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Blood

Composition and Function

Blood is a fluid that flows through blood vessels and transports substances such as digested food, oxygen, and waste products throughout the body. It consists of plasma, a fluid in which different types of cells are suspended.

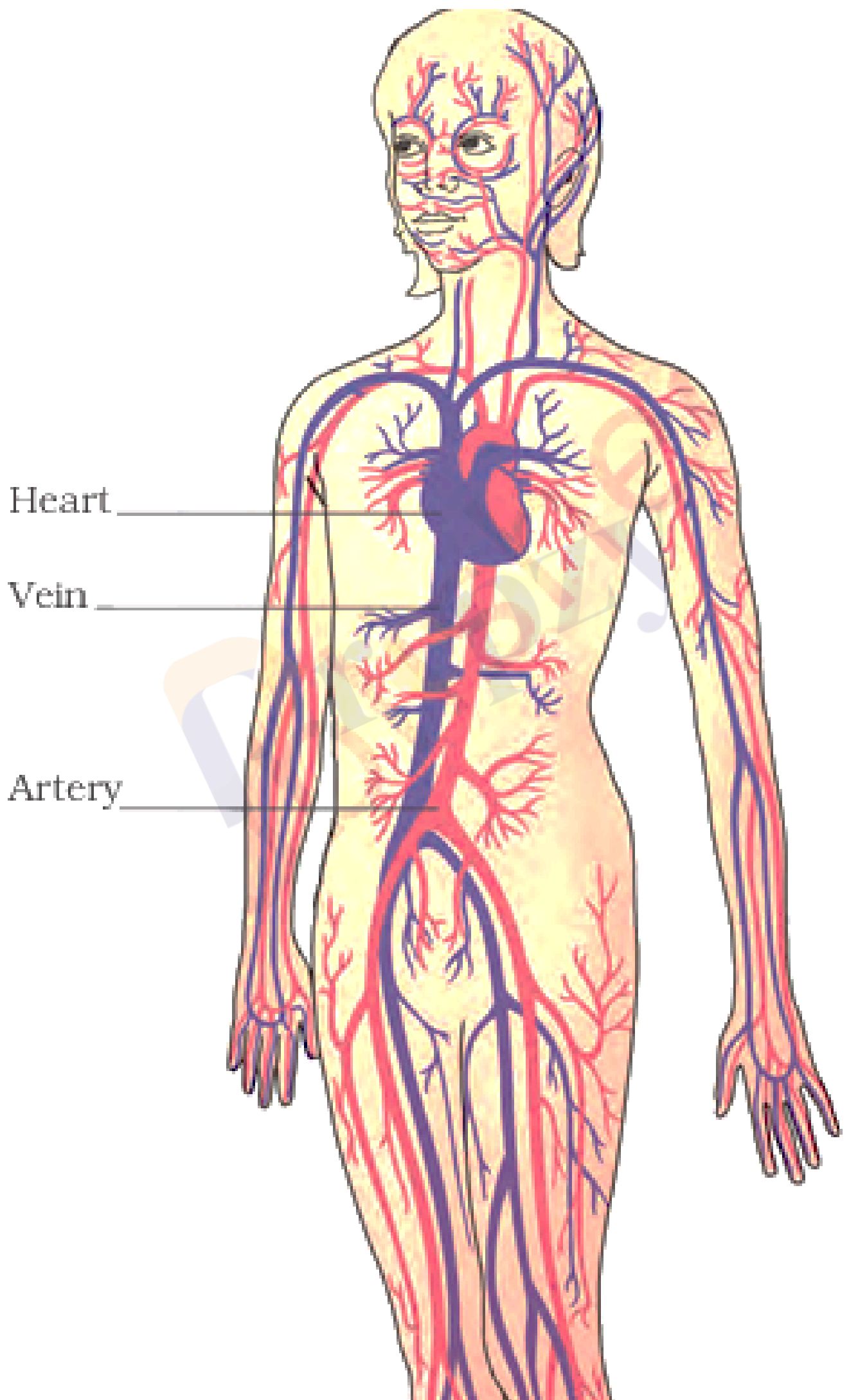
Red Blood Cells and Haemoglobin

Red blood cells (RBCs) contain haemoglobin, a red pigment that binds oxygen and carries it to all parts of the body. Haemoglobin gives blood its red color and is essential for efficient oxygen transport.

