

# BIOLOGY

**Class 9th (KPK)**

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CLASS: \_\_\_\_\_ SECTION: \_\_\_\_\_

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## Chapter No.9

# Transport

### Q1. What is transport?

**Ans: Transport:**

**Definition:**

The movement of substances into and out of the body or cells of an organism is called transport.

**i. Transport in unicellular and simple multicellular organism:**

There is no special transport system or organs in unicellular organisms and less complex multicellular organism. Because their size is very small and the whole body of the organism is in contact with surrounding. So, in these organism transports occur directly through diffusion and osmosis.

**ii. Transport in multicellular organisms:**

The cells of multicellular organisms are far apart from the environment. Therefore, there exists a proper system for the transport of materials.

**Example:**

Transport in animals take place by blood circulatory system.

Transport in higher plants take place by vascular systems. i.e. xylem and phloem

**Xylem:** Transport water and dissolved minerals from root to plant body.

**Phloem:** Transport prepared food from leaves to other part of the plant body.

**Importance:**

Each and every cell of the body needs food and oxygen and also needs to remove the waste products; it produced during its metabolic activities.

### Q2. Describe transport in plants?

**Ans: Transport:**

**Definition:**

The movement of substance into and out of the body or cells of an organism is called transport.

**Transport in lower plants:**

Lower plants like bryophytes and mosses have direct contact with water. These cells absorb water directly by diffusion therefore they have no proper system for the transport of materials.

**Transport in Higher plants:**

Higher plants anchored in the soil and can transport many substances that needed for their growth like water and minerals for metabolism, CO<sub>2</sub> for photosynthesis, O<sub>2</sub> for respiration.

- Water and dissolved salts are transported from the roots to the shoot through the xylem tissue.
- Prepared food from leaves is transported to all parts of the body through phloem.

**Absorption of water and salt:**

Water is a best solvent and medium of transport. It dissolves many substances like minerals and salt. Root absorbs water from the soil by the process of diffusion.

**a. Root hairs:**

Root hairs provide large surface area for absorption. They grow out into the space between soil particles where they are in direct contact with the water. The cytoplasm of the root hairs has higher concentration of salts than the soil water. So, water move by osmosis into the root hairs.

**b. Epidermis:**

From the root hairs, water goes by osmosis to the other cells of epidermis.

**c. Cortex:**

From epidermis, salts and water move to the cortex of root. It is present just below the epidermis.

**d. Endodermis:**

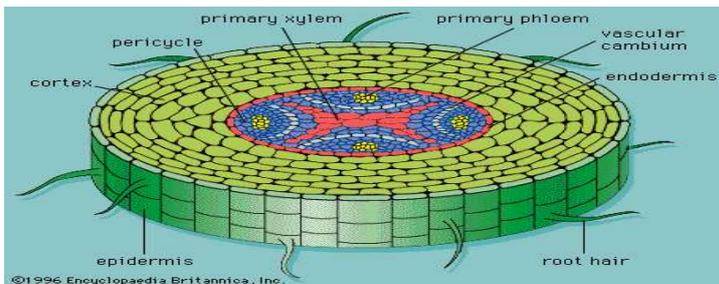
The innermost boundary of the cortex is the endodermis.

**e. Pericycle:**

The water and salts move to a narrow layer of cells called pericycle.

**f. Xylem:**

After crossing the pericycle, water and salts enter in xylem tissue. This water is carried by xylem to all other parts of the plants body.



**Q3: What is transpiration? Discuss transpiration from leaves?**

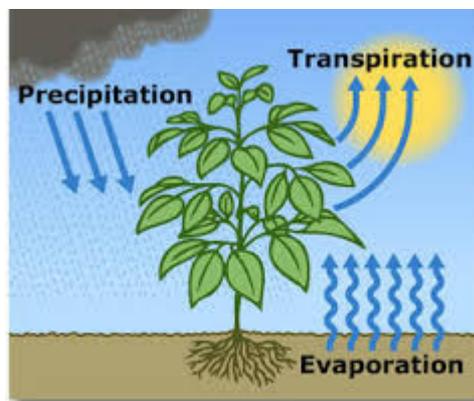
**Ans: Transpiration:**

**Definition:**

The loss of water in the form of water vapours from aerial parts of plant body is called Transpiration. This loss may occur:

- Through Stomata in leaves
- Through cuticle present on leaf epidermis
- Through special openings called lenticels present in the stems of some plants.

Transportation occurs mainly through the special openings present in leaf epidermis. These opening are called stomata. About 90% transpiration occur through stomata. In leaves, water is present in xylem tissues. This water moves to the cell walls of mesophyll cells. From the moist walls of mesophyll cells, water evaporates into the air spaces of the leaf. These water vapours then move towards the stomata and pass into the outside air.



**Q4: Discuss the stomatal control of transpiration?**

**Ans: Transpiration:**

**Definition:**

The loss of water in the form of water vapours from aerial parts of plant body is called transpiration.

**Stomatal transpiration:**

Transpiration occur through stomata in leaves is called stomatal transpiration. Mainly transpiration takes place through stomata. About 90% transpiration occur through stomata.

**Structure of stomata:**

The two guard cells of a stoma are attached to each other at their ends. Guard cells are the only epidermal cells which contains chloroplasts.

**Opening of stomata:**

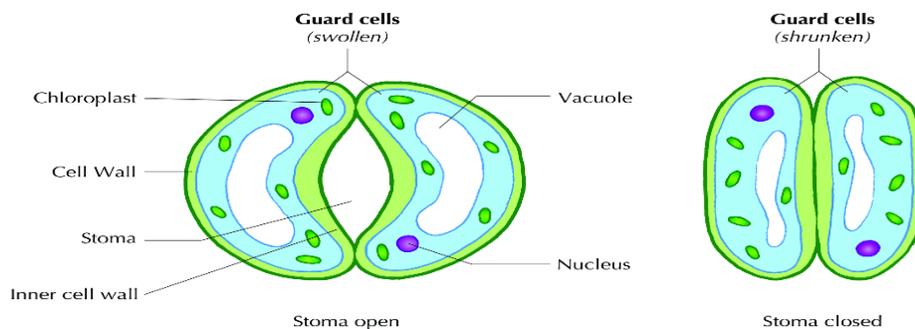
During day time, guard cells do photosynthesis and prepare glucose. So, the solute concentration remains high in guard cells. therefore, water move in them and they become turgid and stomata become open. When there is sufficient water in the soil. Stomata remain open for transpiration.

