the diffusion of $CO_2$ from seeds.

## CHAPTER – 7

## DIVERSITY IN THE LIVING WORLD

### P. 76 Check Your Progress 1

**A. Answer these questions.**

1. Classification means identifying similarities and differences between different kinds of organisms and then placing organisms with similar characteristics in one group and different kinds of organisms in different groups.
2. Species
3. The three rules are:
   - **(i)** The name of the genus comes first and its first letter is always written in capital letter. The name of the species always comes second and it always starts with a small letter.
   - **(ii)** The scientific name should be written in italics or underlined (separately for genus and species name) if handwritten. Example: *Homo sapiens* or Homo sapiens
   - **(iii)** Scientific names are mostly in Greek or Latin and is recognized throughout the world.
4. Five kingdoms of organisms:
   - **(i)** Monera
   - **(ii)** Protista
   - **(iii)** Fungi
   - **(iv)** Plantae
   - **(v)** Animalia

**B. Fill in the blanks.**

1. genus
2. order
3. kingdom

### P. 78 Check Your Progress 2

**A. Answer these questions.**

1. **a.** Bacteria, Cyanobacteria (blue-green algae)
   **b.** *Amoeba, Paramecium*
   **c.** Yeast, mushroom
   **d.** Mango plant, wheat plant
   **e.** Rabbit, Man
2. Organisms to be classified under kingdom Monera should be prokaryotes. They should be unicellular organisms and should not have a defined nucleus or organelle.
   Organisms under kingdom Protista are unicellular eukaryotic organisms. They have a well-defined nucleus and complex membranous organelles.
3. Kingdom Protista
4. **a.** Monera
   **b.** Protista
   **c.** Fungi
   **d.** Plantae

### P. 82 Check Your Progress 3

**A. Answer these questions.**

1. **(i)** Multicellular
   **(ii)** Eukaryotic with cell walls
   **(iii)** Non-motile without definite shape and size.
   **(iv)** Perform photosynthesis due to chlorophyll present in chloroplasts, hence autotrophic.
2. Bryophytes are land plants which grow in moist areas and have no true roots, neither do they have conducting vascular tissues like xylem and phloem. Thus they are called non-vascular cryptogamic plants. They develop a number of hair-like structures known as rhizoids which help in fixing the plant in the soil for absorbing nutrients. They are sometimes called the "amphibians of the plant kingdom" because of their need for moist habitats for sexual reproduction.
3. **a. Bryophyta**
   - **(i)** Have no true roots;
   - **(ii)** Do not have conducting vascular tissues like xylem and phloem; thus they are called non-vascular cryptogamic plants;
   - **(iii)** The plant body is simple, flat and is sometimes differentiated into stem and leaf-like structures.
   - **(iv)** They develop a number of hair-like structures known as rhizoids which help in fixing the plant in the soil for absorbing nutrients.

   **b. Pteridophyta**
   - **(i)** Seedless vascular plants;
   - **(ii)** Feather-like or pinnate fronds;
   - **(iii)** Body differentiated into true stem, leaves and roots like higher plants;
   - **(iv)** They possess well-developed vascular tissues–xylem and phloem for conduction of water and other substances from one part of the plant body to another.

   **c. Gymnospermae**
   - **(i)** Seeds are naked or lie exposed on the surface of megasporophylls;
   - **(ii)** Seeds contain a food laden tissue called endosperm;

(iii) Body is differentiated into root, stem and leaves;

(iv) Stem is erect, may be branched or unbranched.

**d. Angiospermae**

(i) Flowering plants whose seeds are enclosed in a fruit;

(ii) Seeds contain cotyledons called seed leaves;

(iii) After fertilization, ovary develops into a fruit;

(iv) Xylem contains vessels, phloem contains companion cells.

**4. a.**

| Division Bryophyta | Division Pteridophyta |
|---|---|
| Have no true roots; distinct stem and leaves present in some cases. | Body differentiated into true stem, leaves and roots like higher plants. |
| Do not have conducting vascular tissues like xylem and phloem; thus they are called non-vascular cryptogamic plants. | Well-developed vascular tissues for conduction of water and food are present, hence called vascular plants. |
| They develop a number of hair-like structures known as rhizoids which help in fixing the plant in the soil for absorbing nutrients. | They have roots as structure for fixation in soil. |

**b.**

| Gymnospermae | Angiospermae |
|---|---|
| Plants with naked seeds. | Flowering plants whose seeds are enclosed in a fruit. |
| Flowers are absent. | Flowers are present. |
| Companion cells are absent. | Companion cells are present. |

**5. a.** Mosses, liverworts

**b.** *Marsilea, Selaginella* (club mosses)

**c.** *Cycas*, Pine

**d.** *Hibiscus*, Mango

## P. 92 Check Your Progress 4

**A. Answer these questions.**

**1. a. Non-chordates:** Notochord absent.

**Chordates:** Notochord present in all stages of life.

**b. Pisces:** Exclusively water-living animals with a bony or cartilaginous skeleton and their skin is mostly covered with overlapping scales/plates. They have fins for swimming in water.

**Amphibia:** They are partly adapted to live in water and partly on land and have mucous glands on skin.

**c. Aves:** Exoskeleton made of feathers; they have flight capacity and their forelimbs are modified into wings.

**Mammalia:** They have mammary glands and feed their young ones with milk. Body is covered with hair, sweat and oil glands.

**d. Porifera:** Cells not organized to form tissues and body with many pores (ostia), canals and chambers through which water flows.

**Coelenterata:** Body has a gut cavity made of coelenteron with a single opening for food and waste material. Mouth is surrounded by a ring of tentacles.

**2.** The various classes of vertebrates:

(i) Class Pisces

(ii) Class Amphibia

(iii) Class Reptilia

(iv) Class Aves

(v) Class Mammalia

**3. a. Class Pisces:**

(i) Exclusively water-living animals;

(ii) They have bony or cartilaginous skeleton;

(iii) Skin is mostly covered with overlapping scales/plates;

(iv) They have fins for swimming in water.

**b. Class Aves:**

(i) Exoskeleton made of feathers and scales;

(ii) They have flight capacity; their forelimbs are modified into wings for flight;

(iii) Jaw with horny beak, no teeth present;

(iv) They lay eggs with calcareous shell.

**c. Class Amphibia:**

(i) They are partly adapted to live in water and partly on land;

(ii) Slimy skin with mucous glands;

(iii) Gills in larva, lungs in adults;

(iv) Two pairs of pentadactyl limbs.

**d. Class Mammalia:**

(i) They have mammary glands and feed their young ones with milk;

(ii) Body is covered with hair, sweat and oil glands;

(iii) Mostly give birth to young ones;

(iv) External ear pinna is present.

**4. a. Class Reptilia:** Snakes, lizards, crocodiles.

**b. Class Mammalia:** Man, tiger, elephant.

**c. Class Aves:** Pigeon, sparrow, crow.

## P. 93 EXERCISES

### I. Multiple-Choice Questions

**A. Choose the most appropriate answer.**

**1.** b **2.** a **3.** d **4.** a

**5.** c **6.** a **7.** b **8.** d

**9.** b **10.** c **11.** a

### II. Very Short Answer Type Questions

**A. Fill in the blanks.**

**1.** Echinodermata

**2.** R.H. Whittaker (1969)

**3.** Species

**4.** genus name; species name

**5.** Bryophytes

**6.** Pteridophytes

**7.** Gymnosperms

**8.** Arthropoda

**B. Answer these questions.**

**1.** Carl Linnaeus (1753)

**2.** According to R.H. Whittaker (1969) there are 5 kingdoms of life.

These are – Kingdom Monera
– Kingdom Protista
– Kingdom Fungi
– Kingdom Plantae
– Kingdom Animalia

**3.** Division Spermatophyta

**4.** The major phyla of Kingdom Animalia are:

**(i)** Phylum Porifera

**(ii)** Phylum Cindaria

**(iii)** Phylum Platyhelminthes

**(iv)** Phylum Aschelminthes; Nemathelminthes.

**(v)** Phylum Annelida

**(vi)** Phylum Arthropoda

**(vii)** Phylum Mollusca

**(viii)** Phylum Echinodermata

**(ix)** Phylum Chordata

**5.** Phylum Mollusca – Examples: *Pila*, *Unio*, *Chiton*

**C. Note the relationship between the first two words and suggest a suitable word/words for the blanks.**

**1.** Rhizoids

**2.** Naked seeds

**3.** Triploblastic

**4.** Triploblastic

**5.** Reptilia

**D. Match the items in Column A with those in Column B.**

**1.** c **2.** a **3.** b **4.** d **5.** e

**E. Find the odd-one out.**

**1.** *Taenia*

**2.** Flying fish

**3.** Catfish

**4.** *Obelia*

**F. Given below are some characteristic features of a phylum. Name the phylum.**

**1.** Phylum Porifera

**2.** Phylum Nematoda

**3.** Phylum Annelida

**4.** Phylum Cnidaria

**5.** Phylum Arthropoda

### III. Short Answer Type Questions

**A. Answer the following.**

**1.** The scientific system of naming organisms is called Binomial nomenclature. Example: *Mangifera indica* is the scientific name of mango, where *Mangifera* is genus name and *indica* is species name. Binomial nomenclature system was proposed by Carl Linnaeus in 1753. According to it any organism shall be given a name. First part is genus name and the second part is species name.

**2.** The two general classes of Angiosperms are monocotyledons or monocots (seeds with one cotyledon) and dicotyledons or dicots (seeds with two cotyledons). Examples: Monocots: Rice, Wheat. Dicots: Pea, Bean.

3. Animals that breathe by lungs but are without external ear
   (i) Class Amphibia – Frog
   (ii) Class Reptilia – Lizard
   (iii) Class Aves – Sparrow
4. a. Birds (Avis=Bird) have four-chambered heart and are warm-blooded animals.
   b. Amphibians have three-chambered heart and are cold-blooded animals.
5. Bryophyta (Bryon=moss; phyton=plant) are plants belonging to the sub-kingdom Cryptogamae. They are the 'amphibians of the plant kingdom'. They include mosses and liverworts. They are the simplest plants with no true roots. They do not have conducting or vascular tissues such as xylem and phloem. Hence they are called non-vascular cryptogamic plants. The plants develop a number of hair-like structures at their lower end. These are known as rhizoids. Rhizoids help in fixing the plant in the soil and absorbing nutrients. They have chlorophyll and thus they can manufacture their own food by photosynthesis. They generally live in damp and moist places. Examples are mosses, liverworts.
6. Pteridophytes are seedless vascular plants that have sporophytic plant body.
   (i) The body is differentiated into true stem, leaves and roots like higher plants.
   (ii) They possess well-developed vascular tissues – the xylem and phloem for conduction of water and other substances from one part of plant body to another. Pteridophytes are hence called vascular cryptograms.
   (iii) The most conspicuous pteridophytes are the ferns found in humid tropical and temperate areas.

   Examples: *Marsilea*, ferns (*Nephrolepis*), club mosses (*Selaginella*) etc.
7. Kingdom Animalia—
   (i) Have muscle cells and nerve cells.
   (ii) Power of locomotion.
   (iii) Increased sensitivity through nervous system.
   (iv) Heterotropic, i.e., depend on others for food.
8. 3 features of Arthropoda:
   (i) Jointed appendages.
   (ii) Body divided into head, thorax and abdomen.
   (iii) Hard exoskeleton made of chitin.

   'Arthros' = jointed; 'podos' = leg.
9. In cold-blooded animals, body temperature changes with change in the environmental temperature. Example – Pisces (Fishes). In warm-blooded animals, body temperature does not change with change in environmental temperature. Example – Aves (Birds).
10. Characteristic features of Chordates:
   (i) Presence of notochord.
   (ii) Presence of dorsal tubular nerve cord.
   (iii) Presence of true coelom.
   (iv) Triploblastic animals with 3 germinal layers.

**B. Give three examples each of them.**

1. Group Pisces – Rohu, hilsa, catla.
2. Class Reptilia – Snake, lizard, crocodile.
3. Class Aves – Pigeon, bulbul, house sparrow.
4. Class Mammalia – Zebra, giraffe, rat.

### IV. Long Answer Type Questions

**A. Answer these questions.**

1. (Angeio = a vessel; sperm = seed). The seeds contain cotyledons called seed leaves.
   (i) These are flowering plants whose seeds are enclosed within the fruit.
   (ii) After fertilization, the ovary develops into a fruit.
   (iii) Xylem contains vessels and phloem contains companion cells.

   On the basis of number of cotyledons, angiosperms are divided into two groups monocotyledonous or monocot seeds (seeds with a single cotyledon) and dicotyledonous or dicot seeds (seeds with two cotyledons).

   Examples of monocots are rice and wheat and dicots are Peas and Beans.
2. Kingdom Animalia possesses muscles cells and nerve cells.

   Features of Kingdom Animalia—
   (i) Power of locomotion
   (ii) Increased sensitivity through nervous system.
   (iii) Heterotropic, i.e., depend on others for food.
   (iv) They are multicellular eukaryotic organisms.
   (v) Cell wall absent.

## V. Structured/Application/Skill Type Questions

**A.**

| Organisms | Feature | Unmatched Feature |
|---|---|---|
| Mosquito | Compound eyes, Insecta, gills, spiracles | Gills |
| Pila | Aquatic, soft-bodied, Annelida, muscular foot | Annelida |
| Starfish | Marine, diploblastic, five radial arms, calcareous exoskeleton, muscular foot | Calcareous exoskeleton |
| Rohu | Cartilaginous skeleton, fins, gills, bony fish | Cartilaginous skeleton |

**B.**

| Organisms | Phylum/Class/ Order | Odd one out |
|---|---|---|
| *Hydra*, *Obelia*, *Aurelia*, *Ascaris* | Cnidaria | *Ascaris* |
| *Ascaris*, *Enterobius*, *Wuchereria*, *Pheretima* | Nematoda | *Pheretima* |
| Crab, centipede, *Pheretima* | Arthropoda | *Pheretima* |
| Starfish, Hilsa, sea urchin, sea cucumber | Echinodermata | *Hilsa* |

## CHAPTER – 8

## BACTERIA AND FUNGI – THEIR ECONOMIC IMPORTANCE

### P. 101 Check Your Progress 1

**A. Name the following.**

1. *Staphylococcus*
2. *Escherichia coli*
3. *Spirillum*
4. Plasmid
5. Saprophytic
6. Endospores
7. *Streptomyces*
8. Typhoid, tuberculosis
9. Leaf spot disease in cotton caused by *Xanthomonas malvacearum* and bacterial wilt of potato caused by *Ralstonia solanacearum*.
10. *Bacillus anthracis*
11. *Lactobacillus*

### P. 103 Check Your Progress 2

**A. Name the following.**

1. *Mucor*, *Rhizopus*
2. White button mushroom (*Agaricus bisporus*)
3. Fly agaric (*Amanita muscaria*)
4. *Saccharomyces cerevisiae*
5. Athlete's foot

### P. 104 Exercises

#### I. Multiple-Choice Questions

**A. Choose the most appropriate answer.**

**1.** c **2.** b **3.** c **4.** a

#### II. Very Short Answer Type Questions

**A. Answer these questions.**

1. Industrial use of bacteria
   - **(i)** Curdling of milk
   - **(ii)** Retting of fibres, jute and hemp
2. Fungi are non-green plant-like organisms that are found on moist surface.

