

7

Chapter

Transportation in Animals and Plants

We'll cover the following key points:

- Transport in Humans
- Transportation in Plants



Hi, I'm EeeBee

Do you Remember:

Fundamental concept in previous class.

In class 5th we learnt

- Heart: Structure and Function
- Blood

Still curious?

Talk to me by scanning the QR code.



Learning Outcomes

Students will be able to

- Understand the process of material transport in animals and plants.
- Study the human circulatory system and excretory system.
- Gain knowledge about blood, its components, and waste removal.
- Explain the structure and function of the heart and the excretory system.
- Understand the mechanisms of water and nutrient transport in plants.

Guidelines for Teachers

The teacher can introduce the chapter by discussing the essential concept of transportation in living organisms. She/He can explain how animals and plants transport nutrients, gases, and waste products to maintain vital functions.

For **Transportation in Humans**, the teacher can use models or diagrams of the circulatory and excretory systems, pointing out major components such as the heart, blood vessels, blood, kidneys, and nephrons.

For **Transportation in Plants**, the teacher can explain how water and nutrients move through xylem and phloem. To make the lesson interactive, the teacher can conduct a demonstration, such as showing capillary action in plants or using a stethoscope to listen to the heartbeat.

NCF Curricular Goals and Competencies

This chapter covers the following curricular goals and competencies: **CG - 7 (C-7.1)**: Communicates their own questions, observations, and conclusions related to science.



Mind Map

TRANSPORTATION IN ANIMALS AND PLANTS

Circulatory system

i. Blood

Blood is fluid which flows in blood vessel and it is composed of plasma and Blood corpuscles.

•Blood corpuscles

Red Blood corpuscles: Contains a red pigment called haemoglobin.

White blood corpuscles: Fight against germs that enter our body.

Platelets: Helps in clotting of blood.

ii. Blood vessels

Veins : Carry carbon dioxide rich blood from all parts of the body back to the heart.

Capillaries : Extremely thin tubes join from veins which empty into the heart.

Arteries : Carry oxygen rich blood from the heart to all parts of the body.

iii. Heart pumps the blood

Vena Cava: Collects impure or deoxygenated blood from all parts of the body.

Right atrium / Right ventricle : Contains deoxygenated blood. Lungs : Purification of blood.

Left atrium / Left ventricle : Contains oxygenated blood.

Aorta : Distribute pure or oxygenated blood in all parts of body.

iv. Heart Beat

Rhythmic contraction followed by its relaxation.

Pulse : Number of rate beats per minute

Excretion in animals

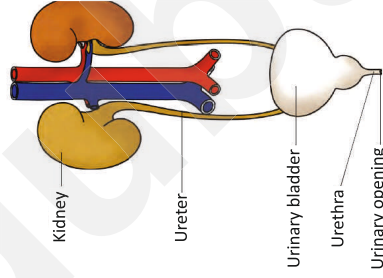
In human excretory system

Kidneys : Ultrafiltration of urine.

Ureters : Passes Urine from kidneys to bladder.

Urinary Bladder : Stores urine

Urethra : Passes urine out



Kidney

Ureter

Urinary bladder

Urethra

Urinary opening



Transpiration

Plants absorb mineral nutrients and water from the soil. Not all the water absorbed is utilised by the plant. The water evaporates through the stomata present on the surface of the leaves by the process of transpiration.

