ORGANISATION IN LIVING THINGS

[DIFFERENT UNITS — WORKING IN COORDINATION]

2

SYLLABUS

1. Characteristics of living things (revision).
2. Cells → tissues → organs → organ systems → organism.
3. Plant tissues : location and function :
   * Meristematic tissue
   * Permanent — simple (parenchyma, collenchyma, sclerenchyma) and complex (xylem, phloem)
4. Animal tissues — location and function :
   * Epithelial tissue
   * Connective tissue — tendons, ligaments, bone, cartilage and blood.
   * Muscular tissue — voluntary and involuntary muscles.
   * Nervous tissue.
5. Organs in animals and plants.
6. Organ systems and their functions with reference to the human body.
7. Organism → population → community → ecosystem → biosphere
   * Study of permanent slides of animal and plant tissues — drawing of the same (E).

You have studied in the previous chapter about cell — the structural and functional unit of life. All living organisms, plants and animals are made up of tiny microscopic cells.

The cell, whether that of a unicellular organism or a multicellular organism, consists of **protoplasm** — the living substance. Cells organise to form **tissues**. Tissues organise to form **organs** and organs form **organ systems**. The organ systems are present in both, plants and animals of higher groups. You have also learnt that there are various organelles present inside the cell. These organelles are arranged in a highly organised manner to perform specific functions. Thus, we can say that the cell is an organised structure.

DEFINITION OF ORGANISATION

The term "organisation" means the manner in which small units of any structure or system are arranged into larger ones and the larger ones into still larger ones in hierarchy, where the units of each level coordinate with one another towards a particular goal.

Organisation can be seen not just within the cell or an organism, but in the

whole living world. From the cells that form an organism to all organisms and their surroundings, the living world is organised step by step. Each step in the organisation of a living being or the living world is called the **level** of **organisation**. Each higher level of organisation is more complex than the lower one.

DIFFERENT LEVELS OF ORGANISATION

Three categories of the grades or levels of organisation are recognised in the living world.

1. Individual or **organism level** of organisation,
2. Levels of organisation **lower to the organisms**, and
3. Levels of organisation **higher to the organisms**.

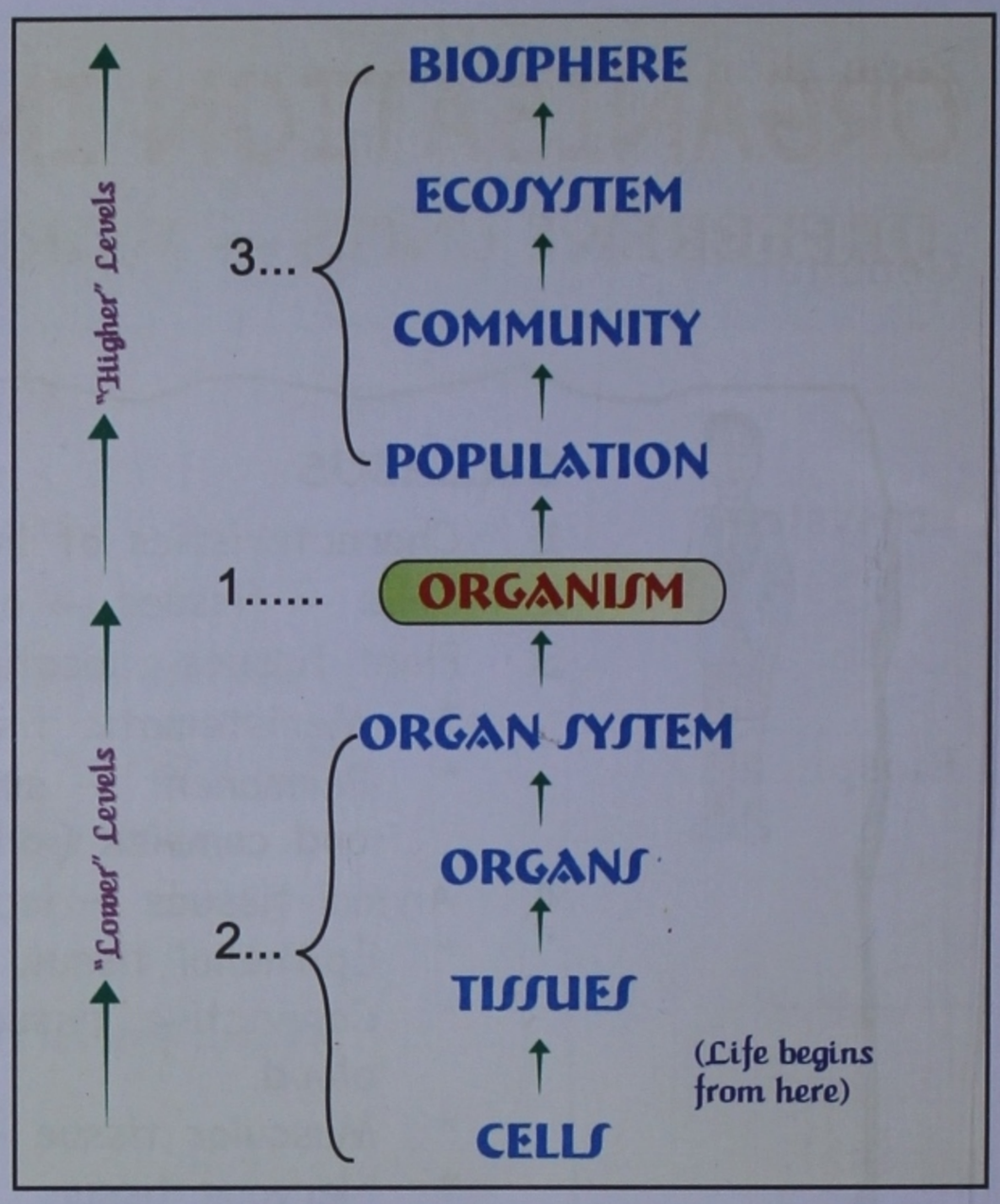


Fig. 2.1 Three levels of organisation of living world

Table 2.1 : Different levels of organisation (from lowest to highest) in the living world alongwith their definitions and examples.

Levels of organisation	Definition	Examples
1. Cell	Structural and functional unit of every living thing.	Epithelial cell, nerve cell.
2. Tissue	A group of similar cells to perform a specific function.	Meristematic tissue in plants, muscular tissue in animals.
3. Organ	Formed from different types of tissues which group together to function in a coordinated manner.	Stomach, liver, lung, ovary, leaf, flower.
4. Organ system	Formed from a group of organs which work together to carry out a specific function.	Shoot system and root system in plants; digestive system, respiratory system in animals.
5. Organism	May be unicellular or multicellular, may be a plant or an animal. It is a separate biological unit.	Man, tiger, parrot, frog, rose plant, neem tree, etc.

(contd.)

6. Population	All the organisms of the same species living in a particular locality.	Human population, ant population, mosquito population, population of rose plants, etc.
7. Community	Aggregation of population of different species living in a particular locality.	A garden where one can find flowering plants, insects, birds, rodents, etc. It is infact, the biotic community of a garden.
8. Ecosystem	A locality (area) where the biotic community and the non-living environment interact with each other.	A forest, a lake, a paddy field, etc.
9. Biosphere	It is the entire inhabited part of the earth, its water, and atmosphere including living and non-living components.	The area extending from the life present in water to the air up above.

1. Individual or organism level of organisation : An individual organism, may it be unicellular or multicellular, or a plant or an animal, is a separate biological unit. This is the organism level, and is considered to be a biological unit as regards all physiological activities, like growth, respiration, nutrition, excretion, reproduction, responsiveness, etc.

2. Levels of organisation lower to the organism :

(i) Organ system level : In higher organisms (e.g. humans), various organs in the **organ system** level work in a coordinated manner to constitute one individual. For example, the systems like the digestive, respiratory, excretory and nervous systems in animals and, root system, shoot system, etc. in plants, show "organ system level" of organisation. In an organ system, the various organs function in a coordinated manner. For example, the organs like the mouth, oesophagus, stomach, intestine, etc., of the **digestive system** (Fig. 2.2) work in coordination.

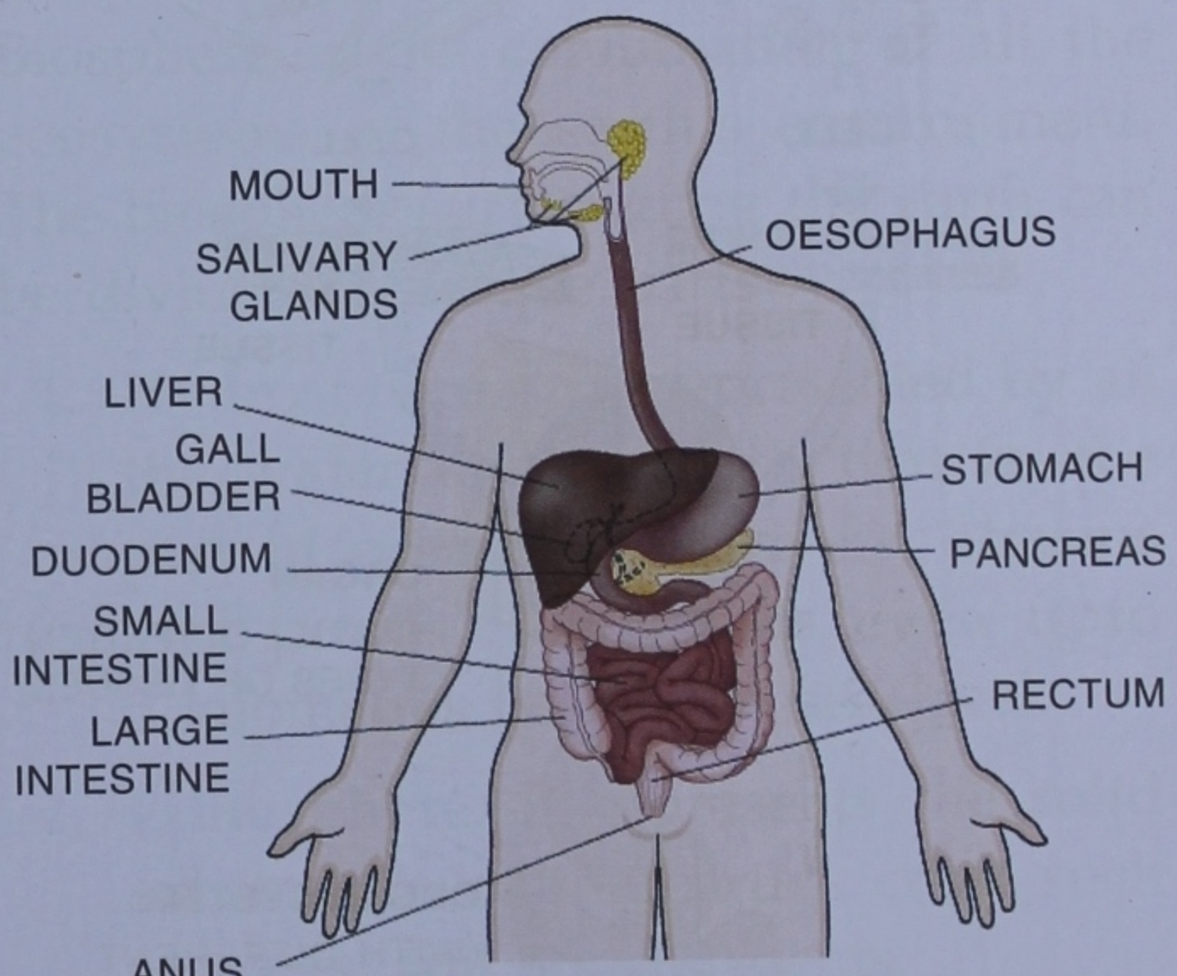


Fig. 2.2 Digestive system

(ii) Organ level : The level of organisation lower to the organ system is the **organ level** of organisation. Intestine, stomach, heart, kidney, root, stem, leaf, flower, etc., represents the organ level of organisation (Fig. 2.3).

