Transportation in Human Beings

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CLASS: X **BIOLOGY**

1. What is transportation?

The movement of a substance absorbed or synthesised in one part to the other parts of the body is called transportation.

2. What is the need for transportation in living beings?

Transportation in living beings is required for the transport of

- Nutrients
- metabolic wastes
- respiratory gases
- hormones
- enzymes and
- other metabolites

3. What are the basic things required for transportation of materials in human body?

Basic things required for transportation of material in human body are:

- Fluid medium to carry material - Blood
- A pump to push this fluid - Heart
- A network of tubes to carry this fluid to various body parts - Blood vessels
- A system that performs maintenance and repair of this network of tubes - Platelets.

4. How are different materials carried through blood?

Blood consists of a fluid medium called plasma in which various corpuscles are present. Plasma transports salts, food, carbon dioxide and nitrogenous wastes in dissolved form. Oxygen is carried by haemoglobin present in the red blood corpuscles.

Human Heart

5. Describe the structure of human heart.

Heart is made of special kind of muscles called cardiac muscles. It consists of four chambers.

The two upper chambers are left atrium and right atrium.

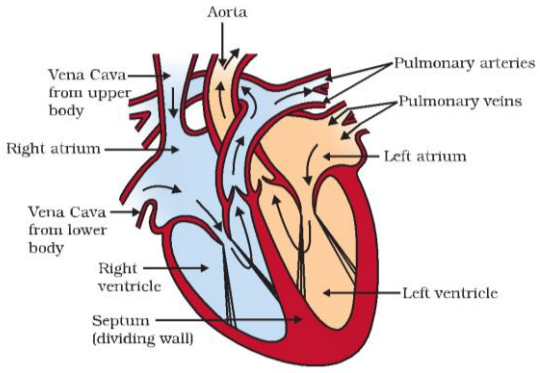
The two lower chambers are left ventricle and right ventricle.

Atria receive blood and ventricles transport blood out of the heart.

These chambers are separated by partitions called septa.

Between atria and ventricles valves are present to prevent back flow of blood.

6. Draw a labelled diagram showing internal structure of human heart.



7. Why does human heart have different chambers that are not connected to each other?

Different chambers in human heart are not connected to each other in order to prevent mixing of oxygenated and deoxygenated blood.

Complete separation of chambers ensures that only oxygenated blood goes to various parts of body.

This increases the efficiency of supply of oxygen to the body to meet the high-energy requirements.

8. Describe the flow of blood through human heart.

Blood is received from various body parts into the right atrium by superior and inferior vena cava, when the chambers are relaxing.

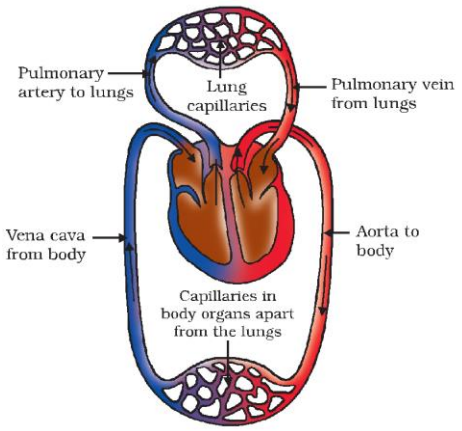
From right atrium blood flows to right ventricle.

From right ventricle blood is transported to lungs for oxygenation by pulmonary artery.

After oxygenation, blood goes to left atrium through pulmonary vein.

From left atrium blood moves to left ventricle.

From left ventricle blood is pumped out to all the body parts through aorta.



9. Name the following blood vessels which

a. Brings deoxygenated blood into the right atrium from upper body parts
b. Brings deoxygenated blood into the right atrium from lower body parts
c. Takes deoxygenated blood from right ventricle to lungs.
d. Brings oxygenated blood from lungs to left atrium -.
e. Largest artery that takes oxygenated blood from left ventricle to all body parts -
f. Supply blood to heart muscles.

a. Superior vena cava.
b. Inferior vena cava.
c. Pulmonary artery.
d. Pulmonary vein.
e. Aorta.
f. Coronary arteries.

10. Name the chambers of heart that carries

a. Oxygenated blood.
b. Deoxygenated blood.
c. Oxygenated blood - left atrium and left ventricle.
d. Deoxygenated blood - right atrium and right ventricle

9. Tabulate the changes taking place in heart when-

a. Both atria and ventricles are relaxed
b. Atria contracts
c. Ventricles contracts.