**Closing of stomata:**

At evening the glucose concentration in guard cells fall down. This is because no photosynthesis occurs in night. Due to this, water also moves from guard cells and these cells loss turgidity.

Their inner side touches each other and the stoma closes.

When there is deficiency of water in the soil, stomata start closing and decrease in the rate of transpiration occurs.



**Q5. What the factors that affecting the rate of transpiration?**

**Ans: Factors affecting on transpiration:**

The rate of transpiration depends on many factors. Some of the important factors and their effects are as follow.

**i. Light:**

Light has direct effect on the opening and closing of stomata. In strong light, stomata are open and rate of transpiration become high. In cloudy weather or in dim light, the rate of transpiration becomes slow while in darkness they are completely stops.

**ii. Temperature:**

The rate of transpiration increases with the increase in temperature. The rate of transpiration becomes double for every 10C° rise in temperature up to 30C°. Above 30C° the stomata start closing and at 45C° the stomata completely closed and the transpiration becomes stops.

**iii. Humidity:**

The presence of water vapours in air is called humidity. The rate of transpiration is inversely proportional to the humidity. Increase in humidity decrease the rate of transpiration while decrease in humidity increases the rate of transpiration.

**iv. Soil moisture:**

If more water is present in the soil more absorption will take place through the roots and rate of transpiration will increase.

**v. Wind:**

Wind (air in motion) carries the evaporated water from leaves and it causes an increase in the rate of evaporation from the surface of mesophyll. When air is still, the rate of transpiration is reduced.

**vi. Number and distribution of stomata:**

The rate of transpiration also depends upon the surface area of leaf. More surface area provides more stomata and there is more transpiration. In most land plants, the number of stomata is greater on the lower leaf surface than on the upper surface. Therefore, more transpiration occurs from the lower surface.

**Q6. Write the significance of transpiration?**

**Ans: Significance of transpiration:**

- i. Transpiration is a vital process in the life of plants.
- ii. Due to transpiration, the mesophyll cells always remain moist. This helps in gaseous exchange.
- iii. Transpiration prevents the leaves from overheating and keeps them cool.
- iv. It helps in the absorption of water from roots.
- v. It helps in the upward movement of water.
- vi. It eliminates the extra water.
- vii. It produces water column from roots to leaves by transpiration pull.
- viii. It keeps balance the water level in plants.

**Q7: Transpiration is a necessary evil-discuss?**

**Ans:** Transpiration is very useful to plants. But it is also harmful in some Aspects. Transpiration is considered to be a necessary evil due to the following reasons.

- i.** Loss of water from plants causes wilting in hot summer season and sometimes even plants die.
- ii.** The shortage of water reduces the growth and the yield of crops like rice maize, whet. Therefore, it affects the economy of nation.
- iii.** Transpiration in higher plants causes the reduction of water level in the soil. As a result, the water table goes down and tube wells become dry out.
- iv.** Deep tube wells are used for irrigation purposes it costs too much. This is also an economic loss.

**Q8: Discuss the transportation of water in plant body?**

**Ans:** The Transportation of water in plant body is explained by Cohesion tension theory. According to this theory “The mechanism by which water (along with dissolved material) is carried upward through the xylem is called transpiration pull.

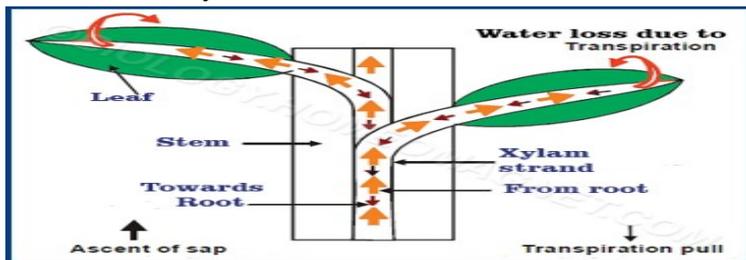
**Transpiration pull:**

The suction force which pulls water up in the xylem tissue is called transpiration pull.

### **Mechanism:**

When the cells of leaves lose water, a force called suction force is generated which pull water from the xylem vessels of leaf which turn take water from branches xylem and branches xylem from stem xylem. Xylem vessels of stem pull water from root xylem and the root take water from the soil. This upward movement of water produces a column from roots to leaves is called transpiration stream. This unbroken water column is mainly due to three reasons;

- The attractive forces among molecule.
- Narrow diameter of xylem vessels.
- The forces by which water molecules are adhere to the wall of the xylem vessels.



**Q9: What do you know about the translocation of organic solutes in plants. OR**

**What is the mechanism of translocation of food? OR**

**How does the pressure flow theory explain the movement of sugars through phloem vessels of a plant?**

**Ans:** When the food is prepared in green leaves by photosynthesis. The green leaves are called “Source of Assimilates” or simply “Source”.

This food is transported by phloem to the other parts like branches, roots, seed and fruits called “sink of assimilates” or simply “sink”. So, translocation may be defined as “The transport of food from the source to sink is called translocation of food”.

Many different theories were presented by different scientists about translocation of food. But the most acceptable theory is pressure flow theory.