(iii) Tissue level : Organs in turn are made up of various types of **tissues**. For example, our intestine is made up of differetn **tissues** like muscle cells, gland cells, nerve cells, etc. **A tissue is defined**

as a group of cells which are similar in structure and perform a specific function.

Different tissues group together and function in coordination to form an **organ**.

(iv) Cell level : The tissues, in turn are made up of **cells**. You already know that all life-activities take place inside the cell. In unicellular organisms, like bacteria and yeast, these activities take place within a single cell. In multicellular organisms, all the cells of the body carry out life-activities. That means, life begins with the formation of a cell.

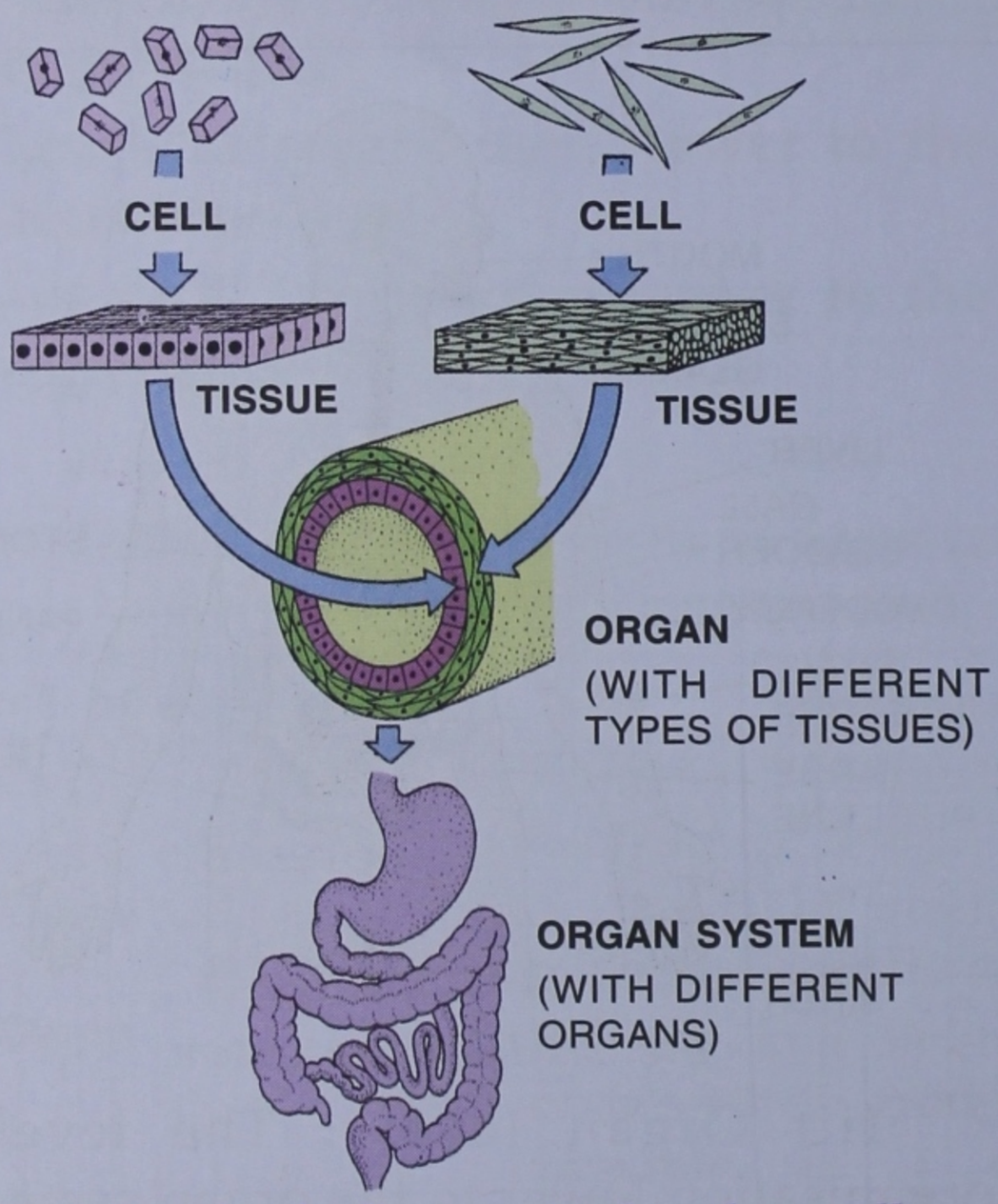


Fig 2.3 A simple diagram to show how cells combine to form tissues, tissues combine to form an organ,and organs combine to form an organ system

3. Levels of Organisation Higher to the Organisms (Fig. 2.4)

(i) Population Level : An organism cannot live in isolation. For its survival and continuity of its race, it has to live in association with other individuals of its own species. **All the organisms of the same species living in a particular locality constitute the population** which is the higher level next to the organisms. The individuals of the same species in a population resemble one another in appearance with only minor differences. The individuals of a species in a population can interbreed among themselves.

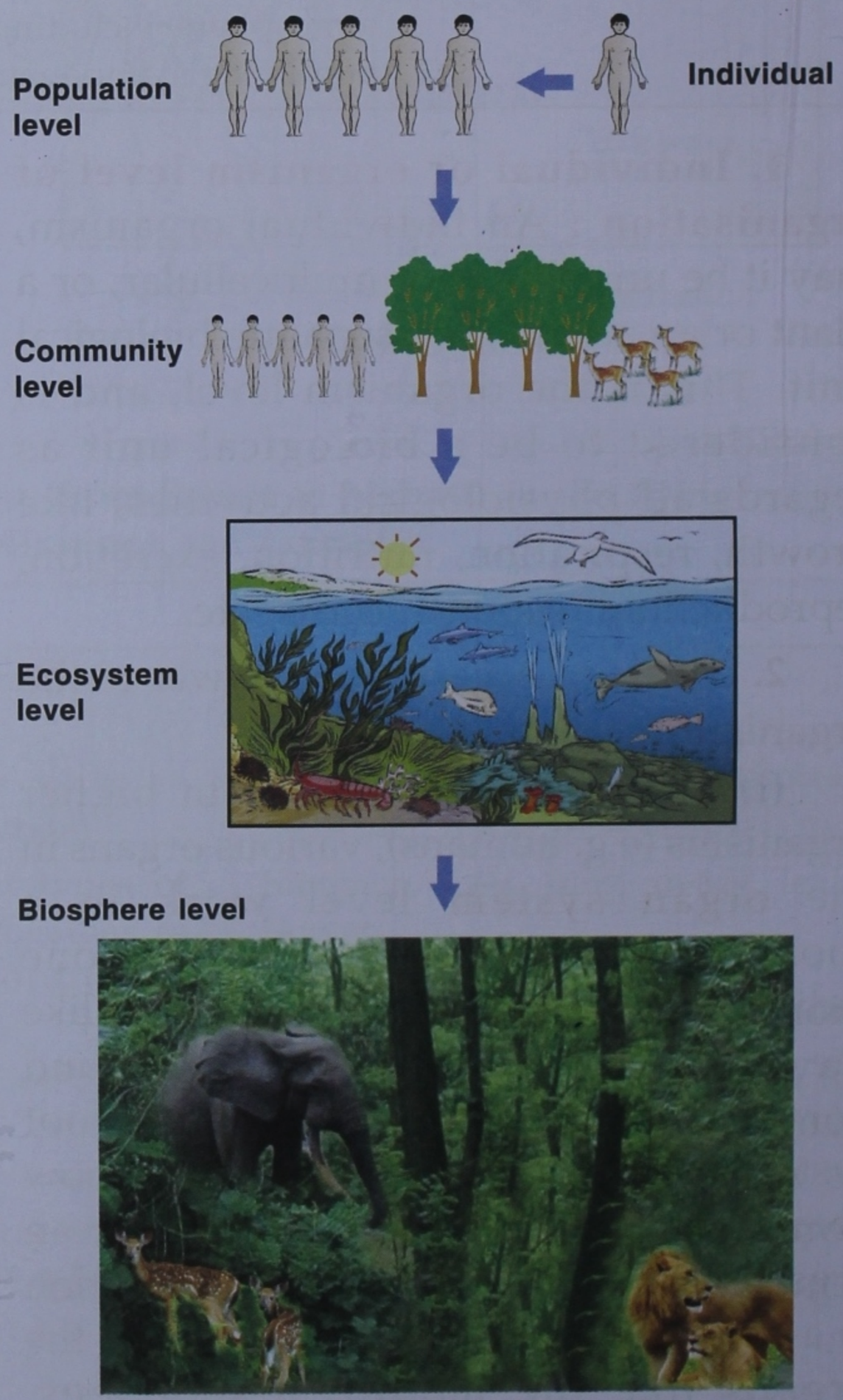


Fig. 2.4 Higher levels of organisation in the living world

(ii) Community Level

The population of different species found in a particular place constitute the community. For instance, in a garden, one can find population of various types of flowering plants, different kinds of insects, birds and rodents. Populations of all these different species found in the garden constitute a **BIOTIC COMMUNITY**. ("Biotic" refers to the organisms. It is different from human communities).

(iii) Ecosystem Level

The biotic communities in an area interact with the physical or non-living environment and the two or more communities together constitute the next level of organisation called ECOSYSTEM. A forest, a mountain, a garden, a paddy field, a pond, etc., are the examples of ecosystem. An aquarium is an example of **artificial ecosystem.**

BIOME

A group of ecosystems constitute a biome. It is a natural grouping of various ecosystems on the basis of climatic conditions. Thus, a biome can be defined as, **"a group of ecosystems taken together in a geographically localised area having the same type of climatic conditions".** A biome is actually a very big ecosystem having the same type of climatic conditions. So, biomes can also be termed as major or big-sized ecosystems. Some common examples of biomes are : temperate forests, deserts (like Thar Desert in India, Sahara desert in Africa), evergreen forests, alpine forests, sea, big lakes (like Dal Lake in Kashmir), etc.

