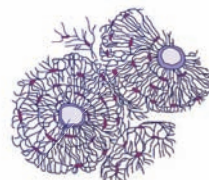


# Animal tissues



We had learnt about plant tissues in the earlier chapter. Do animals also have the four major groups of tissues as in plants? To study about the animal tissue we can take examples of tissues present in some animals that we see around us. In the chapter on plant tissues we observed that different functions were carried out by different tissues. We will try to see whether this happens in animals also.

We know that different organ systems carry out different functions.

## Enlist them:

S.No	Organ system	Function
1.	.....	.....
2.	.....	.....
3.	.....	.....

Do some tissues help the organs to carry out their functions?

How do they do so? Discuss with your friends and write.

There are different kinds of tissues in the animals to perform different functions like plant tissues. Some tissues cover and protect the body. Some tissues helps in the movement which is performed by muscles and bones and other types of tissues make connection between these

two tissues. Some tissues carry information to respond to stimuli.

We will try to learn more about the tissues by doing the following activities.



## Lab Activity

**Aim:** Identification of tissue in collected sample.

**Apparatus:** Microscope, slide, dil HCl, forceps, brush.

**Procedure:** Collect a small piece of chicken with bone from your nearby chicken centre or market.

For observing each type of tissue, you need to follow specific procedure. After completion of every activity, do not forget to draw the diagram and discuss the questions.

Put it in dilute HCl for two hours.

Take the skin part of chicken piece.

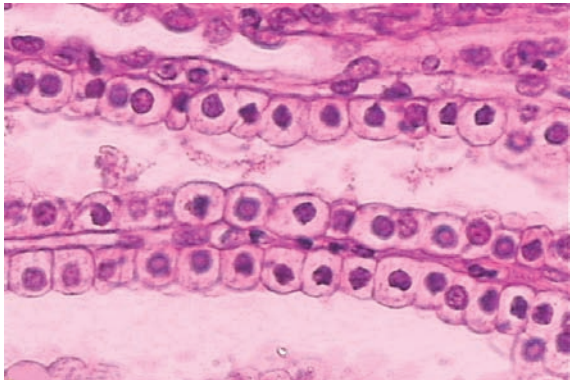
Place the material with forceps or brush on the slide.

Then keep another slide on it and press both the slides gently.

Place a cover slip tap on it and observe under microscope.

Draw the diagram of what you have observed under the microscope in

your note book. Compare your diagram with the following picture.



**Fig-1 Epithelial Tissue**

Now try to find out the answers.

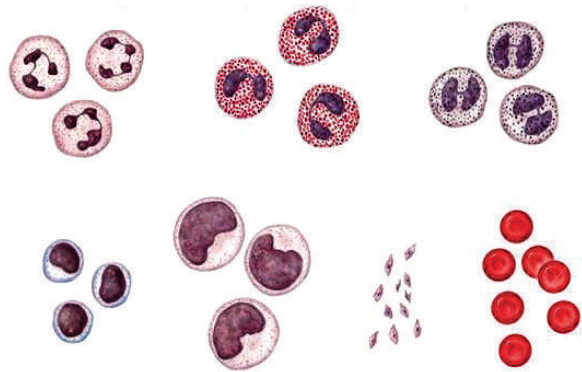
- Are all the cells similar?
- How are they arranged?
- Are these cells tightly packed and arranged as continuous sheath?
- Is there any inter cellular space?
- Think, why these cells look like continuous sheath?
- Does membranous tissue cover and protect the animals body?

### Procedure - 2

Take a sterilized syringe needle. Collect one drop of blood from finger tip by pricking with syringe needle. (Under guidance of teacher)

Take a slide. Keep the finger on the slide to collect one drop of blood

- Put another slide on it gently and press both sides.
- Observe under microscope
- Draw the diagram of what you have observed under the microscope in your note book. Compare your diagram with the following picture.