Transport in Plants

•Xylem

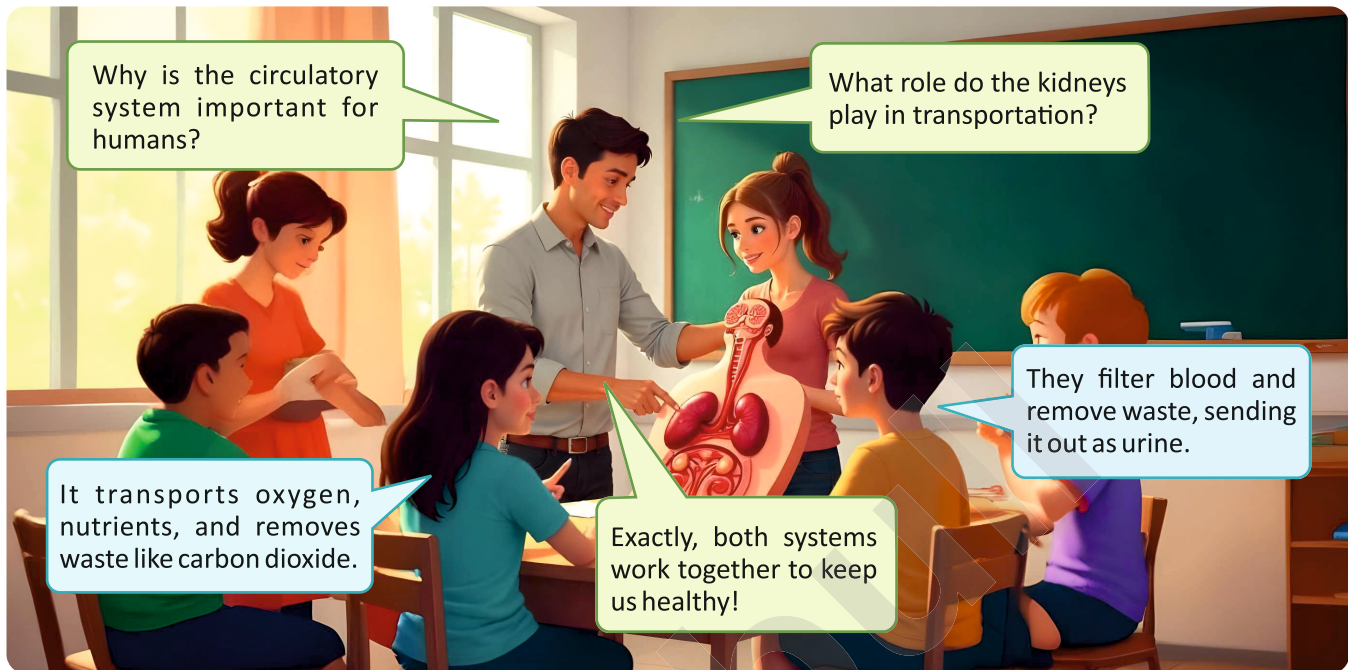
Transports water and dissolve minerals from the roots to the leaves.

•Phloem

Translocate soluble food in plants from leaves to roots.

Transport in Humans

A classroom with a model of the human body on the teacher's desk.



We know that all organisms require food, oxygen, water and other substances for their survival. Every living organism is made up of cells that need energy to do their respective functions. Thus food, water and other substances need to reach every cell of a living organism to provide energy. The waste products produced during various life processes like digestion and respiration too need to be removed from the body for it to be able to perform well.

In History...

- **The Circulatory System:** In the 17th century, William Harvey's groundbreaking work on the circulatory system revolutionized our understanding. He demonstrated that blood circulates through the body in a closed loop, propelled by the heart.
- **17th and 18th Centuries:** Researchers like Marcello Malpighi and Stephen Hales began exploring how plants transport water and nutrients. Hales, known as the father of **plant physiology**, introduced ideas about transpiration and the movement of water through the plant's **vascular system**.

KEYWORDS

Plant Physiology: Plant physiology is the study of the functional processes and mechanisms that occur in plants, such as photosynthesis, respiration, and nutrient transport.

Vascular System: The vascular system in plants consists of xylem and phloem, which transport water, nutrients, and food throughout the plant.

Circulatory System

In human beings, digested food, water, oxygen and waste materials are carried around the body by blood. Blood flows through a network of tubes which are called blood vessels. Blood is pumped to every part of the body by the heart. The heart has an extensive network of blood vessels that spreads in the entire body and the blood which transports various materials together, form the circulatory system. Thus, the human circulatory system consists of blood, blood vessels and the heart.

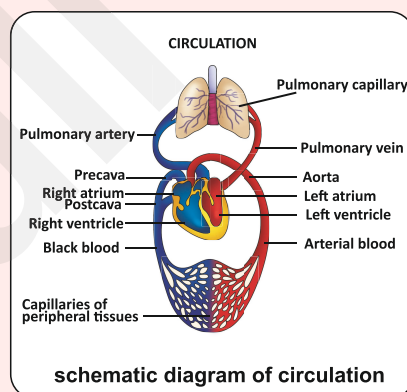
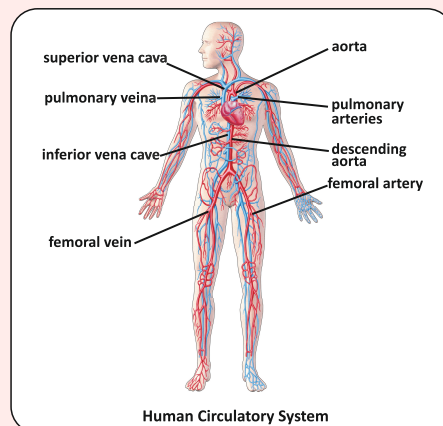
Blood