### **Pressure Flow theory:**

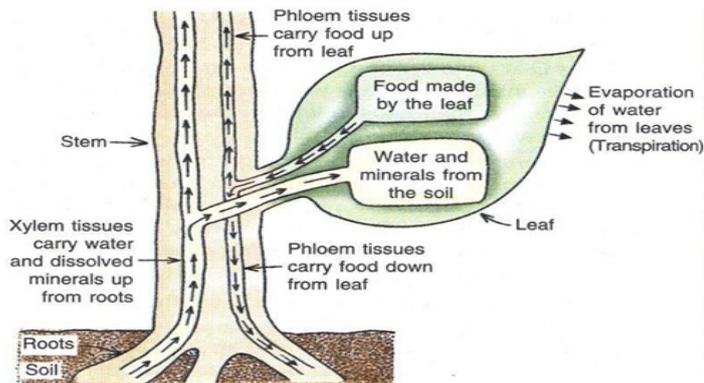
This theory was proposed by a German biologist Ernst Munch in 1930.

#### **Statement:**

According to this theory, the movement of dissolve food molecules occurs from source to sink.

Step of translocation:

- i. At the source site, food (sucrose) enters the sieve tubes of phloem by active transport. Companion cells of phloem provided ATP energy for this transport.
- ii. High solute concentration in sieve tubes absorbs water from nearby xylem tissue osmosis.
- iii. Due to the movement of water the turgor pressure in sieve tube increases and the solution of food start flowing toward the sink.
- iv. At the sink, food is actively removed from sieve tubes.
- v. In this way the turgor pressure in sieve tubes fall down causing a flow of mass from the higher pressure at the source to the lower pressure at the sink.



**Q10: Describe the composition of blood also write the function of blood?**

**Ans: Blood:**

Blood is a red fluid which circulates through blood vessels and heart. Blood is a type of connective tissue and is composed of liquid plasma and blood cells.

- pH of human blood is 7.4.
- The weight of blood is about 1/12<sup>th</sup> of our body.
- The average adult has 5 liters blood.

**Composition of Blood:**

- a) Plasma                      b) Blood Cells

**a) Plasma:**

Plasma is the liquid portion of blood. About 55% of blood consists of blood plasma.

**Composition of Plasma:**

Water	=	90%
Protein	=	7%
Sugar	=	0.1%
Inorganic salt	=	0.9%
Waste product, waste materials and hormone	=	2%.

**Function:**

- i. Plasma keeps all the tissue moist.
- ii. Plasma of the blood transports nutrients, water, salts, hormones and waste materials.
- iii. Plasma helps in regulating body temperature.
- iv. Small amounts of oxygen are also carried by plasma.
- v. Most of CO<sub>2</sub> is transported by plasma.
- vi. Plasma proteins e.g. albumins maintain the osmotic pressure of blood.
- vii. Important plasma proteins called antibodies defend the body against pathogens.
- viii. Another plasma protein fibrinogen is responsible for blood clotting.

**b) Blood Cells:**

Blood cells constitute 45% volume of blood.

There are three types of blood cells.

- a) Red blood cell(erythrocytes)
- b) White blood cells(leukocytes)
- c) Platelets (thrombocytes).

**a) Red Blood cells (erythrocytes)**

**Shape:**

The mature red blood cells are rounded or biconcave in shape.

**Number:**

One cubic millimeter of blood contains 5 million RBCs.

**Size:**

The Average diameter of erythrocytes is 0.8 micrometre.

**Formation of RBC,s:**

In the embryonic stage, RBC,s is formed in liver and spleen. In adults they are formed in the red bone marrows of short bone such as sternum, ribs and vertebrae.

**Structure of red blood cells:**

Mammalian RBC,s when formed have nucleus, mitochondria, endoplasmic reticulum and other cell organelles but these lost with maturation. About 95% of RBC,s are composed of hemoglobin and 5% is of enzymes, slates and other proteins.

**Haemoglobin:**

RBC,s contains red pigment called haemoglobin.

**Average life span of RBC,s:**

The average life span of RBC,s is about 120 days.

**Destruction:**

RBC,s are destroyed in spleen and liver. About 2.5 million of RBC,s are destroyed at every second in the body.

**Function:**

It transports oxygen form lungs to all parts of the body.



**2. White blood cells (Leucocytes):**

**Shape:**

White blood cells are colourless and are nucleated blood cell. They are irregular in shape.

**Size:**

They are large than RBC,s. There are 1 or 2 leukocytes for every 1000 RBC,s.

**Number of white blood cells:**

One cubic millimeter of blood contains 7000 to 8000 white blood cells.

**Average life span:**

The life span is very short form 7 hours to maximum of 3 days.

**Types:** There are three main types of WBC,s. The two main types are further divided into five types.

**1. Granulocytes:**

Granulocytes are the leukocytes which have granular cytoplasm.

Granulocytes include

- i. Neutrophils
- ii. Eosinophils
- iii. Basophils

**2. Agranulocytes:**

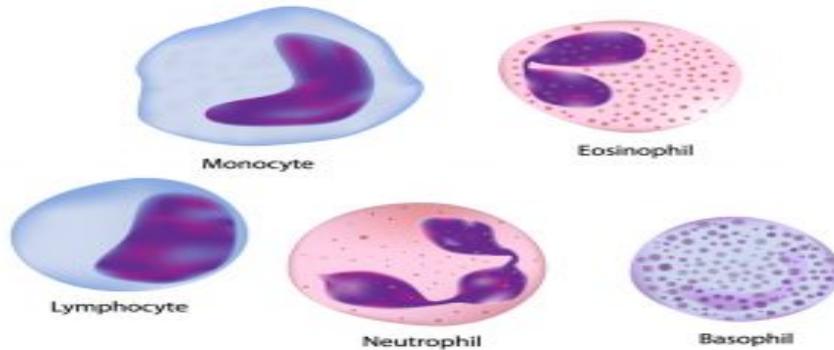
They have clear cytoplasm. They include

- i. Lymphocytes
- ii. Monocytes

**Function:**

- These blood cells are the part of immune system and defend our body against disease.

- They circulate and transport to an area where infection has developed.
- Some WBC kills pathogens like bacteria and virus.
- Some of them also produce inflammation at the site of infection.
- Some WBC makes antibodies against infectious particles.