   **Examples:** Yeast, *Rhizopus*.

**B. Match the items in Column A with those in Column B.**

**1.** d **2.** c **3.** a **4.** b

#### III. Short Answer Type Questions

**A. Answer these questions.**

1. Bacteria move with their flagella. No, all the bacteria do not move, because they do not have flagella.
2. The conditions for bacterial growth are
   - **(i)** Optimum temperature between 25°C–40°C.
   - **(ii)** Alkaline medium
3. Environment gets benefitted by bacteria in several ways:
   - **(i)** Bacteria decompose dead animals and plants.
   - **(ii)** Bacteria help in generating biogas from the animal waste.
   - **(iii)** Bacteria bring about putrefaction.
4. Yes, it is true that some bacteria live in digestive tract of herbivores. Since mammals do not have any enzyme to digest cellulose, therefore such symbiotic bacteria decompose cellulose into simpler forms and thus help in digestion of cellulose.
5. Harmful fungi – Mould–its spores cause allergy.
6. Certain bacteria help in curing tea by eating away unwanted compounds, producing the characteristic flavour. Raw leather is brittle and contains many fatty compounds. The raw skin is immersed in water containing bacteria which eat away the fatty compounds and make the skin soft. Specific humidity and temperature are maintained for this purpose.

**B. Bacteria are very useful to mankind. State the useful role of bacteria in the following areas.**

1. **Agriculture:** Nitrification – The process of conversion of ammonia into nitrites and nitrates by bacteria in the soil takes place in two steps:
   - **(i)** The *Nitrosomonas* bacteria oxidize ammonia ($NH_3$) to nitrites ($NO_2$).
   - **(ii)** The *Nitrobacter* bacteria oxidize nitrites into nitrates ($NO_3$). This nitrate is taken up by the plants.
2. **Nitrogen Fixation:** The conversion of free atmospheric nitrogen into nitrogen compounds is done by free-living nitrogen-fixing bacteria like *Azotobacter*, *Clostridium*, or symbiotic bacteria which live in the root nodules of leguminous

plants (eg. *Rhizobium*) can fix free nitrogen into nitrates.

3. **Production of Vitamins:** Many bacteria live in the intestine of humans and synthesize certain vitamins such as Vitamin B-complex. Some bacteria live in the intestine of herbivore animals and help in the digestion of cellulose.
4. **Production of Medicines:** Bacteria are used in the production of certain antibiotics such as streptomycin, aureomycin, terramycin, etc. Certain genetically induced bacteria produce insulin which is used in research laboratories and in drug production.
5. **Production of Antibiotics:** Antibiotics are used as medicines to fight diseases, as food preservatives to preserve fish and meat, in treating animal feed to prevent internal infections.
   - **(i)** Streptomycin is one of the most widely used antibiotic obtained from a bacterium *Streptomyces griseus*. Streptomycin cures tuberculosis.
   - **(ii)** Chlortetracycline is produced from *Streptomyces aureofaciens* and cures typhoid.
   - **(iii)** Chloramphenicol is produced from *Streptomyces venezuelae*.
6. **Production of Serum and Vaccines:** Serum contains antitoxin. The introduction of serum into the blood is an attempt to build up resistance in the body against microorganisms or their toxins. Human genes are introduced into bacteria such as *Escherichia coli* which is genetically modified. Desirable products can then be extracted from such bacteria. Some examples of bacterial serum are insulin, blood coagulating factor VIII for treatment of haemophilia A, factor IX for the treatment of haemophilia B.

   Vaccines are live weakened germs used to produce active immunity to a disease. The common vaccines obtained from bacteria are TAB vaccine for typhoid made from killed bacteria, BCG Vaccine for tuberculosis made by using live weakened bacteria.

**C. Differentiate between the following.**

1. **Decay** is the complete breakdown of organic matter by bacteria without giving out a foul smell.

   **Putrefaction** is the incomplete breakdown of organic matter by giving out a foul smell.

2. **Antibiotics:** Chemical substances obtained from the bacterial cells which are used to treat diseases caused by bacteria itself are called antibiotics. Antibiotics obtained from bacteria e.g. streptomycin, aureomycin, penicillin from *Penicillium* (fungi). Both bacteria and fungi are used for antibiotics production.

   **Antitoxin:** Serum in blood contains antitoxin which is produced by the body to fight or build up resistance against microorganisms or their toxins before they can actually enter the body and cause harm.

3. Cultivation of mushroom involves:

   **Composting:** The wheat or paddy straw is mixed with chicken manure and organic and inorganic fertilizers to prepare a compost. The compost is kept at about 50°C for about one week.

   **Spawning:** Mushroom seed containing mycelium is spread on the compost and left for 2-3 days.

## IV. Long Answer Type Questions

**A. Answer these questions.**

1. Industrial use of bacteria

   In industry, bacteria are used in curdling of milk, retting of fibres, jute and hemp, tanning of leather, production of vinegar, cheese making, processing of coffee, tobacco etc. Curd is prepared by the conversion of milk sugar (lactose) in the milk to lactic acid, and in the process curd is made.

   Industrial use of fungi:

   - **(i)** In the wine industry, sugar is fermented by yeast to produce ethyl alcohol and carbon dioxide. Carbon dioxide is given off as a bye-product which is solidified in the form of dry ice. Wine is prepared from grapes and beer is prepared from barley. The yeast (*Saccharomyces cerevisiae*) is used in the fermentation process.
   - **(ii)** In the process of cheese production, *Penicillium* and *Aspergillus* are used for fermentation process. Cheese is manufactured by:
     - Curdling of milk by adding Lactic acid bacteria (*Lactobacillus*) into milk, curd processing, salting and then ripening of curd by keeping it at optimum temperature and moisture. *Penicillium* and *Aspergillus* are added for flavouring the cheese.

- In the bread-making industry, yeast is added to bring sponginess to the bread.

Fungi are used to produce chemical compounds that are important to the food processing industry such as citric acid and gluconic acid. Citric acid is used in soft drinks and candies.

2. **Antibiotics:** Chemical substances obtained from the bacterial cells which are used to treat diseases caused by bacteria itself are called antibiotics. Antibiotics obtained from bacteria e.g. streptomycin, aureomycin.

   Both bacteria and fungi are used for antibiotics production.

**V. Structured/Application/Skill Type Questions**

**A. The table given below describes certain microorganisms and the product obtained from them. Complete the following table by filling in the blanks numbered 1 to 6.**

1. Fungi
2. *Streptomyces griseus*
3. Fungi
4. Citric acid
5. Bacteria
6. Chloramphenicol

## CHAPTER – 9

## NUTRITION

### P. 108 Check Your Progress 1

**A. Answer these questions.**

1. **Body-building:** Meat, milk

   **Energy-providing:** Rice, wheat, sugar

   **Protective:** Spinach, cabbage

2. **Monosaccharides:** Glucose, Fructose

   **Disaccharides:** Sucrose, Lactose

3. **(i)** Carbohydrates are a quick and economical source of energy.

   **(ii)** Excess carbohydrates when converted into glycogen serve as a 'reserve source of energy' and produce energy during emergency.

4. **(i)** Fats are the richest source of energy in our body.

   **(ii)** Fats are essential for the absorption of fat-soluble vitamins A, D, E and K.

   **(iii)** Subcutaneous fat acts as an insulator and protects against cold weather and pressure by retaining body heat.

### P. 114 Check Your Progress 2

**A. Answer these questions.**

1. Three types of proteins are trypsin, pepsin and rennin.

   **Functions of protein:**

   **(i)** Needed for growth and repair of the body, building and maintaining body tissues.

   **(ii)** Provide much of the body's nitrogen.

   **(iii)** Found in many enzymes and catalyze biochemical processes like digestion which take place in the body.

   **(iv)** Antibodies are blood proteins which protect the body from foreign substances (antigens).

2. Kwashiorkor.

3. A mineral is an inorganic element, occurring in the form of its salt. They are needed for proper growth, normal functioning and good health of our body, formation of red blood corpuscles, and maintaining acid-base balance and water balance of the body fluid.

   Two major minerals found in our body are calcium and phosphorus.

4. **Two fat-soluble vitamins:** Retinol (Vit. A), Calciferol (Vit. D)

   **Two water-soluble vitamins:** Thiamine (Vit. $B_1$), Riboflavin (Vit. $B_2$)

5. A diet which contains all nutrients in adequate amounts for energy, growth, repair and regulation of various body processes is called a balanced diet. A balanced diet broadly comprises of carbohydrates, fats, proteins, minerals and vitamins, water and roughage.

6.

| Kwashiorkor | Marasmus |
|---|---|
| Occurs due to deficiency of proteins in the diet of children. | Occurs due to deficiency of proteins as well as carbohydrates and fats in the diet of children. |
| Stunted growth, loss of appetite, protruding belly and bulging eyes, dry and scaly skin, reddish hair. | Dry and wrinkled skin, weakness, ribs become prominent. |
| Occurs in children between 1 to 5 years of age. | Occurs in infants less than 1 year of age. |

7. **a.** Iodine
   **b.** Calcium
   **c.** Potassium
   **d.** Sodium and Potassium
   **e.** Iron

### P. 115 Exercises

#### I. Multiple-Choice Questions

**A. Choose the most appropriate answer.**

**1.** c **2.** a **3.** a **4.** b
**5.** b **6.** b

#### II. Very Short Answer Type Questions

**A. Answer these questions.**

1. Calcium
2. Sprouted gram
3. Dried beans and legumes
4. Iron

**B. State whether True (T) or False (F).**

**1.** F **2.** T **3.** F **4.** T

### III. Short Answer Type Questions

**A. Answer these questions.**

1. **Fat-soluble vitamins:** Vitamins which are soluble in fats are called fat-soluble vitamins. Occur in food containing fats that are stored in the body. Examples: Vitamins A, D, E and K are fat soluble.

   **Water-soluble vitamins:** Vitamins which are soluble in water are called water-soluble vitamins. They are not stored in our body and are excreted out in urine when in excess. Examples: Vitamins B, C.

2. A mineral is an inorganic element, occurring in the form of its salt.

   **(i) Calcium:** Milk, beans, green vegetables etc.

   **(ii) Iron:** Beans, eggs, meat etc.

3. **Symptoms observed by the doctor:**

   **(i)** Stunted growth

   **(ii)** Protruding belly and bulging eyes

   **Diet prescribed by the doctor:**

   **(i)** Fish

   **(ii)** Milk (best source of animal proteins)

   **(iii)** Lean meat

**B. Differentiate between the following.**

1. **Body-building food:** Food that is rich in proteins. Examples: Pulses, legumes, nuts, oilseeds, milk, eggs, fish, poultry, meat etc.

   **Protective food:** Food that regulates metabolism. Rich in vitamins, minerals and water. Examples: Amla, guava, orange, etc.

2. **Monosaccharides:** These are smallest molecules containing a single unit of carbohydrate. This single unit cannot be hydrolyzed to smaller compounds. For example, glucose, fructose.

   **Disaccharides:** When two molecules of simple sugars combine together with the removal of one molecule of water, disaccharides are formed. Disaccharides chemical formula: $C_{12}H_{22}O_{11}$. For example, sucrose, maltose.

3. **Water-soluble vitamins:** Vitamins soluble in water. They are not stored in the body but are excreted out in urine when in excess. Examples: Vitamins B,C.

   **Fat-soluble vitamins:** Vitamins soluble in fats. Occur in food containing fats that are stored in the body. Examples: Vitamins A,D,E,K.

4. **Kwashiorkor:** Occurs due to deficiency of proteins in the diet of children. Occurs in children between 1 to 5 years of age.

   **Symptoms:** Stunted growth, loss of appetite, protruding belly and bulging eyes, dry and scaly skin, reddish hair.

   **Marasmus:** Occurs due to deficiency of proteins as well as carbohydrates and fats in the diet of children. Occurs in infants less than 1 year of age.

   **Symptoms:** Dry and wrinkled skin, weakness, ribs become prominent.

### IV. Long Answer Type Questions

**A. Answer these questions.**

1. Deficiency of any of the essential nutrients in our diet for a prolonged period may cause a disease. Disease arising due to deficiency of nutrients is called deficiency disease.

   Protein deficiency diseases and their symptoms:

   **(i) Marasmus:** Dry-wrinkled skin, weakness, ribs become prominent.

   **(ii) Kwashiorkor:** Stunted growth, loss of appetite, protruding belly, bulging eyes, scaly skin, reddish hair.

   Mineral deficiency diseases and their symptoms:

   **(i) Anaemia:** Weakness, loss of appetite, weight loss.

   **(ii) Goitre:** Swelling in neck.

2. Vitamins are complex organic chemicals that are needed in our food in small quantities. Vitamins are classified according to their solubility in either fat or water. Accordingly, vitamins are of two types, fat-soluble vitamins and water-soluble vitamins.

   **Importance of vitamins:**

   **(i)** Vitamins are essential for growth, good health, proper vision and normal digestion process.

   **(ii)** Vitamin D helps in maintaining calcium and phosphorus levels in body.

   **(iii)** Vitamin $B_{12}$ is important for producing new blood cells.

   **(iv)** Vitamin $B_{12}$ is essential for nucleic acid synthesis in rapidly dividing cells.

   **(v)** Vitamin $B_1$ helps in carbohydrate metabolism.

## V. Structured/Application/Skill Type Questions

**A. Given below is a table containing the names of vitamins. Categorize them into various types and put the odd one in the blank and complete the table.**

1. **Category:** Fat-soluble vitamins

   **Odd one:** Thiamine

2. **Category:** Water-soluble vitamins

   **Odd one:** Calciferol

**B. Given below is a table containing names of vitamins, their sources and deficiency diseases. Complete the table by filling in the blanks from 1 to 10.**

1. Rickets
2. Ascorbic acid
3. Citrus fruits
4. Eggs
5. Pernicious anaemia
6. Niacin
7. Retinol
8. Milk
9. Sea-food
10. Beriberi

**C. Given below is a table consisting of a set of food items belonging to a common category. Complete the table by filling in the category and the odd one in the blanks. The first one is done for you.**

1. **Category:** Carbohydrates

   **Odd one:** Calcium

2. **Category:** Fats

   **Odd one:** Sugar

3. **Category:** Proteins

   **Odd one:** Calcium

4. **Category:** Minerals

   **Odd one:** Sugar

5. **Category:** Vitamins

   **Odd one:** Phosphorus

## CHAPTER – 10

## TOOTH – STRUCTURE AND FUNCTIONS

### P. 120 Check Your Progress 1

**A. Give the technical names for the following types of teeth in humans.**

1. incisors
2. canines
3. molars

**B. Fill in the blanks.**

1. 2I 1C 2PM 3M/2I 1C 2PM 3M
2. enamel
3. gum
4. odontoblasts
5. enamel
6. dentine
7. calcium
8. pulp
9. cement
10. periodontal fibres

### P. 120 Exercises

#### I. Very Short Answer Type Questions

**A. Answer these questions.**

1. Arrangement of teeth in a person or animal is called dentition.
2. Dental formula of permanent teeth in humans:

   Upper jaw = 2I, 1C, 2PM, 3M

   Lower jaw = 2I, 1C, 2PM, 3M = 32

   Dental formula of deciduous teeth in humans:

   Upper jaw = 2I, 1C, 2M

   Lower jaw = 2I, 1C, 2M = 20

**B. Name the following parts of a tooth.**

1. Enamel
2. Crown
3. Root
4. Periodontal fibres

**C. Given below is a paragraph on general structure of a tooth in humans showing blanks numbering 1–10. Fill in the blanks.**

1. crown
2. root
3. gum
4. enamel

#### II. Short Answer Type Questions

**A. Answer the following.**

1. Different kinds of teeth present in humans and their functions are as follows:

   (i) **Incisors:** They are used fo cutting and biting the food.