(iv) Biosphere Level

The total world of life is called the **biosphere**. It is the entire inhabited part of the earth, its water and the atmosphere including the living and non-living components. It is about 13 kilometres extending from the life present in water to the air up above. Thus, biosphere consists of two major components — **biotic** that includes all plants, animals and micro-organisms; and **abiotic** that includes physical environment, soil and atmosphere (gases, temperature, humidity, pressure, etc.). Biosphere is the combination of all the ecosystems of the earth's environment. The biosphere surrounding the earth can be divided into three parts :

1. **Hydrosphere.** It is represented by all the water on the earth that is, the part of oceans, seas, rivers, streams and ponds. Life exists even upto 5 kilometres below the sea level.
2. **Lithosphere.** It represents the solid substratum of the earth's crust such as rocks, soil and nutrients.
3. **Atmosphere.** It is the gaseous cover that envelopes the hydrosphere and the lithosphere on the earth. Organisms exist upto 7-8 kilometres in the air above the sea level.

PRINCIPLES OF BIOLOGICAL ORGANISATION

1. Smaller units in the lower level of organisation group together to form the unit of higher level. *For example,*

cells group to form tissues, organs, organ-systems and finally, the entire organism.

2. Higher up the level of organisation, the system becomes more complex in its structure and function.
3. The unit of the level of organisation is independent in its mode of existence and activity. For example, an individual is a unit in the biosphere organisation of the earth. It has an independent existence.
4. Every step of the level of organisation has its own specialised structure and function. For example, stomach is an organ of digestive system. Its structure and function is different from the intestine which is also an organ of digestive system.
5. Every step of the organisation combines the lower levels and thus makes the system more and more complex.
6. Any damage or harm done at the higher level may not affect the lower levels of organisation but any damage done at lower level will affect the higher levels of organisation.

TISSUES (Fig. 2.5)

All multicellular organisms (animals and plants) start their life as a single cell (the fertilised egg or zygote). The fertilised egg divides repeatedly to produce thousands, millions or billions of cells (trillions in human body). Some of these cells form skin, some form muscles, some others form bones, and still others form blood. **A group of cells, which are similar in structure, and perform the same particular function, form a tissue.** For example, the surface cells of the skin form one tissue, the cells constituting muscles are contractile and constitute the muscle tissue, or the green cells of a leaf form one tissue and the wood forming cells of the stem constitute another tissue.

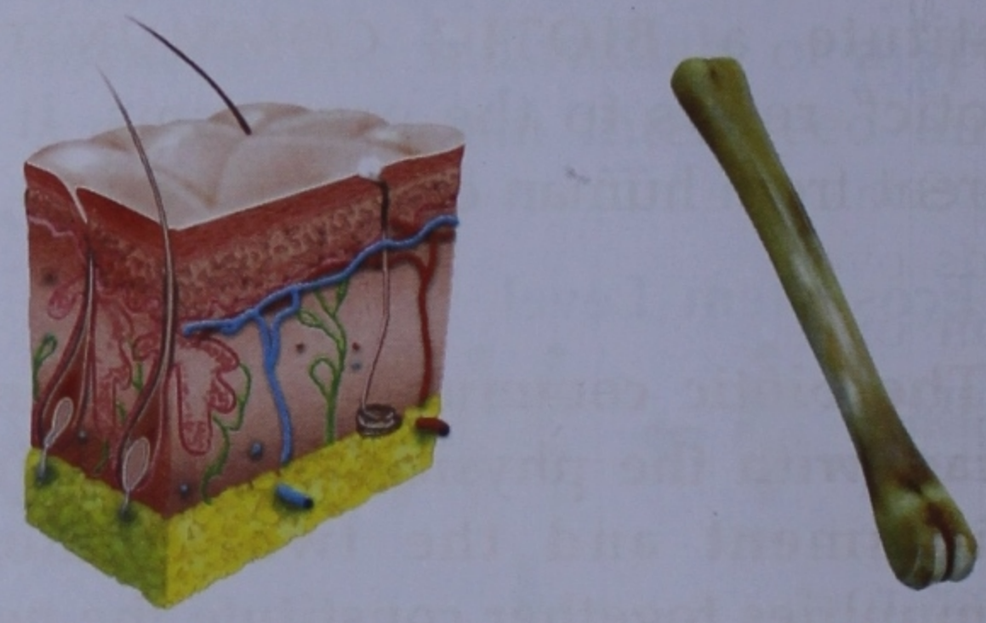


Fig. 2.5 Examples of some tissues

Kinds of Tissues

The plant and animal body consists of a variety of tissues, each of which performs a specific function.

PLANT TISSUES

Plant tissues are basically of two kinds :

1. Meristematic tissues are made up of **actively dividing cells**. Their only function is to produce more cells leading to the growth of the plant body.

Meristematic tissues are found *at all* **growing points** in a plant, like the tips of roots, stems and branches, where growth in length occurs. The growth in the thickness of stem is also due to meristematic tissues.

The main characteristics of meristematic tissues, are as follows :

(i) The cells are **small**.

(ii) The **cell-walls are thin.**

(iii) The **nuclei are large** and conspicuous.

(iv) The cells are almost **without vacuoles.**

(v) The cells **actively divide to add new cells.**

ACTIVITY 1

Soak some green gram (*moong*) seeds overnight in water and then keep them on soaked cotton in a petridish. After two or three days, you will see white sprouts coming out of the seeds. Observe these daily; they grow very fast. Their root tip consists of meristematic tissue which help in their growth.

Sprout of seed

2. Permanent (Non–dividing) tissues : The permanent tissues form the bulk of the plant body. These tissues **do not divide**. They become specialised and remain **same throughout their life.**

According to the function, the permanent tissues are of three types :

(i) Protective tissue,

(ii) Supportive tissue,

(iii) Conducting tissue.

(i) Protective Tissue

Protective tissue consists of cells with thick walls. These are found on the surface of roots, stems and leaves.

Example : **Epidermis** of leaves, which secretes a waxy water-proof substance. (You might have experienced that water drops falling on leaf, do not stick on it).

(ii) Supporting Tissue

Supporting tissue mainly has *three* categories : parenchyma, collenchyma and sclerenchyma.

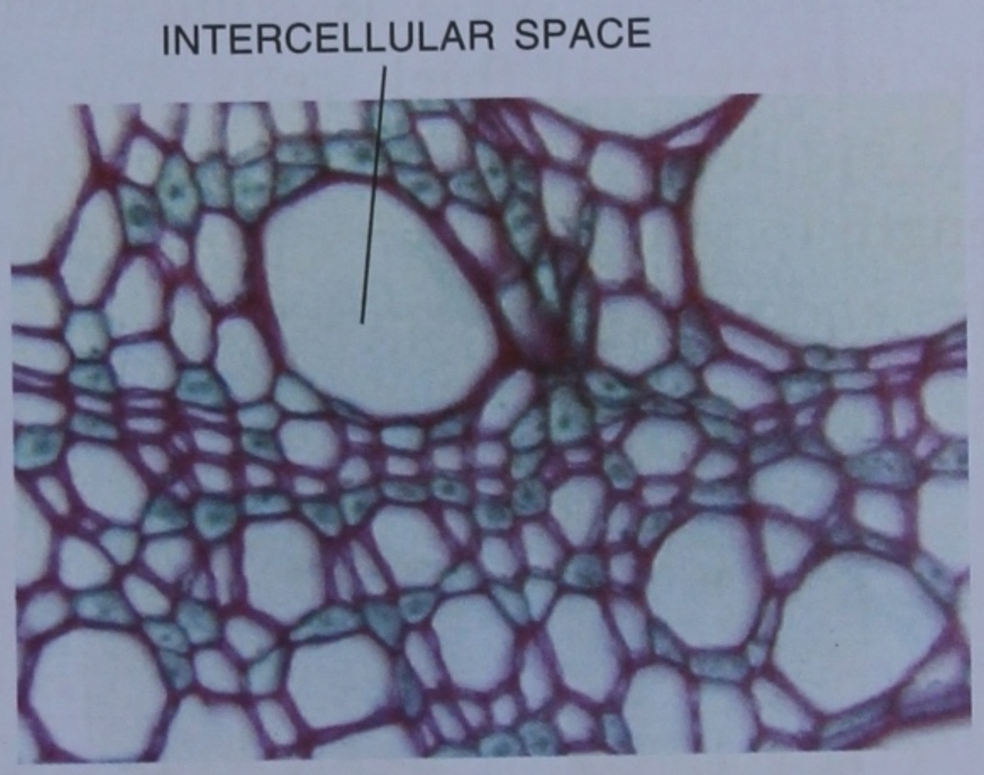


Fig. 2.6 Parenchyma cells

(a) Parenchyma is composed of large **thin walled** cells, usually with **intercellular spaces** (Fig. 2.6). These are the living cells and are found in the soft parts of the plant. They store food material and also provide temporary support to the plant.

Potatoes are mainly composed of parenchyma cells (storing starch). Some parenchyma cells contain chlorophyll (as in leaf) for the manufacture of food.

(b) Collenchyma is made up of parenchymatous cells which are **elongated**

and are **thick at the corners** (Fig. 2.7). This tissue is found in the leaf stalks and below the epidermis of stems. This tissue helps to **support** the plant parts.

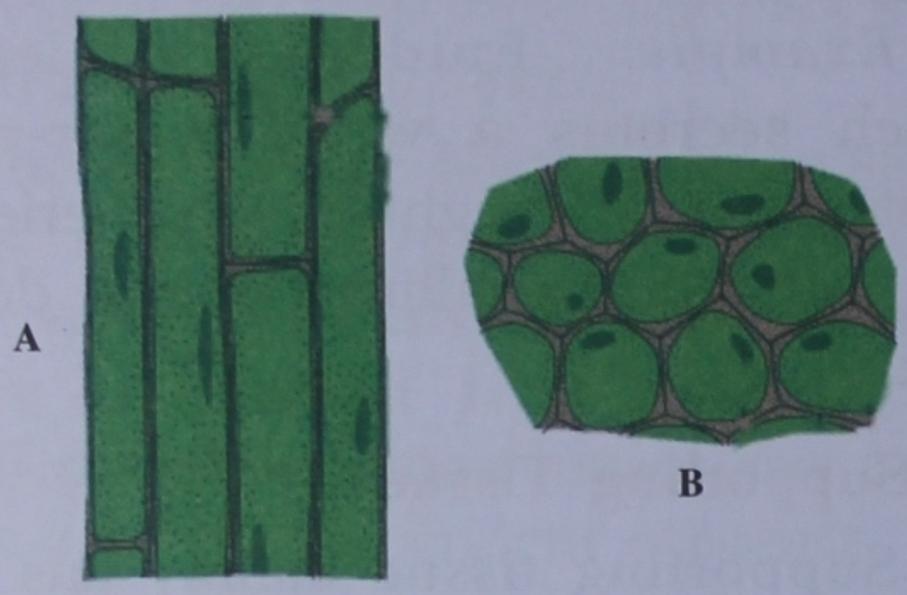


Fig. 2.7 Collenchyma
A - Longitudinal section, B - Cross section

(c) Sclerenchyma is composed of **long, narrow** and **thick cells** (Fig. 2.8). These are dead cells. This tissue provides **strength** to the plant parts. It is found in stems and veins of the leaves.