### **3. Platelets (Thrombocytes):**

Platelets are not true cells because these are the fragments of large cell of bone marrow called megakaryocytes. They do not have any nucleus.

#### **Shape:**

These are spindle in shape.

#### **Colour:**

These are colourless because they have no pigment.

#### **Number:**

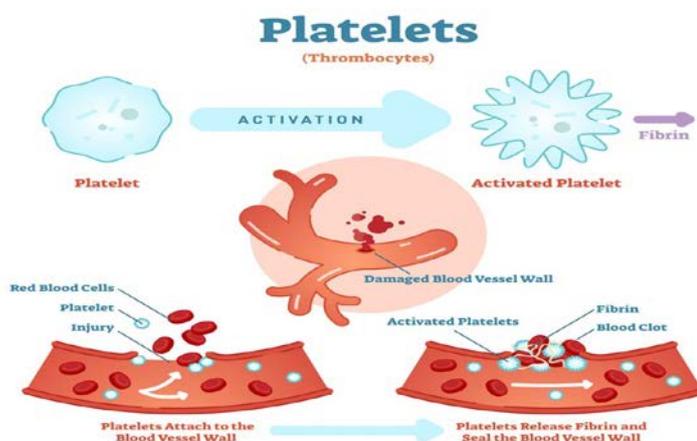
One cubic millimeter of blood contains 15,000 to 450,000 platelets.

#### **Life span:**

Their average life span is about 7 to 12 days.

#### **Function of platelets:**

Platelets help in blood clotting. When a blood vessel ruptures, the blood starts oozing out. Platelets gather around the site of infection and release substances which convert plasma protein into insoluble form fibrin. Fibrin makes a mesh in which platelets and other blood cells are entangled. Thus, a clot is formed which stops the blood flow from the wound.



**Q11: Discuss disorder of blood.**

**1. Leukemia (Leukos – White, haema-blood):**

It is also called blood cancer.

**Cause:**

In this disease the number of WBCs increase abnormally and start engulfing (eating) of RBC and Platelets.

**Symptoms:**

The abnormal cells also attack on bone marrows therefore the bones become soft, fragile and severe pain is produced in bones. A leukemia person suffers in severe Anemia.

**Treatment:**

- Transplantation of bone marrow but it is very expensive.
- Regular blood transfusion is required to save the life of Leukemic person.

**2. Thalassemia (thalasa mean sea, haema mean blood):**

This disease was originally found in those people which living on the shore of Mediterranean sea.

**Cause:**

It is a genetically transmitted disease transfer from parents to offspring. A person with thalassemia has a defective gene for production of haemoglobin.

**Symptoms:**

Severe anemia, enlargement of spleen.

**Treatment:**

The blood is regularly replaced with normal blood.

**Q12: Define Antigen and antibody?**

**Ans: Antigen:**

Any substance which start the production of antibody is called antigen.

**Example:**

Germ or any other foreign substance or toxic are different antigens.

**Antibody:**

The response of WBC,s to produces a specialized type of protein against antigen to kill and destroyed them called antibody.

**Q13: How different blood groups are formed. What is the practical implication in the blood transfusion?**

**Ans: ABO blood group system:**

**Discovery:**

It was discovered by Karl land Steiner in 1901. Different types of blood groups are due to the specific antigen present on the surface of red blood cells. Which are antigen “A” and “B”.

**Blood group “A”:**

A person have blood group A contain antigen “A” and antibodies “B”.

**Blood group “B”:**

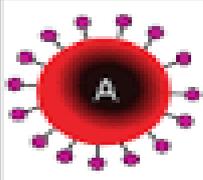
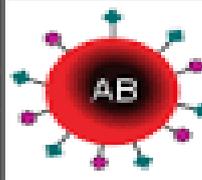
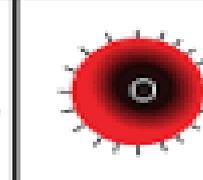
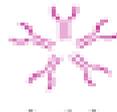
A person have blood group B contain antigen “B” and antibodies “A”.

**Blood group “AB”:**

A person have blood group AB contain both antigen “A” and “B” and have no antibodies.

**Blood group “O”**

A person have blood group O contain no antigen on RBC,s but have both antibodies A&B.

	Group A	Group B	Group AB	Group O
Red blood cell type				
Antibodies in plasma	 Anti-B	 Anti-A	None	 Anti-A and Anti-B
Antigens in red blood cell	 A antigen	 B antigen	 A and B antigens	None

**Q14: Discuss Blood Transfusion in ABO system?**

**Ans: Blood transfusion:**

The transfer of blood from healthy person to a patient is called blood transfusion.

**Practical implication of blood groups in blood transfusion:**

Matching of blood is necessary during blood transfusion. In blood transfusion, a person with blood group "A" cannot donate blood to a person with blood group "B" because plasma of blood group "A" contains antibody "B" and plasma of blood group "B" contains antibody "A".

Due to transfusion of opposite blood group clumping occurs in blood cells which cannot pass in microscopic blood group B transfused with blood group A. Anti-A antibody present in recipients' blood will coagulate with RBCs having antigen A of donated blood.

**Rh Blood group system:**

**Discovery:**

This system was discovered by Karl Land Steiner in 1930's. This system is based on the presence and absence of another antigen called Rh factor or Rh antigen (first discovered in Rhesus monkey) on RBCs.

**Positive or negative blood group:**

If Rh factor is present on RBCs, blood group will be positive. If Rh factor is absent on RBCs, the blood group will be negative.

**Blood transfusion in Rh system:**

Rh +ve blood group can be transfused to Rh+ve recipient because both have Rh antigen. Similarly Rh-ve blood group can be given to Rh-ve donors. If an Rh-ve person receives Rh+ve blood, he will get Rh antigen. His blood will produce anti-Rh antibodies against Rh antigens and it will result in coagulation. But an Rh+ve person can receive Rh-ve blood only if donor's blood (Rh-negative) has never been exposed to Rh-antigen and does not contain any anti-Rh antibody. People who have AB+ve blood group are universal recipients and O-ve blood group are universal donors.

