



# LIFE PROCESSES



## Concepts Covered

- Basic concepts of Transportation

## Introduction

The existence of life is mainly based on certain functions and processes, like some maintenance processes. These processes are essential even if an organism is resting or sleeping. They are necessary for survival. Such processes are called life processes.

- Nutrition, respiration, circulation, and excretion are examples of essential life processes.
- In unicellular organisms, all these processes are carried out by a single cell.
- In multicellular organisms, well-developed systems are present to carry out the processes.

## Transportation

Human beings like other multicellular organisms need a regular supply of food, oxygen, etc. This function is performed by a circulatory system or transport system.

### Transportation in Human Beings:

The circulatory system is responsible for the transport of various substances in human beings. It is composed of the heart, arteries, veins, and blood capillaries. Blood plays an important role in transporting substances.

**Heart:** The heart is a muscular organ situated in the middle of the thorax and is composed of cardiac muscles. It is so small that, it can fit inside an adult's wrist. The heart is a pumping organ that pumps blood. The human heart is composed of four chambers, viz. right atrium, right ventricle, left ventricle, and left atrium.

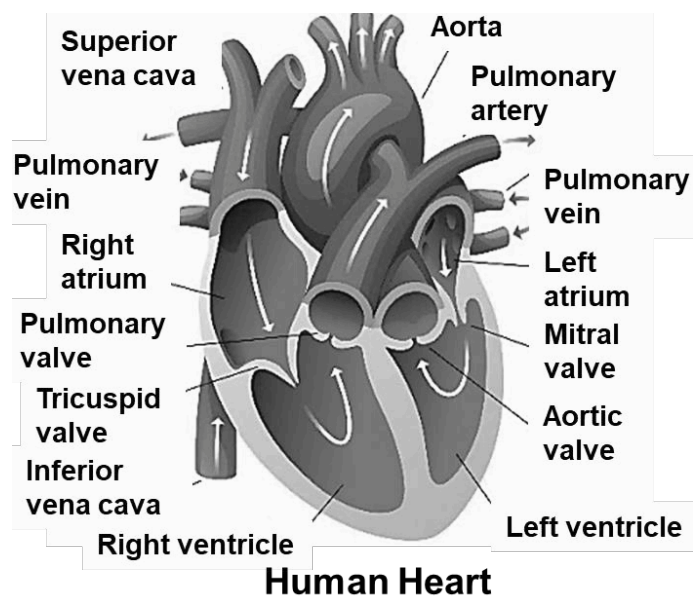
Auricles are the upper chambers and receive blood while ventricles are distributing chambers that help in the distribution of blood to other parts of the body.

**Systole:** Contraction of cardiac muscles is called systole. Blood is pushed away during the systolic phase.

**Diastole:** Relaxation of cardiac muscles is called diastole. Blood is received during the diastolic phase.

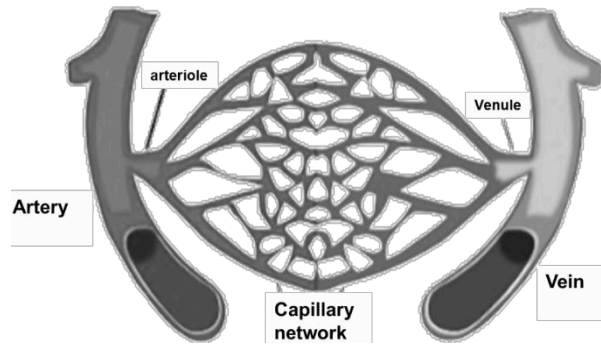
## Blood vessels

**(1) Arteries:** These are thick-walled blood vessels that carry oxygenated blood from the heart to different organs. Pulmonary arteries are exceptions because they carry deoxygenated blood from the heart to the lungs, where oxygenation of blood takes place.



**(2) Veins:** These are thin-walled blood vessels that carry deoxygenated blood from different organs to the heart, pulmonary veins are exceptions because they carry oxygenated blood from the lungs to the heart. Valves are present in veins to prevent the backflow of blood.

**(3) Capillaries:** These are the blood vessels that have single-celled walls and they are present near tissues. Blood flows with very less speed which makes diffusion better.