White Blood Cells and Platelets

White blood cells (WBCs) protect the body by fighting germs. Platelets are cell fragments that help in blood clotting to stop bleeding when injuries occur.

Prepzy



Heart

Vein

Artery



Fig. 7.1 Circulatory system

(Arteries are shown in red colour and veins in blue)

Solved Examples

Practice Set

- **Level 1:** What is the main function of red blood cells?
- **Level 2:** Explain why blood appears red in color.
- **Level 3:** Describe the role of platelets in the circulatory system.

Answer Key

- **Level 1:** Red blood cells transport oxygen from the lungs to the body cells.
- **Level 2:** Blood appears red because of haemoglobin in red blood cells, which binds oxygen and gives blood its red color.
- **Level 3:** Platelets help in blood clotting by forming a plug at the site of injury to stop bleeding.

Blood Vessels

Types of Blood Vessels

Blood vessels include arteries, veins, and capillaries. Arteries carry oxygen-rich blood away from the heart, veins carry oxygen-poor blood back to the heart, and capillaries connect arteries and veins allowing exchange of substances.

Arteries

Arteries have thick elastic walls to withstand high pressure as they carry blood rapidly from the heart to the body. The pulse felt at the wrist is due to the rhythmic flow of blood in arteries.

Veins

Veins have thinner walls and valves to prevent backflow of blood. They carry carbon dioxide-rich blood from the body back to the heart.



