Transportation in Plants and Animals

Introduction

In the body of majority of animals, substances are transported from one part of the body to another through blood. Thus blood is the "tissue for transport" and circulates throughout the body. Circulatory system consists of organs, which make blood circulate throughout the body. Blood transports nutrients, respiratory gases, hormones and waste material from one part of the body to another.

Human circulatory system consists of

Centrally located muscular pump called **heart**, and **blood vessels**, which are tube-like structures, connected to the heart.

Blood vessels are of three kinds:

- ✓ **Arteries:** Carry blood from heart to various parts of body.
- ✓ **Veins:** Bring blood from various parts of body to the heart.
- ✓ **Capillaries:** Thin vessels between the artery and the vein. The capillaries allow the exchange of materials between blood and tissues.

Blood

Blood is a connective tissue that circulates throughout the body. It is made up of a fluid medium called **plasma** in which three types of **blood cells** called red blood cells, white blood cells and blood platelets are present. Blood cells are manufactured in the bone marrow.

Functions of blood:

(i) The digested and absorbed nutrients like glucose, amino acids, fatty acids are first transported to the liver and then to all the tissues for their storage, oxidation and synthesis of new substances.

(ii) The respiratory gases (oxygen, carbon-dioxide) are transported by the blood. Oxygen is transported
from the respiratory surface (lung, skin and buccal cavity) to the tissues and carbon dioxide is exchanged.

(iii) Blood forms a clot at the site of injury and thus prevents the further loss of blood.

(iv) The blood flows in all the parts of body, so it equalizes the body temperature. It carries heat from one place to another place in the body.

(v) The WBCs engulf the bacteria and other disease causing organisms by phagocytosis.

(vi) Different wastes from the different parts of the body are collected by the blood and then taken to the organs (kidneys, lungs, skin and intestine) from where they are excreted.

a) **White Blood Corpuscles (WBCs) or Leucocytes:** The number of leucocytes is comparatively fewer i.e. one ml of blood contains 5000 -10000 leucocytes in humans. These are large in size and contain nucleus. Since they carry no pigments, therefore, they so are colourless WBC have irregular shape. They prevent body from infections by eating up germs or by producing antibodies.

b) **Blood platelets:** These are small and without nuclei. These help in blood clotting at the site of injury.

Blood Vessels

Blood flows through narrow pipe-like structures in the body, known as **blood vessels.** These blood vessels transport food, oxygen and waste within the body.

Blood vessels are of two types

a) **Arteries:** They transport oxygen-rich blood from the heart to the other parts of the body. The blood in the arteries is bright red in colour. Blood flows through the arteries at high pressure, because of which the arteries have thick elastic walls. When an artery is cut, blood rushes out immediately.

The arteries divide into smaller vessels when they enter an organ, and further divide into thin tubes called **capillaries.** These capillaries supply oxygen and nutrients to the tissues and also collect **waste** and **carbon dioxide.**

b) **Veins:** They carry blood low in oxygen content. Veins have valves that allow blood to flow in one direction – towards the heart – only. Veins have thin walls. That is why when a vein is cut, blood comes out slowly and continuously. A number of **capillaries** together form a vein.

Differences between Arteries, Veins and Capillaries

Arteries	Veins	Capillaries
1. Thick-walled with narrow lumen.	1. Thin-walled with broad lumen.	1. Thin-walled with narrow tubes and narrow lumen.
2. Blood flows from the heart to other body parts.	2. Blood flows from the body organ towards the heart.	2. Capillaries join artery with the vein and form a network within the body.
3. Supplies blood to body organs.	3. Collects blood from body organs and brings it back to heart.	3. Helps in exchange of food, oxygen and carbon dioxide between blood and tissues.
4. Situated deeper under the skin.	4. Situated just under the skin.	4. Situated very deep within the organs.
5. Carries oxygenated blood (except pulmonary arteries).	5. Carries deoxygenated blood (except pulmonary veins).	5. Carries both types of blood.