Recipient Blood group	Donor Blood group
A	A and O
B	B and O
AB	A,B,AB,O

O	O only
Rh <sup>+</sup>	Rh <sup>+</sup> , Rh <sup>-</sup>
Rh <sup>-</sup>	Rh <sup>-</sup>

**Q15: Describe the structure of human hart with the help of labeled diagram?**

**Ans: Human Heart:**

Human heart is also called cardium. The word derived from Greek word cardiac mean heart.

**Shapes:**

It is conical in shape and muscular pumping organ.

**Muscles of heart:**

Heart is made of muscles called cardiac muscles. Cardiac muscles are involuntary and composed of branched cells each with a single nucleus.

**Position:**

The heart is present in the chest cavity below the sternum between the ribs.

**Membrane of heart:**

The Heart is enclosed in a membrane called pericardium.

**Pericardial Fluid:**

Between the pericardium and the heart walls a fluid known as pericardial fluid is present.

Pericardial fluid lubricates the heart during movement.

**Chambers of heart:**

Human heart has **Four** main chambers.

- i. Right atrium
- ii. Left atrium
- iii. Right ventricle
- iv. Left ventricle

**i. Right atrium/ Auricle:**

Right auricle is small thin walled chamber. Right Auricles receives deoxygenated blood from the whole body by superior and inferior venacava. Superior venacava bring deoxygenated blood from upper parts of the body while inferior venacava bring deoxygenated blood from lower parts of the body. Right atrium forces the blood right by an aperture called right. Auricular-ventricular aperture guarded by tricuspid valve.

**ii. Right ventricle:**

They are thick walled large chamber. The right ventricle receives the deoxygenated blood from right atrium and pumps it to lungs through pulmonary artery for oxygenation. The semi lunar valve present between the right ventricle and pulmonary artery prevent the back flow of blood from pulmonary artery to right ventricle.

**iii. Left atrium:**

It is thin walled small chamber it receives oxygenated blood from lungs through pulmonary vein. Left atrium force the oxygenated blood to left ventricle by an aperture called left auricular ventricular aperture guarded by bicuspid valve of mitral valve.

**iv. Left Ventricle:**

Left ventricles are thick than right ventricle. The left ventricle receives the oxygenated blood from the left atrium and pumps it into aorta for distribution to the whole body.

**Pathway of blood circulation:**

There are two pathways of blood circulation.

1. Pulmonary blood circulation.
2. Systemic blood circulation.

### **1. Pulmonary blood circulation:**

The pathway on which deoxygenated blood is carried from the heart to the lungs and in return oxygenated blood is carried from the lungs to the heart is called pulmonary blood circulation. Pulmonary blood circulation is carried out by two types of blood vessels.

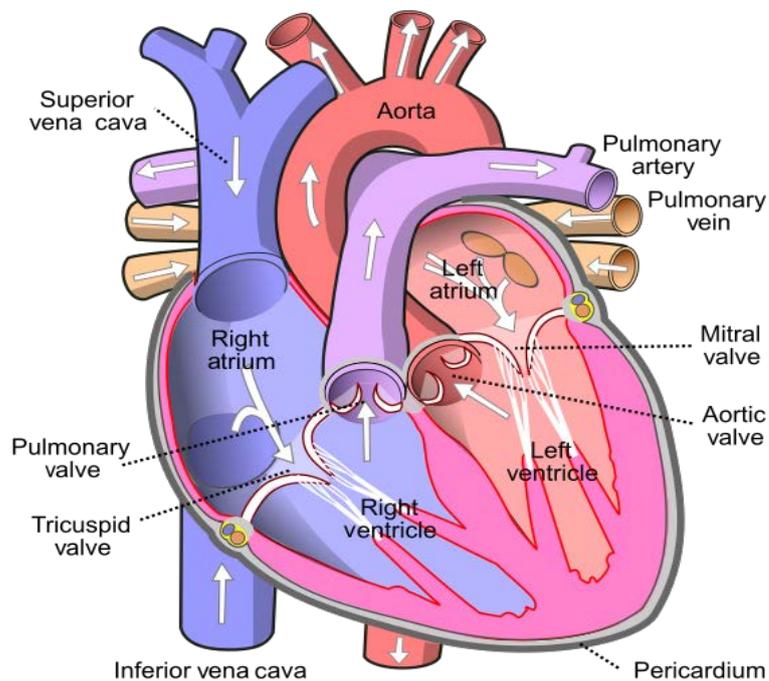
**a. Pulmonary artery:** This artery transport deoxygenated blood from heart to lungs for oxygenation.

**b. Pulmonary vein:** This artery transport oxygenated blood from both lungs to heart.

### **2. Systemic blood circulation:**

The pathway on which oxygenated blood is carried form heart to the body tissues and in return deoxygenated blood is carried from body tissue to the heat is called systemic circulation.

In this circuit oxygenated blood is carried by aorta and deoxygenated blood is carried by vena cava. Pulmonary blood circulation pressure is low and systemic blood pressure is always greater.



### **Q16: What is cardiac cycle?**

**Ans:** Each heart beat consisting of one systole and one diastole is called cardiac cycle. Contraction of heart is called systole while relaxation is called diastole. One cardiac cycle is completed in 0.8 seconds. Normal heart beat of healthy person is 72 beat per minute. This is also called heart rate. The complete cardiac cycle consists of following steps;

#### **Cardiac diastole:**

In cardiac diastole and auricle and ventricles relax and heart is filled with blood. During diastole “dubb” sound is produced due to the closing of semilunar valves.

#### **Atrial Systole:**

Immediately after heart filling, both atria contract and pump the blood towards ventricles. This period in cardiac cycle is called atrial systole.