Events	Changes
Both atria and ventricles are relaxed	Deoxygenated blood flows from body parts to the right atrium through vena cava. Oxygenated blood flows from lungs to left atrium through pulmonary vein
Atria contracts	Deoxygenated blood from right atrium moves to right ventricle. Oxygenated blood from left atrium moves to left ventricle
Ventricles contracts	Deoxygenated blood from right ventricle moves to the lungs through pulmonary artery. Oxygenated blood from left ventricle moves to the body parts through aorta.

10. Why is it necessary to separate oxygenated and deoxygenated blood in mammals and birds?

The separation of the right side and the left side of the heart prevents the mixing of oxygenated and deoxygenated blood.

Separation of oxygenated and deoxygenated blood allows a highly efficient supply of oxygen to the body.

This is specially useful in animals that have high energy needs like birds and mammals, which constantly use energy to maintain their body temperature.

11. Compare the number of chambers in the heart of following animals

(a) Fish
(b) Amphibians
(c) Reptiles
(d) Birds

Animal	Number of Chambers in heart
Fish	2
Amphibians	3
Reptiles (except crocodile)	3
Birds and Mammals	4

12. Give two examples of animals which can tolerate some mixing of oxygenated and deoxygenated blood in their hearts. How do these animals manage their energy requirements?

Amphibians and most reptiles have three-chambered heart. They can tolerate some mixing of oxygenated and deoxygenated blood.
These animals can afford such mixing because their body temperature depends on the temperature in the environment and they do not use energy to constantly maintain it. Their energy needs are therefore less.

13. What is double circulation?

During a cardiac cycle blood enters the heart twice. This is known as double circulation.

Blood Vessels

1. How is blood carried to all parts of the body?

Blood is the fluid connective tissue, which is carried to all body parts through tubes called **blood vessels**

2. What are the different types of blood vessels?

There are three main types of blood vessels:

(a) **Arteries** - Blood vessels that carry blood away from heart
(b) **Veins** - Blood vessels that carry blood from body parts to heart.
(c) **Capillaries** - Blood vessels that joins arteries and veins.

3. Why is the wall of arteries thicker than veins?

Arteries have thicker walls than veins because blood pumped from the heart flows through these arteries with **high pressure**.

4. Why do veins have valves in them?

Veins have valves in them to **prevent backflow** of blood.

5. Actual exchange of material between blood and surrounding takes place in which of blood vessels.

Blood capillaries

6. **Why are the walls of capillaries only one cell thick?**

   The walls of capillaries are one celled thick to facilitate easy diffusion of gases and other materials across it.

7. **Compare arteries, veins and capillaries.**

Arteries	Veins	Capillaries
Wall of artery is thick	Wall of vein is thin	Wall of capillary is very thin
Arteries carry blood away from the heart	Veins carry blood towards the heart	Capillaries carry blood from arteries to veins
Valves are absent	Valves are present	Valves are absent
They carry oxygenated blood (except- pulmonary artery)	They carry deoxygenated blood (except- pulmonary vein)	Exchange of material takes place through capillaries
They are deep seated inside the body	They are superficial	They connect arteries and veins

Maintenance and repair of blood cells

1. **Under what conditions can one suffer from blood loss?**

   One may suffer from blood loss during injury or during a surgery.

2. **What would happen if the bleeding is not minimised or stopped?**

   If the bleeding is not minimised there will be a drop in blood pressure. This would reduce the efficiency of the pumping system and may cause death of the individual.

3. **Name the cells that help in plugging the leaks in the blood vessels. Where are they located?**

   Platelet cells helps in plugging the leaks in the blood vessels. These are present in the blood plasma.

4. **How do platelets help in minimising blood loss during injury?**

   Platelets circulate around the body in the blood vessels. Whenever there is an injury, platelets plug the leaks in the blood vessels by forming blood clots at the point of injury.

Lymph

1. **Name one fluid other than blood that is also involved in the process of transportation**

   Lymph

2. **Why is lymph referred to as tissue fluid?**

   As lymph is present between the **intercellular spaces** in the tissue, hence it is also called tissue fluid.

3. **How is lymph formed?**

   Some amount of plasma, proteins and blood cells (mainly WBC) escape from capillaries and spread into the intercellular spaces in the tissues. This fluid forms the lymph.