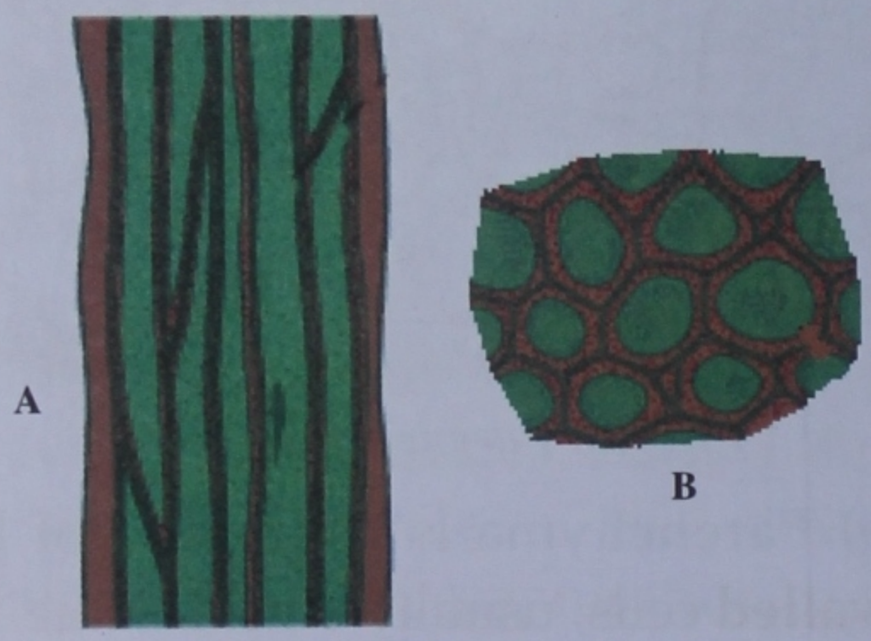


Fig. 2.8 Sclerenchyma
A - Longitudinal section, B - Cross section

(iii) Conducting Tissue

Conducting tissue is also called the **vascular** tissue. It provides passage for water and minerals to move up and down in the plant. Xylem and phloem (Fig. 2.9) are the two types of conducting tissues.

(a) Xylem is formed of thick-walled, tubular and often dead cells.

- The cells are placed end to end like drain pipes.
- The partitions between the cells dissolve to form long pipelines for the transport of water and minerals.

The xylem tissue consists of tracheids, vessels and xylem parenchyma.

Xylem cells transport water and minerals absorbed by the roots from the soil, upward to the leaves. The water is used in preparing glucose during photosynthesis.

Old xylem forms the **wood** and does not participate in transport.

(b) Phloem is formed of living tubular cells which provide a passage for the downward and upward movement of the food, manufactured in the leaves, to various parts of the plant.

The phloem consists of sieve tubes, companion cells, phloem parenchyma, and phloem fibres.

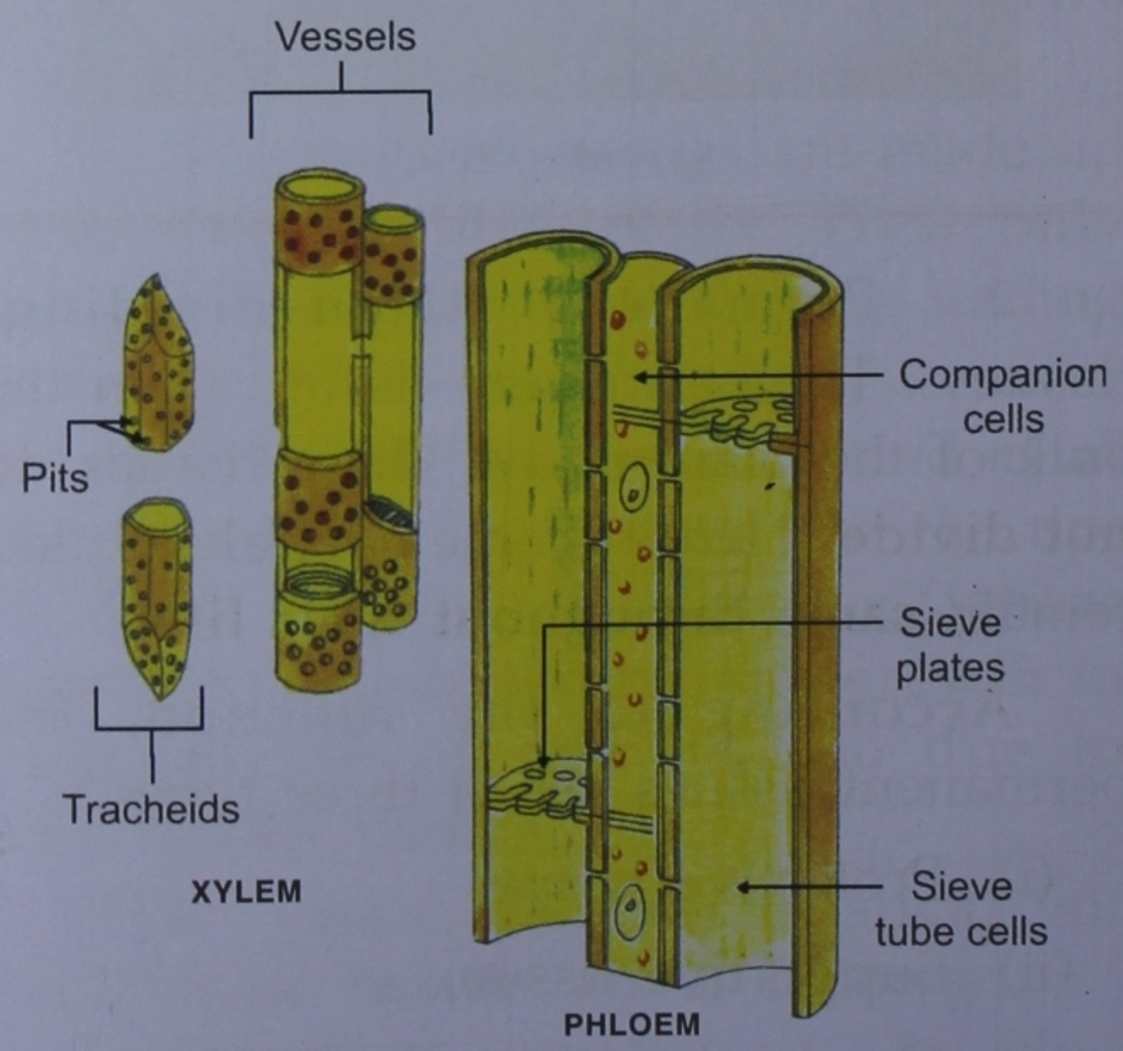


Fig. 2.9 Xylem and phloem

ACTIVITY 2

Request your teacher to provide prepared slides of various plant tissues. Take the slides one by one and place them on the microscope. Ask your teacher to properly focus the slide, and then study it.

1. Parenchyma

- Look at the large thin-walled cells. You will see a large vacuole. Copy this diagram in your note book. Label it.
- Label the nucleus in the cell.

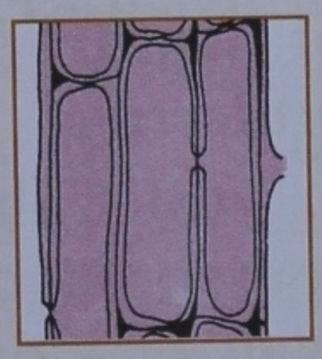
(These cells are found in the softer parts of the plant such as pith of roots and stems).

Parenchyma

2. Collenchyma

- Observe the elongated cells which have become thickened.
- You will see thickenings at the corners ? Copy this diagram in your note book. Label the thickenings.

(These cells are found in the leaf stalks and below the epidermis of stems).



Collenchyma

3. Sclerenchyma

- Look at the long and narrow cells.
- Are they thin-walled or thick-walled ?
- Copy this diagram in your note book. Label the nuclei in the cells.

(They are found in stem and veins of the leaves).

Sclerenchyma

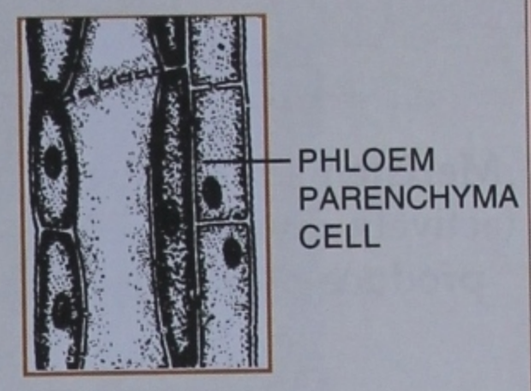
4. Xylem

- Look at the thick-walled tubular cells.
- These cells are placed end to end like a drain pipe.

Xylem

5. Phloem

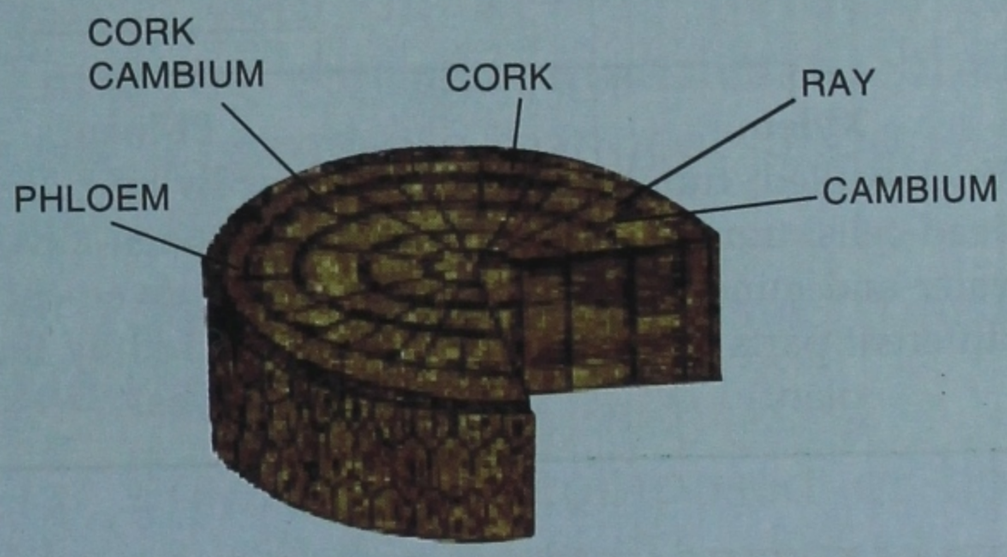
- Look at the tubular cells with distinct nuclei.
- Copy this diagram in your note book. Label the nuclei.



Phloem

Tissues in woody stem

Xylem rings indicate the age of the stem. Here is a diagrammatic sketch of the cross section of a 3 year old woody stem. The cambium (meristematic tissues) gives rise to new xylem ring every year.