   (ii) **Canines:** These help in holding and tearing the food.

   (iii) **Premolars:** These are specialized for crushing and grinding the food.

   (iv) **Molars:** They are used for crushing and grinding the food.

2. Refer to fig. 10.3 on page 118 of the textbook.
3. Carnivores such as dog and cat, have pointed incisors and canines that can be used to kill prey and tear off flesh. The premolars and molars are modified for crushing and shredding.

**B. Differentiate between the following.**

1. **Homodont dentition:** All the teeth in the jaws are similar in shape, size and structure. Examples: frog, fish, etc.

   **Heterodont dentition:** All the teeth in the jaws are not similar in shape, size and structure. Example: humans.

2. **Incisors:** Situated at the front of the buccal cavity. Straight with sharp edges. For cutting and biting.

   **Canines:** Situated at one end on either side of the incisors in each jaw. Sharp and pointed for holding and tearing of food.

3. **Premolars:** There are two premolars situated on either side, next to the canines, having two roots and two cusps.

   **Molars:** Last three teeth in each jaw. Have more than one root, molars in the upper jaw have three roots, while in lower jaw have two roots five cusps.

4. **Enamel:** Crown is covered by enamel which is the hardest substance of the tooth.

   **Dentine:** Beneath the enamel is dentine which forms bulk of the teeth.

5. **Enamel:** Crown is covered by enamel which is the hardest substance of the tooth.

   **Cement:** Bone-like structure that covers and fixes the root in position.

6. **Odontoblast:** Odontoblasts are tall columnar cells located at the periphery of the dental pulp. They produce dentine.

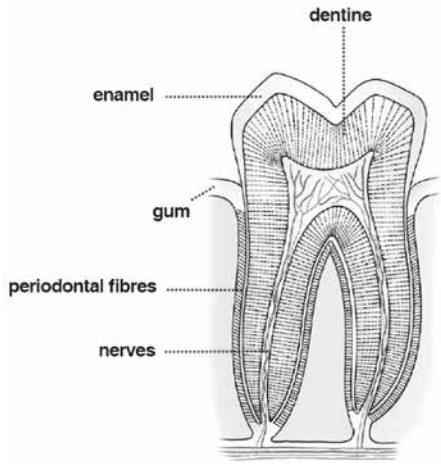
   **Pulp cavity:** Contains odontoblasts, sensory endings, nerves and blood vessels. Nerves allow to sense the pressure and touch. Blood vessels help to deliver nutrients.

7. **Milk teeth:** In humans, teeth appear in two sets during life. The milk teeth or deciduous teeth appear first.

   **Permanent teeth:** The milk teeth are replaced by the permanent teeth by about 12 years of age.

### III. Structured/Application/Skill Type Questions

**A. Given below is the longitudinal section of a human tooth.**

1. 


2. **Enamel:** Enamel is the hardest substance and is the covering of the tooth.

   **Periodontal fibres:** Connect cement at one end and the jaw bone at the other end to fix the tooth firmly in the socket of the jaw bone.

## CHAPTER – 11

## DIGESTIVE SYSTEM

### P. 126 Check Your Progress 1

**A. Match the Column A and Column B.**

**1.** g **2.** f **3.** a **4.** b

**5.** c **6.** d **7.** e

**B. Answer these questions.**

**1.** The three pairs of salivary glands in humans are:

**(i)** parotid glands,

**(ii)** submandibular glands and

**(iii)** sublingual glands.

**2.** Salivary amylase (ptyalin)

**3.** Small intestine

### P. 133 Check Your Progress 2

**A. 1.** mouth

**2.** masticate

**3.** saliva

**4.** ptyalin

**5.** pharynx

**6.** oesophagus

**7.** stomach

**8.** gastric juices

**9.** gastric enzymes

**10.** HCl

**11.** acidic

**12.** gastric enzymes

**13.** pepsinogen

**14.** pepsin

**B. Complete the following enzymatic reactions.**

**1.** Peptones

**2.** Fat

**3.** Alkaline chyme

**4.** Glucose

**5.** Glucose + Galactose

### P. 134 Exercises

#### I. Multiple-Choice Questions

**A. Choose the most appropriate answer.**

**1.** b **2.** d **3.** d **4.** b **5.** d

#### II. Very Short Answer Type Questions

**A. Answer these questions.**

**1.** Trypsin, chymotrypsin, amylopsin, steapsin (lipase).

**2.** Acidic medium is maintained in the stomach due to the presence of 0.5% HCl. HCl acts as bactericidal and dissolves mineral salts.

**3.** Major end products of

**(i)** proteins – amino acids.

**(ii)** carbohydrates – glucose and galactose.

**(iii)** fats – fatty acids and glycerols.

**4.** Alkaline medium is required for the proper functioning of intestinal juice. It is essential for the action of pancreatic enzymes.

**5.** Five steps of digestion are ingestion, digestion, absorption, assimilation and egestion.

**B. Which of the following statements are correct?**

**1.** True

**2.** False

**3.** False

**C. Name the following.**

**1.** Small intestine

**2.** Amylase

**3.** Salivary amylase

**4.** Peristalsis

**5.** Pyloric sphincter

**6.** Small intestine

**7.** Pepsinogen

**D. Name the enzyme connected with the following:**

**1.** Salivary amylase

**2.** Pepsin

**3.** Lipase

**4.** Lactase

**5.** Sucrase

**6.** Maltase

**7.** Peptidases

**8.** Rennin

**E. State the relationship between the following and fill in the blanks.**

**1. Hydrochloric acid:** Chief cells secrete pepsin whereas parietal cells secrete hydrochloric acid.

**2. Saliva:** The liver secretes bile and salivary glands secrete saliva.

3. **Maltose:** During digestion, proteins are broken into polypeptides and starch into maltose in first step.
4. **Amino acids:** During digestion, maltose is broken down to glucose and peptides to amino acids.
5. **Emulsified fats:** Trypsin acts on proteins whereas lipase acts on emulsified fats.
6. **Pepsin:** Pepsinogen is an inactive form whereas pepsin is an active form.
7. **Duodenum:** Caecum is an anterior part of large intestine whereas duodenum is an anterior part of small intestine.

### III. Short Answer Type Questions

**A. Answer these questions.**

1. Gastric hydrochloric acid gives an acidic medium which is essential for the activity of gastric enzymes. It also kills bacteria (bactericidal) contained in food, mineral salts etc. It activates pepsinogen to pepsin.

   Pepsinogen (inactive) $\rightarrow$ Pepsin
2. Microvilli present in small intestine are small finger-like projections. They greatly increase the surface area (nearly eight times that of the outer body surface) available for absorption of digested food and aid in mixing actions.
3. Three functions of liver are:
   (i) It secretes a fluid called bile which helps in emulsification of fats.
   (ii) It produces red blood cells in the embryo.
   (iii) It detoxifies toxic and metallic poisons and excretes them.
4. Bile neutralizes the acid content of the food received from the stomach and also makes it alkaline to enable the pancreatic and intestinal juices to digest the food. It also breaks down fat (oil droplets) into small globules.

   $$\text{Fat} \xrightarrow{\text{Bile}} \text{Emulsified fat}$$

   $$\text{Acidic chyme} \xrightarrow[NaHCO_3]{\text{Bile}} \text{Alkaline chyme}$$
5. Liver retains the excess glucose (product of carbohydrate digestion) and converts it into glycogen which is stored in liver cells. This glycogen is released in the form of glucose whenever it is needed by the body. Thus blood sugar level is regulated.
6. In the small intestine, the food is digested and absorbed completely. The small intestine is a tube-like structure and it lies coiled and folded in the abdomen. The inner wall of small intestine is provided with finger-like projections called intestinal villi which greatly increase the surface area available for absorption of digested food and aid in mixing actions.

   The small intestine is divisible into 3 parts.
   (i) **Duodenum:** The anterior part that receives secretions from the pancreas and the liver.
   (ii) **Jejunum:** The middle part
   (iii) **Ileum:** The posterior part that contains intestinal glands that secrete digestive juices.

   To facilitate the digestion of cellulose, the length of small intestine in grass-eating herbivores is longer than that in carnivores.

### IV. Long Answer Type Questions

**A. Answer these questions.**

1. Oral cavity $\rightarrow$ Tongue: mixes the food in the saliva.

   Teeth: Masticate food and mix the saliva. Ptyalin digests the starch.

   $\downarrow$

   Pharynx: Connects the oral cavity with oesophagus.

   $\downarrow$

   Oesophagus (passage)

   $\downarrow$

   Stomach: Holds food for sometime and produces gastric juice which makes food acidic and protein digestion begins here.

   $\downarrow$

   Duodenum: Food mixes with bile; emulsification of fats, oils.

   $\downarrow$

   Jejunum (passage) no digestion occurs.

   $\downarrow$

   Ileum: secretes intestinal juice; digestion continues. Completely digested food absorbed by villi, supplied with blood capillary.

   $\downarrow$

   Monosaccharides, peptides, amino acids are absorbed either by active transport or diffusion and transported into the capillaries.

   $\downarrow$

   Hepatic portal vein delivers absorbed food to the liver.

   $\downarrow$

   Food material is absorbed by various cells to carry out activities.
2. Organs of digestive tract include the alimentary canal and associated glands. The functions of the organs are as follows:

   **Teeth:** mastication of food

   **Salivary glands:** production of saliva

**Tongue:** mixing food with saliva and helps in swallowing

**Pharynx:** connects the oral cavity with oesophagus

**Oesophagus:** contains mucus which helps in slipping the food down

**Stomach:** produces gastric juice which makes food acidic and digests protein

**Small intestine:** site of complete digestion of carbohydrates, proteins and fats

**Duodenum:** food mixes with bile, emulsification of fats and oils

**Jejunum:** no specific function

**Ileum:** secretes intestinal juice, here completely digested food is absorbed

**Large intestine:**

**Caecum:** no specific function

**Colon:** absorption of water

**Rectum:** holds undigested matter (faeces) prior to defecation

3. Oesophagus is a muscular tube-like structure extending from the pharynx to the stomach. It is 25 cm in length. Muscles in the wall of the oesophagus work in a coordinated manner to push food and liquids down into the stomach. This muscular movement is called peristalsis. Peristalsis involves a series of muscular contractions and relaxations, which propel food forward until it reaches a ring-like valve called the 'sphincter' at the junction of the oesophagus and the stomach. Oesophageal sphincter helps prevent regurgitation of food in the stomach back into the oesophagus. Mucous glands are scattered throughout the oesophagus and produce mucus to moisten and lubricate the inner lining of the tube.

4. a. **Rennin:** Converts casein of milk into paracasein which is further digested by pepsin.

Casein $\xrightarrow{\text{Rennin}}$ Paracasein

b. **Trypsin:** Acts on proteins and converts them into polypeptides.

Proteins $\xrightarrow{\text{Trypsin}}$ Polypeptides

c. **Maltase:** Acts on maltose to produce glucose.

Maltose $\xrightarrow{\text{Maltase}}$ Glucose

d. **Ptyalin:** Acts on starch to produce maltose

Starch $\xrightarrow{\text{Ptyalin}}$ Maltose

e. **Pepsin:** Breaks down proteins into proteases and peptones

Proteins $\xrightarrow[\text{acidic medium}]{\text{Pepsin}}$ Proteoses + Peptones

f. **Lipase:** Acts on emulsified fats and converts them into fatty acids and glycerols.

Emulsified fats $\xrightarrow[\text{alkaline medium}]{\text{Lipase}}$ Fatty acids + glycerols

### V. Structured/Application/Skill Type Questions

**A.** **1.** Proteins

**2.** Amino acid

**3.** Salivary amylase

**4.** Maltose

**5.** Lipase

**6.** Fatty acids + Glycerol

**7.** Lactose

**8.** Glucose + Galactose

**9.** Sucrase

**10.** Glucose + Fructose

**B.**

| Enzyme | Site of Production | Substrate acted upon | Product(s) |
|---|---|---|---|
| Pepsin | Stomach | Proteins | Peptones and proteoses |
| Steapsin | Duodenum | Emulsified fats | Fatty acids and glycerols |
| Erepsin | Small intestine | Polypeptides | Amino acids |
| Maltase | Small intestine | Maltose | Glucose |

**C.** **1.** The structure given is villi that are found in the small intestine. Finger-like projections, covered by cell. Thick epithelium contains core of connective tissue housing blood capillaries and lymph vessels.

**2.** **a.** Villus **b.** Blood capillaries **c.** Muscular wall

**3.** They greatly increase the surface area (nearly 8 times of the outer body surface), available for digestion of food, absorption and aid in mixing actions. In villi, monosaccharides, peptides and amino acids are absorbed either by diffusion or active transport into the blood capillaries.

**D. 1. a.** Stomach

**b.** Duodenum

**c.** Small intestine (jejunum)

**d.** Liver

**e.** Large intestine

**f.** Rectum

**g.** Oesophagus

**2. a.** Stomach

**b.** Liver

**c.** Small intestine (Ileum)

**d.** Stomach and lleum

**e.** Colon

**3.** Water is absorbed in colon and indigestible matter becomes compacted into faeces, which moves towards the rectum by peristalsis.

**E.** Digestion of proteins begins in stomach. Gastric juice contains an enzyme 'pepsin' which hydrolyzes proteins into proteoses and peptones.

$$\text{Proteins} \xrightarrow[\text{acidic medium}]{\text{Pepsin}} \text{Proteoses + Peptones}$$

In the small intestine digestion of protein is completed by protein digestive enzymes dipeptidase and amino peptidase.

Polypeptides $\rightarrow$ Tripeptides

Polypeptides $\rightarrow$ Dipeptides

Dipeptides + Tripeptides $\rightarrow$ Amino acids (building blocks)

**F. 1.** Gland A is salivary gland, substance B is Saliva and enzyme C is salivary amylase.

**2.** Tube D is oesophagus and movement E is peristaltic movement.

**3.** Substance F is hydrochloric acid, G is gastric enzyme and H is mucus.

## CHAPTER – 12

## MOVEMENT AND LOCOMOTION

### P. 143 Check Your Progress 1

**A. Fill in the blanks numbered 1 to 20.**

**1.** bones **2.** cartilage

**3.** bony **4.** osteocytes

**5.** hard matrix **6.** calcium

**7.** phosphorus **8.** cartilage

**9.** joints **10.** 206 bones

**11.** axial **12.** appendicular

**13.** skull **14.** vertebral column

**15.** sternum **16.** appendicular

**17.** pelvic girdle **18.** axial

**19.** appendicular **20.** 126

### P. 146 Check Your Progress 2

**A. Answer these questions.**

**1. a.** Immovable joints: Joints in bones of the skull, joints in pelvis.

**b.** Slightly movable joint: Joint between collar bone and chest, joint between two vertebrae.

**c.** Freely movable joint: Joints of shoulder, knee.

**2.** Fibrous joints do not have synovial cavity and the bones are held by fibrous connective tissue. They are immovable or slightly movable joints.

Cartilaginous joints do not have synovial cavity and the bones are held together by cartilage. Like fibrous joints, they allow little or no movement.