Fig. 7.2 Pulse in the wrist

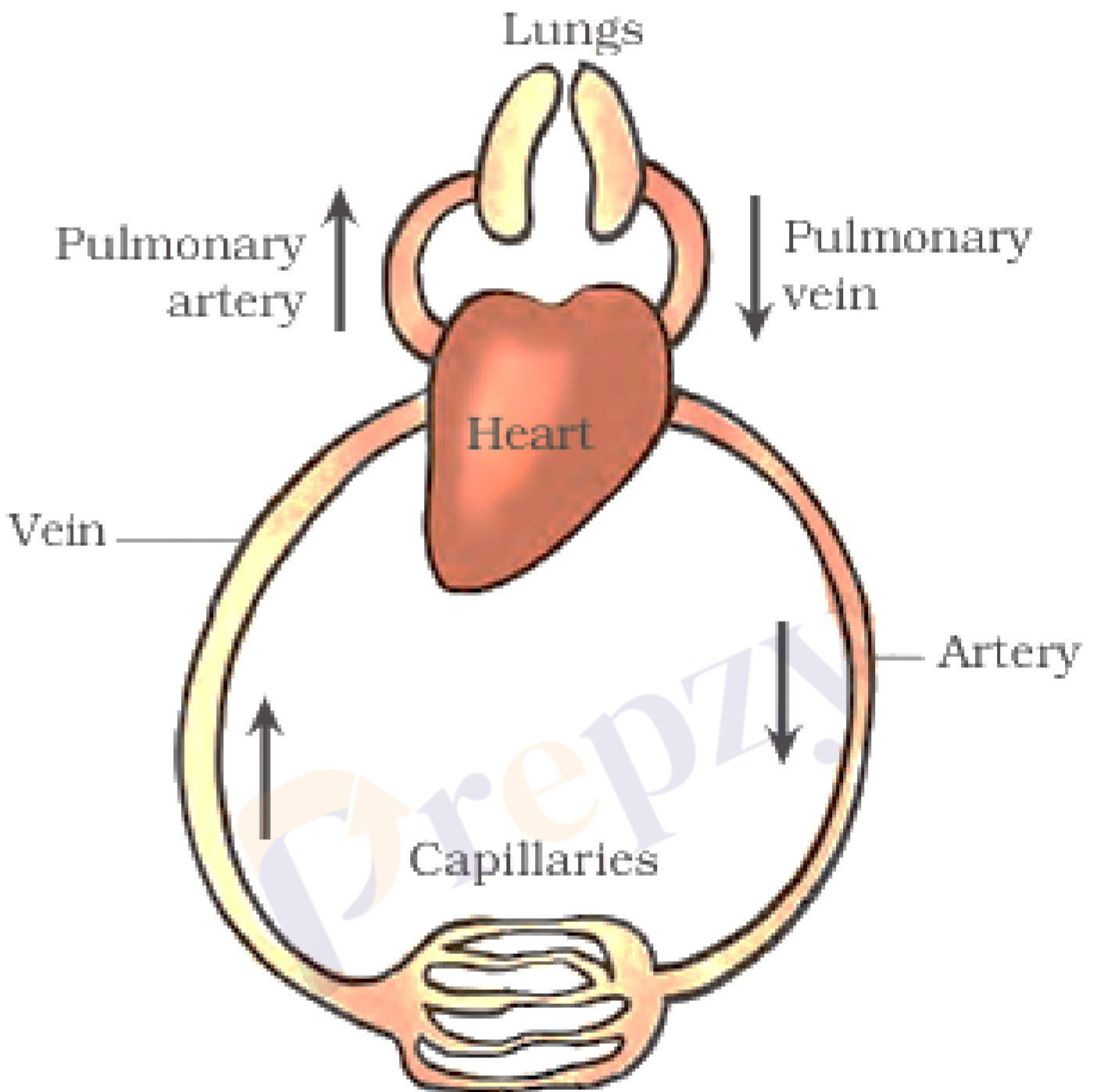


Fig. 7.3 Schematic diagram of circulation

Solved Examples

Practice Set

- **Level 1:** What type of blood do arteries carry?
- **Level 2:** Why do veins have valves?
- **Level 3:** Explain the difference between arteries and veins in terms of structure and function.

Answer Key

- **Level 1:** Arteries carry oxygen-rich blood from the heart to the body.
- **Level 2:** Veins have valves to prevent the backflow of blood and ensure it flows towards the heart.
- **Level 3:** Arteries have thick elastic walls to handle high pressure and carry oxygen-rich blood away from the heart, while veins have thinner walls with valves and carry oxygen-poor blood back to the heart.

Heart

Structure of the Heart

The heart is a muscular organ located in the chest cavity, roughly the size of a fist. It has four chambers: two upper atria and two lower ventricles, separated by a partition called the septum to prevent mixing of oxygen-rich and oxygen-poor blood.

Function of the Heart

The heart pumps blood throughout the body. The right side receives oxygen-poor blood and sends it to the lungs, while the left side receives oxygen-rich blood from the lungs and pumps it to the body.

Major Blood Vessels

Key vessels include the vena cava (brings oxygen-poor blood to the heart), pulmonary artery (carries oxygen-poor blood to lungs), pulmonary vein (carries oxygen-rich blood from lungs), and aorta (carries oxygen-rich blood to the body).