The blood is the main transport medium in human body. It is fluid connective tissue and has the following functions :

1. White Blood Cells (WBCs): These are also called leucocytes. White blood cells protect the body from disease-causing organisms and fight infections.
2. Red blood cells (RBCs): Red blood cells are red in colour due to the presence of a red pigment called haemoglobin inside them. These are also called erythrocytes.

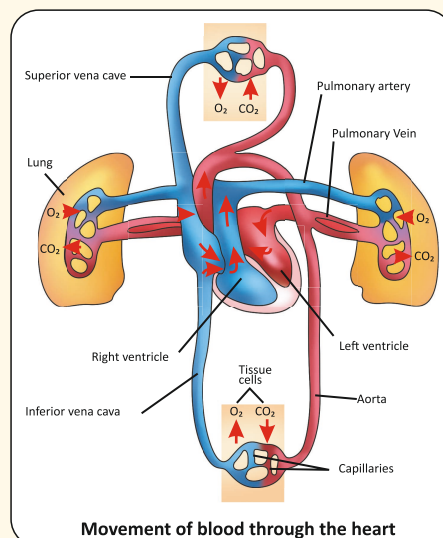
Chief function of RBCs is to transport oxygen from the lungs to the tissues. For this function, red blood cells contain the pigment haemoglobin, which combines with oxygen to give oxyhaemoglobin:

The average Red blood cell only lasts for about 120 days, because it lacks nucleus and other organelles needed to maintain the cell.



Heart

The heart is a small muscular organ which is responsible for pumping the blood. The human heart has four chambers, namely the right auricle, the right ventricle, the left auricle and the left ventricle. The upper chambers are called auricle or atrium. The lower chambers are called ventricle. The following flow chart shows the movement of blood through the heart (the blue colour shows deoxygenated blood or the venous circulation and the red colour shows oxygenated blood or the arterial circulation). From the body–Right Atrium –Right Ventricle–Pulmonary Artery– Lungs –Pulmonary Vein –Left Atrium– Left Ventricle –To the body.



Did You Know ?

The volume of blood in a human is about in 4-5 liters.

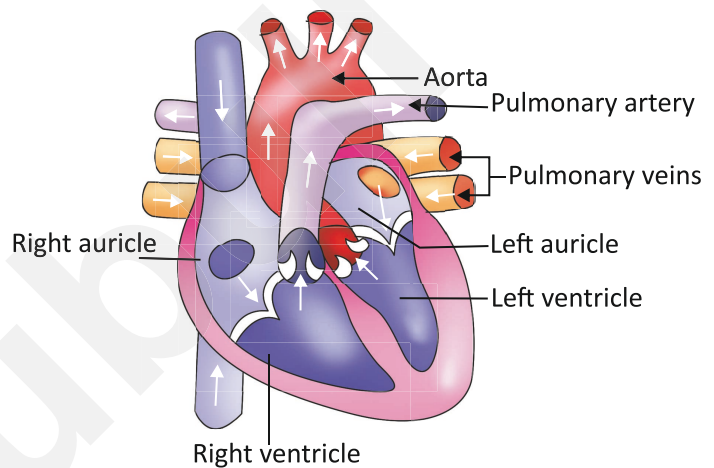


Activity

Take a small funnel of 6-7 cm in diameter. Fix a rubber tube (50 cm long) tightly on the stem of funnel. Stretch a rubber sheet or a balloon on the mouth of the funnel and fix tightly with rubber band. Put the opened end of the tube on the one of your ears. Place the mouth of the funnel on your chest near the heart. Now try to listen carefully. What do you hear?

Heart Beat and Heart Sounds

The rhythmic contraction and relaxation of auricles and ventricles is called heartbeat. Human heart beats about 72 times per minute. The heartbeat can be heard as lub and dub sounds. The sound of heartbeat is caused by the contraction of heart muscles and shutting down of **cuspid valves** (lub sound) and **semilunar valves** (dub sound).