**B. Match the types of joints in Column A with the examples in Column B.**

**1.** e **2.** f **3.** b **4.** d

**5.** c **6.** a

### P. 147 Exercises

#### I. Multiple-Choice Questions

**A. Choose the most appropriate answer.**

**1.** c **2.** b **3.** b **4.** d

**5.** c **6.** c

#### II. Very Short Answer Type Questions

**A. Name the following.**

**1.** Bone

**2.** Cartilage

**3.** 80

**4.** Cervical, thoracic, lumbar, sacral, coccygeal (caudal)

**5.** Centrum

**6.** True ribs

**7.** Neural canal

**8.** Synovial fluid

**9.** Pivot joint

**10.** Hinge joint

**B. Choose the odd one out in each of the following:**

**1.** Cartilaginous joint

**2.** Pelvic girdle

**3.** Sternum

**4.** Coxal bone

#### III. Short Answer Type Questions

**A. Differentiate between the following on the basis of what is given in brackets against each.**

**1. Axial skeleton:** The centre or longitudinal axis of the body is a straight line running through the body's centre of gravity, extending through the head and down to the space between the legs. The part of the skeleton that lies around the axis is known as axial skeleton. Thus ribs, skull, hyoid, are some of the bones of the axial skeleton.

**Appendicular skeleton:** The bones of the free appendages, i.e., the upper and lower limbs, and the bones (girdles) which connect the limbs to the axial skeleton, is the appendicular skeleton, i.e., pectoral and pelvic girdles.

**2. Lumbar vertebrae:** They allow bending and rotation of trunk.

**Sacral vertebrae:** They transmit weight of the body to hips and legs.

**3. Cervical region:** Cervical region consists of seven vertebrae.

**Thoracic region:** Thoracic region consists of twelve thoracic vertebrae.

**4. Sternum:** The sternum or breastbone is a flat narrow bone located in the median line of the front part of chest.

**Ribs:** There are twelve pairs of ribs which make up the sides of the thoracic cavity.

5. **True ribs:** The first to seventh ribs have a direct anterior attachment to the sternum by a strip of hyaline cartilage. These ribs are called true ribs.

   **False ribs:** The remaining five pairs of ribs do not attach directly to the sternum. Hence, they are called false ribs.

6. **Pectoral girdle:** The pectoral or shoulder girdle consists of two bones, the anterior clavicle and the posterior scapula. The paired pectoral girdle and associated muscles form our shoulders.

   **Pelvic girdle:** The pelvic or hip girdle consists of two bones, namely coxal bones or hip bones. The pelvic girdle attaches the lower limbs to the axial skeleton.

**B. Differentiate between the following types of joints.**

1. **Pivot joints:** The joints in which a rounded, pointed or conical surface of one bone articulates within a ring formed partly by another bone and partly by a ligament and the movement is primarily rotational are called pivot joints. E.g. Joints between radius and ulna.

   **Hinge joint:** A joint in which the convex surface of one bone fits into the concave surface of another bone and movement is primarily in one direction or in a single plane is called a hinge joint. The joints are so named because the motion is similar to that of a hinged door. E.g. Elbow joint, ankle joint.

2. **Gliding joints:** The joints in which articulating surface of the bones are usually flat and one bone slips over the other are called gliding joints. E.g. Joints between carpal bones, tarsal bones.

   **Socket joint:** A joint in which the ball-like surface of one fits into a cup-like depression of another bone and movement is primarily in three planes of motion, is called a ball and socket joint. E.g. Shoulder joint, hip joint.

3. **Hinge joint:** A joint in which the convex surface of one bone fits into the concave surface of another bone and movement is primarily in one direction or in a single plane is called a hinge joint. The joints are so named because the motion is similar to that of a hinged door. E.g. Elbow joint, ankle joint.

   **Socket joint:** A joint in which the ball-like surface of one fits into a cup-like depression of another bone and movement is primarily in three planes of motion, is called a ball and socket joint. E.g. Shoulder joint, hip joint.

**C. Answer these questions.**

1. The centre or longitudinal axis of the body is a straight line running through the body's centre of gravity, extending through the head and down to the space between the legs. The part of the skeleton that lies around the axis is known as axial skeleton.

   The various components of the axial skeleton include:

   **(i)** The skull which is made up of two set of bones, namely the cranial bones and the facial bones.

   **(ii)** The vertebral column which consists of 33 irregular bones called vertebrae.

   **(iii)** The sternum or breastbone which is a flat narrow bone located in the median line of the front part of the chest.

   **(iv)** Twelve pairs of ribs which make up the sides of the thoracic cavity.

2. The bones of the free appendages, i.e., the upper and lower limbs, and the bones (girdles) which are connected to (or appended to) the limbs to the axial skeleton, is the appendicular skeleton.

   The appendicular skeleton in humans consists of 126 bones. Its various components are:

   **(i)** The pectoral or shoulder girdles consist of two bones each, i.e., a total of four bones, namely the anterior clavicle and the posterior scapula.

   **(ii)** Bones of the limbs which consists of a pair of forelimbs and hindlimbs having a total of 60 bones each, in the pair of forelimbs and hindlimbs.

   **(iii)** Pelvic (hip girdle) consists of two bones, namely coxal bones or hip bones.

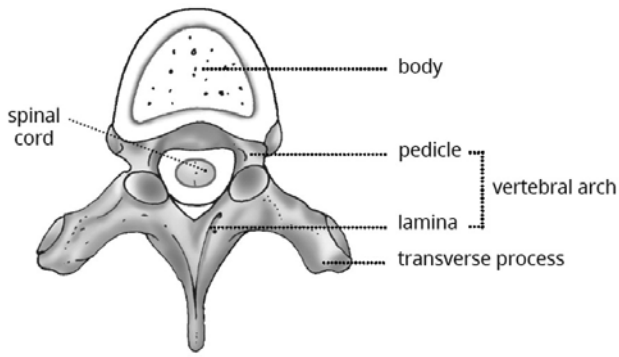
3. Synovial joints are those joints in which there is a synovial cavity and bones forming the joint are united by a surrounding articular capsule and accessory ligaments. They also contain synovial fluid and are freely movable joints. The synovial fluid occupies all free spaces within the joint capsule. The bones of a freely movable synovial joint are held in place by bands of fibres called ligaments. Synovial joints can be classified into following types: Hinge joint, Ball and socket joint, Gliding joint, Pivot joint and Saddle joint.

   Fibrous joints have no synovial cavity and the bones are held by fibrous connective tissue. These joints are immovable or slightly movable joints. There are three types of fibrous joints: sutures, syndesmosis and gomphosis.

## IV. Long Answer Type Questions

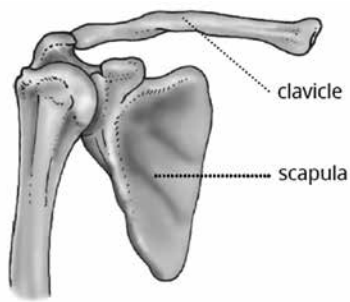
**A. Answer these questions.**

**1.**




Each vertebra is an irregular ring-like bone which has a main body or centrum and a vertebral arch posteriorly. The centrum is the thick, disc-shaped anterior portion which is the weight-bearing part of the vertebra. The vertebral (or neural) arch extends posteriorly from the body of the vertebra. It has a canal called neural canal that runs in the centre of the neural arch. The spinal cord runs through this vertebral or neural canal. Posteriorly, there is a spinous process called neural spine which is a flat, longitudinal projection. Seven processes arise from the vertebral arch. A transverse process extends laterally on each side. A spinous process extends posteriorly. Remaining four processes form joints with other vertebrae.

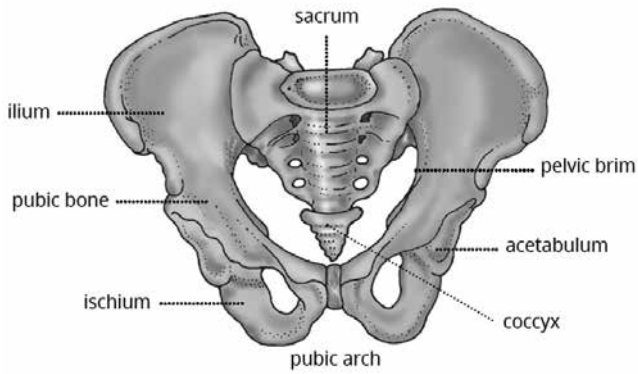
**2.**




Bones of the pectoral girdle

The appendicular skeleton consists of upper and lower limbs, pectoral and pelvic girdle. The pectoral or shoulder girdle consists of two bones, the anterior clavicle and posterior scapula. The paired pectoral girdle and associated muscles form our shoulders. The pectoral girdle attach the bones of the upper extremities to the axial skeleton. The clavicles or collar bones are slender, doubly curved long bones, which articulate with the sternum. The scapula articulates with the clavicle and humerus.

**3.**




Bones of the bony pelvis

The appendicular skeleton consists of upper and lower limbs, pectoral and pelvic girdle. The pelvic (hip) girdle consists of two bones, namely coxal bones or hip bones. Each coxal bone comprises of an ilium, ischium and pubis. Each coxal bone unites with its partner anteriorly and with the sacrum posteriorly. The deep, basin-like structure formed by the coxal bones, together with sacrum and coccyx is called the bony pelvis. The pelvic girdle provides surface for articulation of hindlimbs and also for joining of muscles. It attaches the lower limbs to the axial skeleton, transmits the weight of the upper body to the lower limbs and supports the visceral organs of the pelvis.

**4.** Joint is a point of contact by flexible connective tissue between bones, between cartilage and bone or between teeth and bones.

Joints can be classified on the basis of their functions, i.e. on the basis of their degree of movement they allow, joints can be described as immovable, slightly movable and freely movable.

**(i)** Immovable joints are those in which the bones are bound firmly together by tough fibres so that no movement is possible. For example, joint between the bones of skull.

**(ii)** Slightly or partially movable joints are joints in which bones can move a little against a pad of cartilage situated between them. For example, vertebrae in vertebral column.

**(iii)** Freely movable joints allow free movement of bones. There are about 70 freely movable joints. The portion of bones of freely movable joints rub together and are covered with shiny slippery cartilage. These joints are lubricated with synovial fluid. Thus they are also called synovial joints. For example, the joints of shoulder, knee, elbow.

Joints can be classified on the basis of their structures also. Structurally, joints are classified on the basis of presence or absence of synovial (joint) cavity (a space between the articulating bones) and the kind of connective tissue that binds the bones together. Thus, structurally the joints can be classified as fibrous joints, cartilaginous and synovial joints.

**(i)** Fibrous joints have no synovial cavity and the bones are held by fibrous connective tissue. These joints are immovable or slightly movable joints. There are three types of fibrous joints – sutures, syndesmosis and gomphosis.

**(ii)** Cartilaginous joints have no synovial cavity and the bones are held together by cartilage. They allow little or no movement. The two types of cartilaginous joints are synchondrosis (the temporary joints in the long bones and permanent joints in rib 1 and sternum) and symphysis (joints between vertebrae).

**(iii)** Synovial joints are those joints in which there is a synovial cavity and bones forming the joint are united by a surrounding articular capsule and accessory ligaments. They also contain synovial fluid and are freely movable joints. The synovial fluid occupies all free spaces within the joint capsule. The bones of a freely movable synovial joint are held in place by bands of fibres called ligaments. Synovial joints can be classified into following types: Hinge joint (e.g. Elbow joint), Ball and socket joint (e.g. shoulder joint), Gliding joint (e.g. joints between carpal bones), Pivot joint (e.g. joint between radius and ulna), and Saddle joint (e.g. joint between metacarpal of thumb).

### V. Structured/Application/Skill Type Questions

**A.** The structure given in the diagram is a typical vertebra.

The following having been indicated by labels.

**a.** Body

**b.** Pedicle

**c.** Spinal cord

**d.** Transverse process

**B. 1.** Synovial joint

**2. a.** Fibrous layer

**b.** Synovial membrane

**c.** Synovial fluid

**d.** Bone marrow

**e.** Slippery cartilage

**3.** Freely movable joint

## CHAPTER – 13

## SKIN – STRUCTURE AND FUNCTIONS

### P. 151 Check Your Progress 1

**A. Fill in the blanks.**

1. epidermis, dermis
2. stratum corneum
3. germinative layer
4. melanin
5. nerve endings

### P. 155 Check Your Progress 2

**A. State whether True (T) or False (F). Rewrite the wrong statements correctly.**

1. False

   Hair are epidermal growths of the malpighian layer.

2. True
3. True
4. False

   Nail is a plate-like modification of epidermis.

5. False

   The most numerous sweat glands are found in the skin of soles and palm.

6. False

   Mammary glands are modified sweat glands.

### P. 156 Exercises

#### I. Multiple-Choice Questions

**A. Choose the most appropriate answer.**

**1.** b **2.** c **3.** b **4.** d **5.** d

#### II. Very Short Answer Type Questions

**A. Match the terms given in Column A with their description in Column B.**

**1.** d **2.** a **3.** e **4.** b **5.** c
**6.** f **7.** g

**B. Answer these questions.**

1. Three sub-layers of epidermis are:

   **(i) Outermost:** Cornified layer (stratum corneum)

   **(ii) Middle:** Granular layer (stratum granulosum)

   **(iii) Innermost:** Malpighian or germinative layer

2. Two types of glands:

   **(i) Sweat glands:** Secretion of sweat–(acts as a form of excretory duct) to regulate body temperature in the summer season.

   **(ii) Sebaceous glands:** Oil glands secrete sebum. Sebum lubricates the skin, hair and prevents water loss from the skin.

3. Composition of sweat:

   99% – water

   0.2–0.5% salts

   0.8% urea

   Vitamin C

   Lactic acid (minimal quantities)

   Ammonia

4. Sebaceous glands
5. Hypothalamus

#### III. Short Answer Type Questions

**A. Answer these questions.**

1. Three functions of skin are:

   **(i)** Protection of underlying tissues and organs against mechanical injuries.

   **(ii)** Regulation of body temperature.

   **(iii)** Stores excessive subcutaneous fat which can be used in times of need.

2. The arrector pili muscles are attached in such a way that their contraction pulls the hair follicle into an upright position and dimples the skin surface to produce goose flesh in response to cold external temperature or fear. It is an important heat retention and protection mechanism in other animals.

3. With each hair follicle a bundle of smooth muscle cells are associated. These are called arrector pili muscles (raiser of hair).

   They are attached in such a way that their contraction pulls the hair follicle into an upright position producing goose flesh (in response to cold or fear).

4. **Albinism:** Complete loss of pigmentation (melanin) all over the body including hair, eyebrows. Skin appears pinkish due to

underlying capillaries. It is a recessive trait due to inheritance.

**Leucoderma:** Loss of pigmentation, in the form of small or large patches are formed at different regions of the body. Exact cause is not known.

5. Sebaceous glands or oil glands are simple alveolar glands found all over the body except palm, soles. These glands secrete an oily secretion called sebum. Sebum lubricates hair and skin from becoming brittle and slows down water loss from the skin. These glands are relatively inactive in childhood and become active during puberty.

6. When the external temperature falls, hair are raised, vasoconstriction occurs, sweat glands decrease sweating, skeletal muscles shiver and metabolic rate is increased leading to heat gain in the body. This process is known as vasoconstriction.

7. Apocrine glands are largely found in the axillary (skin) and genital areas. These are a type of sweat glands. Their ducts empty their secretion into hair follicles. Their secretion is odourless. The secretion is later decomposed by the bacteria on the skin causing unpleasant smell (body odour).

### IV. Long Answer Type Questions

**A. Answer these questions.**

1. The main function of sweat is thermoregulation to prevent overheating of the body. Sweating goes on at all times in minute quantities. It is more during exercises and in summer season.