**Fig-2 Blood**

In this procedure you can identify only red blood cells. Compare with above diagram. Though blood contains all the cells shown in the picture, you might not be able to find them under microscope. For this you need a separate technique. Visit a nearby blood testing centre (Pathological lab) and submit a report on it after collecting the information.

### Procedure - 3

Take a piece of muscle of chicken which is collected for activity-1.

Put in dilute HCl or Vinegar and leave it for two hours.

Next morning collect the piece of muscle on a slide with forceps.

Press gently with another slide, put few drops of water and place a cover slip on it.

Observe under microscope.

Draw the diagram of what you observe under microscope in your note book. Compare your diagram with the following picture.



**Fig-3 Muscle**

Now try to find out the answers.

How are the cells arranged?

Do you find any difference between skin cells and muscle cells?

Procedure - 4

If you want to observe the bone tissue in the chicken bone, settle it in vinegar or diluted HCl over night.

It is better to do this one day before your discussion in the class. Then only the bone becomes soft. Take a piece from it by using knife.

Do you find any relation do you find any relation between the tissues you observed previously.

Will this tissue help for movements in our body?

There are four major types of tissues in the animals.

Epithelial tissue protects and covers the animals body from inside and out side.

- A loosely spaced tissue mainly as rendering support to various organs is the connective tissue.
- The tissue which is responsible for movements in our body is known as muscular tissue.

A specialized tissue that responds to internal, external stimuli is called, nervous tissue.

Are the functions of all the above tissues the same?

Let us study about tissue in our body.

## Epithelial Tissue:

(Epi means-Outer, Thelium means-Tissue)

Epithelial tissues are present in the skin, lining of mouth, lining of blood vessels, lung alveoli and kidney tubules.

### Activity-1

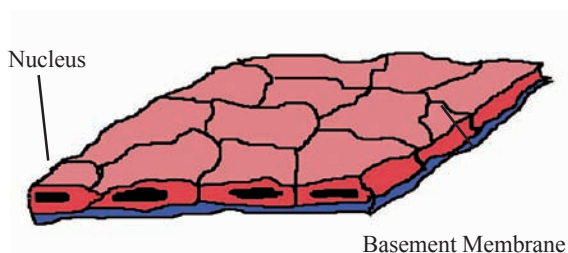
Collect the substance lining the mouth by using wooden spoon and observe this under the microscope. Draw the diagram that you have observed in the microscope, in your note book.

In the activity performed in 8th class you observed cells. Now you observe tissues

How are the cells arranged?

Are there any inter cellular spaces?

The epithelial tissue, extremely thin and flat, form a delicate lining. This is called as squamous epithelium. We find this type of epithelium in oesophagus, lining of mouth, lining of blood vessels, lung alveoli where transportation of substances selectively occurs through permeable membrane (you will learn about permeability in the next chapter of "Transport across Membrane").



**Fig-4 Squamous Epithelium**



The epithelial cells in skin are arranged in the form of layers. This is called as stratified squamous epithelium.

Think, why are the epithelial cells in the skin arranged in the form of layers?

If you drink hot tea or chilled cool drink, how do you feel?

If your skin burns or is wounded which tissue would get effected?

### Activity-2

Take a permanent slide of cuboidal epithelium from your laboratory slide box and observe under the microscope. Draw the picture in your note book. How are the cells arranged?



**Fig-5 Cuboidal Epithelium**

These are the cuboidal epithelial cells which form the lining of organs or tubules like ureters or other parts and provide mainly mechanical support to salivary glands.

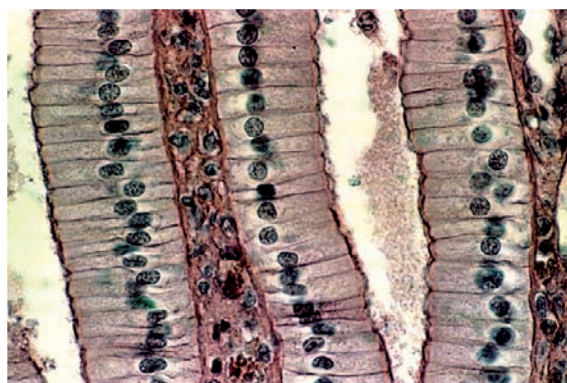


### Do you know?

Sometimes a portion of epithelial tissue folds inward and formed a multi cellular gland. Hence it is called as glandular epithelium.