Sections of human heart

Phases of Heartbeat:

Atrial Systole: The atria contract, pushing blood into the ventricles.

Ventricular Systole: The ventricles contract, ejecting blood into the aorta and pulmonary artery.

Diastole: The heart muscles relax, allowing blood to refill the atria and ventricles.

First Heart Sound (S1 - "Lub"): Produced by the closure of the cuspid valves (tricuspid and mitral) at the start of ventricular systole.

It indicates the beginning of the contraction phase when the ventricles start pumping blood.

Second Heart Sound (S2 - "Dub"): Produced by the closure of the semilunar valves (aortic and pulmonary valves) at the start of ventricular diastole.

It indicates the end of the contraction phase and the beginning of relaxation.

KEYWORDS

Cuspid Valves: Cuspid valves, like the mitral and tricuspid valves, regulate blood flow between the atria and ventricles, preventing backflow.

Semilunar Valves: Semilunar valves, located at the bases of the aorta and pulmonary artery, prevent backflow of blood into the ventricles.

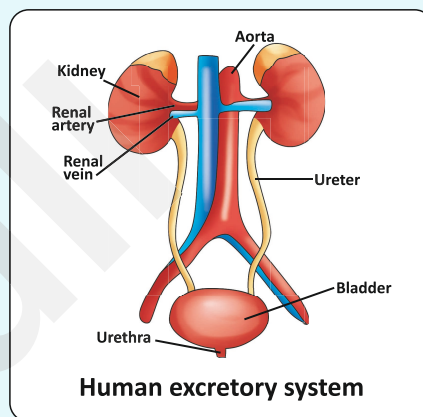
Excretion

In all living organism, various activities continue to take place inside the body. These activities are collectively known as metabolism. Many harmful substances are created during metabolic activities. These substances can prove lethal if not removed from the body in time. The process of removal of waste from the body is known as excretion.

Excretory System in Humans

The human excretory system is composed of a pair of kidneys, two tubes called ureter and a urinary bladder.

Kidney: Kidneys are bean-shaped structures which work like filters. When blood containing waste materials enters the kidney, the waste is filtered from the blood and the purified blood is sent for the normal circulation. The waste along with water is transferred to the urinary bladder through the ureters. It is called urine. Urine contains 95% water, 2.5% urea and 2.5% other wastes. Urine is expelled out from time to time. In normal human beings, during the course of one day, i.e. 24 hours, we pass about 1-1.8 litre of urine.



Did You Know ?

The English physician Willian Harvey discovered the circulation of blood.

Type of waste and mode of excretion

Proteins contain nitrogen. Metabolism of proteins creates nitrogenous waste in the body. The nitrogenous waste is the main waste in animals. This waste takes different forms in different animals. These are ammonia, urea and uric acid. Based on the type of nitrogenous waste, the animals can be divided into following categories:

- **Ammonotelic:** Ammonia is the main nitrogenous waste in these animals. Lot of water is required for removal of ammonia. Ammonotelism is present in aquatic animals, e.g. fish, frogs, etc.
- **Ureotelic:** Urea is the main nitrogenous waste in these animals. Less water is required for removal of urea. Ureotelism is present in mammals.
- **Uricotelic:** Uric acid is the main nitrogenous waste in these animals. Removal of uric acid requires negligible amount of water. Uricotelism is present in reptiles and birds.

Some of the waste materials are removed along with sweat. Carbon dioxide is an important waste which is removed through the lungs.

Let's recall what we know

Apply Concept in Context

Apply

How does your heart and kidneys respond to ensure the proper transport and removal of substances in your body?

If a person drinks too little water, how might it affect their excretory and circulatory systems?

Skills Covered: Critical thinking, Applicative thinking, Brainstorming

Examine Further

Analyse

- What will happen if the blood flow or waste removal in the human body stops?
- Give your answer with relation to the circulatory and excretory systems.

Skills Covered: Critical thinking, Analytical thinking, Brainstorming, Research, Investigation

Self-Assessment Questions

Evaluate

- What is the role of blood in transportation?
- Name the key components of blood and their functions.
- What are the main organs of the excretory system?
- How does the heart pump blood through the circulatory system?