   **Regulation:** By the sympathetic division of the autonomic nervous system.

2. Ectotherms are organisms that obtain heat from external sources and their body temperature fluctuates according to the temperature of the environment. Example : Reptiles

   Endotherms are animals which maintain more or less constant body temperature by generating their body heat metabolically. Example : Mammals

   Ectotherms are cold-blooded (poikilotherm) animals. They generally stay in environments where the temperature is almost constant. Snakes and lizards, for instance, sit in the sun, hide in the shade, or burrow underground to regulate their body temperature.

3. **Vasoconstriction:** Arterioles leading to the blood capillaries in the surface layers of skin narrow down, reducing the flow of blood of the skin. Regulated by sympathetic nerves from the brain in the winters.

   **Vasodilation:** Arterioles leading to skin capillaries dilates and shunt-vessels are closed leading to increased blood flow to the skin.

4. During bright sunny days, vasodilation occurs, sweat glands secrete more sweat. It is controlled by the sympathetic nervous system. It helps in thermoregulation. When sweat evaporates it cools and lowers the body temperature and prevents overheating of the body due to high temperatures.

### V. Structured/Application/Skill Type Questions

**A. 1.** **a.** Stratum corneum

**b.** Stratum malpighii

**c.** Hair bulb

**d.** Hypodermis

**e.** Nerve endings

**f.** Sebaceous gland

2. **a.** **Stratum corneum:** Outermost, topmost layer of epidermic keratin (a dead protein) forms the chemical basis of the skin tissues such as hairs, feathers etc. It covers the entire body except the skin tissues. It provides a durable overcoat for the skin and protects the deeper cells from mechanical injury, bacterial infection etc.

   **e.** These are nerve cells, which help to respond to various external stimuli received.

   **f.** Secretes an oily secretion called sebum (seb: grease). Sebum lubricates and softens the hair and skin from becoming brittle and slows down the water loss from the skin when the external humidity is low. It kills bacteria on the surface of skin.

3. The pigment is melanin. Melanin provides colouration to the skin and absorbs the harmful ultraviolet rays; protecting underlying tissues.

**B. 1. a.** Hair shaft

**b.** Sebaceous gland

**c.** Hair bulb

**d.** Hair follicle

**e.** Hair papilla

**f.** Arrector pili muscles

**2. (i)** Outermost cornified layer (Stratum corneum)

**(ii)** Middle granular layer (Stratum granulosum)

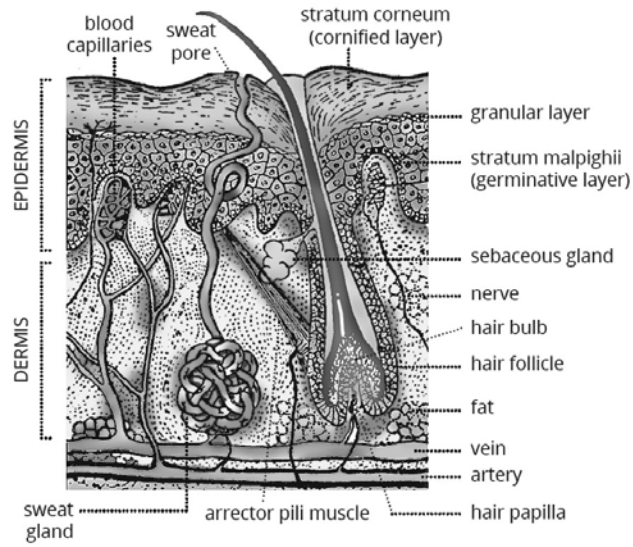
**(iii)** Inner Malpighian layer (Germinative layer)

**3. Keratin:** A dead protein which provides tough durable overcoat which help to prevent inner underlying cells from mechanical injury and from bacterial infection.

**4. Albinism:** Complete loss of pigmentation all over the body including hair, eyebrows. Skin appears pinkish due to haemoglobin in underlying capillaries.

**Leucoderma:** Loss of pigmentation, small or large patches are formed at different regions of the body. Exact cause still unknown.

**C.**




Vertical section of the skin

**D. Dermal structures:** Nerve endings, vein, dermal papillae, fibroblasts, sebaceous gland

**Epidermal Structures:** Stratum corneum, keratin

## CHAPTER – 14

## THE RESPIRATORY SYSTEM

### P. 160 Check Your Progress 1

**A. Answer these questions.**

1. Respiration is a chemical process of releasing energy by breaking down glucose for carrying out life processes.
2. Adenosine triphosphate
3. $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + 2880$ kJ
4. Aerobic respiration and anaerobic respiration
5. Cellular or internal respiration involves release of energy by oxidation of food (glucose), and conversion of the energy released into a biologically usable form, such as ATP (adenosine triphosphate) inside the cell. In this, carbohydrates and other metabolites are broken down with the simultaneous build-up of ATP. The process of oxidation of food occurs in the mitochondria of the cell.

### P. 166 Check Your Progress 2

**A. Answer these questions.**

1. The respiratory system in human beings includes nostrils, nasal cavity, pharynx, larynx, trachea, bronchi, bronchioles, alveolar sacs or alveoli and lungs.
2. Pleural membrane
3. These keep the trachea in dilated position and prevent it from collapsing.
4. Emphysema is an obstructive lung disease in the people who smoke regularly. In smokers, the walls separating alveoli breakdown, leading to abnormal alveoli. Thus, the area for gaseous exchange is reduced. This leads to reduction in gaseous exchange by lungs. As a result of this, the heart has to pump in more blood which may lead to heart attack. Emphysema is most often caused by tobacco smoking and long-term exposure to air pollution.
5. Carbon dioxide

### P. 167 Exercises

#### I. Multiple-Choice Questions

**A. Choose the most appropriate answer.**

**1.** c **2.** d **3.** c **4.** b **5.** a

**6.** a **7.** c **8.** d **9.** b

#### II. Very Short Answer Type Questions

**A. Answer these questions.**

1. Alveoli
2. Bronchioles
3. Epiglottis is a cartilaginous flap which guards the entry of food during swallowing or water from entering the respiratory tract. It guards the entrance to trachea (windpipe).
4. Breathing involves two steps:
   - **(i)** Inhalation/Inspiration.
   - **(ii)** Exhalation/Expiration.
5. Trachea

**B. Fill in the blanks.**

**1.** vital capacity. **2.** diaphragm.

**3.** oxygen, carbon dioxide **4.** 6

**5.** 3.3

**C. Given below is an example of a certain structure and its function.**

**'Kidney and excretion'**

**Fill in the blanks on a similar pattern.**

**1.** guards trachea **2.** exchange of gases

**3.** breathing **4.** supports trachea

**5.** protection of lungs

**D. Match the Columns A and B.**

**1.** e **2.** d **3.** c **4.** a **5.** b

**6.** f

#### III. Short Answer Type Questions

**A. Answer these questions.**

**1.**

| Aerobic respiration | Anaerobic respiration |
|---|---|
| Takes place in the presence of oxygen. | Takes place in the absence of oxygen. |
| Glycolysis takes place in cytoplasm and Krebs cycle takes place in mitochondria. | The whole process of respiration takes place in the cytoplasm. |
| Energy is produced in larger quantity. 38ATP molecules are produced by oxidation of one molecule of glucose. | Energy is produced in small quantity. 2ATP molecules are produced by oxidation of one molecule of glucose. |

2. Haemoglobin is the respiratory pigment in human beings which takes up oxygen from air in the lungs and carries it to the tissues having deficiency of oxygen. It is present in the red blood cells. Due to its high affinity for oxygen, it binds with oxygen molecules very fast and carries it to the tissues across our body. The structure of the haemoglobin molecule enables it to bind with four oxygen molecules. Release of oxygen molecule at target site is also easy as it does not form covalent bond with oxygen rather a transient interaction occurs.

3. The nasal passages are lined by ciliated epithelium and mucous-secreting cells. Both the cilia and mucus check the entry of microbes and dust particles in the respiratory tract. Mucus has a rich blood supply inside the nasal passage which makes the inhaled air moist and warm.

4. Alveoli are tiny air sacs across whose thin, moist walls, gaseous exchange takes place, are in close association with capillaries and provide a large surface area for gaseous exchange. There are around 700 million alveoli present in the lungs (nearly 70 $m^2$) surface area. Therefore, larger the surface area more the diffusion of gases takes place.

5. It is healthier to breathe through nose because nose contains the vestibular region. It contains hairs and mucous glands. The hair act as filters and prevent the entry of dust particles. When breathing through mouth, the particles will move directly into the respiratory tract.

6. The inner surface of the nasal passage is lined by hairy, ciliated epithelium and mucous secreting cells. Both cilia and mucus check the entry of microbes and dust particles in the respiratory passage. If dust particles enter the nasal cavity, they get stuck to hair and mucus, and are thrown out by the movement of cilia. Mucus and the rich blood supply inside the nasal passage keeps the inhaled air moist and warm.

**B. Differentiate between the following pairs on the basis of the aspect given in the brackets.**

1.

| Alveolar air | Inspired air |
|---|---|
| $CO_2$ content is 4% | $CO_2$ content is 0.3% |

2.

| Residual Volume | Tidal volume |
|---|---|
| Quantity of air: 1500 mL | Quantity of air: 500 mL |

3.

| Breathing | Respiration |
|---|---|
| Lungs | Cells |

### IV. Long Answer Type Questions

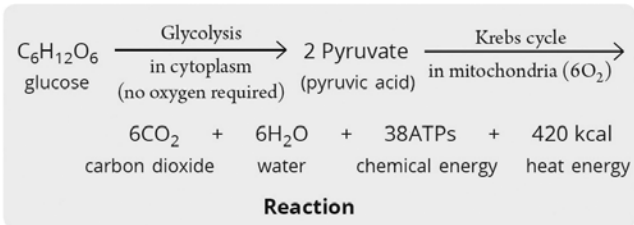
**A. Answer these questions.**

1. The concentration of $O_2$ in lung alveoli is higher than that in the deoxygenated blood in capillaries. This difference causes $O_2$ to diffuse from the alveoli into the lung capillaries since diffusion continues as long as the molecules concerned are unequally distributed. The blood contained in the capillaries has high concentration of $CO_2$ which it has absorbem d from body tissues. $CO_2$ diffuses out from capillaries.

2. **a.** Aerobic respiration

   **b.** Living cell: Glycolysis – In cytoplasm; Krebs Cycle – In mitochondria.

   **c.**



**Reaction**

3. **a.** Anaerobic respiration

   **b.** Cytoplasm

   **c.** **Anaerobic Respiraton:** It takes place in the absence of oxygen. Incomplete Oxidation of food takes place. Occurs in cytoplasm. 2ATP molecules are produced.

   Products: $C_2H_5OH$, $CO_2$

   **Combustion:** It is a non-metabolic process. Energy is released at once. Occurs at high temperature. No enzymes are required.

4. The respiratory system in humans include nostrils, nasal cavity, pharynx, larynx, trachea, bronchi, bronchioles, alveolar sacs or alveoli and lungs.

   **Nostrils and nasal cavity:** The nasal passages are paired, tube-like structures. The inner surface of nasal passage is lined by fine hairy ciliated epithelium and mucous-secreting cells. Both cilia and mucus check the entry of microbes and dust particles in the respiratory passage. If dust particles enter the nasal cavity, they get stuck to mucus and are thrown out by the movement of cilia. Mucus and rich blood supply inside the nasal passage make the inhaled air moist and warm.

**Pharynx:** The pharynx is situated at the back of the mouth. From the nasal cavities, the air moves into the pharynx. The pharynx opens into the larynx which leads to the trachea.

**Trachea:** The trachea or windpipe extends into the thoracic cavity. It lies on the ventral side of the oesophagus. Its wall is provided with incomplete C-shaped cartilaginous rings. These keep the trachea in dialated position and prevent it from collapsing. The ciliated epithelial lining and the mucus help in preventing any dust particle or microbe from entering the lungs.

**Bronchi and bronchioles:** At its lower end, the trachea splits into primary bronchi. Within the lung each bronchus divides into several bronchioles. The smallest tubes, called respiratory bronchioles are about 0.5 mm in diameter.

**Alveoli:** Each bronchiole terminates in a sac called alveolar sac. Alveoli are the actual sites of respiratory exchange. Each alveolus has a dense network of blood capillaries on its outer side.

### V. Structured/Application/Skill Type Questions

**A. 1.** blood with high $CO_2$ content → b

**2.** blood with high $O_2$ content → d

**3.** contains a red pigment → c

**4.** where gases enter and leave the air → a

**B. 1.** a **2.** c **3.** d

**C. 1.** a–Nose

b–Pharynx

c–Lungs (right)

d–Diaphragm

e–Nasal cavity

f–Windpipe

g–Left bronchus

h–Alveoli

**2.** The concentration of $O_2$ in lung alveoli is higher than that in deoxygenated blood in capillaries.

This difference causes $O_2$ to diffuse from the alveoli into the lung capillaries since diffusion continues so long as the molecules concerned are unequally distributed. The blood contained in the capillaries has high concentration of $CO_2$ which it has absorbed from body tissues. $CO_2$ diffuses out from blood capillaries into the alveoli.

**3.** Partial pressure is the pressure of a single gas in a mixture of gases. Partial pressure of $CO_2$ is higher in the capillaries than in the alveoli. Thus, $CO_2$ diffuse out from capillaries to the alveolar air during gaseous exchange.

**4.** Exchange of $O_2$ depends upon the concentration of $CO_2$ tension in the blood. When $CO_2$ concentration is more it stimulates the breathing centre which lies in medulla oblongata (brainstem) of the brain which in turn sends messages to the lungs for the breathing mechanism of exhaling $CO_2$ and inhaling $O_2$.

**D. 1.** (b) **2.** (d) **3.** (d) **4.** (d)

**E. 1.** Intercostal muscles and diaphragm.

**2.** During inspiration, an increase in the thoracic cavity volume is brought about by simultaneous contraction of intercostal and the diaphragm muscles. This produces a forward outward movement of the rib-cage. As the lungs expand, the air pressure in them reduces and so air rushes into them from the atmosphere.

**3.** $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + 38ATP$

**4. a. Residual air:** The air left in lungs even after forceful breathing out of air. Residual volume in lungs–1500 mL.

**b. Dead Air Space:** The air remaining in the respiratory passage, trachea, bronchi, (bronchioles) is called dead air space. It is about 150 mL.

**F. 1. Tidal volume:** The total amount of air breathed in and breathed out in normal condition. Normal value: 500 mL

**2. Inspiratory reserve volume:** The maximum air that can be breathed in forcefully over the tidal volume. Normal value: 3000 mL

**3. Expiratory reserve volume:** The maximum air that can be breathed out forcefully even after an ordinary or normal expiration. Normal value:1000 mL

**4. Vital capacity:** The maximum value of air that can be taken in and given out of lungs by maximum inspiration and expiration. Cases in which it is higher:

**(i)** Males have higher than females.

**(ii)** Adults than children.

**(iii)** Fit people than unfit people.

**5.** Residual volume is the air left in the lungs even after a forceful breathing out. The residual volume of air in our lungs is about 1500 mL.

**G. 1.** Windpipe **2.** Diaphragm

**3.** Ribcage **4.** Alveoli

## CHAPTER – 15

## HEALTH AND HYGIENE

### P. 173 Check Your Progress 1

**A. Answer these questions.**

**1.** Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

**2. (i)** Avoid smoking and using of tobacco products.

**(ii)** Physical exercise like outdoor games and sports maintain the heart in good condition.

**B. Fill in the blanks.**

**1.** heart and liver

**2.** germs and pesticides

**3.** carbohydrates, proteins, fats, vitamins and minerals

**4.** flies and germs

### P. 175 Check Your Progress 2

**A. Match the Columns A and B.**

**1.** f **2.** e **3.** d **4.** b

**5.** a **6.** c

**B. Answer these questions.**

**1. Communicable disease:** Cholera, Malaria

**Non-Communicable disease:** Diabetes, Cancer

**2.** A disease becomes an epidemic when there is a rapid spread of infectious disease to a large number of people in a given population within a short period of time.