### Activity-3

Take a permanent slide of columnar epithelium from the slide box and observe it under the microscope.



**Fig-6 columnar epithelium**

- Draw the figure that you have observed under the microscope
- How are the cells? Do you find any hair like projections on the outer surface of epithelial cells.

This types of cells are present where ever absorption and secretion occurs. Try to think where is this type of epithelial tissues present in your body?

Do you know?The skin is also a kind of epithelial tissue. Where does nails, and hair grow from. The scales of fishes, reptiles and feathers of birds also grow from epithelium. These are modified epithelial tissues. You learn more about them in the chapter: Adaptations in different Ecosystems.

### Connective tissue

If you tilt your body to any side of your body, what will happen to your internal organs? Is there any displacement? The internal organs are located at specific places without any displacement in organs

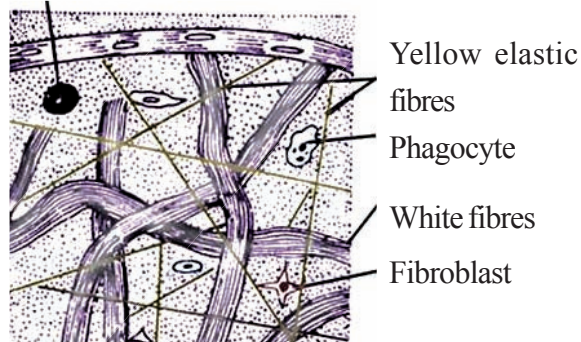
due to connective tissues. The tissue connect organs and muscles. These tissues are called connective tissue.

Connective tissues help in binding the other tissues and organs together and provide a frame work and support to various organs in the body. These tissues also play a major role in the transport of material from one tissue to another. They also help in the body defence, body repair and storage of fat. There are different types of connective tissues, each performing a different function.

How do glasswear items carry for longer distance?

Areolar tissue is one type of connective tissue which joins different tissues. It helps in packing and helps to keep the organs in place. These cells are called **fibroblasts**. These are the major components in this type of connective tissue. These cells secrete fibrous material which holds the other tissue in position. These cells also help in repair of the tissues when they are injured.

Mast cell

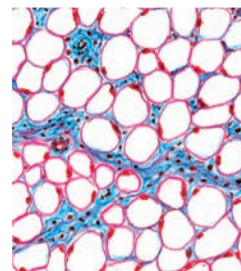


**Fig-7 Areolar Tissue**

The muscles in our body are attached to the skin and bone by this type of tissue. We can see this type of tissue around blood vessels and nerves.

Why do old people shiver more in winter than youngsters? Is there any special arrangement to prevent the escape of heat energy during winter?

Fat storing adipose tissue is found below the skin and between



**Fig-8 Adipose tissue**

internal organs. The cells of this tissue are filled with fat globules. Storage of fat also acts as insulator.

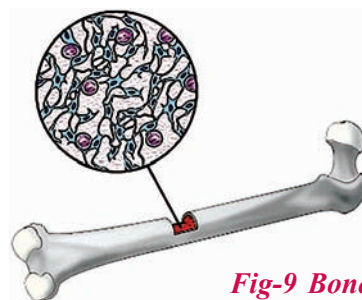
Are all tissues in our body smooth and soft?

Which tissue gives definite shape to body of vertebrae?

