# Chapter 6

# STRUCTURAL ORGANIZATION IN LIVING ORGANISM

### 6.1 Different Levels of Organization

You know that there are various metabolic activities like nutrition, respiration, and digestion. To carry out these processes, the systems of the body have been listed in table in 6.1. Write down the names of the organs associated with each and their functions.

	Table - 6.1		
S.No.	Name of organ system	Name of organs	Function of system
1.	Respiratory System	Nose, Trachea, Lungs	Respiration
2.	Digestive system		
3.	Circulatory system		
4.	Excretory system		
5.	Reproductive system		

Each organ, though being part of a particular organ system, performs its own separate function; for example, nose, trachea and lungs are organs of the respiratory system. The nose helps in inhalation and exhalation, tract carries air to the lungs and lungs help in the exchange of oxygen and carbon dioxide.

Different organs perform different functions. But all these organs collectively carry out the respiratory function. In this way, the group of all the organs associated with a particular system is called the organ system. But an organ is not the smallest structural unit of the body. You have already learnt that body of every animals and plant is made up of very small cells. Cells can be seen using a microscope (fig. 6.1)



Let us see, how a microscope is used. Maximum experiments of this chapter are based upon studies using a microscope. Those who are not used to handling a microscope may initally face problems. It takes hours to study the fine (microscopic) structures in detail. After practice, it is easier to see even minute structures.

That's why it is said, "Practice makes a man perfect". The more you practice, the more perfect you become. When you learn how to use the microscope, you will be able to view small structures and learn about them.

The correct way of using a microscope *i.* Keep the microscope in a place with sufficient light.

- *ii.* Clean the lens and mirror of the microscope with a cloth.
- *iii.* Wash the slide properly and wipe it dry.
- iv. In order to observe an object, put 2 –3 drops of water on the slide, place the object carefully on the water drop with the help of a forceps or a pin or a babool thorn. Ensure that the object does not float around in water, but remains stationary.
- v. Fix the slide just below the lens with clips and focus it.
- vi. Observe the object after adjusting the light by turning the mirror. .

Now let us observe some cells with the help of the microscope

# Activity - 1

Materials required :- Microscope, onion, slide cover slip, water, safranine or red ink.

To observe the cells under the microscope, separate a thick, fleshy peel of onion and break it into two pieces. On separating the two pieces, you will see a thin, transparent layer. Now remove this layer and cut it into small pieces. Put 2-3 drops of water on the slide, place one of these pieces on it and then put safranine or red ink. Now, warm it gently on the candle – flame and leave it for 10 minutes. Be careful not to let the piece dry up. If it starts drying, put 1- 2 drops of water over it (fig. 6.2 a). Now observe the piece under the microscope. Draw a diagram of whatever you see. You will see that the layer of onion is made up of many small structures, called cells. All the cells of the membrane are alike, but different types of cells are found in other plants (fig. 6.2 b).



(a) Making a slide of onion peel Fig. 6.2

You know that, like other organisms, human body is also made up of cells. Let us observe them under microscope.



**Materials required :**– A microscope, slides, cover slip, water, safranine or red ink.

Clean your mouth properly with water. Scrape the inner epithelial lining of your cheek lightly with the help of an icecream spoon or a match stick (without the head). Now, place the scraping on the slide, in 1-2 drops of water and put a drop of safranine or red ink over it. Warm it gently on candle flame



Fig. 6.3 Tissues of Cheek Epithelial

and leave it for some time. Observe it under the microscope after 10 minutes. Draw a diagram of whatever you see.

You will see the tissue of cheek epithelium, which is made up of many small cells. All these cells are identical. (Fig. 6.3)



#### 6.1.1 Lower Order of Organization

All plants and animals are made up of cells and tissues. It is not necessary that small organisms have smaller cells and large organisms have large cells. Usually cells of large animals are structurally similar to those of small animals but the number of cells is larger

Some cells of human body are so small that a heap of 40,000 – 50,000 such cells is as big as the head of a pin.

Organisms viewed under the microscope may be made up of one or many cells. Some plants and animals are made up of just one cell. They are called unicellular organisms. Amoeba, Paramecium, Yeast and bacteria etc are such organisms. In these organisms the single cell carries out the processes of nutrition, respiration, excretion, locomotion and reproduction.

Most organisms have bodies made up of many cells. They are called multicellular organisms. In these organisms different organs perform different functions, for example, the - cells of lungs perform respiratory function and the cells of the digestive system digest food. Cells performing similar functions in the same organism have similar size and shape.

Tissues of plants are called plant tissues and those of animals are called animal tissues.

### **Plant Cells**

Let us observe plant cells under a microscope.

(b) Epithelial Tissue :

**Materials required :-** Stem of any plant, microscope, cover slip. slide, glycerine, red ink

Take a stem of a soft plant i.e. of a herb. Cut transverse sections of the stem; they will look like the section shown in fig. 6.4. Keep the thinnest section on a slide. Put one drop of safranine or red ink over it followed by 2-3 drops of glycerine. Now put a cover slip over the section and observe it under microscope. What do you see?