### P. 178 Check Your Progress 3

**A. Mention if the following statements are True (T) or False (F).**

**1.** F **2.** T **3.** T **4.** T

**B. Tick mark the correctly matched pairs with regard to diseases spread by houseflies.**

1, 2, 4, 5.

### P. 179 Check Your Progress 4

**A. Match the Columns A and B.**

**1.** c **2.** d **3.** a **4.** b

**B. Answer these questions.**

**1.** Various means of transmission of infectious diseases are:

**(i) Through air:** When an infected person coughs or sneezes, the microbes spread into air as droplets which when inhaled by healthy person causes infection.

Examples: pneumonia, mumps, influenza, tuberculosis, etc.

**(ii) Through water:** The microbes from the excreta of a person suffering from gut infection enters the body of a healthy person when he drinks polluted and contaminated water.

Examples: cholera, typhoid.

**(iii) Through sexual contact:** Sexual contact with infected person transmits sexually transmitted diseases from infected to healthy person.

Examples: AIDS, syphilis, gonorrhoea, etc.

**(iv) Through vectors:** Vectors are intermediate carriers of disease causing agents which transmit the pathogens from reservoir of infection to healthy person. Many insects and animals spread diseases and are potential vectors of certain diseases.

Examples: Malaria spread by female *Anopheles* mosquitoes, Dengue by female *Aedes* mosquitoes.

**2.** Vectors are living organisms like insects, ticks, mites that act as intermediate carriers to transmit pathogens to humans and animals.

Vectors take up the pathogen from the reservoir of infection and pass it to healthy persons. For examples, houseflies carry the causative organisms of cholera, typhoid, dysentery and tuberculosis on their legs and mouthparts from the faeces and sputum to drinks and food and contaminate them. When this contaminated food is taken by a healthy person, he/she gets the infection. The commonest vector is the mosquito. Females of many species of mosquito require blood containing high nutritious food in order to lay mature eggs. Mosquitoes feed on warm - blooded animals including human and in turn transmit disease from one person to another.

### P. 180 Exercises

#### I. Multiple-Choice Questions

**A. Choose the most appropriate answer.**

**1.** c **2.** a **3.** a **4.** c **5.** a

#### II. Very Short Answer Type Questions

**A. Name the following.**

**1.** Community hygiene/Public hygiene

**2.** Vectors

3. Female *Anopheles* Mosquito
4. Cholera, typhoid
5. Myiasis
6. *Anopheles sp.*
7. *Gambusia*
8. DDT, deltamethrin

**B. Match the disease in column A with the group of pathogens in column B.**

**1.** b **2.** c **3.** a **4.** e **5.** d

### III. Short Answer Type Questions

**A. Answer these questions.**

1. We should wash fruits and vegetables before consumption to make them free from germs and pesticides.
2. **(i)** House should be kept clean and free from dirt, flies and germs.
   **(ii)** Cooking utensils, plates, and other utensils should be kept clean.
   **(iii)** Garbage should be thrown inside covered dustbins.
3. **Viral diseases:** poliomyelitis, hepatitis
   **Bacterial diseases:** cholera, typhoid
4. Dengue is caused by *Aedes sp.* of mosquitoes. They usually breed in clear stagnant water such as rain pools, coolers, etc. Hence, stagnant water can cause dengue.
5. Washing hands with soap makes them germ free. Having food with dirty hands will make us sick because the dirt on our hands might carry certain disease-causing germs. Hence the hands should be washed before eating food.
6. Houseflies and mosquitoes.

**B. Differentiate between the following.**

**1.**

| Domestic hygiene | Community hygiene |
|---|---|
| Domestic hygiene means cleanliness in the house i.e. sanitary preparation of food, cleanliness, and ventilation. | These are activities undertaken in the local or government organizational level to maintain health of the people. |
| It includes keeping the house, utensils, etc free from dirt, germs and flies, throwing garbage in covered dustbins, etc. | It includes providing safe drinking water, running immunization and health awareness programmes, etc. |

**2.**

| Urogenital myiasis | Nasopharyngeal myiasis |
|---|---|
| It is the condition when larvae of houseflies enter the urogenital tract of humans and live there. | It is the condition when larvae of houseflies enter the respiratory tract of humans through nose and live there. |

**3.**

| Vectors | Pathogens |
|---|---|
| An intermediate carrier that transmits an infectious pathogen into another living organism. | An agent that causes disease in humans, plants and animals. |
| It mostly includes insects, ticks and mites. | It can be bacteria viruses, fungi or protozoa. |

**4.**

| Chemical control | Biological control |
|---|---|
| It is a method to control insects and other vectors of diseases by spraying chemical insecticide. | It is a method of controlling insects, mites, ticks, etc. by using other organisms which are their natural predators. |
| It has harmful effect on the environment. | It does not harm the environment. |
| They are fast acting. | They are slow acting. |
| For example: DDT, deltamethrin, malathion | For example: *Gambusia* fish which naturally prey on mosquito larvae. |

**5.**

| *Anopheles* | *Culex* |
|---|---|
| Sits obliquely while resting. | Sits parallel white resting. |
| Wings have dark spots. | Wings are unspotted. |
| Eggs laid singly and horizontally. | Eggs are laid in masses and each mass has 100 or more eggs. |
| Act as a vector for pathogens causing malaria. | Act as vector for pathogens causing filaria (elephantiasis) |

6.

| Communicable diseases | Non-communicable diseases |
|---|---|
| The diseases which spread from one person to another. | The diseases which do not spread from one person to another. |
| They are caused by pathogens. | These diseases are either connected to our lifestyle or genetic make-up. |
| Infection is transmitted through direct contact or through medium. | Not transmitted through direct contact or medium. |
| Example: influenza, AIDS, herpes, chickenpox, measles, etc. | Example: cancer, diabetes, asthma, haemophilia, goitre etc. |

**C. Define the terms.**

1. **Endemic disease:** A disease occurring in a specific area attacking only a smaller number of people is called endemic disease.

   Example: yellow fever, measles (in African countries), goitre (in Sub-Himalayan region).

2. **Epidemic disease:** An epidemic is an outbreak of disease which spreads rapidly from one place to another affecting a large population.

   Example: In India, people suffered from plague epidemic in 1994 which was caused by flea infected rats.

3. **Sporadic disease:** When there are scattered individual cases of a disease, it is called sporadic disease.

   Example: Malaria and cholera.

4. **Pandemic disease:** If a disease occurs on a global scale, that is, it spreads across the world, it is called pandemic.

   Example: AIDS is a current pandemic.

## IV. Long Answer Type Questions

**A. Answer these questions.**

1. The state of the body when any of its normal functions are disturbed or when the structures are altered is called disease.

   Various modes of spread of infections diseases:

   **(i) Through air:** When an infected person coughs or sneezes, the microbes spread into the air and enter the body of healthy person.

   **(ii) Through water:** The microbes from the excreta of a person suffering from a gut disease enter the body of a healthy person when he drinks polluted and contaminated water. Example: cholera.

   **(iii) Through sexual contact:** Microbial diseases like AIDS and syphilis are transmitted by sexual contact with an infected person.

   **(iv) By vectors:** Some organisms act as carrier of pathogens and spread the diseases.

   Example: Female *Anopheles* mosquito (which spreads malaria)

2. Filariasis is a parasitic disease characterized by the swelling of the legs and scrotum. The disease is commonly known as elephantiasis due to its resemblance to a leg of an elephant.

   Vector of filariasis is female *Culex* mosquito.

   Causative agent is a worm, *Wuchereria*.

3. The housefly is a physical carrier of pathogens and may transmit the pathogen in various ways-

   **(i) Feet and body hair of flies pickup filth and pathogens:** The housefly has a hairy body. The fly picks up pathogens along with dirt on its body when it visits dirty places. The same fly leaves those pathogens as it sits on our food.

   **(ii) Mouthparts:** The mouthparts of a housefly have a swollen bulbous end which provides enough surface area for the pathogens to hang on which may fall on the food just by single touch.

   **(iii) Regurgitation or vomit:** Sometimes, the fly regurgitates, that is, pours our already swallowed food back from mouth, on to our food. This food might have been swallowed from dirty places and may contain pathogens that are transmitted to our food.

   **(iv) Deposition of faeces:** While the housefly feeds, it excretes simultaneously on the food stuff. The faecal spots may contain pathogens.

4. To keep the environment healthy, we should be careful about the following while maintaining domestic hygiene -

   **(i)** House should be kept clean and free from dirt, flies and germs.

   **(ii)** Cooking utensils, plates and other utensils should be kept clean.

   **(iii)** Garbage should be thrown inside the dustbins. Throwing household garbage on the roadside makes street dirty and allows flies, mosquitoes and other animals to breed.

**(iv)** Keeping dustbins covered: To prevent the entry of insects and other animals inside the house, dustbins should be kept covered. The bins should also be cleaned after emptying the garbage.

**5.** Measures to control:

**a. Cockroaches:**

**(i) Sanitation:** To prevent cockroaches, clean up all spilled food materials. Do not leave dirty dishes overnight. Store food items in air tight containers. Properly make structural repairs in kitchen, bathroom and other areas of the house.

**(ii) Chemical control:** Insecticidal spraying or dusting of cockroach-breading places should be done. Dusts of organophosphate insecticides such as fenthion, malathion, chlorpyrifos, dichlorovos or carbonates such as carbaryl, propoxur should be used.

**b. Mosquitoes:**

**(i) Elimination of breeding places:** Small ponds and other stagnating water places can be filled up with soil and the choking drains can be cleared so that mosquitoes do not get a breeding place.

**(ii) Personal protection:** In order to avoid mosquito biting, mosquito repellants and fine mesh veils, gloves and tightly worn clothes can be used.

**(iii) Spraying:** There are a number of insecticides available in the market that can be used to control the mosquitoes. For example, Paris green dust, pyrethrin, residual treatment of DDT, deltamethrin, aerosol sprays can be effectively used as sprays to control mosquitoes.

**(iv) Biological control:** Certain fishes such as *Gambusia* which selectively eat mosquito larvae can be introduced in the ponds.

**6.**

| Disease | Vector | Causative pathogen |
|---|---|---|
| Amoebic dysentery | Houseflies | Protozoa |
| Typhoid | Houseflies | Bacteria |
| Yellow fever | *Aedes* mosquito | Virus |
| Malaria | *Anopheles* mosquito | Protozoa |
| Dengue | *Aedes* mosquito | Virus |
| Poliomyelitis | Houseflies | Virus |
| Cholera | Houseflies | Bacteria |

### V. Structured/Application/Skill Type Questions

**A. 1.** Diabetes

**2.** Influenza

**3.** Tuberculosis

**B.**

| Communicable diseases | Non-communicable diseases |
|---|---|
| cholera | scurvy |
| tuberculosis | kwashiorkor |
| rabies | marasmus |
| malaria | rickets |
| filariasis | |

## CHAPTER – 16

## DISEASE – CAUSES AND CONTROL

### P. 187 Check Your Progress 1

**A. Fill in the blanks.**

1. BCG
2. venereal
3. HIV

### P. 189 Check Your Progress 2

**A. Name the causative agent of the following diseases.**

1. **Chickenpox:** *Varicella zoster* (Virus)
2. **AIDS:** HIV (Virus)
3. **Cholera:** *Vibrio cholerae* (bacteria)
4. **Elephantiasis:** *Wuchereria bancrofti* (worm)

**B.** Disease - Taeniasis

Stage - Larval cyst of *Taenia* sp.

Drug - Praziquantel

### P. 190 Exercises

#### I. Multiple-Choice Questions

**A. Choose the most appropriate answer.**

**1.** d **2.** b **3.** c **4.** a **5.** c

#### II. Very Short Answer Type Questions

**A. Define these terms.**

1. **Pathogen:** Pathogens are microscopic organisms that cause or have the potential to cause disease. Different types of pathogens include bacteria, viruses, fungi, protozoa and worms.
2. **Definitive host:** The host which harbours the adult stage of parasite and the parasite reproduces sexually within them are called definitive host.
3. **Reservoir host:** The host which harbours the parasite and serves as an important source of infection to other host is known as reservoir host.
4. **Bacteriophage:** Certain viruses attack bacteria for their multiplication. Such viruses are called bacteriophage. For example, $T_1$, $T_2$, $T_3$...$T_7$ are seven strains of bacteriophages that attack the bacterium, *Escherichia coli*.

**B. Fill in the blanks.**

1. food and water
2. viral
3. Human Immunodeficiency Virus (HIV)
4. Ascariasis

**C. Answer these questions.**

1. AIDS and influenza
2. Incubation period refers to the period between exposure to an infection and onset of disease.
3. Disease caused by protozoa - Malaria

   Causative agent - *Plasmodium* sp.

**D. Given below are four groups with some examples in each. In each group there is one example that does not fit into the category. For each of these groups, write down the category of the group and identify the odd one.**

1. Group - Bacteria

   Odd one - *Plasmodium* (protozoa)
2. Group - Bacterial diseases

   Odd one - Small pox (Viral disease)
3. Group - Protozoal disease

   Odd one - Ascariasis (caused by Helminthic Worm)

#### III. Short Answer Type Questions

**A. Answer these questions.**

1. Food poisoning bacteria like *Clostridium botulinum* grow in food and produce toxin like botulin. When swallowed this irritates the stomach lining, causing pain, nausea and sickness. The toxins may also enter the intestine and cause diarrhoea. Toxins can survive cooking, even though the bacteria that produced them are killed.
2. HIV may be transmitted in following ways -
   - **(i)** Sexual contact with the infected person through semen or vaginal fluid or through blood during the intercourse.
   - **(ii)** Exposure to infected blood by using the same syringe already infected by an infected person, and infected blood during blood transfusion.
3. **(i)** Ascariasis caused by *Ascaris* sp.

   **(ii)** Elephantiasis caused by *Wuchereria bancrofti*.

4. HIV is the virus which causes AIDS, a pandemic disease.

HIV causes AIDS by weakening the immune system of the infected person.

HIV cannot be treated.

5. Hepatitis, AIDS

6.

| Definitive host | Intermediate host |
|---|---|
| Harbours the adult stage of the parasite. | Harbours the larval or immature stage of the parasite. |
| Parasite reproduce sexually within this host. | Parasite reproduce asexually to produce large no. of offsprings in this host. |

### IV. Long Answer Type Questions

**A. Answer these questions.**

1. Methods to control bacteria -

**(i)** **Washing hand:** Hand washing is the best way to prevent cross contamination and the spread of bacteria.

**(ii)** **Antibiotic:** Antibiotic inhibits the growth of bacteria and are effective against wide range of pathogenic bacteria. Antibiotics block their biochemical pathways.

**(iii)** **Vaccination:** Vaccine produces immunity in the body against pathogens and helps to fight their action in the body.

Methods to control HIV -

**(i)** Using barrier method of contraception during sexual intercourse. This prevents direct contact between body fluids of two person.

**(ii)** Screening of blood before transfusion.

**(iii)** Use of disposable needles and syringes.

**(iv)** Avoiding pregnancy if the mother is HIV positive.

2. Hepatitis is an inflammatory condition of liver, commonly caused by viral infection.

Mode of transmission:

Hepatitis virus is transmitted by faecal-oral route by consuming contaminated water, food or milk.