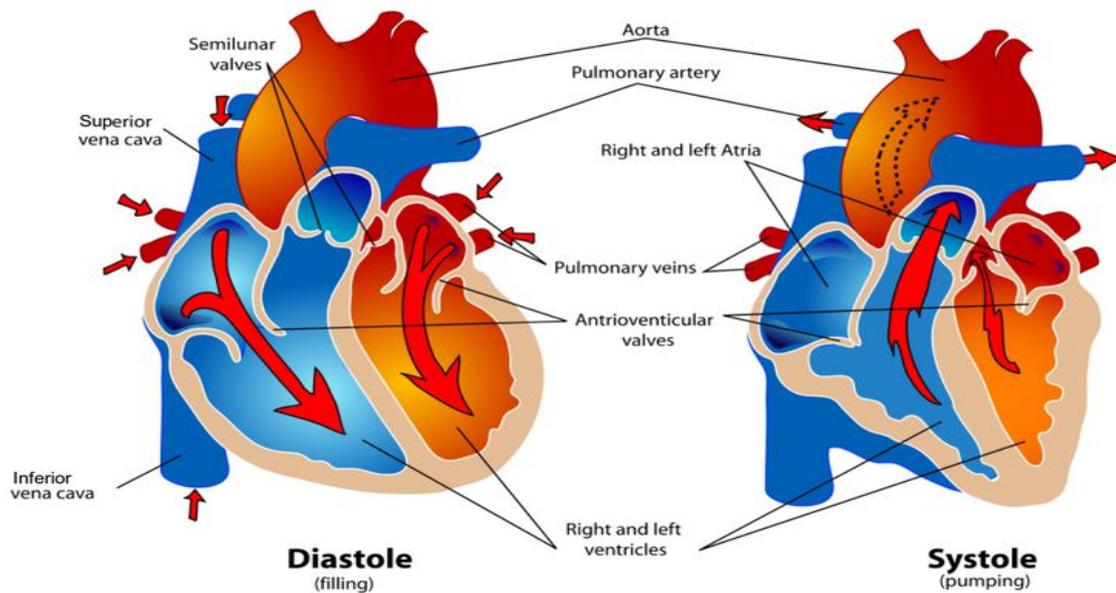
#### **Ventricular systole:**

When both ventricles contract and pump blood toward body and lungs is called ventricular systole. The period of ventricular contraction is about 0.3 seconds. During diastole “dub” sound is produced with the closing semi lunar valves.

Cardiac diastole = 0.4 seconds

Atrial systole = 0.1 seconds

Ventricle systole = 0.3 seconds



**Q17: Write a note on pulse rate?**

**Ans: Pulse:**

A pulse is a series of expansion waves in an artery cause by the contraction of left ventricle. When left ventricle contracts, it forces the blood into arteries. The elastic walls of arteries expand. The arteries in wrists are closed to the surface so pulse can be felt easily here.

**Measurement:**

The heart rate can be measured by feeling the pulse. The pulse can be felt at in area where the arteries are close to skin. For example, at the wrist, neck, groins or top of the foot. Most commonly people measure their pulse in their wrist.

Pulse rate is an easy way to understand the condition of heart because pulse rate is equal to heart rate. The average pulse rate is 72 times per minute.

- The vessels must stretch to allow the increased blood flow to pass.
- The stretching of an artery close to the skin's surface pushes on the skin, which we sense as a pulse.
- Pulse rates are good indicators of fitness.



**Q 18: What are blood vessels? Describe the structure and function of various blood vessels?**

**Ans: Blood vessels:**

Blood vessels are the part blood circulatory system that transports blood throughout the body. These vessels have internal hollow cavity called lumen.

**Types:**

Blood vessels are of three types.

- i. Arteries
- ii. Veins

### iii. Capillaries

#### **i. Arteries:**

Those blood vessels which carry blood away from the heart toward body organs are called arteries. These blood vessel carry oxygenated blood from heart to various organs of the body except Pulmonary artery that carry deoxygenated blood to lungs for oxygenation.

#### **Colour:**

Arteries are bright red in colour due to the processes of oxygenated blood.

#### **Structure of Arteries:**

The wall of an artery is made of three layers.

- i. Outer layer ( tunica externa)
- ii. Middle layer ( tunica media)
- iii. Inner layer ( tunica interna)

#### **i. Outer layer (tunica externa):**

This layer allows arteries to expand and withstand high blood pressure. It is composed of connective tissue.

#### **ii. Middle layer ( tunica media):**

The middle layer of artery consists of circular smooth muscles and elastic tissue called tunica media.

#### **iii. Inner layer (tunica interna):**

It is the innermost layer comparatively thinner than outer and middle layer and is made up of endothelial cells.

#### **Aorta:**

Aorta is the largest artery of the body which arises from the left ventricle. Many arteries arise from aorta. These arteries divide into smaller branches called arterioles and arterioles divide into capillaries.

### **2. Capillaries:**

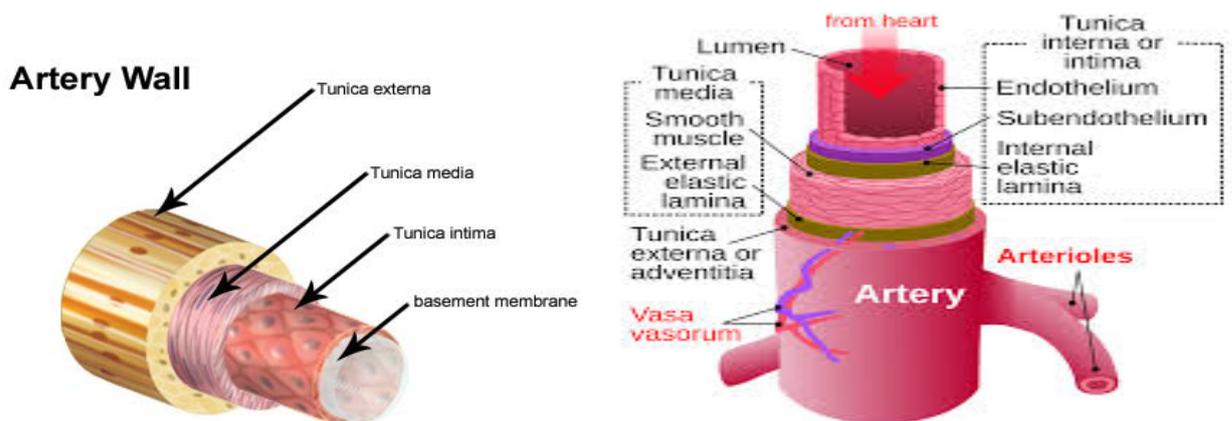
Capillaries are the smallest microscopic blood vessels that arise from arteries. Capillaries are so small that blood cells pass through them in a single file.