## Blood:

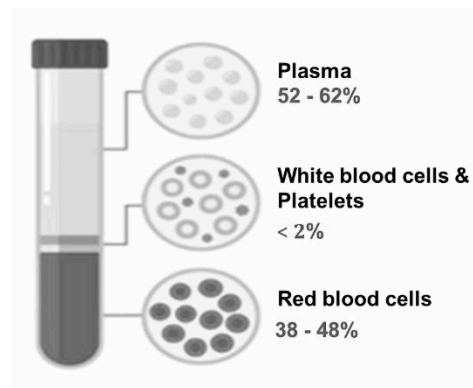
Blood is a connective tissue that plays the role of the carrier for various substances in the body. Blood is composed of plasma and Blood cells.

**(1) Blood plasma:** Blood plasma is a pale-colored liquid that is mostly composed of water. Blood plasma forms the matrix of blood.

**(2) Blood cells:** There are two types of blood cells, viz. red blood cells (RBCs), white blood cells (WBCs), and platelets (thrombocytes).

(a) Red Blood Corpuscles (RBCs)/ Erythrocytes: These are red because of the presence of haemoglobin which is a pigment. Haemoglobin readily combines with oxygen and carbon dioxide. The transport of oxygen happens through haemoglobin. Some part of carbon dioxide is also transported through haemoglobin.

(b) White Blood Corpuscles (WBCs)/ Leucocytes: These are pale white. They play important role in immunity.



(c) Platelets/ Thrombocytes: Platelets are responsible for blood coagulation. Blood coagulation is a defense mechanism that prevents excessive loss of blood, in case of an injury. Excessive loss of blood results in a decrease in blood pressure and thus will affect the normal functioning of the heart.



**Blood is thicker and slightly heavier than water. Its pH ranges from 7.35 to 7.45 (slightly alkaline).**

## Lymph:

- It is a yellowish fluid that escapes from the blood capillaries into the intercellular spaces.
- It contains fewer proteins than blood.
- It flows from the tissues to the heart which helps in transportation and destroying germs.
- It carries digested and absorbed fat from the intestine and drains excess fluid from the extracellular space back into the blood.

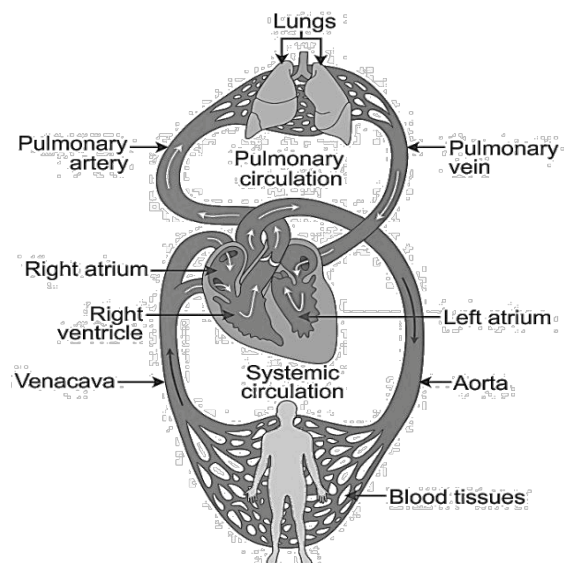
## Blood circulation:

In the human heart, blood passes through the heart twice in one cardiac cycle. This type of circulation is called double circulation. One complete heartbeat in which all the chambers of the heart contract and relax once is called the cardiac cycle. The heart beats about 72 times per minute in a normal adult. In one cardiac cycle, the heart pumps out 70 mL of blood and thus, about 4900 mL of blood in a minute.

Double circulation ensures complete segregation of oxygenated and deoxygenated blood which is necessary for optimum energy production in warm-blooded animals.

**(1) Pulmonary Circulation:** The pulmonary circulation is maintained by the right portion of the heart. It begins in the right ventricle which expels the blood into the pulmonary trunk. The blood flows into the vascular system of the lungs becomes oxygenated and returns to the left atrium through the pulmonary veins.

**(2) Systemic Circulation:** This circulation is maintained by the left ventricle which sends the blood into the aorta and from the aorta it is transported throughout the body. Two of the several sub-divisions of the systemic circulation: (a) coronary (cardiac) circulation (b) hepatic portal circulation.



