

TRANSPORTATION IN LIVING ORGANISMS

13.1 Absorption of Water and Minerals and Transportation of Food in Plants

Water and minerals are absorbed from the soil by the roots of plants. These are transported to different parts of the plant through the stem. You know that in our towns and villages, water is transported through pipelines. Do you think plants have similar pipelines by which, the water absorbed by the roots, is transported to the leaves? You have read about xylem and phloem in plants. Let us see how plants absorb water and how water, minerals and food formed in leaves are transported.

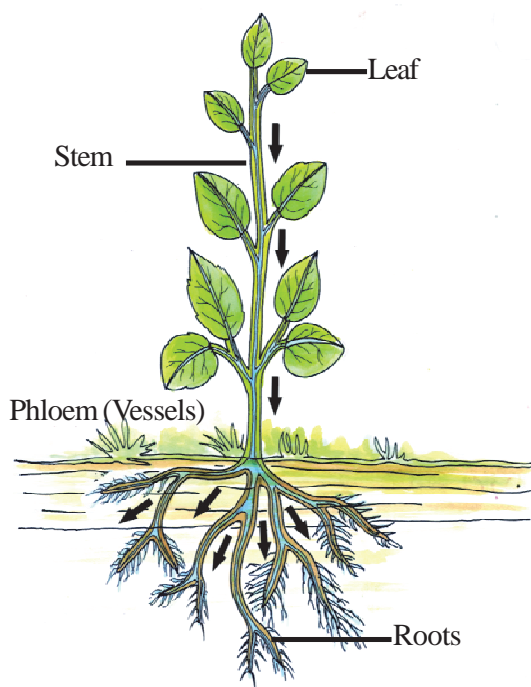


Fig.13.1. Mineral Transportation in Plants

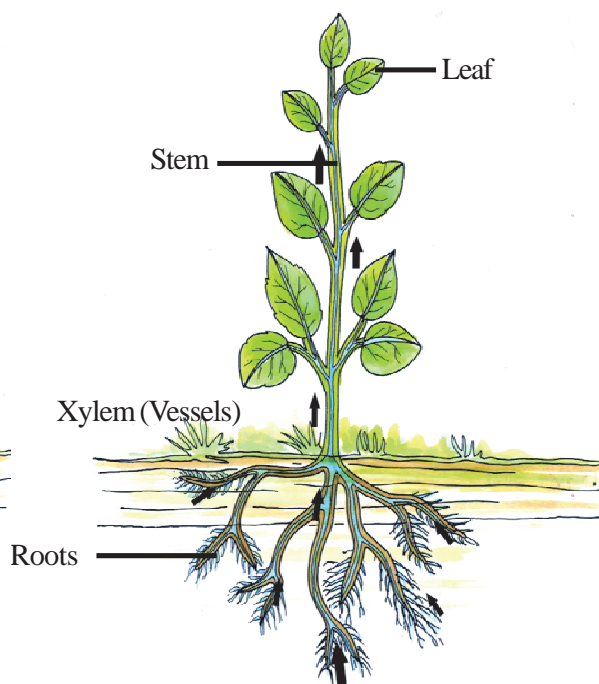


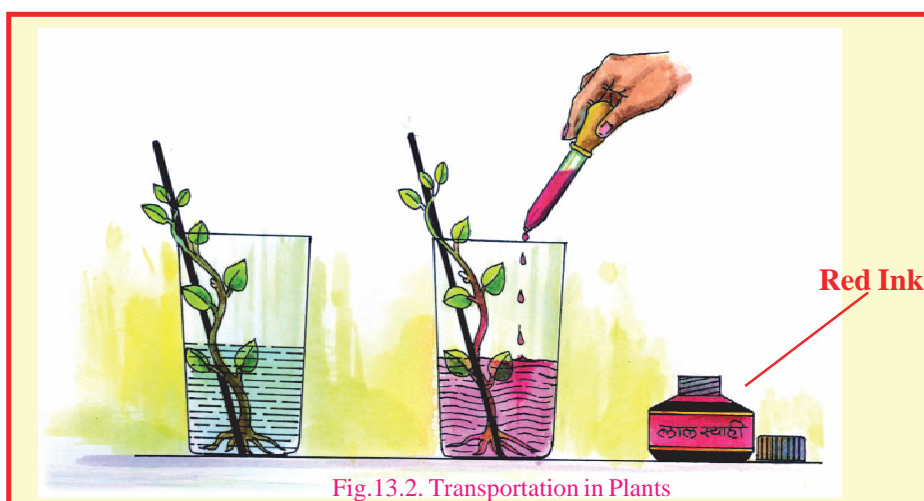
Fig.13.1a. Water Transportation in Plants