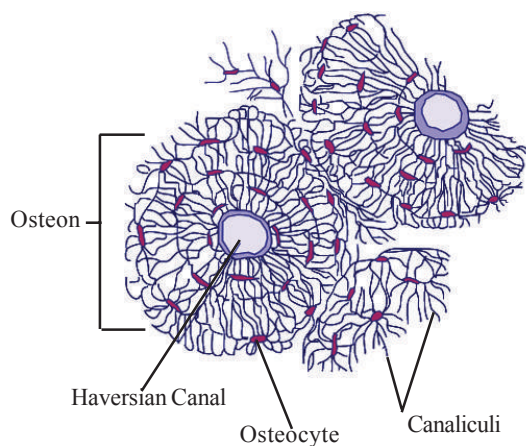
Bone is another type of connective tissue; it forms the frame work that supports the body. It is a major component of the skeletal system of several vertebrae (except some fishes like sharks).

### **Do you know?**

Bone is made of calcium phosphate and calcium carbonate. These salts are secreted by cells called osteocytes. These cells are present in the central hollow portion of the bone called bone marrow.

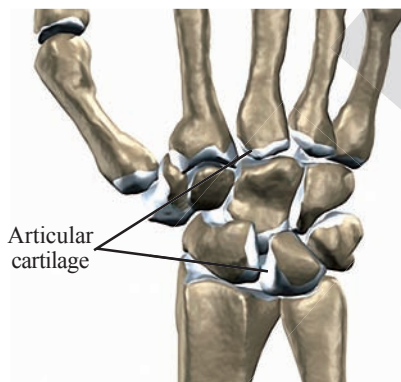


**Fig-9 Bone**



**Fig-10 Osteocyte (bone cells)**

**Cartilage** is a type of connective tissue found in the joints of bones, tip of ribs, tip of the nose, external ears and in trachea. Embryos of several vertebrae do not have bone but have cartilage. The entire skeleton of fishes like sharks is made of cartilage. Cartilage is hard but not as hard as bone.



**Fig-11 Cartilage**

How two bones are connected at joints?

**Ligament** is yet another type of connective tissue that connects bones at the joints and holds them in position. It is made up of large number of fibres. These fibres are made up of a protein called collagen. This is very elastic in nature.

You know that, body movement is because of muscles attached to bones. How muscles are attached to bones?

Tendon is a type of connective tissue which is also made up of fibres.

The tendon joins the muscle to the bone. It is also made up of collagen.



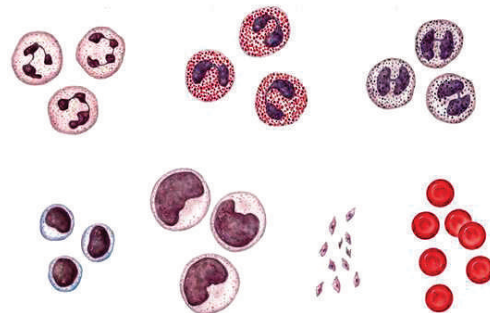
### Think and discuss

Blood is a type of connective tissue. Why is it called connective tissue?

### Activity-4

Invite a scientist or doctor to your place. Record an interview about blood structure and its functions. It is important to make a questionnaire in order to conduct interview. After completion of interview, prepare a booklet about blood and keep it in the class room library or display it on the bulletin board.

It differs from other types of connective tissues. There are different types of cells in blood and each one has a different function. All the cells in the blood float freely in the plasma. Extra cellular space is filled with fluid called plasma. There are no fibres in blood.



**Fig-12 Blood cells**



## Blood

Blood is also a tissue which is having different components. Let us know more about blood.

There is a red stream that flows in closed canals in our body. Think what is it?

The red stream that flows in closed tubes in our body is blood. It is also a type of connective tissue. Blood explains many things about us. Blood is the source to identify our wellness or illness. It is very interesting to know about the blood current in our body. There is highly sophisticated and well developed mechanism to circulate the blood to the entire body. Our heart pumps nearly 36 thousand litres of blood to a distance of nearly 20 thousand kilometers in the time period of 24 hours. Blood is red in colour. Do you agree with the statement that all animals carrying red blood are your blood relatives? The blood is always not red in all animals. The cockroach has white blood where as there is blue coloured blood in snail. It is really a wonder that blood appears in different colours.