Skills Covered: Research, Observation, Recall

Creative Insight

Create

The circulatory and excretory systems work together to maintain balance in the human body. The heart pumps oxygen-rich blood through arteries to deliver nutrients to cells, while veins carry deoxygenated blood back to the heart. Simultaneously, the kidneys filter the blood, removing waste products and excess water to produce urine, which is expelled from the body. This coordination ensures the transport of essential substances and the removal of harmful waste.

Task: Create a flowchart showing the flow of blood and filtration of waste in the human body based on the concepts discussed in the chapter.

Skills Covered: Creativity, Critical and logical thinking, Brainstorming, Observation, Organization

SCAN TO ACCESS



Take a Task



Watch Remedial

**Bloom's
Taxonomy**

Transportation in Plants

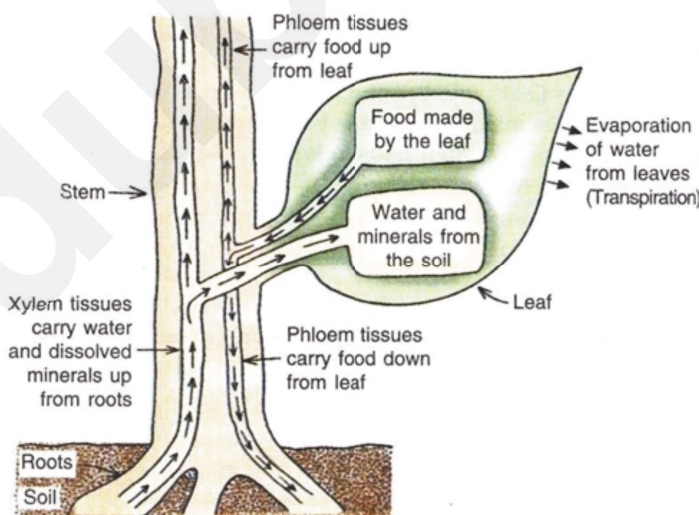
The teacher is holding a small potted plant, pointing to its leaves and roots.



There are two main tissues, namely xylem and phloem for the process of transportation in plants. These are composed of narrow tube-like structures. Xylem is responsible for transport of water, while phloem is responsible for transport of food.

Plants take water from the soil. Following are the main steps in transport of water in plants. From soil the water enters the root hairs by the process of osmosis. From root hairs water moves to xylem. The transport of water through xylem is known as ascent of sap. The process of movement of water includes the following steps:

- Root pressure is responsible for the rise of water to some heights. Capillary action pushes the water further up. The rise of liquid for a very narrow tube is known as capillary action. Capillary action happens because of very small diameter of the tube.
- **Adhesion cohesion:** Water molecules stick to each other and makes a continuous column inside the xylem tubes.



Flow chart showing the movement of water from the soil to the stomata through transpiration

- **Transpiration pull:** There are numerous small pores on the surface of leaves. These pores are called stomata. Water vapour is continuously removed through stomata during daytime. Removal of water vapour from leaves in plants is known as transpiration. This creates a pull in the underlying xylem tissues. This pull is called transpiration pull.

Food prepared in the leaves needs to be transported to different plant parts for use and storage. The transport of food takes place through phloem. It contains cells called sieve tubes which transfer food from one part of plant to another. The food is transported in solution which is called phloem sap. Phloem sap moves from a sugar source (leaves) to a sugar sink a part where food can be stored, like roots. This process is known as translocation. Translocation involves diffusion and osmosis.

Let's recall what we know

Apply Concept in Context

Apply

- How does water reach the leaves in tall plants? What role do xylem and transpiration play in this process?
- If the soil lacks nutrients, how might it affect the plant's ability to transport food and minerals?

Skills Covered: Critical thinking, Applicative thinking, Brainstorming

Examine Further

Analyse

- What will happen if water and minerals are not transported properly within a plant?
- Give your answer with relation to photosynthesis and plant growth.

Skills Covered: Critical thinking, Analytical thinking, Brainstorming, Research, Investigation

Self-Assessment Questions

Evaluate

- What is the role of xylem in transportation?
- What is phloem, and how does it transport food in plants?

Skills Covered: Research, Observation, Recall

Creative Insight

Create

Water and minerals absorbed by the roots travel upward through the xylem, while food produced in the leaves through photosynthesis is distributed to other parts of the plant via the phloem. Transpiration, the loss of water vapor from leaves, creates a pull that helps in the upward movement of water.