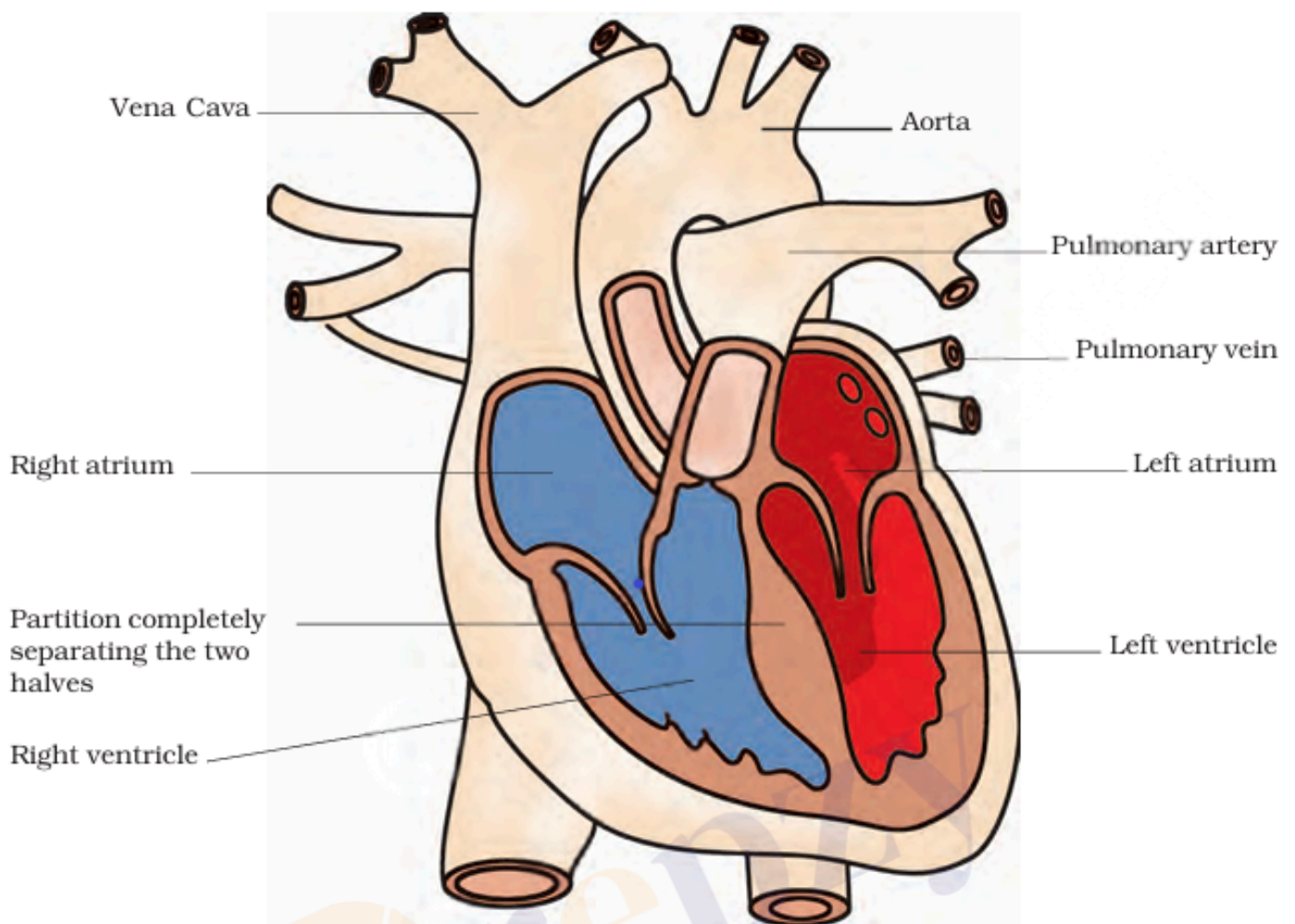


Fig. 7.4 Sections of human heart

Solved Examples

Practice Set

- **Level 1:** Name the four chambers of the heart.
- **Level 2:** Why is the septum important in the heart?
- **Level 3:** Describe the path of blood flow through the heart and lungs.

Answer Key

- **Level 1:** The four chambers are right atrium, right ventricle, left atrium, and left ventricle.

- **Level 2:** The septum separates oxygen-rich and oxygen-poor blood to prevent mixing.
- **Level 3:** Oxygen-poor blood enters the right atrium, moves to the right ventricle, is pumped to the lungs via pulmonary artery, returns oxygen-rich via pulmonary vein to left atrium, moves to left ventricle, and is pumped to the body through the aorta.

Heartbeat

Mechanism of Heartbeat

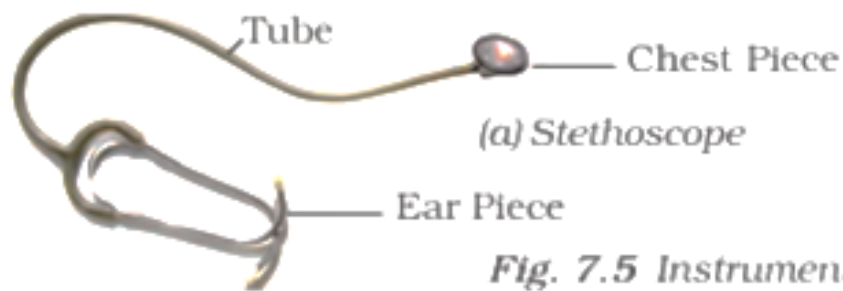
The heart muscles contract and relax rhythmically, producing a heartbeat. This rhythmic action pumps blood continuously throughout life.