Normal adult human beings have about 5 litres of blood. A chief component in blood is water, which is stored in the plasma.

Besides water, it also has several nutrients such as glucose, amino acids, proteins, vitamins, hormones, required for the body and also excretory products such as lactic acid, urea, salts etc. Plasma also contains factors responsible for blood clotting. Heparin helps to prevent blood clotting in blood vessels.

Cells present in blood are corpuscles. They are three types 1. RBC, 2. WBC, 3. Blood platelets.

Red blood cells also known as erythrocytes which are red in colour. They have red coloured protein called **haemoglobin**. Because of haemoglobin blood is red in colour, which helps in the transport of oxygen and carbon dioxide 1ml of human blood has about 5 millions of red blood cells which live for 120 days in blood.

Taking blood of an adult we can make a chain of red blood cells around the earth at equator with 7 circles. When you are in your mother's womb your RBC are formed in the liver and spleen. After your birth these RBC are generated from the bone marrow of long bones. In mammals, mature red blood cells are without nucleus.

The second type of cells present in blood are white blood cells. These cells do not have haemoglobin, hence they are colourless and called 'leucocytes'. These cells are less in number when compared to the RBC. They are of two types - granulocytes and agranulocytes.

There are three types of cells in the **granulocytes** - Neutrophils, Basophils and Eosinophils. These cells attack and destroy the microorganisms that enter the blood.

Some white blood cells sacrifice their life to fight against external enemy (micro organisms). These dead WBC come out of wound as pus. Neutrophils are the first line of defence against bacteria. So they are called microscopic policemen.

There are two types of **agranulocytes** lymphocytes and monocytes. Lymphocytes secrete antibodies to guard against foreign material that enter into blood. Monocytes move like amoeba and attack the foreign

materials and engulf them. The foreign materials are destroyed inside these cells. They are called as ‘scavengers’.

Blood platelets are a separate group of cells which do not have a nucleus. They are disc like projections. Whenever a blood vessel is injured, platelets accumulate at the site of injury and help in the formation of a blood clot. The clot seals the wound in blood vessels and prevents further blood loss.

“Your sisters and brothers are not your relatives”. This shocks you. But it is true, if you take into consideration the blood groups. Because, they may not have the same blood group as yours. Land Steiner, a German doctor, found a new blood relation among us. He divided human beings into four major groups. They are A, B, AB and O. The person who lives on another side of the globe is same with your blood group is also a blood relative. Do you agree this? AB group human beings can receive the blood from any other groups. Hence they are called “Universal Recipients”. ‘O’ group people can donate the blood to any other group. So these people are known as “Universal donors”.



### Lab Activity

#### Find your blood relations:

Let us find out your blood relatives in your class. For this we need a kit (That is available in your school lab.) to find out your blood group.

**Aim :** Identification of Blood Group

**Apparatus :** Blood group Identification Kit, Glass Slide, Wax Pencil, Disposable Needle.

### Kit Components and Storage

All the reagents should be stored at 2-8°C when not in use.

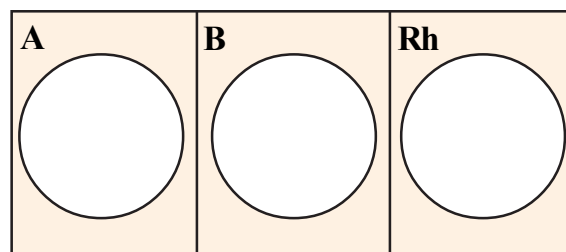
Sl No	Components	Quantity (100 tests)
1	anti-A sera	5 ml
2	anti-B sera	5 ml
3	anti-RhD sera	5 ml
4	porcelain white plate	2
5	Wax pencil	1
6	Needle (24G)	100
7	Instruction manual	1

#### Materials Required (not included in the kit):

Cotton, 70% alcohol, toothpicks.