Compare what you saw under the



Fig. 6.4 Stem of plant

microscope with fig 6.4. You will find that there are different types of tissues. Plants have mainly four types of tissues.

- (a) Meristematic Tissue : These tissues are found at the tip of roots and stems. The cells of these divide quickly and this results in an increase in the length of roots and stems.
  - If you observe fig. 6.4, you will see epithelial tissue in the form of the outermost layer. This tissue forms the outer covering of every part viz. root, stem, leaf, flower, fruit and seed. Apart from providing protection,

	respiration, photosynthesis etc. the epithelial tissues of the plant roots
	help in drawing water from the soil.
(c) Vascular Tissue :	These tissues transport water, and food to different parts of the plant.
	In earlier classes, we have done experiments related to functions of
	root and stem. Plants have two types of vascular tissues, one type carries
	water and mineral salts from roots to leaves. This vascular tissue is
	known as Xylem. Another type of vascular tissue distributes the food
	manufactured in leaves to different parts of the plant. This tissue is called
	Phloem. Generally, Xylem and Phloem are found in groups called
	vascular bundles.
(d) Ground Tissues :	In fig. 6.4, ground tissue has been shown just inside the outermost or
	dermal layer. Its function is to provide support to the plant. In leaves it
	manufactures food through photosynthesis and also stores food in the
	roots of many plants. Pith is also a ground tissue.

these tissues also exchange carbon, oxygen and water vapour for



i. Write names and functions of the tissues found in plants.

ii. What are vascular bundles? What is its importance for the plants?

iii. Write cell will be bigger - that from an elephant's body or that of an ant's body?

### **Animal Tissues-**

Body of almost all multicellular organisms is made up of four types of tissues.

### (a) Epithelial Tissue :

Keep a live frog in a bottle filled with water. After some time, you will see a transparent membrane floating on water. Find out where did it come from on the surface of water.

You will see that the floating membrane has come from the outer skin of the frog. This is a kind of tissue that provides covering to the outer and inner body – surfaces. This is called **epithelial tissue**. It protects the body and its organs. Epithelial tissue of stomach forms digestive enzymes and that of intestine helps in digestion and absorption of food (fig. 6.5)

### (b) Muscular Tissue :

You might have seen the moving fleshy structure of the rump and shoulders of cow, buffalo etc during their locomotion. These structures are called Muscles. These are made up of muscular tissue. Make a list of those parts of your body, by touching or moving so that you can feel the muscles. You will see that muscular tissue is found in all the moving body parts Cells of this tissue can contract and relax due to which there is movement of hands, feet and other organs(fig. 6.6). There are three different types of muscles.



(a) Voluntary Muscles



(b) Involuntary Muscles Fig. 6.6 Muscular Tissue



(c) Cardiac Muscles

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- (a) Voluntary Muscles : They work according to our will. Example: Muscles of hand and feet.
- (b) Involuntary Muscles : They do not work according to our will e.g. muscles of the digestive tract, blood vessels, etc.
- (c) Cardiac muscles
- Heart is made up of cardiac muscles. Their structure is the same as : voluntary muscles but their function is not under our control.
- Activity 4

Sit on the floor, fold one of your feet and hold the calftightly. Now lift your leg slightly above the ground and move the leg up and down.

Now, answer the following questions:

- Can you feel the movement of the muscles of the a. calf?
- b. Can you move the foot without moving the muscles?
- What is the relationship between muscles and the с. movements of parts of the body?



Fig. 6.7

(d) Connective Tissue : Bones and blood present in your

body are actually connective tissue. Their cells are of a different structure and function differently according to conditions. This tissue provides structure and support to our body.

You know that transport of oxygen and food material throughout the body is carried out by blood. Since these tissues connect to all tissues of the body, they are called connective tissue.

(e) Nervous Tissue : This tissue is made up of nerve cells. You know nerves, brain, spinal cord and sensory organs constitute the nervous system. All these organs are made up of nerve cells. These cells join together to form long, fiber-like structures. The network of these fibers is spread throughout the body. They carry impulses to different body parts and to the brain. Due to the nervous system, we can perceive the



**Figure 6.8 Connective Tissue** 



Figure 6.9 Nerve fibre

smell of a flower, the taste of a biscuit, melodious music and feel pain when injured.

Now you would have understood the different levels of the organization of the body.

Cells — Tissues — Organs — Organs System — Body of the Organism

In the organization of living world; these levels show the internal organisation of the body, hence they are called the lower level of organization.

# Answer these

What would have happened if:-

- Muscles did not have the capacity to contract and relax? i.
- ii. Blood were absent from the body?
- There were no nervous cells in our body? iii.