4. **What are the components of lymphatic system?**

   Components of lymphatic system are- lymph, lymphatic capillaries, lymph vessels, lymph nodes and lymph glands.

5. **Differentiate between lymph and blood.**

Blood	Lymph
The colour of blood is red due to the presence of RBC.	Lymph is colourless due to the absence of RBC.
The components of blood are RBC, WBC, platelets and plasma.	The components of some WBC and plasma
It moves through arteries, veins and capillaries.	It moves through lymphatic vessels and capillaries.
It moves only in vessels	It can come out of the vessels and bathe the tissues as extra cellular fluid.
It transports nutrients, waste materials, causes blood clotting, and forms the immune system.	It transports fats, fight against infection
It circulates from heart to body parts and back	It circulates only from body parts to heart.

6. **What are the functions of lymph?**

1. Lymph contains lymphocytes, which fight against infection and help in body's defense mechanism.
2. Lymph also carries digested fat.
3. Lymph returns proteins and fluid from circulation to tissues.

Transportation in Plants

1. **List the materials that require transportation in plants.**

   Water, minerals, sugars and other metabolites synthesised in leaf, hormones synthesised at shoot and root tips, stored food from part of storage to other plant part, etc.

2. **Name the two conducting tissues of plants.**

   Xylem and phloem.

3. **Why do plants require a proper system of transportation?**

   In trees and big plants, diffusion process is not sufficient to provide raw material to the leaves from the roots and energy reserves to the **roots** from the leaves. Therefore, a proper system of transportation is essential in plants.

4. **Why plants can afford to have a slow transport system as compared to animals?**

   Plants do not move and have a large proportion of dead cells in many tissues. Therefore, their energy needs are less and therefore they can afford to have a slow transport system as compared to animals.

5. **What is root pressure?**

   The pressure that is created due to difference in concentration of salts which forces water absorbed from the soil, to move through the roots and up the stem of the plant is known as root pressure.

6. **Why root pressure alone cannot be responsible for transport of water in plants?**

   Root pressure alone cannot be responsible for transport of water in plants because this pressure created due to concentration gradient and osmosis is not enough to move water over great heights of commonly found tall plants.

7. **Explain the mechanism of upward movement of water and minerals in plants.**

   The upward movement of water and minerals in plants occurs through **xylem.**

   Root hairs of plants are in direct contact with the film of water in between the soil particles.

   Water enters the roots through root hairs and maintains a continuous column of water in the xylem of root and stem.

   The suction force created in the xylem of leaves by **transpiration-pull** transports the water upward.

8. **When does root pressure becomes a major driving force for movement of water in plants and why?**

   At night, root pressure becomes a major driving force for movement of water in plants. This is because the stomata are closed during nighttime and transpiration is not possible.

9. **What is transpiration? What is its importance?**

   The loss of water in the form of water vapour from the leaves into the atmosphere is called transpiration. Evaporation of water molecules from cells of a leaf due to transpiration creates suction, which is responsible for pulling water from xylem cells.

   Hence, movement of water and minerals from roots to leaves in the form of a continuous column is due to transpirational pull. This water is utilised by plant during photosynthesis

Transport of food and other substances

1. **What is translocation?**

   Transport of products of metabolic processes from where they are formed to other parts of the plant is called translocation. For e.g., sugar formed during photosynthesis is translocated to other parts of plant body.

2. **Name the tissue responsible for translocation.**

   Phloem.

3. **Name the components of phloem that are involved in translocation**.

   Sieve tubes and companion cells.

4. **Name two substances other than sugar that are translocated through phloem.**

   Amino acids and hormones.

5. **Explain the mechanism of translocation in plants.**

   Transportation of sugar, other metabolites and hormones, occurs through phloem is termed as translocation.

   Translocation takes place through sieve tubes with the help of adjacent companion cells both in upward and downward directions.

   Food materials like sucrose enter the phloem from leaves, using energy from ATP.

   This increases the osmotic pressure of the tissue causing water to move into it.

This pressure moves the material in the phloem to tissues which have less pressure.

Translocation is an active process as energy is required to move these substances.

6. Differentiate between transport of water and translocation of food in plants.

Transport of Water	Translocation of Food
Transport of water and minerals occur	Transport of food, other metabolites hormones occur
It occurs through dead xylem	It occurs through living phloem
It occurs from roots to leaves	It occurs in all directions
It occurs along with the concentration gradient hence no energy is spent	Energy is spent as it is an active process

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