#### Procedure:

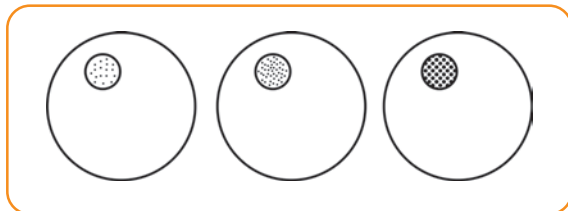
1. Take one porcelain plate, clean and dry it. The plate must be very clean so that it does not interfere with the reaction.
2. With a wax pencil, draw three circles on the plate to divide the surface into three parts and draw three circles, one in each part as shown in Figure 13.



*Fig-13 Template on a porcelain plate for blood grouping.*



- Place one drop of the corresponding antiserum (at room temperature) near the edge but within each of the circles as shown in Figure 14.

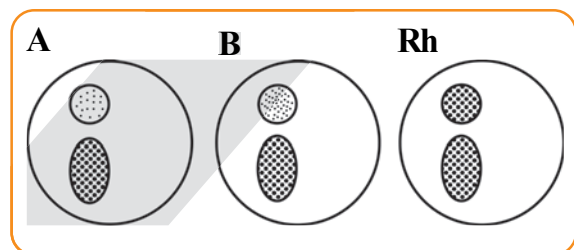


**Fig-14 Addition of anti-sera on the glass slide.**

- Choose a finger (usually left ring finger). Clean this fingertip with alcohol in a cotton ball and let it dry. Keep the cotton ball nearby, as it is needed again. Dangle the hand down to increase the amount of blood in the fingers.
  - Press on the bottom of the fingertip with the thumb of the same hand (to help hold blood in the fingertip) and quickly prick the fingertip with the help of a needle.
- Note: The needle is sterile, so do not touch the tip with anything before using it.
- Quickly, let one drop of blood get into each circle but not touching the anti-sera. Do not touch any of the anti-sera.
  - After putting three drops of blood, apply gentle pressure to the wound with cotton ball.  
Remember to properly dispose the used needle.
  - Use a toothpick to mix the blood and antiserum and stir gently. Do it for each of the circles using a fresh

toothpick every time. The wax pencil circle will help to keep the sample isolated.

- Watch to see if any of the samples show agglutination. The agglutination will appear as the grainy clumps of red blood cells (RBCs) suspended in a clear solution. Rh is slower to agglutinate, so do not give up too soon.



**Fig-15 Blood added on the glass slide.**

### Result and inference :

Determine the blood type depending on the result. Following table can be used to determine the blood type:

**Table: Determination of blood group (type).**

Anti-A	Anti-B	Type
Yes	No	A
No	Yes	B
Yes	Yes	AB
No	No	O

Independent of whether agglutination occurs in anti-A and anti-B sera, clumping may or may not occur in anti-RhD serum. If agglutination occurs in anti-RhD serum, the Rh factor is positive; and if it does not, the Rh factor is negative.

Result should be noted in the given table

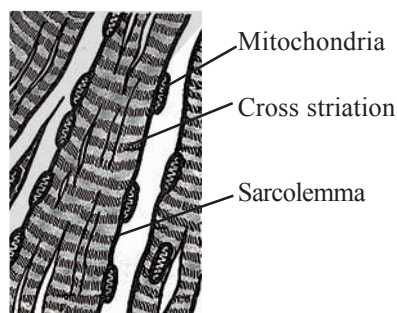
Sl.No	Name	Blood Group

**Note:** While taking blood samples, don't use same needle for all. It is very dangerous. It spreads different diseases. You should use separate disposable needles for each pupil. It is better to conduct such kind of test only with the help of a Health Inspector.