Symptoms:

**(i)** Fever

**(ii)** Decreased appetite, nausea and vomiting.

**(iii)** Pain in muscles and joints

**(iv)** Dark coloured urine

**(v)** Release of bilirubin due to damage of liver cells by virus resulting in jaundice.

Prevention:

**(i)** Vaccination against hepatitis virus

**(ii)** Improved sanitation

**(iii)** Food safety

### V. Structured/Application/Skill Type Questions

**A.** 1. Protozoa

2. Dengue

3. Bacteria

4. Caused by *Mycobacterium tuberculosis*

5. Virus

6. Caused by HIV

7. Dengue

8. Tuberculosis

9. AIDS

10. AIDS

**B.**

| Disease | Causative agent | Vaccine |
|---|---|---|
| 1. Poliomyelitis | Poliovirus | Salk's vaccine |
| 2. Cholera | *Vibrio cholerae* bacteria | Anticholera vaccine |
| 3. Chickenpox | *Varicella zoster* virus (VZV) | *Varicella* vaccine |
| 4. Filariasis | *Wuchereria bancrofti* (helminthic worm) | No vaccine available |
| 5. AIDS | HIV virus | No vaccine available |

**C.** 1. *Mycobacterium tuberculosis*

2. BCG

3. *Salmonella typhi*

4. Cholera

5. Anticholera vaccines

## CHAPTER – 17

## AIDS TO HEALTH

### P. 195 Check Your Progress 1

**A. Answer these questions.**

1. Immunity is the body's ability to fight against foreign substances and pathogens by producing antibodies that can kill or neutralize these foreign substances. Thus, immunity means body's defence against infections.
2. Pathogens may attack our body in several ways, such as:
   - **(i)** directly through the skin;
   - **(ii)** through mucous membranes that line the body passages such as eye membrane, inner walls of digestive, respiratory and urinary tract, etc.;
   - **(iii)** through contaminated air, food and water.

**B. Give one example of each of the following with respect to immunity.**

1. Skin
2. Inflammation
3. Hydrochloric acid secreted by stomach
4. Antibodies
5. Common cold

**C. State whether following statements are True (T) or False (F).**

**1.** F **2.** F **3.** T **4.** F **5.** F

**6.** T **7.** F

### P. 198 Check Your Progress 2

**A. Fill in the blanks with suitable words.**

1. Antibiotic
2. disinfectant
3. Disinfectants
4. antitoxin, chemical
5. antibiotic

**B. Given below are certain microorganisms. Name the antibiotic produced from each of these.**

1. Chlortetracycline
2. Chloramphenicol
3. Penicillin

### P. 200 Check Your Progress 3

**A. On the basis of how they are produced, give an example of each of the following vaccines.**

1. Salk's vaccine
2. Vaccine against diphtheria
3. Vaccine against small pox
4. Oral polio vaccine
5. BCG (Bacille-Calmette Guerin)

**B. Mention the purposes for which following vaccines are used.**

1. Protection against tetanus toxoid
2. Protection against tuberculosis
3. Protection against diphtheria, pertussis (whooping cough) and tetanus
4. Protection against measles, mumps and rubella
5. Protection against diphtheria and tetanus
6. Protection against polio

### P. 201 Exercises

#### I. Multiple-Choice Questions

**A. Choose the most appropriate answer.**

**1.** c **2.** b **3.** c **4.** a **5.** b

#### II. Very Short Answer Type Questions

**A. Write the full forms of following abbreviations.**

1. **BCG** - Bacille-Calmette-Guerin
2. **TT vaccine** - Tetanus toxoid vaccine
3. **DPT vaccine** - Diphtheria, Pertussis and Tetanus vaccine
4. **OPV** - Oral Polio Vaccine
5. **MMR vaccine** - Measles, Mumps and Rubella vaccine

**B. Define the following terms.**

1. **Antiseptic:** An antiseptic is a mild chemical substance that when applied on the external surfaces of the body kills or prevents the growth and reproduction of various disease-causing germs. Example: Methylated spirit or alcohol.
2. **Acquired Immunity:** Immunity to a disease acquired by an individual during his lifetime is called acquired immunity. It requires prior exposure to a pathogen before acquiring immunity. Once a person acquires immunity

against a particular disease, he normally does not get that disease again. Example: Immunity against cholera.

3. **Antitoxin:** An antitoxin is a chemical which has the ability to neutralize a specific toxin. They can also kill bacteria and other microorganisms. Antitoxins are made within organisms, but can be injected into the body of other organisms, including humans.

4. **Immunization:** Immunization is the term used for introducing dead or weakened germs in the human body to develop immunity or resistance against the particular disease. Example: Children above 1 year of age should get immunization with the administration of MMR vaccine.

5. **Vaccine:** A vaccine is a preparation used to produce active immunity to a disease, in order to prevent infection by specific microorganism. Example: BCG vaccine.

**C. Name the following.**

1. Diapedesis
2. Antibodies
3. Oral polio vaccine
4. Innate immunity
5. Immunoglobulin
6. OPV
7. Lysozyme
8. MMR
9. Antigens

**D. Mention if the following statements are True or False and rewrite the wrong statements from 1 to 6 below in the correct form by changing only the last one or two words.**

1. False

   DPT is a vaccine for diphtheria, pertussis and tetanus.

2. False

   DDT is a pesticide.

3. False

   Penicillin obtained from *Penicillium notatum* is an antibiotic.

4. False

   The body's first-line of defence against pathogens are physical and chemical barriers.

5. False

   The type of general protection that we have against infections is known as natural immunity.

6. True

**E. Match the items in Column A with those in Column B.**

**1.** c **2.** f **3.** b **4.** e **5.** d
**6.** a **7.** g

### III. Short Answer Type Questions

**A. Differentiate between the following.**

**1.**

| Disinfectants | Antiseptic |
|---|---|
| Disinfectants are strong chemical substances applied on spots or places where germs thrive and multiply. | An antiseptic is a mild chemical substance that when applied on the external surfaces of the body kills or prevents the growth and reproduction of various disease-causing germs. |

**2.**

| Active immunity | Passive immunity |
|---|---|
| Active immunity is the immunity produced by one's own body. It occurs when one's own immune system produces a specific immune response to a previous infection or antigen that enters the body. It is a long lasting immunity. | Passive immunity is borrowed from another source supplied from outside. Thus, this immunity is not produced in one's own body. It lasts for a short time. |

**3.**

| Antibiotic | Antitoxin |
|---|---|
| An antibiotic is a substance produced by a microorganism, that inhibits the growth or kills another microorganism. | An antitoxin is a chemical which has the ability to neutralize a specific toxin. They can also kill bacteria and other microorganisms. Antitoxins are made within organisms, but can be injected into the body of other organisms, including humans. |

**4.**

| Innate immunity | Acquired immunity |
|---|---|
| Innate immunity is also known as natural immunity or inborn immunity. This is a type of general protection that we have against infections. Everyone is born with this immunity. It also includes external barriers of the body such as skin and mucous membrane, which are the first-line of defence. Innate immunity depends upon body's genetic make-up. | Immunity to a disease acquired by an individual during his lifetime is called acquired immunity. It requires prior exposure to a pathogen before acquiring immunity. Once a person acquires immunity against a particular disease, he normally does not get that disease again. Example: Immunity against cholera, polio, chickenpox, etc. |

**5.**

| Vaccination | Sterilization |
|---|---|
| Vaccination is a term coined by Edward Jenner for the process of administering live or weakened microbes into the body, for developing resistance against a particular disease. | Sterilization is the elimination of all transmissible agents (such as bacteria, fungi and viruses) from a surface or piece of equipment or surgical instruments. This is different from disinfection, where only organisms (that can cause disease) are removed by a disinfectant. Sterilization can be performed by heat, chemicals or even radiation. |

**B. Briefly describe the following terms and then answer as directed after each.**

**1.** An antiseptic is a mild chemical substance that when applied on the external surfaces of the body kills or prevents the growth and reproduction of various disease-causing germs. Example: Methylated spirit or alcohol.

**2.** Disinfectants are strong chemical substances applied on spots or places where germs thrive and multiply. Three examples are: Chlorine, Ozone, Phenol.

**3.** An antitoxin is a chemical which has the ability to neutralize a specific toxin. They can also kill bacteria and other microorganisms. Antitoxins are made within organisms, but can be injected into the body of other organisms, including humans.

**4.** An antibody is a protein molecule produced in an animal in response to an antigen or a foreign substance. Antibodies belong to the category of proteins called immunoglobulin.

**5.** An antibiotic is a substance produced by a microorganism, that inhibits the growth or kills another microorganism. Some antibiotics actually kill the bacteria (bactericidal), whereas others merely prevent the bacteria from multiplying (bacteriostatic) so that the host's immune system can overcome them. Example: Penicillin is an antibiotic produced from *Penicillium notatum*.

**C. Answer these questions.**

**1.** Immunity is the body's ability to fight against foreign substances and pathogens by producing antibodies that can kill or neutralize these foreign substances. Thus, immunity means body's defence against infections. The defence system in our body works at local and immune system level.

**2.** Merits of the local defence system:

**(i)** They eliminate many microorganisms before they can enter the body tissues.

**(ii)** They respond to any microbial infection without waiting to determine the invader's identity.

**(iii)** They provide fast responses to protect us against wide range of diseases.

## IV. Long Answer Type Questions

**A. Answer these questions.**

**1.** Third-line of defence represents the immune system. Sometimes even the second-line of defence is not enough and the pathogen enters the body. At this point, the last-line of defence, i.e. the immune system comes to rescue. The immune system will recognize, attack, destroy, and remember each foreign substance and pathogen that enters the body. It produces antibodies or immunoglobulins against specific antigens. Antibody binds with that specific antigen and nutralize the same. The immune system discriminates between kinds of pathogens. For each type of pathogen, the immune system also produces macrophages.

For example, if pathogens such as bacteria enter the body, white blood cells (macrophages) squeeze out of walls of blood capillaries (called diapedesis) and destroy the germs by engulfing them. This is known as phagocytosis. Puss in wound is formed due to the destroyed pathogens, dead cells and by phagocytes or WBCs

2. Refer to fig. 17.3 on page 195 of the textbook

### V. Structured/Application/Skill Type Questions

**A. Given below is a table consisting of a set of items belonging to a common category. Complete the table by filling in the category and the odd term.**

| Set | Category | Odd term |
|---|---|---|
| Hydrogen peroxide, Phenol, Penicillin, Chlorine | Disinfectant | Penicillin |
| Boric acid, Ozone, Iodine, Alcohol | Antiseptic | Ozone |
| Penicillin, BCG, DPT, MMR | Vaccine | Penicillin |

**B. Given below is a series of diagrams (a–c) to show the activity of a certain kind of cells in the human body. https://www.msn.com/en-in/feed?rc=1**

1. The structures seen in **a.** are WBC, RBC and capillary wall.
2. The significant activity shown in **a.** is a WBC coming out of capillary wall. The technical term for this activity is diapedesis.
3. In **b.** the WBC is moving towards bacteria and **c.** shows the engulfing of bacteria. If pathogens such as bacteria enter the body, white blood cells (phagocytes) squeeze out of walls of blood capillaries (diapedesis) and destroy the germs by engulfing them. This is known as phagocytosis.

**C. Given below is an incomplete table relating to certain vaccines, time of their administration and purpose. Study the same and then give the appropriate answer by filling the blanks numbered 1 to 10.**

1. At 6 weeks after birth
2. Protection against tuberculosis
3. OPV
4. At birth
5. TT
6. Protection against Tetanus
7. At 15 months after birth
8. Protection against Measles, Mumps and Rubella
9. DT
10. Protection against Diptheria and Tetanus

**D. Given below in the box is a set of 18 biological terms, out of these, 12 can be paired into 6 matching pairs. Out of the 6 pairs, one has been done for you as an example. Write down the remaining 5 matching pairs. Number the pairs made by you as 1 to 5. https://www.msn.com/en-in/feed?rc=1**

1. BCG – Tuberculosis
2. Tetanus – TT
3. Acquired immunity – Immunity against cholera
4. Penicillin – Antibiotic
5. Weakened microbes – vaccine

## CHAPTER – 18

## HEALTH ORGANIZATIONS

### P. 205 Check Your Progress 1

**A. Answer these questions.**

1. Indian Red Cross Society was established in the year 1920.
2. Headquarters of WHO is located in Geneva, Switzerland.
3. WHO

### P. 205 Exercises

#### I. Very Short Answer Type Questions

**A. Name the following.**

1. Red Cross Society
2. WHO
3. Red Cross Society
4. The National Malaria Eradication Programme
5. WHO
6. Red Cross Society

#### II. Short Answer Type Questions

**A. Answer these questions.**

1. **a.** WHO – World Health Organization
   **b.** UNO – United Nations Organization
2. Two health programmes run by Indian government are :
   **(i)** The National Malaria Eradication Programme
   **(ii)** National Pulse Polio Programme
3. The Red Cross Society is an international organization which undertakes activities to prevent or remove human sufferings in peace time as well as war time. It was founded in 1864 during Geneva Convention. In India, Indian Red Cross Society was established in 1920.
4. Two main functions of Red Cross Society of India:
   **(i)** Promoting fundamental principles and humanitarian values.
   **(ii)** Disaster preparedness and response.
5. The World Health Organization (WHO) is a specialized agency of United Nations Organization (UNO). It was established by the UN on April 7, 1948.
6. WHO has its headquarters located in Geneva, Switzerland.
7. Two functions of WHO:
   **(i)** To develop health systems that improve health of the general public.
   **(ii)** To promote and support projects for research on diseases.

**B. Given below are certain activities undertaken by International organizations. Categorize the activities between Red Cross Society and WHO.**

1. WHO
2. Red Cross Society
3. Red Cross Society
4. WHO
5. Red Cross Society
6. Red Cross Society
7. Red Cross Society
8. Red Cross Society

#### III. Long Answer Type Questions

**A. Answer these questions.**

1. The member countries of United Nations Organization felt a need to have an international body to look after the health problems of the world especially by research on causes of diseases. It was felt that the combined efforts in this direction will give better and faster results. The poor and developing countries were to benefit most from this decision. Thus, that is how WHO was formed.
2. The following is the list of activities undertaken by Red Cross Society to prevent human sufferings:
   **(i) Promoting fundamental principles and humanitarian values:** It includes protection of life, health and human dignity, non-discrimination on the basis of nationality, race, gender, religion, class or political opinion, and mutual understanding, friendship, cooperation and restoring peace among people.
   **(ii) Disaster preparedness and response:** Red Cross Society with the assistance of other national societies provides services to the victims of calamities, procures and supplies food and other items for the needy in case of a calamity.
   **(iii) Health and social services:** This includes to arrange for ambulance service in an emergency, to extend first-aid in case of accidents, to provide mother and child health care programmes. It also helps to procure and supply blood for the victims of war, other calamities and diseases. Indian Red Cross Society has blood banks at the major cities in India.

## CHAPTER – 19

## WASTE GENERATION AND MANAGEMENT

### P. 210 Check Your Progress 1

**A. Answer these questions.**

**1.** **(i)** Domestic waste

**(ii)** Industrial waste

**(iii)** Agricultural waste

**(iv)** Commercial waste

**(v)** Municipal waste

**(vi)** e-waste

**2.** Electronic wastes or e-wastes are mainly loosely discarded, surplus, obsolete or broken electrical or electronic devices. Obsolete and broken refrigerators, mobile phones, computers, mixer grinders, television sets, etc are some examples of e-wastes.