Activity - 1

Materials required :- Glass, saffron colour or eosin or red ink, soft stem of *balsam* or *chiraiya*, sharp blade, slide, microscope.

Mix some drops of safranin or eosin or red ink in the glass of water. Place the branch of the plant, which has a soft stem like *balsam* or *chiraiya* in the coloured water. (fig.13.2) After approximately an hour, cut thin sections of the stem, put the thinnest section on the slide, and observe it through a microscope. Which part of the section appears to be red? Compare it with fig.6.4. and identify it.



Take a leaf from the branch, which had been kept in coloured water, cut thin sections of it and compare it with the coloured portion of the section of the stem. You will see that the coloured part seen in the section of the stem is xylem. Try to locate the position of xylem with the help of fig 6.4.



Activity - 2

Required Materials : - Take Two branches of a plant with hard stem like China rose or peepal, sharp blade or knife, glass bottle.

Cut out the bark of branch 'a' in the form of a ring so that only the inner tissue is left as shown in fig.13.3. With the help of a needle or a pin, destroy the inner tissues of the branch 'b' so that only the bark is left. Now place the two branches in two separate bottles full of coloured water. Observe the branches for 24 hours every 2-3 hours and answer the following questions:

1. What difference can be seen between the leaves of the two branches?

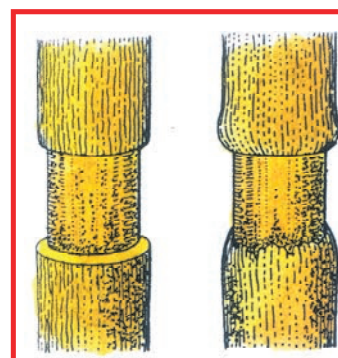
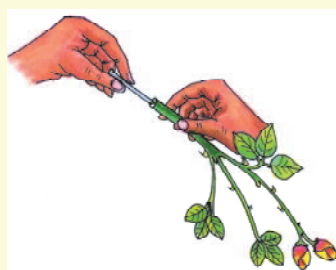
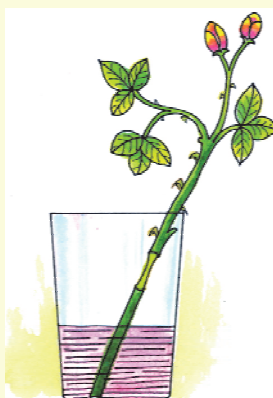


Fig.13.3 Branch 'a'



Branch 'b'



Branch 'a'



Branch 'b'

Fig. 13.3

2. Cut the tops of both the branches and observe the differences between their tissues.
3. Observe the differences between the two branches on the next day.
4. What could be the reason for the difference?

As you can see on the basis of fig.13.3, the phloem lies in the outer region i.e., in the bark, whereas the xylem lies in the inner, hard region. When we damage the bark of the branch 'a' its phloem too gets damaged while the xylem, which is inside, is left intact. Similarly, in branch 'b' phloem remains undamaged in the bark and only the xylem is damaged. This is why the leaves of branch 'a' are fresh on the next day while leaves of branch 'b' are wilted.



Activity - 3

Materials required :- Cut the stems of some weeds, as described in activity 2, study them regularly for 15 days and note the changes.

You might have seen or heard that when the leaves of wheat or rice crops start turning yellow, farmers apply fertilizer and water to save the crops because minerals present in the fertilizer reach to the different parts of the plant with the water and the leaves start making food.

We eat potatoes, carrots, radishes, turnips etc. All these are actually formed from the food materials, manufactured in the leaves. These food materials are transported through the phloem and get stored in the under ground parts of the plant. Now, it must have become clear to you that vascular tissues involved in transportation are in fact the pipelines of the plants. Water travels through the xylem and the food materials are transported to different parts of the plant through the phloem.