**Blood Circulation**

BLOOD PRESSURE CATEGORY	SYSTOLIC mm Hg (upper number)		DIASTOLIC mm Hg (lower number)
NORMAL	LESS THAN 120	and	LESS THAN 80
ELEVATED	120 – 129	and	LESS THAN 80
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 1	130 – 139	or	80 – 89
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 2	140 OR HIGHER	or	90 OR HIGHER
HYPERTENSIVE CRISIS (consult your doctor immediately)	HIGHER THAN 180	and/or	HIGHER THAN 120



**BLOOD PRESSURE:** The force that blood exerts against the wall of a vessel is called blood pressure. This pressure is much greater in arteries than in veins. The pressure of blood inside the artery during ventricular systole contraction is called systolic pressure and pressure in an artery during ventricular diastole relaxation is called diastolic pressure. The normal systolic pressure is about 120 mm of Hg and diastolic pressure is 80 mm of Hg.

## Transportation in plants:

Plants have specialized vascular tissues for the transportation of substances. There are two types of vascular tissues in plants.

(1) Xylem (2) Phloem

### (1) Xylem:

Xylem is responsible for the transportation of water and minerals. It is composed of tracheids, xylem vessels, xylem parenchyma, and xylem fiber. Tracheid and xylem vessels are the conducting elements. The xylem makes a continuous tube in plants that runs from roots to stem and right up to the veins of leaves.

Carry water and minerals from the leaves to the other part of the plant.

**Transpiration pull:** Loss of water vapor through stomata and lenticels, in plants, is called transpiration. Transpiration through stomata creates a vacuum which creates a suction, called transpiration pull.

The transpiration pull sucks the water column from the xylem tubes and thus, water can rise to great heights in even the tallest plants.

The various forces that help in the transportation of water are:

#### (i) Ascent of sap:

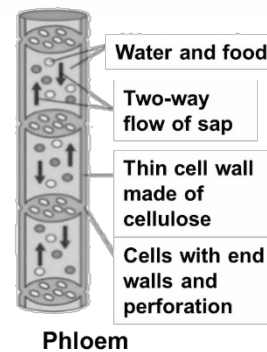
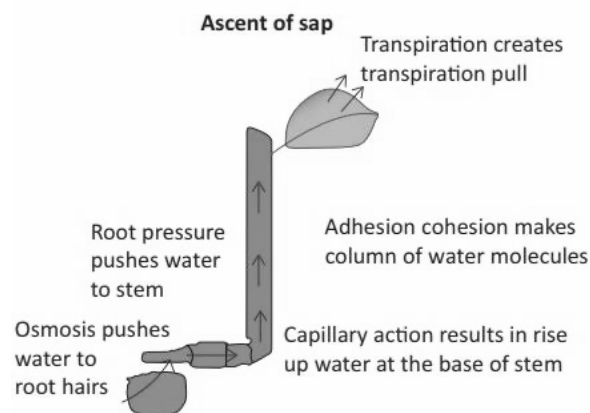
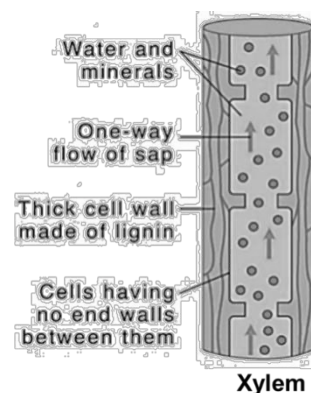
The upward movement of water and minerals from roots to different plant parts is called the ascent of sap.

#### (ii) Root pressure:

Water along with mineral ions is pushed up by the cells of the root. This is significant in small-sized plants.

### (2) Phloem:

- Phloem is responsible for the transportation of food.
- Phloem is composed of sieve tubes, companion cells, phloem parenchyma, and bast fibers. Sieve tubes are the conducting elements in the phloem.
- Carries product of photosynthesis from roots to other parts of the plant.