**3.** Biodegradable wastes are wastes that can be broken down to simple non-poisonous substances by the action of microorganisms. They can be recycled naturally as well as by man and their products do not pollute the environment. Useful products can be produced after biodegradation. They do not disturb the ecological balance in nature.

Examples: Paper, cowdung, vegetable peels, fruit peels.

**4.** The waste material that cannot be decomposed to simpler non-poisonous substances in the nature by the action of microorganisms are called non-biodegradable waste materials. DDT is a non-biodegradable waste. It cannot be degraded or decomposed into simple compounds by the microorganisms in nature like bacteria. Thus it gets accumulated in the environment and harms humans, other animals, and even vegetables and plants. Thus DDT has been banned from use in most of the countries.

**5.** Non-biodegradable: silver foil, plastic mugs.

### P. 214 Check Your Progress 2

**A. Answer these questions.**

**1.** Segregation of waste is the first step towards waste disposal.

**2.** Sewage created by residentials includes domestic liquid waste from toilets, kitchens etc, that are disposed off via sewers.

Sewage treatment is a process of removing contaminants from waste water and household and domestic sewage before discharge. Biodegradable and non-biodegradable wastes should be segregated before recycling. In the kitchen we should maintain separate boxes to keep kitchen wastes (organic wastes), plastic bags, glass, metal scrap, paper, etc.

**3.** Dumping sites are located at a place isolated from human inhabitation so that the liquid that leaches out does not pollute the ground water and foul smell do not spread in the locality.

**4.** Composting of sludge is an aerobic process that involves mixing the sludge with sources of carbon such as sawdust, straw or wood chips. In the presence of oxygen, bacteria digest both the waste water solids and the added carbon source and, in doing so, produce a large amount of heat.

Compost can be prepared with the help of earthworms where the earthworms hasten the process of decomposition of plant and animal refuse. This process is known as vermicomposting.

**5.** Sludge is a thick, soft, wet mud or a similar viscous mixture of liquid and solid components, especially the product of chemical industries.

**6.** Various stages of sewage treatment:

**(i)** Pre-treatment

**(ii)** Primary treatment

**(iii)** Secondary treatment

**(iv)** Tertiary treatment

**7.** Fabric filters and Electrostatic precipitator.

### P. 215 Exercises

#### I. Very Short Answer Type Questions

**A. Name the following.**

**1.** Domestic waste

**2.** Industrial waste

**3.** Agricultural waste

**4.** Electronic waste or e-waste

**5.** Biodegradable waste material

**6.** Wet scrubbers

**B. Define these terms.**

**1.** **E-waste** or electronic wastes are mainly

discarded, surplus, obsolete or broken electrical or electronic devices.

2. **Domestic waste:** It primarily includes waste generated by our domestic or household activities like those in the kitchen. Domestic waste can be liquid or solid waste. Liquid waste includes kitchen and toilet drainage, sewage, excretory waste of humans and animals. Solid wastes include kitchen waste (leftover food), vegetable peels, discarded raw or cooked food, paper and plastics, paints and chemicals.
3. **Commercial waste:** It consists of waste from premises used for the purpose of trade or business or for the purpose of sports, recreation, education or entertainment. For example, waste generated from hospitality industries like restaurants and hotels, waste generated from printing press.
4. **Sludge:** Sewage treatment process includes processes to remove physical, chemical and biological contaminants to produce an environmentally-safe fluid stream and a solid waste (or treated sludge) suitable for disposal or reuse.
5. **Incineration:** Incineration of solid waste is a waste treatment process which involves combustion or burning of organic substances contained in waste materials at very high temperature. Waste is incinerated in open or closed incinerators where it is converted into ash, flue gas and heat. Incineration reduces solid mass of the waste by 80-85% and the volume by 90-95%, depending on the type of waste. The heat generated by this process can be used to generate electricity, which is known as waste to energy (WtE).
6. **Composting:** Composting of solid waste is an aerobic process that involves mixing the solid waste with sources of carbon such as sawdust, straw or wood chips. In the presence of oxygen, bacteria digest both the waste and the added carbon source and, in doing so, produce a large amount of heat.
7. **Sewage:** Sewage is created by residential, institutional and commercial and industrial establishments and includes domestic liquid waste from toilets, kitchens etc, that is disposed off via sewers. Sewage also includes liquid waste from industry and commerce. Sewage treatment is a process of removing contaminants from waste water and household and domestic sewage before discharge.
8. **Electrostatic precipitator:** An electrostatic precipitator is a device containing a chamber that induces an electric charge on the particles of polluted air. These particles are then attracted to the oppositely charged electrode and are deposited there. In this technique, a gas or air stream containing aerosols in the form of dust, mist or fumes, is passed between the two electrodes of the electrostatic precipitator. During this process, the aerosol particles get precipitated on the electrode.
9. **Segregation:** Segregation of the waste is the first step towards waste disposal. It means separating the waste into reusable, degradable and non-biodegradable parts. After the waste is segregated, it can be then subjected to separate type of treatment depending on the type of waste.
10. **Effluents:** Effluents are the liquid form of industrial wastes. Effluents come from oil industries. Effluents may contain heavy metals and detergents. Industrial waste water contains pollutants such as nitrates, chlorides, calcium, sulphides, heavy metals and radioactive wastes. Waste water from tanneries, abattoirs and hospitals are also liquid industrial wastes.

**C. Match the items in Column A with those in Column B.**

**1.** d **2.** a **3.** b **4.** c

**D. Answer these questions.**

1. Electronic wastes or e-wastes are mainly loosely discarded, surplus, obsolete or broken electrical or electronic devices. Obsolete and broken refrigerators, mobile phones, computers, mixer grinders, television sets, etc are some examples of e-wastes. The processing of e-wastes causes serious health and pollution problems. Some e-scrap such as cathode ray tubes contain contaminants such as lead, mercury, cadmium, etc. which cause health hazards to persons handling these wastes.
2. The waste material that cannot be decomposed to simpler non-poisonous substances in the nature by the action of microorganisms are called non-biodegradable waste materials. DDT is a non-biodegradable waste. It cannot be degraded or decomposed into simple compounds by the microorganisms in nature. Thus it gets accumulated in the environment and harms humans, other animals, and even vegetables and plants. Thus DDT has been banned from use in most of the countries.

## II. Short Answer Type Questions

**A. Differentiate between the following.**

1.

| Domestic waste | Commercial waste |
|---|---|
| Primarily includes waste generated by our domestic or household activities like those in the kitchen. | Consists of waste from premises used for the purpose of trade or business or for the purpose of sports, recreation, education or entertainment. |
| For example, liquid wastes from kitchen and toilet drainage, sewage, excretory waste of humans and animals and solid wastes like kitchen waste (leftover food), vegetable peels, discarded raw or cooked food, paper and plastics, paints and chemicals. | For example, waste generated from hospitality industries like restaurants and hotels, waste generated from printing press. |

2.

| Biodegradable waste | Non-biodegradable waste |
|---|---|
| Can be broken down to simple non-poisonous substances by the action of microorganisms. | Cannot be broken down to simple non-poisonous substances by the action of microorganisms. |
| Can be recycled naturally as well as by man and their products do not pollute the environment. | Cannot be recycled naturally as well as by man and their products pollute the environment. |
| Can produce useful products after biodegradation. | Remain unchanged chemically because they are not biodegradable. |
| They do not disturb the ecological balance in nature. | Most of the time they disturb the ecological balance of nature. |
| Examples: Paper, cowdung etc. | Examples: DDT, Synthetic fibres, etc. |

3.

| Industrial waste | Agricultural waste |
|---|---|
| Industrial waste is a waste produced by industrial activity such as that of factories, mills and mines. Industrial plants and power stations using coal and crude oil, furnaces using coal, firewood, kerosene and cowdung cakes, cement, ceramics, glass and asbestos industries, oil refineries etc. are the main sources of pollution.<br>The industrial wastes may be solid, liquid or gaseous types. | Agricultural waste is generated during agricultural activities and by livestocks. Minerals and organic wastes from agricultural fields with phosphate and nitrogen fertilizers that reach lakes, rivers and sea, deoxygenates the water and degrades aquatic life. Agricultural residues such as plant parts, rice husk, etc. remain after obtaining the usable portion. These are usually used as animal feed. |

4.

| Primary treatment | Secondary treatment |
|---|---|
| In this treatment of sludge, sewage is passed through a grinding mechanism. The sewage is temporarily held in a basin where heavy solids can settle to the bottom while grease and lighter solids float to the surface. Then it is passed through several settling chambers and lime is added. The neutralized sewage still contains a large number of pathogenic and non-pathogenic organisms and a large number of organic matter. The settled and floating materials are removed and the remaining liquid is subjected to secondary treatment. | In this treatment, the neutralized effluents are passed through a reactor, UASB (Upflow Anaerobic Sludge Blanket). In the UASB reactor, the anaerobic bacteria degrade the biodegradable material in neutralized effluents. In this process, the foul odour and methane are released and the pollution load is reduced by 85 per cent. In this way, sewage is converted into clean water and sludge. The water is sent to aeration tanks where air and bacteria are added to it. The bacteria helps in digesting the organic matter present in the water. |

5.

| Fabric filters | Wet scrubbers |
|---|---|
| In this technique, gaseous emission containing dust, soot and fly ash is passed through porous fabric filters made of fabric (woven or filled fabric). The particles of pollutants present in the gas get trapped in this fabric and are collected in the filter and the gases free from the pollutant particles are discharged. | Wet scrubbers are used in chemical, metallurgical and mining industries. The wet scrubbers trap $SO_2$, $NH_3$ and metal fumes in their tank and clean gases are discharged into the atmosphere. |

**B. Answer these questions.**

**1. (i)** Domestic

**(ii)** Industrial

**(iii)** Agricultural

**(iv)** Commercial

**(v)** Municipal

**(vi)** e-waste

**2. (i)** Sludge

**(ii)** Metal scrap

**(iii)** Discarded machines

**(iv)** Machine parts

**(v)** Broken tools

**3. (i)** Ammonia

**(ii)** Hydrogen sulphide

**(iii)** Steam and water vapour

**(iv)** Hydrocarbons

**(v)** Oxides of nitrogen

**4.** Agricultural wastes are organic wastes, chemicals, fertilizers, pesticides and biomass waste from plant and animal remains. Pesticides kill soil fauna (insects, worms, etc.). Without them, plant matter does not get broken down, instead the soil structure breaks down, and the soil becomes unfertile. Too much fertilizer can increase microbial populations which may cause disease in plants and soil fauna. Some crop plants will not grow in acidic soil. Acid loving weeds may become a problem.

**5.** Municipal waste or municipal solid waste (MSW) is waste that includes municipal sewage, household and office waste and other waste collected by municipality of the given area. Municipal waste includes both bio-degradable and non-biodegradable waste from households, market area and offices.

**6.** Electronic wastes or e-wastes are mainly loosely discarded, surplus, obsolete or broken electrical or electronic devices. Obsolete and broken refrigerators, mobile phones, computers, mixer grinders, television sets, etc. are some examples of e-wastes. The processing of e-wastes causes serious health and pollution problems. Some e-scrap such as cathode ray tubes contain contaminants such as lead, mercury, cadmium, etc. which cause health hazards to persons handling these wastes. The chemicals released from e-wastes such as heavy metals seep into the soil and ground water and cause health problems.

### III. Long Answer Type Questions

**A. Answer these questions.**

**1.** Various methods of safe disposal of waste:

**(i)** Segregation

**(ii)** Dumping

**(iii)** Composting (farm and domestic waste)

**(iv)** Drainage

**(v)** Treatment of effluents before discharge

**(vi)** Use of scrubbers and electrostatic precipitators.

**Composting:** Composting of sludge is an aerobic process that involves mixing the sludge with sources of carbon such as sawdust, straw or wood chips. In the presence of oxygen, bacteria digest both the waste water solids and the added carbon source and, in doing so, produce a large amount of heat.

**Use of Scrubbers and Electrostatic precipitators:** Wet scrubbers are used in chemical, metallurgical and mining industries. The wet scrubbers trap $SO_2$, $NH_3$ and metal fumes in their tank and clean gases are discharged into the atmosphere.

In the process of safe disposal of waste, some devices such as scrubbers, fabric filters and electrostatic precipitators are used to clean up the waste before releasing into the atmosphere. An electrostatic precipitator is a device containing a chamber that induces an electric charge on the particles of polluted air. These particles are then attracted to the oppositely charged electrode and are deposited there. In this technique, a gas or air stream containing aerosols in the form

of dust, mist or fumes, is passed between the two electrodes of the electrostatic precipitator. During this process, the aerosol particles get precipitated on the electrode.

2. Segregation is the first step towards waste disposal. Segregation means separating the waste into reusable, degradable and non-degradable parts before it is recycled.
   - **(i)** Reusable waste includes paper (newspaper, magazine, packaging material), cloth, metallic components, etc.
   - **(ii)** Degradable waste includes waste that can be degraded into non-toxic components by the use of chemicals or by the action of microorganisms such as organic waste (vegetables, fruit peel, etc.).
   - **(iii)** Non-degradable waste includes plastic waste such as toys, packaging, plastic sheets, polythene, glass bottles and containers, metal cans, electronic items.

3. Segregation is the first step towards waste disposal. Segregation means separating the waste into reusable, degradable and non-degradable parts before it is recycled. We can keep separate boxes to keep kitchen waste (organic waste), plastic bags, glass, metal scrap, paper, etc. This makes the process of recycling easy.

4. Sewage treatment process includes processes to remove physical, chemical and biological contaminants to produce an environmentally-safe fluid stream and a solid waste (or treated sludge) suitable for disposal or reuse.

   Sewage treatment generally involves pre-treatment and three more stages: primary, secondary and tertiary treatment.

   **a.** In the primary treatment, sewage is passed through a grinding mechanism. The sewage is temporarily held in a basin where heavy solids can settle to the bottom while grease and lighter solids float to the surface. Then it is passed through several settling chambers and lime is added to neutralize it. The neutralized sewage still contains a large number of pathogenic and non-pathogenic organisms and a large number of organic matter. The settled and floating materials are removed and the remaining liquid is subjected to secondary treatment.

   **b.** Secondary treatment removes dissolved and suspended biological matter. In this treatment, the neutralized effluents are passed through a reactor, UASB (Upflow Anaerobic Sludge Blanket). In the UASB reactor, the anaerobic bacteria degrade the biodegradable material in neutralized effluents. In this process, the foul odour and methane are released and the pollution load is reduced by 85 percent. In this way, sewage is converted into clean water and sludge. The water is sent to aeration tanks where air and bacteria are added to it. The bacteria helps in digesting the organic matter present in the water. This process is called biological or secondary treatment.

   **c.** Tertiary treatment: The water obtained as a result of secondary treatment is still unfit for agricultural and drinking purposes and needs further purification. This is done by tertiary treatment. This is a disinfectant process in which final traces of organics, bacteria and any dissolved organic solids are removed. Chlorination, evaporation and exchange absorption methods are employed thereafter, to obtain clean water.

5. Sludge is generated through the sewage treatment process. The sludge is treated to reduce odour, decomposing of organic matter and to disinfect the sludge. The sludge must be treated and disposed off in a safe and effective manner. Sludge treatment depends on the amount of solids generated and other site-specific conditions. Composting is most often applied to small-scale plants.

   Composting of sludge is an aerobic process that involves mixing the sludge with sources of carbon such as saw-dust, straw or wood chips. In the presence of oxygen, bacteria digest both the waste water solids and the added carbon source and, in doing so, produce a large amount of heat.