Diagrammatic sketch of the cross section of a 3 year old woody stem. Note the three concentric rings of xylem indicating age

ACTIVITY 3

Cut the lower end of a fresh carrot and you will see a central yellowish circle. Leave the carrot with its cut end dipped in a solution of red ink in a beaker for a few hours. Now cut this carrot lengthwise. You will see that the central cylinder in the carrot has become red in colour. This shows that the ink has been absorbed and transported upwards.

PLANT TISSUES

- **Meristematic Tissues** (actively dividing cells; produce more cells)
- **Permanent Tissues** (specialised cells to perform a particular function; do not divide)
  - **Protective tissue** (on the surface of roots, stems and leaves)
  - **Supporting tissue**
    - **Parenchyma** (large, thin-walled cells)
    - **Collenchyma** (elongated cells thickened at the corners)
    - **Sclerenchyma** (long, narrow and thick cells)
  - **Conducting tissue**
    - **Xylem** (thick-walled, tubular dead cells; transports water and minerals to different parts of the plant)
    - **Phloem** (tubular living cells; provide passage for the downward movement of food prepared by the leaves)

ANIMAL TISSUES

The animal tissues may be classified into four major groups :

1. Epithelial (covering) tissue.
2. Connective (supportive) tissue.
3. Muscular (contractile) tissue.
4. Nervous (message conveying) tissue.

1. Epithelial Tissue (Fig. 2.10)

Epithelial tissue is a thin protective layer of cells. It covers the surface of the body and forms the lining of various body cavities and internal organs. Epithelial cells may be flat, cuboidal or columnar in shape.

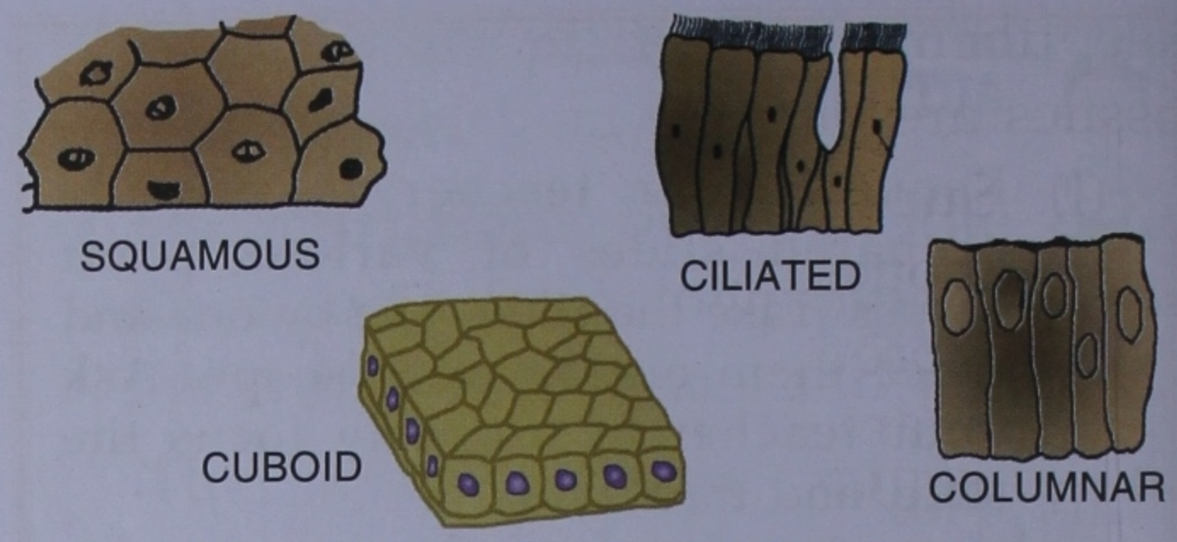


Fig. 2.10 Kinds of epithelial tissues

The epithelial tissue performs various functions such as protection, absorption, secretion, sensory perception, etc. On the basis of the shape of the cells, the epithelial tissues are of four types :

(i) Squamous epithelium : They are composed of thin, flattened and scale-like cells. Example : Cells of the outer layer of skin. These cells are usually *protective*.

(ii) Cuboidal epithelium : They are composed of cube-like cells. *Example* : Wall of kidney tubules. These cells are usually concerned with **absorption**.

(iii) Columnar epithelium : They are composed of vertically arranged, tall, cylindrical or column-like cells. Example : Inner lining of stomach and intestine. These cells are usually **secretory**.

(iv) At some places in the body, for example in the lining of the wind pipe, the columnar epithelium has developed cilia. Such an epithelium is called **ciliated epithelium**. The cilia keeps lashing and move the substances in its contact.

2. Connective Tissue

Connective tissue connects various other tissues and organs, as well as it provides support to different organs to

keep them in proper position. Connective tissues are of three kinds :

(i) Supportive connective tissue (bones, etc.),

(ii) Fibrous connective tissue (tendons, ligaments),

(iii) Fluid connective tissue (blood and lymph).

(i) Supportive connective tissue consists of **cartilage** and **bone.**

(a) Cartilage covers the ends of bones, and gives support to certain organs such as tip of the nose, external projection of the ear, and wind pipe. Press, fold or twist your external ear and leave it. It reverts to its normal shape. You can feel the supporting cartilage in your ears. Similarly, there is cartilage between your two nostrils at the tip of the nose. Cartilage consists of a clear ground substance (matrix) (Fig. 2.11), which contains a large number of spaces, each occupied by one or more cells.

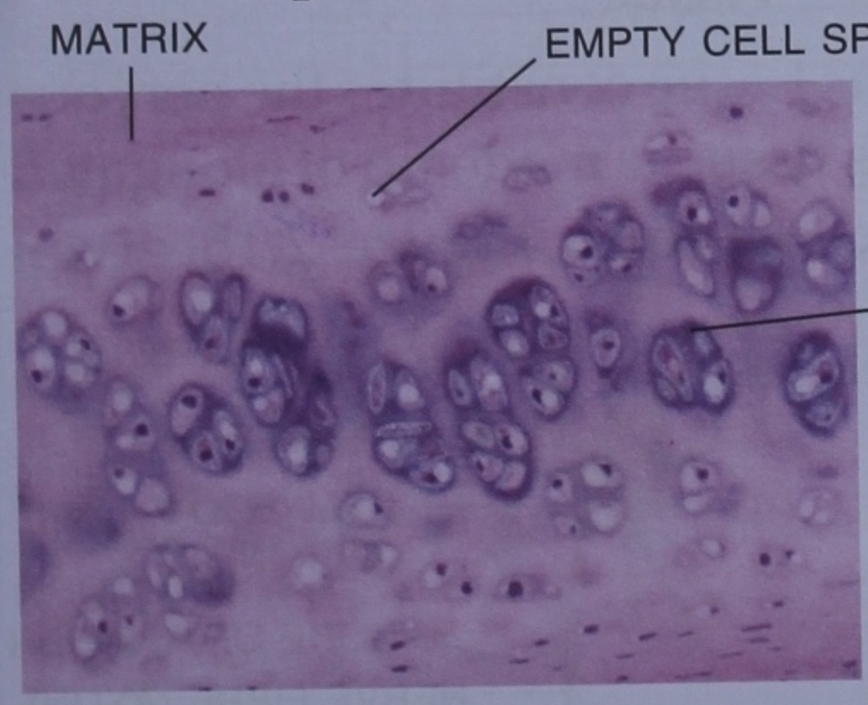


Fig. 2.11 Section of cartilage

(b) Bone is the main supportive structure of vertebrates. The bone cells are embedded in a **hard** matrix of calcium and phosphorus salts. The matrix is deposited in the form of concentric layers (Fig. 2.12) around a central canal. The bone cells occupy small spaces.

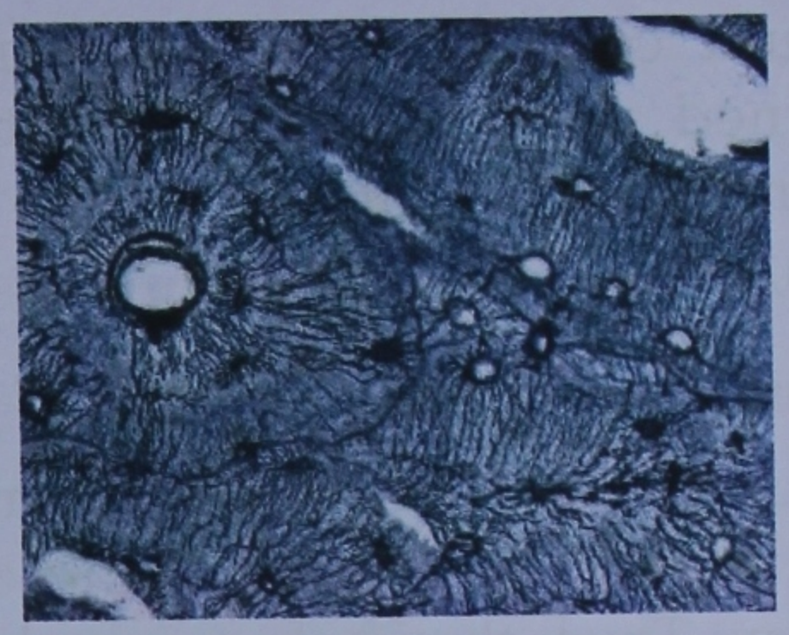


Fig. 2.12 Section of human bone

(ii) Fibrous connective tissue serves for packing and binding most of the organs. (a) **Areolar tissue** binds our skin to the underlying tissue. (b) **Adipose tissue** contains cells filled with fat globules, and makes a person fat. (c) **Tendons** connect muscles to bones and (d) **Ligaments** connect a bone to another bone

(iii) Fluid connective tissue consists of **blood** and **lymph** (Fig. 2.13).