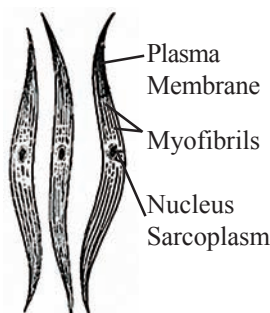
## Muscle Tissue:

If you are wounded deeply, a deep scar would form at the place of wound? If we are wounded on skin, a lighter scar would form. Why? For the reason, that the skin cells have regenerating character. Think about the muscle cell. Will they get regenerated like epithelial cells?

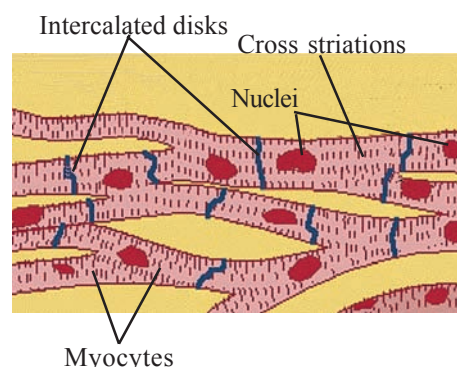
Muscles are responsible for the movements of hands and legs and also of several internal organs such as intestine and heart. Small amounts of muscle tissues also present in blood vessels. These help in increasing or decreasing the diameter of the blood vessel and thus the blood flows. Heart is made of only one type muscle cells and they help in pumping the blood.



**Striated muscles**



**Non-striated muscles**



**Cardiac muscles**

How do muscles contract and relax?

Muscular tissue consists of elongated cells called muscle fibres. This tissue is responsible for movement in our body. Muscles contain special protein called contractile proteins which contract and relax to cause movement.

During winter, body shivers. Why?

When the body is exposed to cold air, we shiver. During shivering muscles contract and relax producing large amount of heat. This keeps the body hot.

Based on their structure, location and function, muscles are three types. They are striated muscle, non-striated muscle, cardiac muscle.

We can move some muscles by our conscious effort. For example the muscle present in inner limbs move according to our wish and will. Such muscles are called voluntary muscle. These muscles also called as skeletal muscles as they are mostly attached to bones and help in body movement; these muscles show alternate light and dark bands or striations. As a result, they are also called striated muscle. The cells of this tissue are long, cylindrical, unbranched and have many nuclei in the cytoplasm (multi nucleated).

### Activity-5

Collect three types of muscle slides (Striated muscles, Non-striated muscles, Cardiac muscles) from slide box. Then observe these under microscope. Write your findings in the following table.

Sl.No	Striated muscles Characters	Non-striated muscles Characters	Cardiac muscles Characters

The movement of food in alimentary canal and the contraction and relaxation of blood vessels are involuntary. We cannot really start them or stop them simply by wanting to do so. Smooth muscle or involuntary muscles control such movements. They are also found in the Iris of the eye, in uterus and in the bronchi of the lungs. The cells are long with pointed ends and having a single nucleus (uni nucleated). They are also called un striated muscle.

Can you tell why are they called as un striated muscle?

The muscles present in the heart are responsible for pumping of blood. The cells are long branched and have nuclei. Cells are joined to each other at their ends. All the muscle cells in cardiac muscle have striations. Though it resembles the striated in its structure, it is an involuntary muscle. Presence of intercalated disks is the characteristic feature of cardiac muscle.

### Nervous Tissue

If you put your fingers in a glass of hot water, how do you feel?

How would you know the water is hot or cold? If you put your leg on a sharp edged stone while walking, how will you feel?