Answer these

1. Why is it necessary to water the plants after applying fertilizers to the fields and gardens?
2. In the plants of potatoes and sweet potatoes-
 - a. In which part of the plant is the food prepared?
 - b. Where is the food stored?
 - c. Which part transports the food?
3. What is the importance of transportation in plants?

13.2 Transportation in Animals

All living organisms need energy for their life activities. They get this from food. Food digested by the digestive organs is circulated to all parts of the body. The waste materials are transported to the excretory organs. In the same way, all organs of the body require oxygen for respiration. Carbon dioxide produced in respiration is harmful for the body, so it should be removed from the body. This means that transportation of different materials keeps taking place in the body of living organism in some way or the other. Let us see whether this transportation takes place in the same way for all living organisms or different methods are adopted for this.

You know that some living organism eg. Amoeba, paramecium etc. are so small that they can be only seen under a microscope. Since most of the unicellular micro-organism live in water therefore, different materials are ingested and excreted from their body by diffusion.

13.2.1. Blood Circulation in Human Being

In human beings, blood transports different materials. Let us see what blood is and how it reaches to the different parts of the body.

We know that blood is a connective tissue. It is not merely a fluid. If we spread a drop of blood on a slide and observe it under a microscope, we see many particles in it. Actually these are cells, which float in the plasma. Plasma is the liquid part of the blood that contains 92% of water; remaining 8% is made up of food materials, waste materials and minerals. Which are transported by the blood. Blood cells are of mainly of three types (diagram 13.3a) :-

1. **Red blood corpuscles:** - These cells are red in color, small in size and are very large in number; they impart the red colour to the blood. The red colour of the red blood cells is due to the presence of haemoglobin. If the number of red blood cells in the body is high then it can absorb more oxygen.
2. **White blood corpuscles:** - These cells are colorless, big in size and less in number. If bacteria virus or any other external material enter the body, the white blood cells destroy them. Thus they protect our body.
3. **Platelets:** - You would have seen that when we are injured, blood starts to flow. If the blood drop falls on the floor then it clots after some time. In the same way blood clots on the wound. The reason behind the clotting of blood is the presence of platelets. These are also a type of cells and are less in numbers as compared to red blood cells.

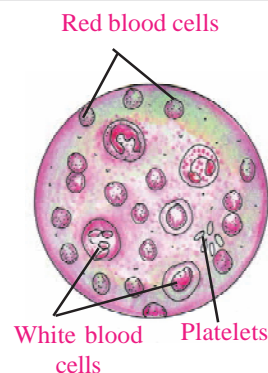


Fig.13.3a. Connective Tissue (Blood)

Sometimes, due to an accident or illness, there is a deficiency of blood in the body on such occasions blood is transfused from the body of a healthy person to protect the life of the patient. This is called blood donation or blood transfusion. The person, who donates blood is called donor and who accepts blood is called recipient. But the donation of blood is not easy. The donor and the recipient must have the same blood group.

In the previous classes, you have studied about heart, veins and arteries. Heart is the main part of the transportation (circulation) system. Oxygenated blood flows out of heart through the arteries. As the branches of arteries spread in tissues they become narrower and thinner, and are known as blood capillaries. (Fig.-13.4).

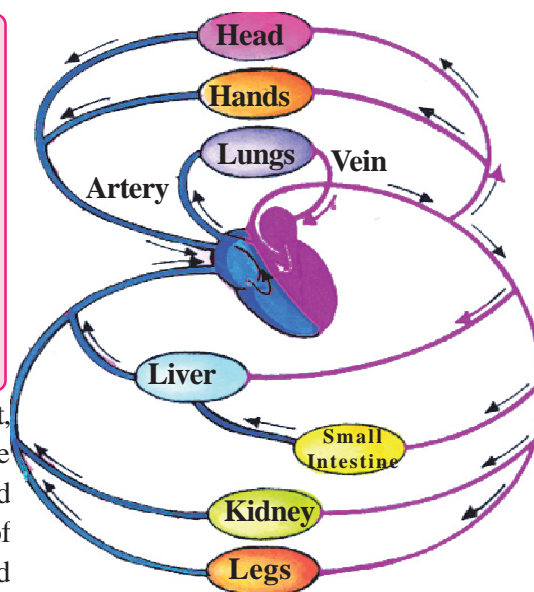


Fig.13.4 Diagram of blood transportation in human being

These blood capillaries, pass between cells and when blood comes in contact with cells. This leads to an exchange of materials. These blood capillaries join together to form thicker pipes, which are known as veins. Veins transport de-oxygenated blood from different parts of the body to the heart.