(a) Blood : It is composed of both liquid and cellular parts. The liquid part in the blood is the **plasma,** and the cellular part includes the **red blood corpuscles, white blood corpuscles** and **platelets.**

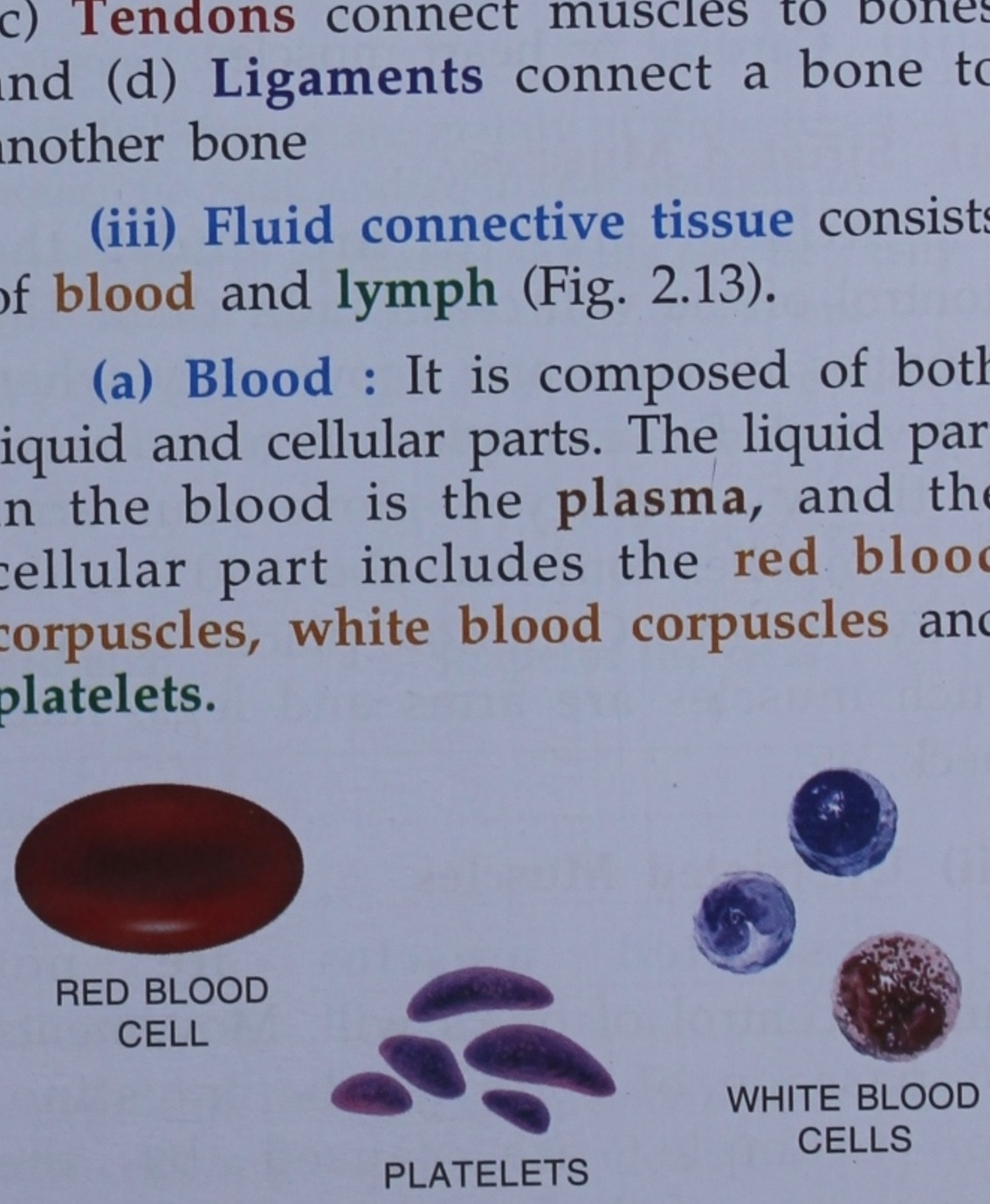


Fig. 2.13 Magnified Human blood cells

(b) Lymph is the fluid surrounding the body cells. It is essentially the plasma with some leucocytes or white blood cells that has oozed out of the blood capillaries.

Fluid connective tissue is mainly concerned with the transportation of substances, like glucose, amino acids, oxygen, etc.

3. Muscular Tissue (Fig. 2.14)

Muscular tissue forms the muscles of the body. The muscles can contract and relax. Thus, they help the body in all its movements.

Three distinct kinds of muscles are :

(i) **Striated** (skeletal, striped, or voluntary) muscles,

(ii) **Unstriated** (smooth, unstriped, or involuntary) muscles, and

(iii) **Cardiac** or heart muscles.

(i) Striated Muscles

Striated muscles are under the control of the will of an individual. The muscles in your arm move only when you want. For example, when you want to throw a ball, you move your arm. Such muscles constitute about 40% of the body weight. Common places to find such muscles are arms and legs, face, neck, etc.

(ii) Unstriated Muscles

Unstriated muscles are not under control of one's will. Movements of passage of food in the intestine, for example, are caused by the contraction of the unstriated muscles in the intestinal walls. Such muscles are composed of slender, tapering cells. Muscles of the iris in the eye and those in the urinary bladder wall are also unstriated or smooth muscles.

(iii) Cardiac Muscles

Cardiac muscles are also involuntary, but of different kinds. The cells here are striated and comparatively short. Unlike the others, **cardiac muscles are branched.** These muscles are found only in the heart. They can contract without outside stimulation and do not get tired soon.

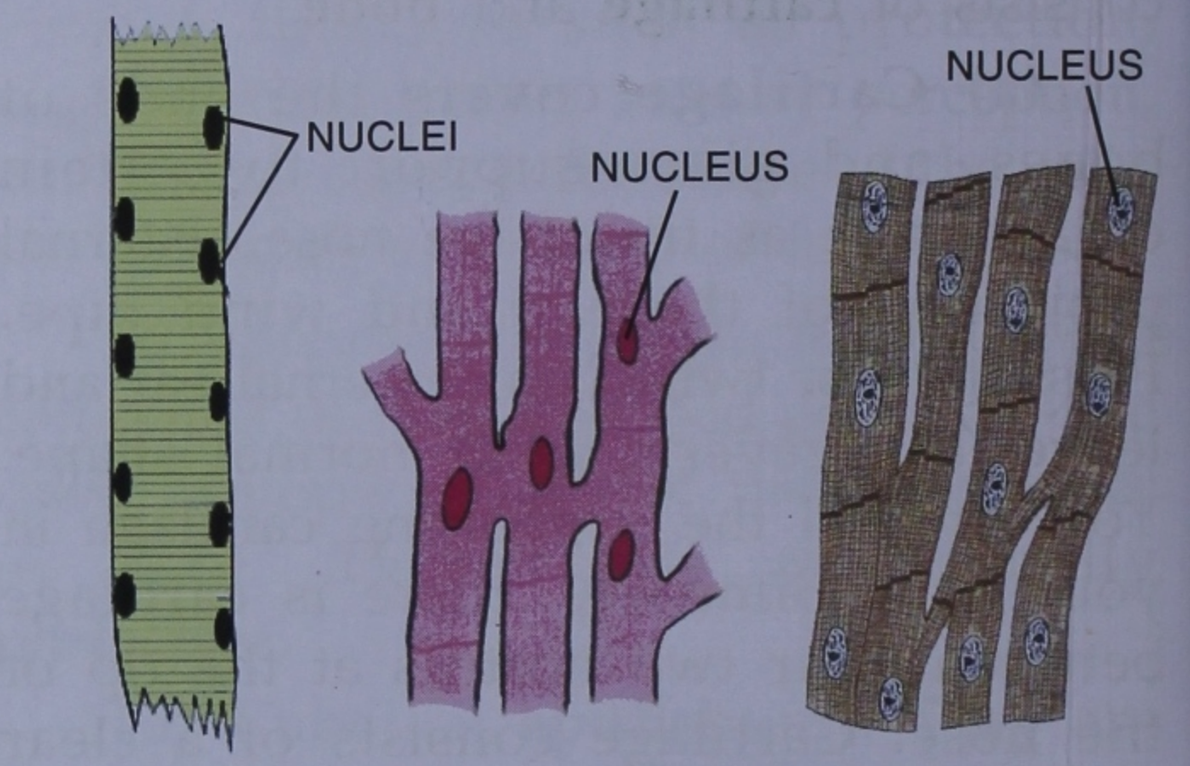


Fig. 2.14 Three different kinds of muscles

4. Nervous Tissue

Nervous tissue constitutes the nervous system. This tissue is made up of elongated cells, called ***neurons***. Figure 2.15 given

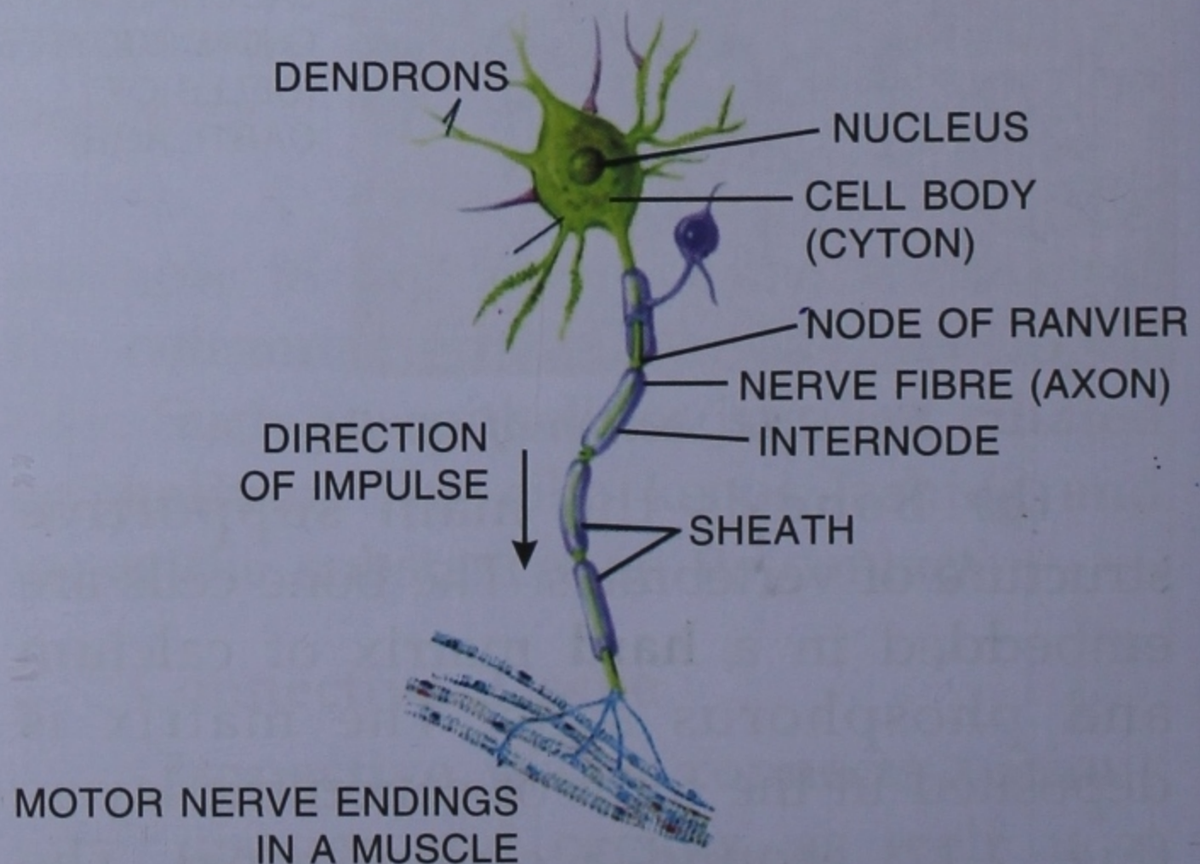


Fig. 2.15 A nerve cell (neuron)

here shows a typical neuron or nerve cell. Each nerve cell consists of a cell body (**cyton**) containing the nucleus and one or more elongated hair-like extensions (**dendrites** or **dendrons**). One of these, the **axon**, may be very long, sometimes as long as one metre. Axons bundle together and form a *nerve* (Fig. 2.16).