The effect of root pressure in the transport of water is more important at night. During the day when the stomata are open, the transpiration pull becomes the major driving force in the movement of water in the xylem



### Check Your Concept - 1

- What will happen to a plant if its xylem is removed?
- Name the component of blood that helps in the formation of a blood clot in the event of a cut.
- State the functions of the following components of the transport system:
  - Blood
  - Lymph
- Explain the process of translocation.

## Solved Examples

**(1) Transport of food is bidirectional in plants. Explain how is food transported in plants?**

**Answer:** Food is transported in plants through phloem which consists of sieve tubes, sieve cells and companion cells. The food prepared in leaves in soluble form transported to leaves phloem. Active transport of food passes to all other parts of plants.

**(2) Give reason:**

**(a) Capillaries have very thin walls.**

**(b) Diffusion is insufficient to meet the oxygen requirements of multicellular organisms.**

**(c) Ventricles have thick muscular walls than auricles.**

**Answer:** (a) Capillaries have a very thin wall. This feature, enables nutrients and oxygen to pass and diffuse from the blood into the tissues. This thus enables waste products to diffuse out from tissues into the blood to be passed to the lungs, ultimately turning oxygen-rich again.

(b) Diffusion is insufficient to meet the oxygen requirement of multicellular organisms like a human because all the cells are not in direct contact with the environment and diffusion is a slow process. Diffusion is too slow to cover the distance between the gas exchange surface and the sites where oxygen is required.

(c) Ventricles have thicker walls than auricles because they have to pump blood to different organs and the pressure with which the blood flows through them is more than the auricles. Therefore, the walls are thicker in ventricles than in auricles.

**(3) (a) How is food transported in plants?**

**(b) Why is it necessary to separate oxygenated and deoxygenated blood in mammals and birds?**

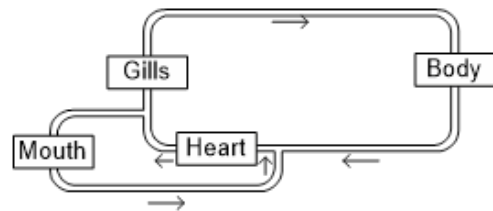
**Answer:** (a) Food is transported in plants through phloem which consists of sieve tubes, sieve cells and companion cells. The food prepared in leaves in soluble form transported to leaves phloem. Active transport of food passes to all other parts of plants.

(b) The separation of the right and left sides of the heart is useful to prevent oxygenated blood and deoxygenated blood from mixing. Such separation allows a highly efficient supply of oxygen to the body. This is useful in animals that have high energy needs, such as birds and mammals that constantly use the energy to maintain their body temperature.

## Exercise

### OBJECTIVE TYPE QUESTIONS

- (1) Which plant does tissue transport water and minerals from the roots to the leaf?  
(A) Xylem (B) Phloem  
(C) Parenchyma (D) Collenchyma
- (2) A blood vessel that pumps the blood from the heart to the entire body:  
(A) Artery (B) Capillary  
(C) Vein (D) Haemoglobin
- (3) Statements:  
(1) Carbonic anhydrase is present in the erythrocytes.  
(2) In erythrocytes the carbon dioxide combines with water and is transported.  
(A) Statement 1 is correct and is responsible for statement 2.  
(B) Statement 1 is not correct but statement 2 is correct.  
(C) Both statements 1 and 2 are wrong.  
(D) Statement 1 is correct but not involved in statement 2.
- (4) Mitral valve in mammals guards the opening between:  
(A) Right atrium and right ventricle (B) Left atrium and left ventricle  
(C) Right atrium and left ventricle (D) Left atrium and right ventricle
- (5) Diapedesis is:  
(A) Formation of pus (B) Bursting of WBC  
(C) Formation of WBC (D) Passage of WBC
- (6) The diagram depicts a circulatory system of certain air-breathing fish in which the blood gets oxygenated in the gills as well as in the mouth. In this type of fish:  
(A) Body received fully oxygenated blood while gills received partly oxygenated blood.  
(B) Both body and gills receive partly oxygenated blood.  
(C) Blood reaching the heart is fully deoxygenated.  
(D) Both body and mouth receive partly deoxygenated blood.



## Answer Key

### OBJECTIVE TYPE QUESTIONS

- (1) (A)
- (2) (A)
- (3) (A)
- (4) (B)
- (5) (D)
- (6) (A)