Structure of Heart:

Heart is a powerful muscular organ lying between lungs in the upper part of thorax of our body. Human heart is four-chambered- two (right and left) atria (*sing.* atrium, also called auricles) and two (right and left) ventricles. The heart is made of specialised muscle cells (also called cardiac muscle fibres), which contract and relax all the time without getting tired.

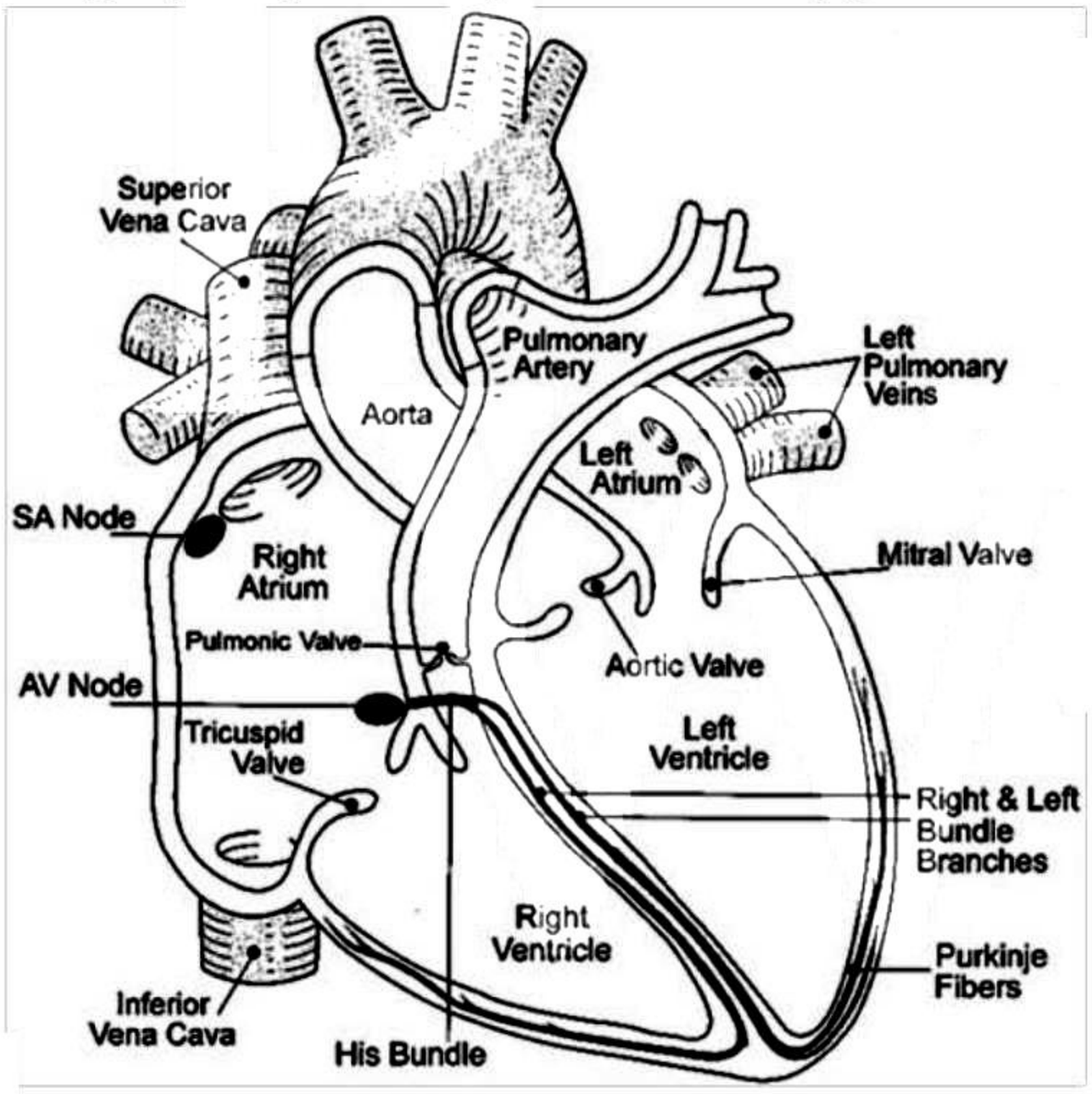
- ✓ There are four valves in the heart which control the direction of blood flow in the heart and into the blood vessels. They open and close about 100,000 times a day.
- ✓ The two upper chambers which are the **atria** and the two lower chambers called **ventricles** are separated by a partition called the **septum.**
- ✓ A tricuspid valve guards the opening of right atrium into right ventricle.