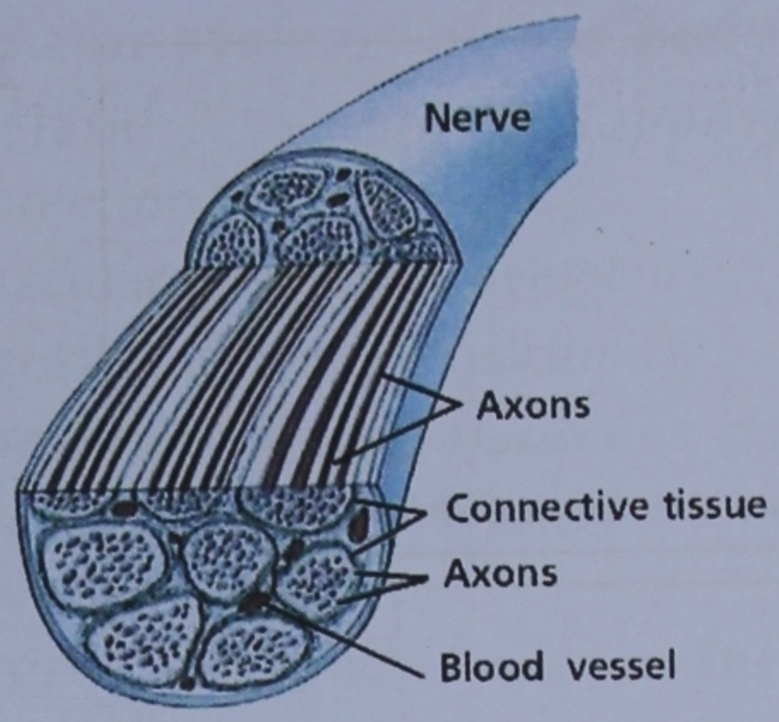


Fig. 2.16 Nerve is a bundle of axons

ACTIVITY 4

Request your teacher to provide prepared slides of different animal tissues.

➢ Focus the slides one by one under the microscope and view them carefully.

Space for drawing Squamous epithelium

Space for drawing Cuboidal epithelium

Space for drawing Columnar epithelium

1. Epithelial tissue :

- The epithelial tissues are mainly of three types — squamous, cuboidal, and columnar epithelium.
- The three types of epithelial tissues can be easily identified on the basis of the shape of the cell.
- Observe the shape of the cells in the three slides and give your observations in the table given below.

Observations :

Type of epithelial tissue	Shape of the cells
1. Squamous	.....
2. Cuboidal	.....
3. Columnar	.....

- Draw neat and labelled diagrams of different epithelial cells in the spaces provided alongside.

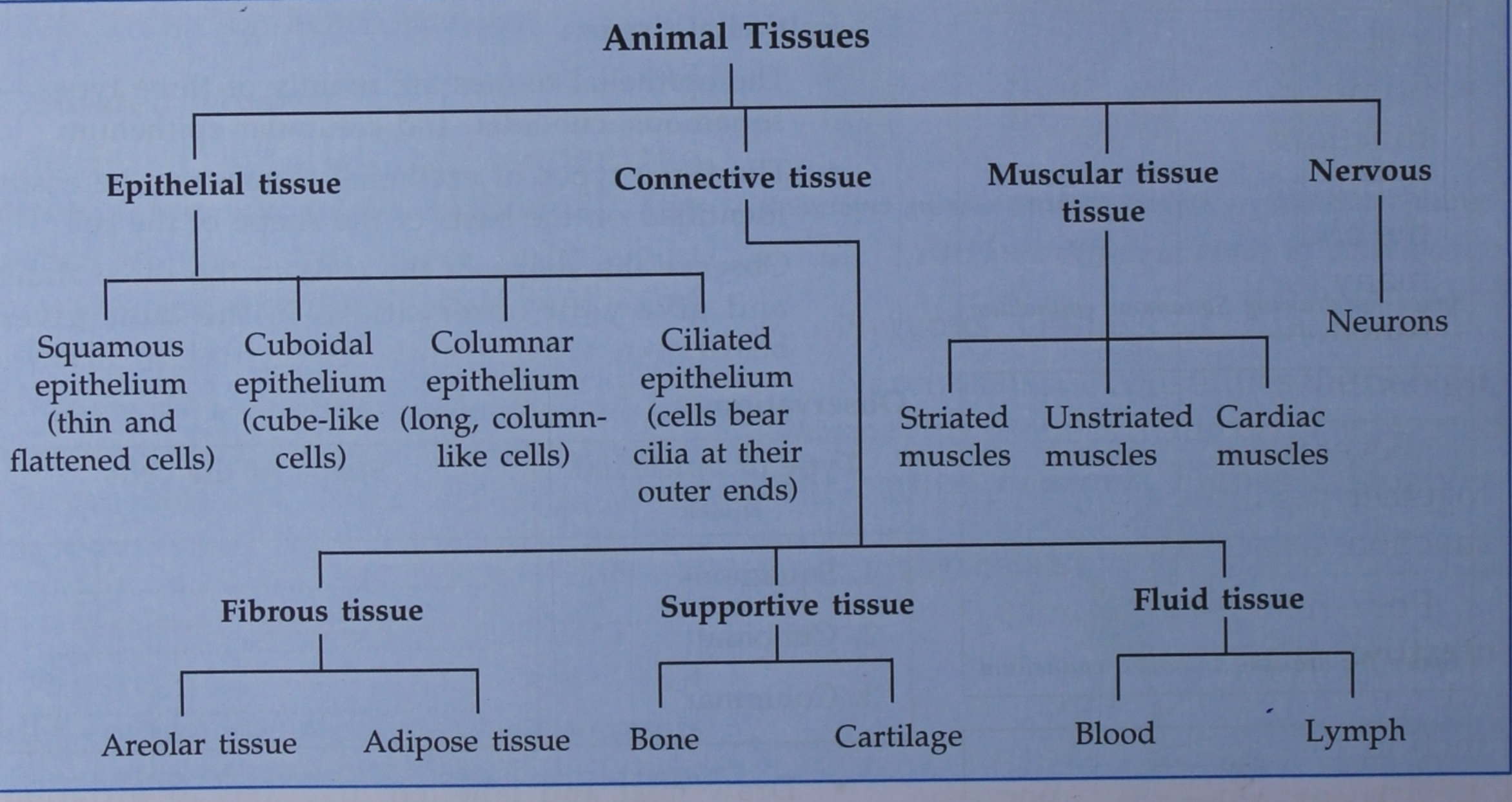
Contd.

Space for drawing striated muscle

Space for drawing nerve cell

2. **Striated muscle :**
   - Examine the long fibres.
   - Do the fibres show any cross striations throughout the length ? Yes/No
   - Draw the diagram in the space provided alongside.
3. **Nerve cell :**
   - Do you see a single cell in your slide or several cells ?
   - Observe the main cell part and the fibre extending out from it.
   - Do you see a nucleus in the cell body ? Yes/No.
   - Draw a neat and labelled diagram in the space provided alongside.

Note : Draw neat diagrams of the tissues you have observed, in the spaces provided.



TISSUES TOGETHER FORM ORGANS

Two or more kinds of tissues combine together to form an organ.

Example : **Tongue** — Think of an organ in your body, like the tongue. It is made up of a covering of ***epithelium, internally located muscles*** that move it, the *blood-vessels* (the connective tissue) and also the *nerves* and the *sensory cells*. All these tissues collectively make the tongue an efficient organ to perform its specific functions.

***Example* : Leaf** — The leaf of a plant is made up of the surface epidermis, the conducting tissue of the veins and the chlorophyll containing parenchyma. All these different tissues make the leaf an organ to perform the specific function of photosynthesis.

Single function or multiple functions of organs

- Some organs perform just *one function*, for example, the **heart** simply pumps the blood around the body.
- Some organs perform more than one function. For example, the **kidneys** get rid of toxic waste substances and also regulate the amount of salt and water in the body.
- Some organs perform numerous functions. **Liver** is an organ which is performing the maximum functions in the body. Even **skin** is an organ doing many functions— can you name a few functions which our skin performs ?

Organs form Organ - System

Several organs of a body combined together performing a common general function constitute an organ system.

For instance, **mouth**, **stomach**, **intestine**, together with **liver**, **pancreas** and **gall bladder** perform the common function of digestion and constitute the **digestive system.**

In the same way, kidney, ureter, urinary bladder form the **urinary system**. Brain, spinal cord, and various nerves constitute the **nervous system**.

In a flowering plant, stem, leaves and buds make up a system called the ***shoot system.***

Some major systems of our body :

1. Skeletal system (*Support and protection*)
2. Muscular system (*Movement*)
3. Digestive system (*Nutrition*)
4. Respiratory system (*Gaseous exchange*)
5. Circulatory system (*Transport for supply and collection*)
6. Excretory system (Harmful *waste removal*)
7. Nervous system (*Sensation and coordination*)
8. Reproductive system (*Continuance of race*)

1. Skeletal system (Fig. 2.17) : The bones in the body join together to form the skeletal system.

- It gives shape to our body.
- It helps us to stand erect and move about.
- It protects the delicate organs in the body.

Fig. 2.17

2. Muscular system (Fig. 2.18) : All the muscles in the body form the muscular system. Muscles are attached to bones in such a way so as to help the body to move. Every movement in the body is the result of muscular action, *e.g.*, movement of limbs, passage of food down the food pipe, breathing movements of the chest, or even the beating of heart.

Fig. 2.18

DO YOU KNOW ?

Muscles make up about 50% of our body weight.

3. Digestive system (Fig. 2.19) : Mouth, stomach, and small and large intestines together with liver and pancreas form the digestive system.

The digestive system helps us to digest the food we eat. When we chew food, it gets mixed with **saliva**, the juice secreted in our mouth. From here, the food enters the stomach. In the stomach, it mixes with other digestive juices. Then, it enters the small intestine.

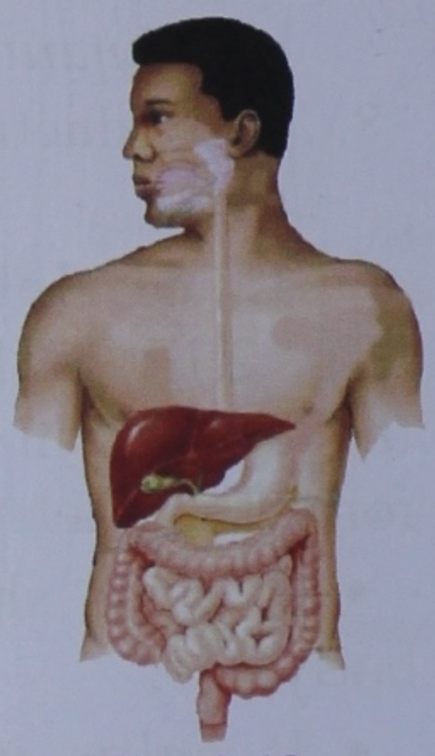


Fig. 2.19

In the intestine, all the digested nutrients from the food are absorbed by the blood. The waste or undigested and unabsorbed food goes to the large intestine and from there, it is passed out through the anus as faeces.

Note : Passing off of the waste material through anus is **defecation** and not excretion.

DO YOU KNOW ?

The human alimentary canal from lips to anus is about 10 metres long.