Task: Create a flowchart showing the transportation of water and food in plants, highlighting the roles of xylem, phloem, and transpiration.

Skills Covered: Research, Creativity, Observation, Brainstorming

SCAN TO ACCESS



Take a Task



Watch Remedial

**Bloom's
Taxonomy**

SUMMARY



Transportation in animals and plants is a crucial biological process that ensures the movement of essential materials like nutrients, water, oxygen, and waste products within an organism. It is vital for sustaining life by facilitating growth, energy production, and the maintenance of homeostasis. This topic is divided into two main concepts:

Transportation in Humans and Transportation in Plants.

Transportation in Humans

In humans, transportation involves the **circulatory system** and the **excretory system**, both working together to transport nutrients, gases, and waste products effectively.

Circulatory System:

The circulatory system is responsible for the transportation of oxygen, carbon dioxide, nutrients, hormones, and waste products to and from different parts of the body.

- **Heart:** Acts as the central pumping organ, propelling blood throughout the body.
- **Blood Vessels:** Include arteries (carry oxygen-rich blood away from the heart), veins (carry oxygen-poor blood back to the heart), and capillaries (facilitate the exchange of materials between blood and tissues).
- **Blood:** Contains red blood cells (oxygen transport), white blood cells (immunity), platelets (clotting), and plasma (carries nutrients and hormones).

Excretory System:

The excretory system removes waste products like urea, toxins, and excess water from the body to maintain homeostasis.

- **Kidneys:** Filter blood, removing waste and forming urine.
- **Ureters and Bladder:** Transport and store

urine before expulsion.

Transportation in Plants

In plants, transportation is essential for moving water, minerals, and food to support growth and metabolic activities. Unlike animals, plants lack a central pumping system, relying on specialized tissues and natural processes.

Water and Mineral Transport:

- Water and minerals are absorbed by roots from the soil.
- Xylem transports water and minerals from roots to leaves.
- Movement is facilitated by:
 - **Root Pressure:** Pushes water upward.
 - **Capillary Action:** Moves water through narrow xylem vessels.
 - **Transpiration Pull:** Evaporation from leaves creates suction, pulling water upward.

Food Transport:

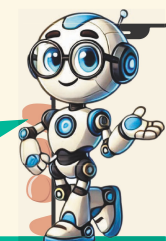
- Phloem transports food (mainly sucrose) from leaves to other plant parts.
- The process, called translocation, is energy-dependent and bidirectional (upward and downward).
- Ensures the distribution of nutrients to growing parts, storage organs, and energy-requiring areas.

EeeBee: Your AI Buddy

Explore! **Transportation in Animals and Plants** with EeeBee AI Buddy.

Hi Friend! Use prompts to ask me questions about the chapter we just finished! eeee, lets go!

Start by Scanning this QR Code:





Gap Analyzer™
Take a Test



EXERCISE

That turn curiosity into confidence—let's begin!



A. Choose the correct answer.

- Which of the following is responsible for transporting oxygen in humans?
(a) Plasma ☐ (b) Platelets ☐
(c) Red blood cells ☐ (d) White blood cells ☐
- What is the function of phloem in plants?
(a) Transporting water ☐ (b) Transporting food ☐
(c) Absorbing nutrients ☐ (d) Transpiration ☐
- Which organ in the excretory system filters blood to remove waste?
(a) Liver ☐ (b) Kidney ☐
(c) Bladder ☐ (d) Stomach ☐
- Which part of the plant is responsible for water absorption?
(a) Leaves ☐ (b) Stem ☐
(c) Roots ☐ (d) Flowers ☐
- What structure stores urine in the human body before excretion?
(a) Kidney ☐ (b) Bladder ☐
(c) Ureter ☐ (d) Urethra ☐

B. Fill in the blanks.

- The tissue responsible for transporting water in plants is called _____.
- In humans, _____ carry oxygen-rich blood from the heart to different parts of the body.
- Food is transported in plants through the _____ tissue.
- The organ responsible for filtering blood in humans is the _____.
- The loss of water vapor from plant leaves is called _____.

C. Write True or False.

- The xylem transports food in plants.
- The kidneys are part of the human excretory system.
- Phloem is responsible for transporting water in plants.
- The bladder stores urine temporarily before excretion.
- Transpiration occurs in the roots of plants.