Measuring Heartbeat

Heartbeat can be felt on the chest or wrist as a pulse. Doctors use a stethoscope to listen to heartbeats. The pulse rate indicates the number of heartbeats per minute.

Effect of Activity on Heartbeat

Physical activity increases heartbeat and pulse rate to supply more oxygen and nutrients to the body.



(a) Stethoscope

Fig. 7.5 Instrument to hear heartbeat



(b) Model of stethoscope

Solved Examples

Practice Set

- **Level 1:** What causes the pulse that can be felt at the wrist?
- **Level 2:** How does physical activity affect heartbeat?
- **Level 3:** Explain how a stethoscope helps in listening to heartbeats.

Answer Key

- **Level 1:** The pulse is caused by the rhythmic expansion and contraction of arteries due to heartbeats.
- **Level 2:** Physical activity increases heartbeat and pulse rate to meet the higher oxygen demand.
- **Level 3:** A stethoscope amplifies the sound vibrations of the heartbeat, allowing doctors to hear the heartbeats clearly.

Excretion

Excretory System in Humans

Excretion is the removal of waste products produced by cells. The human excretory system includes kidneys, ureters, urinary bladder, and urethra. Kidneys filter blood to remove wastes and excess water as urine.

Urine Formation and Pathway

Blood reaches kidneys where wastes are filtered. Urine formed passes through ureters to the urinary bladder, where it is stored before being expelled through the urethra.

Other Excretory Processes

Sweat glands remove water and salts through sweat, which also helps cool the body. Different animals excrete wastes differently based on their habitat.

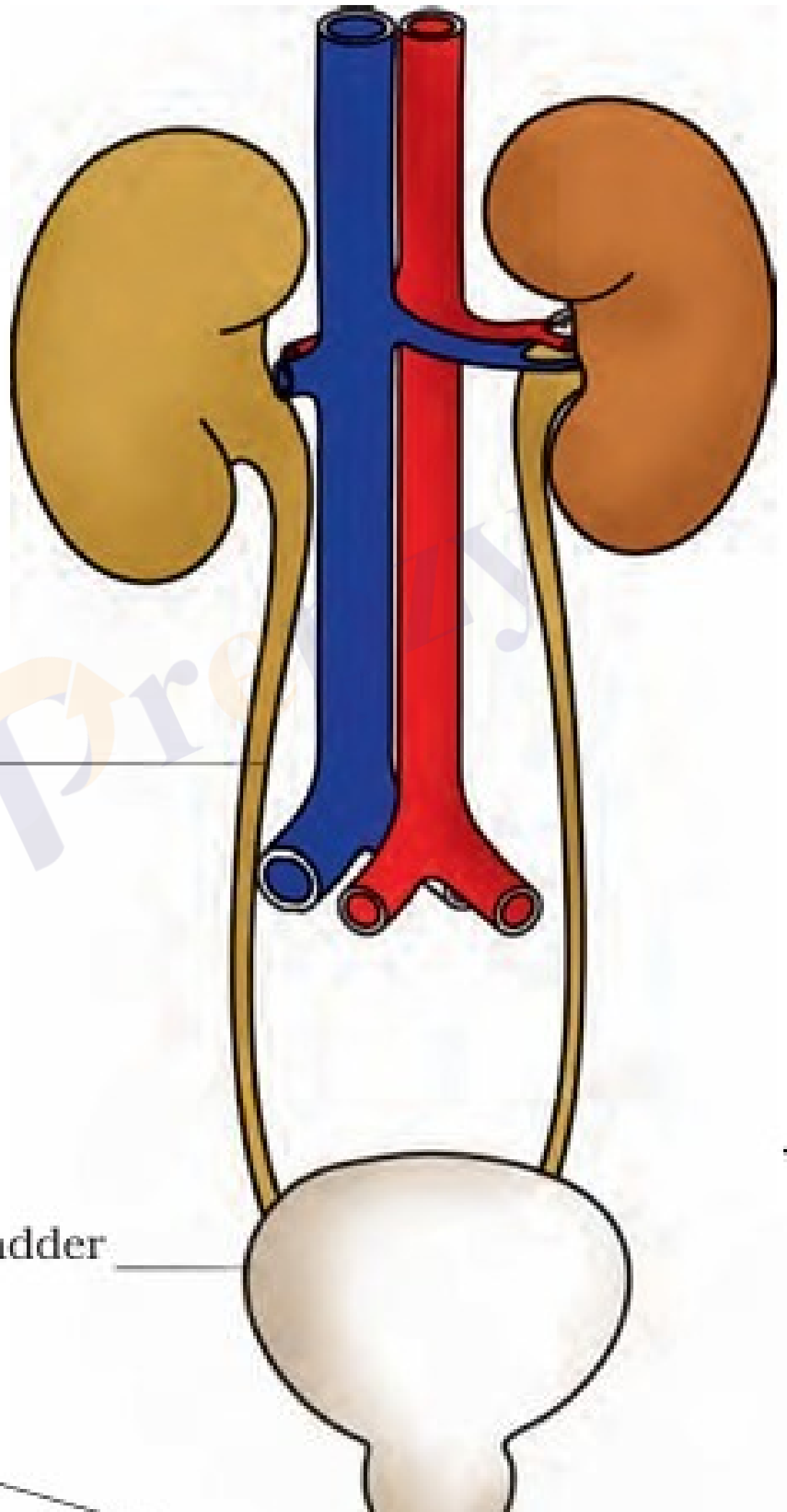
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Kidney