#### **Wall:**

The wall of capillaries are composed of only a single layer of cells called endothelium. Their diameter is about 8 to 10 micrometre.

#### **Function:**

The exchange of materials like water, oxygen, nutrients and waste products between cells and body fluid is carried out through capillaries.



### **3) Veins:**

Veins are the blood vessels that carry deoxygenated blood back from body organs to heart. Veins carry deoxygenated blood from all part of the body toward heart except pulmonary vein which carries oxygenated blood from lungs to heart.

**Colour:**

Veins are blue in colour due to the presence of deoxygenated blood.

**Structure:**

The wall of vein are made of three layers

- i. Outer layer (tunica externa)
- ii. Middle layer (tunica media)
- iii. Inner layer (tunica interna)

**i. Outer layer (tunica externa):**

It is composed of connective tissue

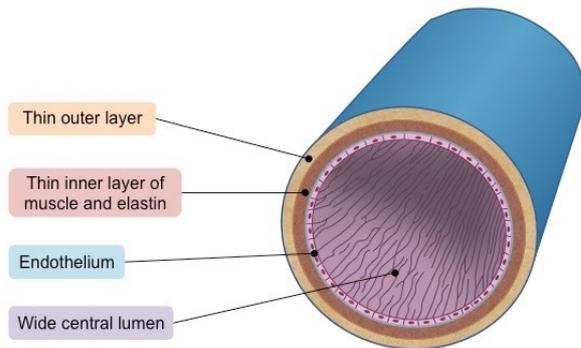
**ii. middle layer (tunica media):**

As compared to arteries they are thin. It has less smooth muscles and elastic tissue.

**iii. Inner layer (tunica interna):**

It is the innermost layer of the vein.

Veins also have valves which allow the flow of blood in one direction i.e. Towards heart and prevent backward flow. The largest veins in the body are vena cave. Superior venacava bring deoxygenated blood from head and upper region of the body and inferior vana cava brings deoxygenated blood from lower part of the body.



**Q19: Name major arteries and veins and discuss the organ to which they target?**

**Ans:** The human circulatory system consists of two sub system.

**i. Arterial system**

**ii. Venous system**

**i. Arterial system:**

All the arteries make arterial system. Arteries carry blood away from heart to body organs.

**Aorta:**

Aorta is the largest artery of the body that arises from the left ventricle. All the other arteries arise from aorta.

**a) Coronary artery:**

They supply oxygenated blood and food to the muscles of the heart.

**b. Carotid artery:**

It run upward along trachea and supply oxygenated blood to head region.

**c. Subclavian artery:**

It supplies oxygenated blood to arms.

**d. Coeliac artery:**

It supplies oxygenated blood to the stomach and spleen.

**e. Mesenteric artery:**

It supplies oxygenated blood to the digestive organs like pancreas, duodenum and rectum etc.

**f. Hepatic artery:**

It supplies oxygenated blood to the liver.

**g. Renal arteries:**

It supplies oxygenated blood to the kidneys.

**i. iliac arteries:**

It supplies oxygenated blood to legs.

**j. Pulmonary artery:**

It supplies deoxygenated blood from heart to lungs for oxygenation.

**2. Venous system:**

All veins make the venous system. Veins bring deoxygenated blood from all parts of the body back to heart.

**Venacava:**

These are the largest veins of the body. It consists,

**a) Superior Vena Cava:**

Superior vena cava is formed by the union of many pairs of veins from head, shoulders and arms.

**b) Inferior vena cava:**

The inferior venacava is made of many veins from parts of the lower region of the body. All the other veins are connected with these two main veins. Other veins are,

**a) Jugular vein:**

They bring deoxygenated blood from head region to heart.

**b) Femoral vein:**

It brings deoxygenated blood from legs region.

**c) Subclavian vein:**

They bring deoxygenated blood from arms and shoulder to heart.

**d) Hepatic vein:**

They bring deoxygenated blood from liver to heart.

**e) Renal vein:**

They bring deoxygenated blood from kidney to heart.

**f) Celiac vein:**

They bring deoxygenated blood from stomach and spleen to heart.

**g) Mesenteric vein:**

They bring deoxygenated blood from digestive organs like duodenum, pancreas, intestine and rectum etc to heart.

**h) Pulmonary vein:**

Pulmonary veins originate from lungs and bring oxygenated blood to left atrium.

**Q20: Discuss the discovery of blood circulation?**

**Ans:** Pioneers of discovering blood circulation Ibn-Al-Nafees and William Harvey. Many other names are also included in the list but the contribution of these two are high.

**Ibn-Al-Nafees:**

**Introduction:**

Ibn-Al-Nafees was born in 1210 A.D. He was a Muslim anatomist. He studied medicine at Al-Nouri and al-kabeer hospital in Damascus. In Cairo he took up medicine as a career.

**Contribution:**

- He was the first Muslim anatomist to explain pulmonary blood circulation in human beings. He discovered the central role of heart in the whole circulatory system.
- He explained the blood is purified in the lungs.

**Date of Death:**

He died in 1288 A.D.

**William Harvey:**

**Introduction:**

Harvey was born in 1578 A.D in Kent, England. He was an English physician.