There are different ways of transportation in multi-cellular and non-chordate animals. Generally, these animals do not have heart and blood vessels like humans. So the blood in these animals is directly in contact with cells. This is called open blood circulatory system. In all chordate animals blood is pumped by the heart and flows in vessels. This is called closed circulatory system.

Let us see, the difference between veins and arteries:-

Difference between Veins and Arteries

Arteries		Veins	
1.	Walls of arteries are thick.	1.	Wall of veins are thin.
2.	These are narrow from inside.	2.	These are wider.
3.	Due to thick walls, they do not collapse even if blood is not present.	3.	Due to thin walls, they collapse when empty.
4.	The blood flows fast and in a jerky manner.	4.	Blood flow is slow and constant.

When the doctor holds your hand to check the pulse, he/she actually counts the number of jerks, caused by the flow of blood in the arteries. You can also feel them. You might have also heard about blood pressure. This is the pressure of blood in arteries and is measured by a special device. High or low blood pressure can be dangerous. Tension, presence of excess fats and lack of physical work and proper exercise can result in change in blood pressure.

Let us perform an activity to study the flow of blood through arteries.



Activity - 4

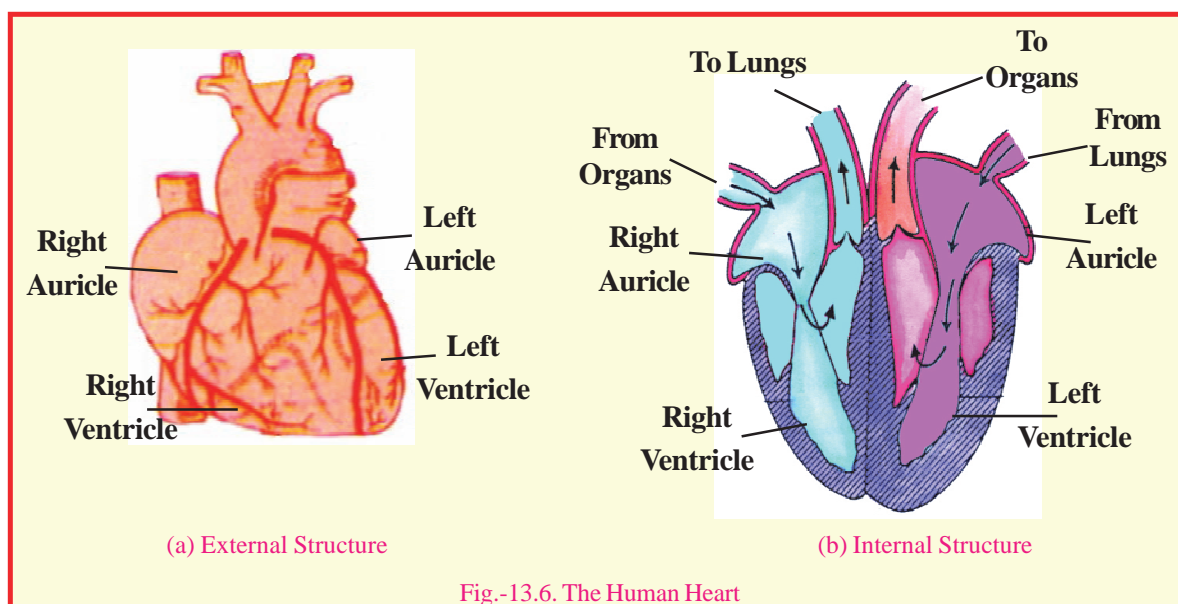
Place the middle and index finger of your right hand on the inner side of your left wrist (fig.13.5). Can you feel same throbbing movements? This throbbing is called the pulse and it is due to the blood flowing in the arteries. Count the number of pulse beats in one minute. The number of beats per minute is called the pulse rate. A resting person usually has a pulse rate between 72 and 80 beats per minute. Find other places in your body where you can feel the pulse.