Ureter

Urinary bladder

Urethra



Urinary opening



Fig. 7.6 Human excretory system

Solved Examples

Practice Set

- **Level 1:** Name the organs involved in the human excretory system.
- **Level 2:** What is the function of kidneys?
- **Level 3:** Explain how sweating helps in excretion and body temperature regulation.

Answer Key

- **Level 1:** Kidneys, ureters, urinary bladder, and urethra.
- **Level 2:** Kidneys filter blood to remove waste products and excess water, forming urine.
- **Level 3:** Sweating removes water and salts from the body and cools the body by evaporation.

Plant Transport

Transport of Water and Minerals

Plants absorb water and minerals from the soil through root hairs. Water moves upward through xylem vessels from roots to leaves.

Transport of Food

Food produced in leaves is transported to other parts of the plant through phloem vessels.

Transpiration

Water evaporates from leaves through stomata in a process called transpiration, creating a suction pull that helps draw water upward through the plant.

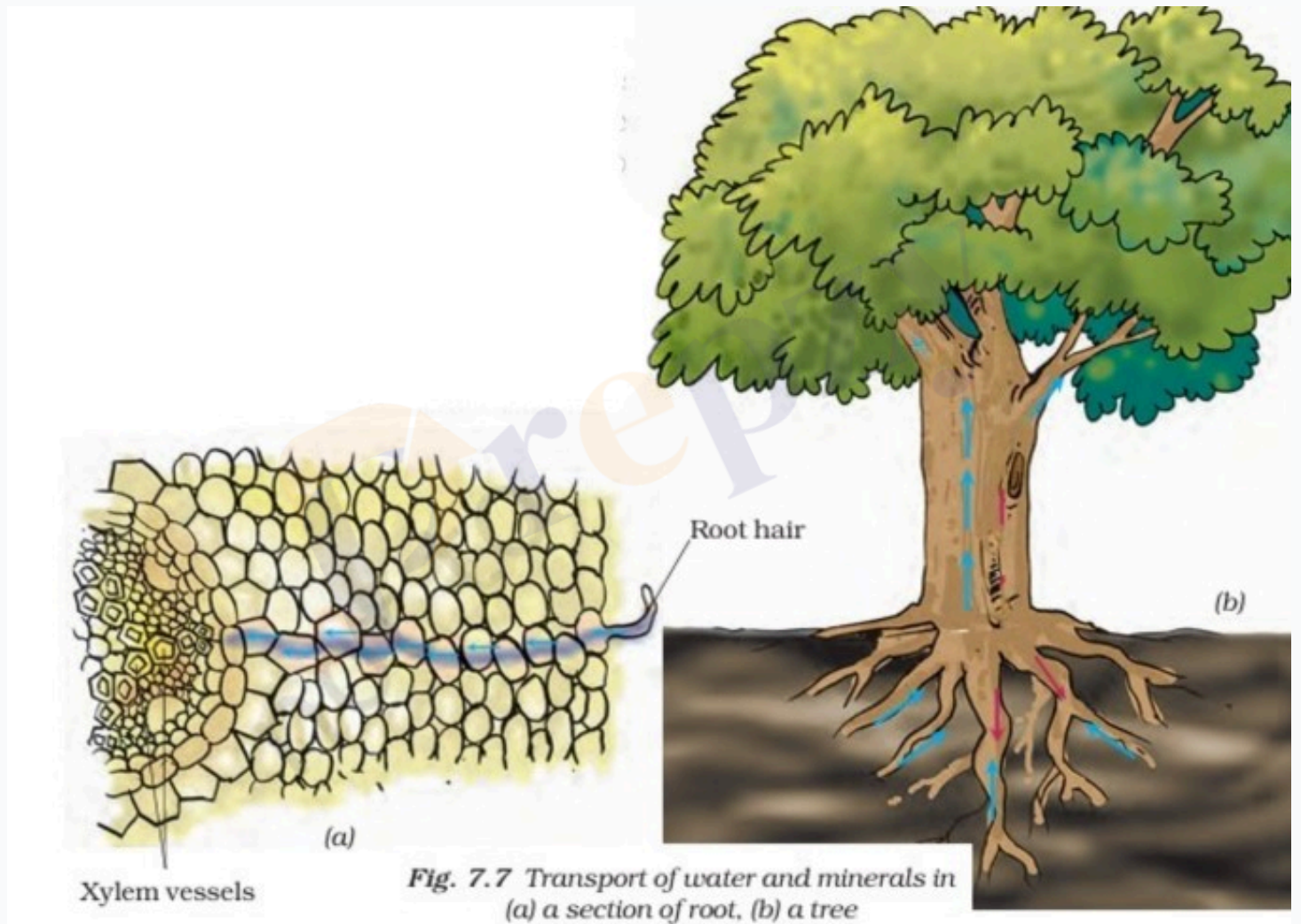
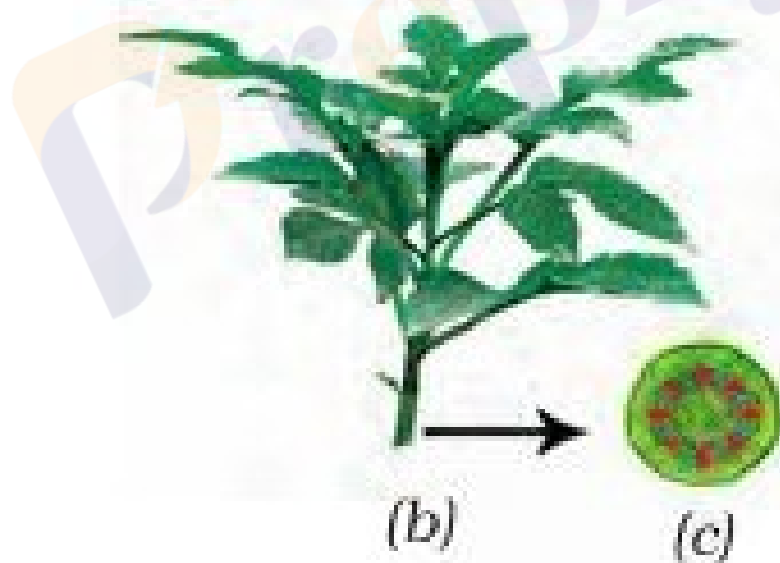




Fig. 7.8 (a) Stem placed in coloured water



*Fig. 7.8 (b) Water moves up in the stem
(c) Enlarged view of open end of stem*

Solved Examples

Practice Set

- **Level 1:** What is the function of root hairs in plants?
- **Level 2:** Name the vascular tissues involved in transport in plants.
- **Level 3:** Explain the process of transpiration and its importance.

Answer Key

- **Level 1:** Root hairs increase surface area for absorption of water and minerals from the soil.
- **Level 2:** Xylem transports water and minerals; phloem transports food.
- **Level 3:** Transpiration is the evaporation of water from leaves, creating suction that pulls water upward through xylem; it also helps cool the plant.

Quick Reference Table

Common Mistakes and Misconceptions

Glossary