D. Define the following terms.

- | | | |
|------------------|------------|-------------|
| 1. Xylem | 2. Phloem | 3. Arteries |
| 4. Transpiration | 5. Kidneys | |

E. Match the columns.

Column A

1. Xylem
2. Phloem
3. Kidneys
4. Arteries
5. Bladder

Column B

- (a) Transport of food in plants
- (b) Transport of water in plants
- (c) Filtering waste from blood
- (d) Carry oxygenated blood
- (e) Stores urine temporarily

F. Give reasons for the following statements.

1. Xylem is essential for transporting water in plants.
2. The heart acts as a pump in the circulatory system of humans.
3. Transpiration helps in the upward movement of water in plants.
4. Kidneys play a vital role in removing waste from the blood.
5. Phloem transports food from leaves to other parts of the plant.

G. Answer in brief.

1. What is the function of the xylem in plants?
2. How does the heart ensure proper blood circulation in humans?
3. Explain the role of transpiration in plants.
4. What are the main components of the human excretory system?
5. How is food transported in plants?

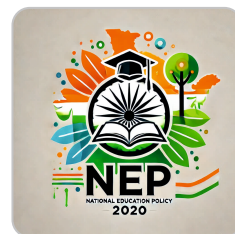
H. Answer in detail.

1. Describe the process of water transport in plants through xylem.
2. Explain the structure and functioning of the human circulatory system.
3. Discuss the role of phloem in transporting food in plants.
4. Explain how the kidneys filter blood and remove waste in the human excretory system.
5. Compare the transportation systems in humans and plants.



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With the new focus on holistic progress cards, your personality, creativity, and extracurricular talents will shine.



Skill-based Activity



Your Own Circulatory System Model

STEM

Perform the given activity at your home to understand the working of the circulatory system. You will need a balloon, a straw, a water bottle, and some colored water.

1. Fill a water bottle halfway with colored water to represent blood.
2. Place a straw through a hole in the cap, ensuring it fits snugly.
3. Attach a balloon to the top of the straw to simulate the heart.
4. Squeeze the balloon gently to pump the colored water through the straw.
5. Observe how the water moves out of the bottle, similar to how the heart pumps blood.

Now, answer the following questions:

1. How does the heart act as a pump in the circulatory system?
2. Why is it important for blood to circulate throughout the body?

How do the kidneys filter waste from the blood during circulation?

Skills Covered: Observation, Analytical thinking, Logical thinking, Brainstorming

Plant-Vascular System Model

Art

Create a 3D model of the vascular system of a plant using clay and craft materials:

1. Model the xylem and phloem tissues in a plant stem.
2. Highlight how water and nutrients are transported through these tissues.

Label each part clearly and write a description of its function in your notebook.

Skills Covered: Creativity, Analytical thinking, Organization, Brainstorming

Check the Flow!

Group Activity

The students can check their friend's pulse rate using their index and middle fingers while sitting quietly and after performing a physical activity, such as running or jumping. Then, they can compare the data in a chart showing resting and active heart rates.

Skills Covered: Critical thinking, Logical thinking, Brainstorming, Collaboration, Social skills, Networking

Water Movement in Plants

Case to Investigate

Investigate how the following factors affect the transportation of water and nutrients in plants. Talk to your teacher and collect data based on observations or experiments.

Factors	Data Collected
Temperature	
Soil Moisture	
Transpiration Rate	
Type of Soil	

Compile your findings and present them as a report.

Skills Covered: Critical and analytical thinking, Research, Brainstorming, Investigation, Communication

Sustainable Systems

Aligning with SDGs

Discuss how modern advancements in agriculture and healthcare (e.g., irrigation systems, dialysis machines) improve the overall functioning of transport systems in plants and animals. Reflect on how these technologies address challenges such as drought and kidney failure.

Aligned with SDG 3: Good Health and Well-being.

Skills Covered: Global awareness, Critical thinking, Research, Analytical thinking, Problem-based thinking

Personalized Fitness Plan

Integrated Learning

Using your knowledge of the human circulatory and excretory systems, create a wellness plan for a friend. Include exercises to improve heart health and a diet plan that supports kidney function. Consider your friend's physical and emotional needs when designing the plan.

Skills Covered: Applicative thinking, Critical thinking, Research, Brainstorming, Empathy, Emotional intelligence