Record your own pulse beats per minute and four of your classmates. Compare the values you obtained, and discuss in your class

You know that heart is towards the left side of the chest cavity. The size of heart is nearly equal to the closed fist. A double-layered membrane covers the heart. In between these two membranes, there is a liquid, which protects the heart from shock or accident.



Fig. 13.5 Pulse in the wrist.



The heart is made up of cardiac muscles and works continuously. It is divided into two parts by a muscular septum. Each part is again divided into two parts; the upper two parts are known as auricle/ atria (singular-atrium) and the lower ones as ventricles (Fig.13.6).

Oxygenated blood coming from lungs is collected in the left ventricle and is circulated to all body parts through arteries. Deoxygenated blood from the whole body is collected in the atrium through veins and is again transported to the lungs for oxygenation.



Answer these

1. How many types of blood corpuscles are there? Write their functions.
2. What do you mean by open and closed blood circulation?
3. What do you mean by blood donation?
4. What are the differences between veins and arteries ?
5. What do you understand by pulse rate?



We have learnt

- In plants the transportation of water and minerals takes place through vascular tissues.
- Water and minerals absorbed by the roots of plants, are transported to different parts of the plant through xylem.
- Food manufactured by the leaves, is transported to different parts of the plant through phloem.
- Transportation of materials in unicellular organisms takes place by diffusion.
- Multi-cellular, non-chordate animals have open blood circulation.
- All chordate animals have closed blood circulation system.

- Human heart is divided into four chambers with the help of muscular septum. Upper two chambers are called atria and lower two chambers are called ventricles.
- Heart is made of cardiac muscles, which work continuously.
- If there is deficiency of blood in the body due to some accident or illness, then blood is transferred from some other person. This is called blood transfusion.
- Pressure of blood in arteries is called blood pressure.



Questions for practice

1. Choose the correct answer-

1. **Transportation in unicellular animals is**
 - (a) by closed transportation
 - (b) by absorption
 - (c) by diffusion
 - (d) by distillation
2. **Transportation in human beings is**
 - (a) through water
 - (b) through muscles
 - (c) through nerves
 - (d) through blood
3. **Main part of blood transportation system in human beings is**
 - (a) heart
 - (b) Capillaries
 - (c) Arteries
 - (d) Veins
4. **In non-chordate animals, circulation of blood is**
 - (a) closed circulation
 - (b) open circulation
 - (c) Both open and closed circulations
 - (d) none of these
5. **The meaning of deficiency of blood in the body of a human being is-**
 - (a) deficiency of blood in the body
 - (b) deficiency of plasma in blood
 - (c) deficiency of white blood cells in blood
 - (d) deficiency of haemoglobin in red blood cells

2. Fill in the blanks:-

1. When we cut the bark of a stem then with itis also destroyed along with it.
2. Blood is atissue.
3.help in clotting of blood.
4. Oxygenated blood is circulated to all body parts through
5. blood is brought to the heart from all body parts through veins.

3. Write the answers to the following questions:-

1. What is the role of lungs in the blood circulatory system?
2. What will happen if the capacity of the cardiac muscles to contract and relax gets weakened?

3. What will be the effect of the following situations on the growth of the plant? If
1. Xylem of plant A is damaged.
 2. Bark of plant B is infected.
 3. Appropriate fertilizer and water are provided to plant C.
 4. Appropriate fertilizer and water are sprinkled only over the leaves of plant D.

4. Correct the following statements :-

1. Chordate animals have open blood circulation.
2. Blood donation is required for saving the life of a healthy man.
3. Pressure of blood in veins is called blood pressure.
4. Capillaries join together to make small vessels.



Do these also

Visit, along with your parents or teachers, the blood donation camps organized in your school, locality or in different health centers. Collect information from newspapers, magazines etc. about blood donation. Paste this in your scrapbook, and discuss it in your class.