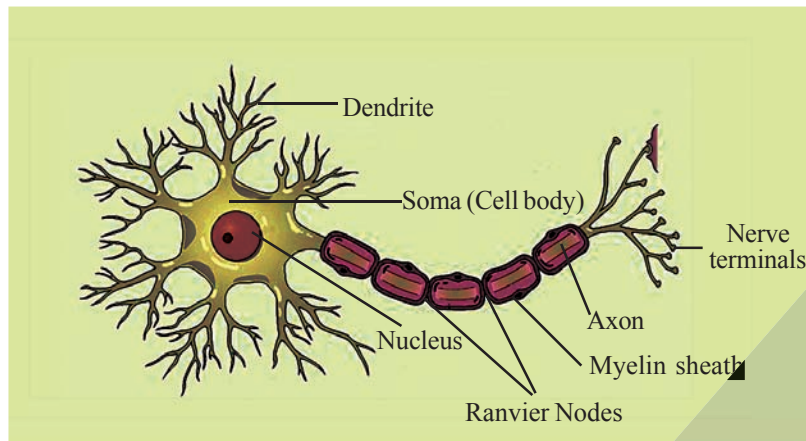
The feelings like the above situations is because of specialized mechanism in our body. It works like electric current passing through wires. Brain, spinal cord and nerves play active role in this mechanism.

### Activity-6

Collect a slide of nerve cells from the slide box. Observe it under microscope. Write your findings

Nerve cells are the only cells in the body which do not have the ability of regeneration. These are very specialized cells. No two neurons or nerve cells in the nervous system have same appearance.

Cells of nervous system are highly specialized for transmitting the stimulus rapidly from one place to another within the body. We can identify 3 distinct parts in nerve cells. They are 1. Cell body or cyton 2. Axon 3. Dendrites



**Fig-17 Nerve cell**

Cell body or cyton has a large nucleus and cytoplasm. The cytoplasm contains granular structure called Nissal's granules.

There are some projections arising from cell body. These are called dendrite. They are sharp, branched, more in number. One projection of the cyton is somewhat longer than remaining projections. This is

called axon. Some nerve cells have axon covered with sheath like structure. This sheath is called as Myeline sheath. Gaps or nodes present at regular intervals on myeline sheath are known as Ranvier Nodes.

Axon of a nerve cell is connected with Dendrites of a near by nerve cell to form a web like structure throughout body.



### Key words

***Epithelial tissue, Connective tissue, Insulator, Bone marrow, bone, cartilage, Muscle tissue, Nerve tissue, Ranvier nodes, Blood groups.***



### What we have learnt?

Tissue is a group of cells similar in structure and functions.

- Animal tissues can be epithelial, connective, muscular and nervous tissue.
- Depending on shape and function, epithelial tissue is classified as squamous, cuboidal, columnar, ciliated and glandular.
- The blood consists plasma, RBC, WBC, Platelets.
- The different types of connective tissues in our body include areolar tissue, adipose tissue, bone, tendon, ligament, cartilage and blood.

Striated, unstriated and cardiac are three types of muscle tissues.

Nervous tissue is made of neurons that receive and conduct impulses.





## Improve your learning

1. What do you understand by the term tissue? (AS1)
2. What is the specific function of the cardiac muscle? (AS1)
3. Differentiate between striated, unstriated muscles on the basis of their shape and site / location in the body. (AS1)
4. Name the following. (AS1)
  - a) Tissue that forms the inner lining of our mouth.
  - b) Tissue that connects muscle to bone in humans.
  - c) Tissue that transports food in animals.
  - d) Tissue that stores fat in our body.
  - e) Connective tissue present in the brain.
5. Identify the types of tissue in the following: Linings of the organs; skin, bone, internal lining of kidney tubule. (AS1)
6. If you touch at elbow, you get a shock like feeling. Why? (AS 7)
7. Why the blood is called a connective tissue.(AS1)
8. What happens, if the platelets are not present in the blood? (AS2)
9. Show the difference between the three types of muscle fibres with diagrams. (AS3)
10. Write the procedure to identify your blood group with the help of kit? (AS 3)
11. Collect the old blood reports of your friends / relatives and prepare a project report on the contents of the blood (AS 4)
12. Draw a neatly labelled diagram of a neuron. (AS 3)
13. Ramu felt weak. Ramu's father took him to hospital. The doctor advised a blood test. The report says that he does not have the required levels of haemoglobin. What are its ill effects? (AS 6)
14. How is blood test useful to diagnose the disease. Explain with a daily life situation.(AS 7)