- ✓ A bicuspid valve guards the opening of left atrium into left ventricle.
- ✓ Blood rich in oxygen is pumped out from the left ventricles to all parts of the body.

- ✓ Blood rich in carbon dioxide is pumped out from the right ventricle to the lungs through the **pulmonary artery.** It is the only artery in the human body that carries carbon dioxide-rich blood.
- ✓ The **pulmonary vein** is the only vein in the body that carries oxygen-rich blood.

Working of heart and circulation of blood

- ✓ When both atria and ventricles are relaxed the atria gets filled with blood. The right atrium receives deoxygenated blood from various parts of the body and the left atrium receives oxygenated blood from lungs by pulmonary veins.
- ✓ Now both atria contract simultaneously and their cuspid valve opens up. Blood from left atrium comes into the left ventricle and from right atrium into right ventricle.
- ✓ Both the atria relax and ventricles contract. The cuspid valves closes and semilunar valves open up.
- ✓ The oxygenated blood from left ventricle is pumped into aorta and is distributed to all body parts by arteries.
- ✓ The deoxygenated blood from right ventricle is pumped into pulmonary aorta and is transported to lungs by the pulmonary arteries for oxygenation.



Human Heart

Transportation in Plants

- ✓ Plants make their own food by taking in carbon dioxide from the air, minerals and water from the soil. They release oxygen and water vapour, and the process is termed photosynthesis. Plants get energy from the food to perform the vital activities. Food and water is transported to various cells in the body.
- ✓ Plants take in water through their roots. All roots have a root cap to protect the tender root tip from getting damaged by the soil particles. When the plants grow, the root branch gets fixed in the soil.
- ✓ At the root tips, there are a large number of cells that absorb water and nutrients from the soil. The amount of water absorbed is proportionate to the number of root hairs. As

the number of **root hair** increases, the surface area also increases, and the plant absorbs more water and minerals.

Xylem and Phloem

- ✓ There are pipe-like vessels in plants through which water and minerals enter. Each vessel is made up of thick walls and elongated cells.
- ✓ A tissue is a group of cells that performs a specialised function in organisms. These are commonly known as conducting tissues.

- ✓ The conducting tissues are of two types. They are xylem and phloem. These tissues form a continuous network within the plants, and spread across the roots, stem, branches and leaves.
- ✓ The xylem carries water and nutrient minerals from the roots to the leaves.
- ✓ The phloem carries food from the leaves to various parts of the plant.
- ✓ **Transpiration Process:** By the force of suction, water and nutrients are transported to all parts of a plant. Water and minerals reach the leaves and use only a small amount to make food. There are small pores, called the stomata, on the lower surface of the leaves through which excess water is released in the form of water vapour. The process of releasing water vapour from the leaves into the atmosphere through the stomata is called transpiration.
- ✓ Transpiration increases the moisture content in the atmosphere and cools the surroundings. Suction develops in the plant when water from the leaves is lost in the form of water vapour. This force is used to absorb more water and minerals. The suction force is also known as the **transpiration pull.** It is strong enough to draw water even in tall trees.