Let us now see how the higher level of the organization of the biotic world is formed.

# 6.1.2 Higher Level of Organization

Can you live in a place where there are neither human beings, nor animals, nor plants? Every living organism is dependent upon other living organisms and non-living things found in its own environment. Actually it is impossible for us to live alone.



# Activity - 5

Go to a garden or a field near your home or school. Here, choose an area of about 1 square metre near a tree. Write down in table 6.2 the names and numbers of animals and plants known to you found in that area. If you don't know the name, write it as (a), (b) or (c) and mention its number.

S.No.	Name of plant/animal	Number
1.		
2.		
3.		
4.		
5.		

We see small groups of different plants and animals around us. Every small group amongst them represents a particular species. The number of individuals of a particular variety or species is called the population of that particular variety or species. In the natural environment organisms of different species live together to form a community.



Answer these

i. Count and write the population of your school.

ii. Find out and write the population of your village / town.

In your previous class, you have learnt about the interdependence of living organisms, food chain and food webs. Such communities of living beings are also found in our environment. All these communities are dependent upon other organisms for their survival. For example, many other families live in your colony and they all form a community despite differences in caste, language, work and nature.



Fig.6.10

Several plants and animals live together. We call them Biotic Community. Now tell, how many such communities can there be on the earth? Do all biotic communities live under similar environmental conditions? You will be surprised to know that, many biotic communities live together even in small pond of water. Similarly different biotic communities live together in oceans, mountains, deserts and forests. Together with the abiotic factors of that environment, they constitute the Ecosystem. A small pond of water can be a small ecosystem and an ocean a large ecosystem. There are many such ecosystems on the earth. All these ecosystems together constitute the biosphere (fig.6.10).

The biosphere is constituted by all the biotic communities of the hydrosphere, lithosphere and atmosphere and includes the biotic and abiotic factors included in these.

 $\rightarrow$  Population  $\longrightarrow$  Community  $\longrightarrow$  Ecosystem  $\longrightarrow$  Biosphere Organisms -Species – 00

# We have learnt

- Living world has two levels of organization lower and higher
- Cell is the smallest unit of the body of an organism.
- The group of cells that are structurally similar and together carry out the same function is called 6 Tissue.
- Cells form tissues, tissues form organs, groups of organs form organ systems, and organ systems  $\geq$ together constitute the body of the organism.
- Four types of plant Tissues meristematic, epithelial, vascular and ground tissue  $\geq$
- In animals mainly four types of tissues are found, viz., epithelial, muscular, connective and nervous  $\triangleright$ tissue.
- Every living organism is dependent on other organisms and non-living things of its environment.
- Each species has its own population.
- Questions for practice
- Choose the correct answer.

#### The lowest level of organization in the living worlda.

- i. Organ
- Tissue ii.
- iii. Cell
- iv. Body

#### b. Stem is made up of -

- i. Epithelial tissue
- ii. Vascular Tissue
- iii. Ground Tissue
- All the above iv.

#### Skin of our body is made up of c.

- Epithelial tissue i.
- ii. Skeleton
- Blood iii.
- Nervous Tissue iv.

#### d. Cells of some tissue are -

- i. Only structurally same
- ii. Only functionally same
- Structurally and functionally different iii.
- Similar in structure and function iv.

#### Highest level of organization in the living world ise.

- Species i.
- ii. Biosphere
- iii. Community
- iv. Ecosystem

#### 2. **Fill in the blanks**

3.

- Different.....together constitute the organ-system in multi cellular organisms a.
- .....tissue is found at the tip of root and stem. b.
- $\longrightarrow$  Organ  $\longrightarrow$  Body Cells с.
- ......and......together constitute the biotic community. d.
- Organism Community Biosphere Amoeba, Paramecium are ...... organisms e.
- f.
- The..... tissue of the plant root absorbs water. g.
- h. Bones and Blood are....tissues.
- i. Cells of muscular tissue may be.....and.....

### Identify the true and false statements among the following. Correct the false statements and rewrite them.

- i. The length of root and stem increases due to vascular tissues.
- ii. Xylem transports the food manufactured in the leaf to the other parts of plant.
- Different organs of excretory system are made up of nerve cells. iii.
- iv. Every organism depends upon other living organisms in its environment.
- Different biospheres of the earth together constitute the ecosystem. v.

# Do these also

## Answer the following questions.

- If in a pond, all the living organisms except fish die, what will happen? Write. i.
- How would the death of the entire vegetation affect the life on earth? Write ii.
- iii. Draw labelled diagrams of the following
  - Nerve Cell a.
  - Section of stem b.
- Go to the nearby garden/field/pond etc. with your teacher. Identify different biotic communities • found there. Write them as written below;

#### **Place Biotic Community**

Algae, small insects, fish, frogs, human beings. Pond

Prepare coloured, clear and labelled posters of the tissues found in plants and animals and organize • a competition in your school.