4. Respiratory system (Fig. 2.20) : The nose, the wind-pipe and the lungs together form the breathing or respiratory system. We breathe through our nose. Tiny hairs in the nose stop dust particles and germs entering our body.

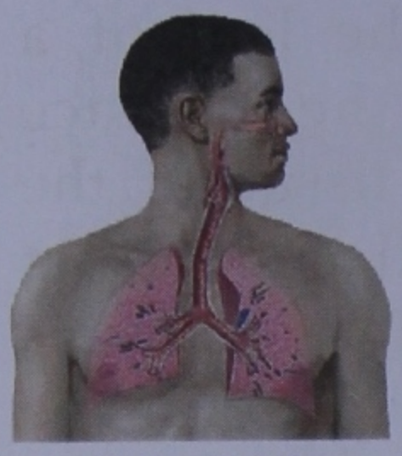


Fig. 2.20

The air we breathe in has oxygen in it. It goes into the lungs. Here, the blood absorbs the oxygen and takes it all over the body. The air we breathe out has carbon dioxide.

5. Circulatory system (Fig. 2.21) : The heart, blood and the blood vessels together form the circulatory system. The heart pumps the blood and sends it to every part of our body as well as receives it back.

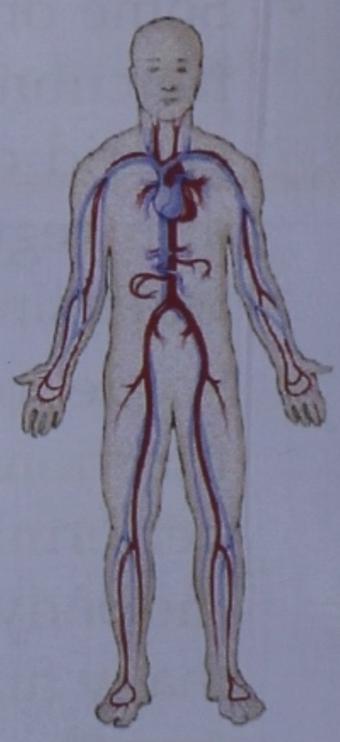


Fig. 2.21

Blood absorbs the nutrients of the food we eat, in the intestine, and takes it to every part of the body. It also takes in oxygen from the lungs (oxygenated blood) and carries it to all parts of the body.

6. The excretory system (Fig. 2.22) : The kidney, the lungs and the skin form the excretory system. They throw out the substances which the body does not need, or are harmful.

- The two kidneys help to remove the poisonous urea and extra water and salts in the form of urine.
- The lungs pass out carbon dioxide.

Fig. 2.22

7. The nervous system (Fig. 2.23) : The brain, the spinal cord and the nerves form the nervous system.

- The **brain** controls the whole body. It helps us to do all our actions. It helps us to think, to learn, to understand.
- The **spinal cord** and the **nerves** in the body help the brain to do its job.

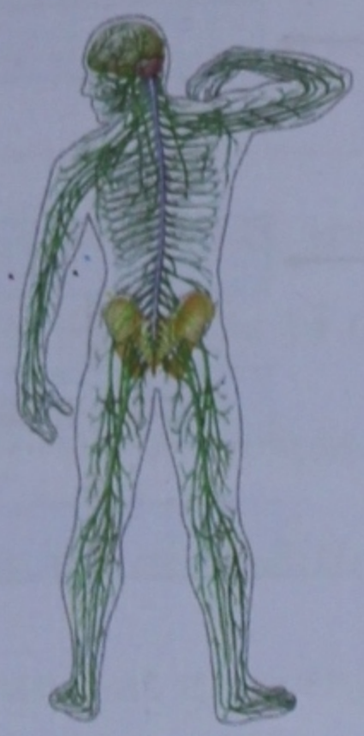


Fig. 2.23

8. The reproductive system : The organs of this system help to produce babies. Because of the reproductive system in all organisms, the life on Earth goes on.

An organism is formed of the organ-systems working together to make an individual plant or animal.

REVIEW QUESTIONS

1. What is meant by the term "organisation" with reference to the living world ?

2. Is this statement correct - "Organisation occurs in the living world only" ? Justify your statement.

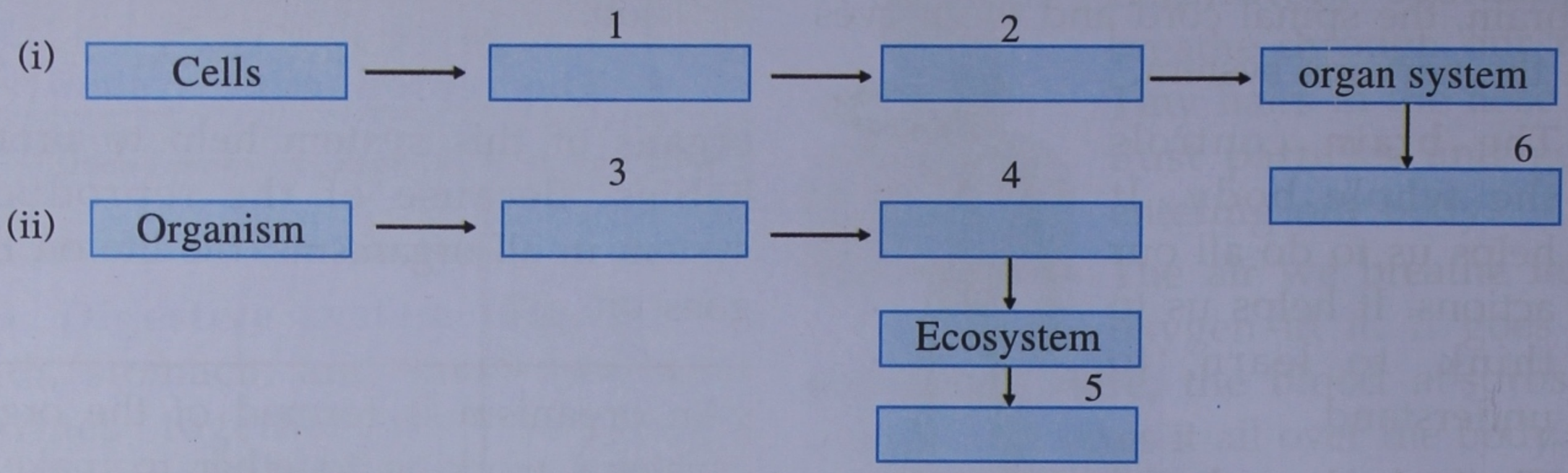
3. Explain the various levels of organisation with suitable examples.

4. Rearrange the following levels of organisation in their correct sequence :
   Cell, organ, tissue, organism, organ system.

5. Fill in the blanks in the following table by giving one example of each in an animal and in a plant :

Level of organisation	Examples in Animals	Examples in Plants
Cell	.....	.....
Tissue	.....	.....
Organ	.....	.....
Organ system	.....	.....
Organism	.....	.....

6. Fill in the blank spaces (1-6) in the following levels of organisation :



7. Define the following terms :

(i) Tissue : _____

(ii) Organ : _____

(iii) Population : _____

(iv) Ecosystem : _____

8. How is a community different from an ecosystem ?

_____

_____

_____

9. Distinguish between :

(i) Population and community

_____

_____

(ii) Ecosystem and biosphere

_____

_____

10. Answer the following :

(i) What is a meristematic tissue ?

_____

_____

(ii) Which living material would you take to demonstrate meristematic tissue ?

_____

_____

(iii) What is the function of meristematic tissue ?

_____

_____

11. State whether the following statements are ***True*** or ***False***.

(i) A tissue is formed of only one type of cells.

(ii) Only one type of tissue forms an organ.

(iii) Permanent tissue is made up of undifferentiated and dividing cells.

(iv) Meristematic tissue is found at growing tips of a plant.

(v) Phloem is formed of dead tubular cells.

12. Fill in the blanks by selecting suitable words from the list given below :
"(Thin-walled, collenchyma, vascular, tissues, conducting)"

(i) A group of different ..... working together to perform a function is called an organ.

(ii) Xylem and phloem form the ..... tissue.

(iii) Conducting tissue is also called ..... tissue.

(iv) Cells are elongated and thick at the corners in ..... tissue.

(v) Parenchyma is composed of large ..... cells.

13. Match the items given in **Column A** with those given in **Column B** :

Column A	**Column B**
(i) Fibrous connective tissue	(a) blood
(ii) Fluid connective tissue	(b) cartilage
(iii) Supportive connective tissue	(c) connects a bone to another bone.
(iv) Ligament	(d) areolar tissue
(v) Tendon	(e) connects a muscle with a bone.

14. How do you rank the following among cells, tissues, organs, or organism ?

(i) Amoeba : _____

(ii) Euglena : _____

(iii) Skin : _____

(iv) Lungs : _____

(v) Neuron : _____

15. Each of the tissues listed in **Column A** is related to one of the functions given in **Column B**. Match the correct pairs by drawing lines.

Column A (Tissue)	**Column B (Function)**
(a) Epithelial tissue	(i) transport
(b) Connective tissue	(ii) protection
(c) Blood tissue	(iii) messages
(d) Nervous tissue	(iv) support
(e) Muscular tissue	(v) movement

16. Name the kind of tissue that

(a) Carries oxygen around your body _____

(b) Brings about movement in animals _____

(c) Supplies plant with food _____

(d) Transports water in plants _____

(e) Supports the body _____

(f) Binds different tissues together _____

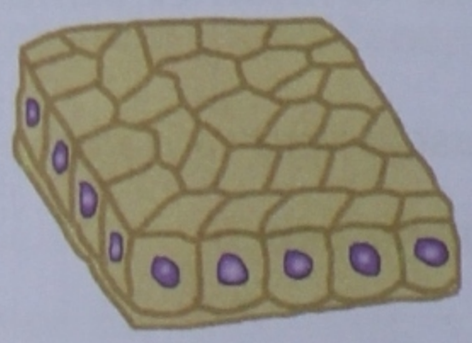
(g) Conducts messages from one part of the body to another _____

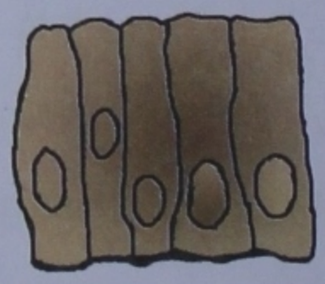
17. Based on the following information, identify the three types of epithelial tissue in the figures given below :

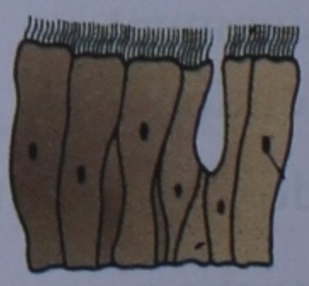
(i) **Cuboidal epithelium :** It consists of a single layer of cuboidal cells.

(ii) **Columnar epithelium :** It is composed of tall, cylindrical cells with oval nuclei usually placed at the base of the cells.

(iii) **Ciliated epithelium :** It consists of cells being hair-like cilia on their free surface.







(a) ..... (b) ..... (c) .....