**Contribution:**

- William Harvey was first scientist in the western world to describe correctly systemic circulation.
- He also describes the properties of blood.
- He demonstrate that heart and blood vessels form a continuous and closed system of circulation.

**Date of Death:**

Harvey was died in 1657.

**Q21: Discuss cardiovascular disease?**

**Ans: Cardiovascular disease:**

The diseases of heart and blood vessels are collectively called cardiovascular disorders. These diseases are one of the leading cause of death in the world.

**i. Atherosclerosis( Gr: athere-grout, sclerosis – harden):**

The disease of the arteries occurs due to deposition of fatty materials (cholesterol) inside the arteries. In this disease the lumen of arteries reduces in size and may be completely blocked.

**Effect on body:**

- Decrease blood supply to the organs
- Hypoxia (lack of oxygen)
- Anginal pectoris

**Causes:**

- Hypertension
- Smoking
- Diabetic mellitus.
- Increased lipid level.

**Prevention:**

- Using food with less cholesterol
- Avoid smoking
- To perform daily exercise.

**Treatment:**

- Coronary bypass surgery
- Placement of stent

**ii) Arteriosclerosis( artere – artery, sclerosis- harden):**

Thickening and hardening of the wall of arteries is called arteriosclerosis. This occurs mainly due to deposition of calcium in the wall of arteries.

**Effect on body:**

This type of artery cannot expend during systole. This inflexibility of artery makes the heart to work harder.

**Causes:**

- Increasing age
- Sever atherosclerosis
- Increased calcium level in the blood

**3. Myocardial infarction:**

Myocardial infarction is also called heart attack. It occurs when a portion of heart muscle dies due to sudden reduction of blood supply to heart muscle. It mostly occurs in person over 45 year of age.

**Causes:**

- Hypertension
- Atherosclerosis
- Narrowing of coronary artery

- Increase demand of oxygen during exercise
- Excitement, fear and worry etc.

**Symptoms:**

- Chest pain
- Angina pectoris (moving pain in the left arm)
- Sweating
- Nausea
- Shortness of breath

**Treatment:**

- **Angioplasty:** In this treatment a balloon tip catheter is passed in the artery. The balloon is inflated at the site of blockage which opens the artery.
- **Stent:** Some time a metallic ring is placed there at the site. The stent remain there as a part of artery.
- **Coronary bypass surgery:** In this treatment a vessel is taken from some other part of body and grafted from aorta to the coronary artery system.

**Prevention:**

- Use of balance diet.
- Regular exercise
- Regular medical check up
- Avoid smoking, stress and tension.

## SHORT QUESTIONS

**b. Give short answers to the following questions.**

**Q1: Why does a RBC lack cellular organelles?**

**Ans:** RBCs are specialized cells. 95% of their cytoplasm is composed of haemoglobin. The main function of RBC is to carry oxygen around the body. It has no nucleus and organelles so it can carry as much oxygen as possible. Absorption and release of oxygen by Hb is a spontaneous process and it does not need any kind of metabolic activity. Therefore RBC lack nucleus and other cellular organelles.

**Q2: Is the rate of transpiration higher on a sunny day or a rainy day, why?**

**Ans:** Light intensity and temperature accelerates the rate of transpiration while humidity slows down the rate of transpiration. So it shows that rate of transpiration will be higher on a sunny day than rainy day.

**Q3: What will happen to transpiration stream if the air is injected in xylem vessels?**

**Ans:** The unbroken column of water which moves up in the xylem vessels is called transpiration stream. The entrance of air in the xylem is called air embolism if the air is injected in the xylem the column of water will break up and transpiration stream will stop.

**Q4: What is translocation of food in plants?**

**Ans:** See Q No. 9

**Q5: What is transpiration pull? Describe the importance of transpiration in the life of the plant?**

**Ans:** See Q No. 8

**Q6: how does the pressure-flow theory explain the movement of sugars through phloem vessels of plant?**

**Ans:** See Q No. 9

**Q7: Describe the composition of human blood. What are the main function of blood cells?**

**Ans:** See Q No. 10

**Q8: How are different blood groups formed. What is their practical implication in blood transfusion?**

**Ans:** See Q No.13

**Q9: If we do not take water the whole day in the month of June, what would be the effect on volume of plasma in blood?**

**Ans:** Blood plasma is composed of 90% of water. In the month of June due to high temperature sweating occur. Sweating causes loss of water from the blood plasma. So if we do not take water the whole day in the month of June. The volume of blood plasma will reduce and lead to dehydration.

**Q10: Write any four differences between xylem and phloem?**

**Ans:**

<b>Characteristics</b>	<b>Xylem</b>	<b>Phloem</b>
<b>Cell living/ Dead</b>	Three dead cells (Vessel, tracheid's, xylem fiber)  One living cell (xylem parenchyma)	One dead cell (phloem fiber)  Three living cells (sieve tubes, companion cells and phloem parenchyma)
<b>Cell wall thickness</b>	Thick	Thin
<b>Composition of cell wall</b>	Lignin	Cellulose
<b>Direction of flow</b>	Upwards	Down and up
<b>Cell wall permeability</b>	Impermeable	Permeable

## Long Question

**C. Give detailed Answers to the following Question.**

**Q1: Draw the internal structure of a human heart and show the blood circulation with the help of arrows.**

**Ans:** See Q No. 15.

**Q2: Discuss the function major arteries and veins.**

**Ans:** See Q No. 19

**Q3: Discuss transpiration and its importance.**

**Ans:** See Q No. 3 & 6.

**Q4: Can a person with blood type AB donate blood to a person with blood type A? Explain your answer?**

**Ans:** A person having blood group AB cannot donate blood to a person having blood type A because plasma of blood group A contain antibody B. Blood group AB contain antigen A and B. Antibody B will attack on antigen B and antigen-antibody reaction will occur. As a result RBC,s will clump and the recipient can die of this effect.