Sprint Through Vessels

Trace how vessel structure supports transport and exchange.

HAP.10.3 "Investigate the structure and function of different types of blood vessels (e.g., arteries, capillaries, veins). Identify the role each plays in the transport and the exchange of materials."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline a structural feature of each vessel type, circle what that feature helps the vessel do, and write A, C, or V beside each matched pair for artery, capillary, or vein.

What Happens in a Working Leg?

1. During a sprint, your leg muscles use oxygen faster than they do at rest. Oxygen enters the blood in tiny vessels around the lungs, then the blood returns to the heart. The heart pushes this blood into arteries that lead toward the legs. Artery walls have thick layers of muscle and elastic tissue. Those walls stretch when the heart pumps and recoil between beats, helping blood move under high pressure. Arteries carry blood away from the heart, not always blood rich in oxygen. For example, pulmonary arteries carry oxygen-poor blood from the heart to the lungs.

2. As an artery branches into smaller vessels in a working leg, blood reaches capillaries woven among the muscle cells. Each capillary wall is only one cell thick, and many capillaries run close to the cells they supply. This short distance lets oxygen and nutrients move from blood into muscle tissue. Carbon dioxide and other wastes move from the tissue into the blood. Red blood cells stay inside the capillaries, while dissolved materials cross the thin walls. Because blood moves more slowly through these tiny vessels than through large arteries, there is time for materials to be exchanged.

3. After passing through the capillaries, blood enters small veins that merge into larger veins on its way back to the heart. Veins carry blood toward the heart at much lower pressure than arteries. Their walls are thinner, and many veins in the legs contain one-way valves. When leg muscles squeeze nearby veins, these valves help keep blood from slipping backward. The returning blood carries carbon dioxide toward the lungs, where it can leave the body. The heart sends this oxygen-poor blood to the lungs through pulmonary arteries, and pulmonary veins bring oxygen-rich blood from the lungs back to the heart.

2 ANSWER WITH EVIDENCE

Use the passage

1. How do an artery's walls help move blood toward a working leg?

2. Why are capillaries suited to exchanging materials with leg muscles? Name two features and the materials that move in each direction.

3. Blood in leg veins is at lower pressure than blood in arteries. How do the veins' valves and nearby muscles help it return to the heart?

4. Pulmonary arteries carry oxygen-poor blood, but pulmonary veins carry oxygen-rich blood. How does each vessel's direction of flow explain its name?

3 YOUR TURN

Your own words

A student sits still during a long bus ride, then walks up a steep hill. In 5 to 6 sentences, trace blood through the leg's arteries, capillaries, and veins during the walk, connecting one structural feature of each vessel type to its role; explain how walking changes the help veins get from leg muscles.

Sprint Through Vessels

PART 1 · READ AND MARK

Underline a structural feature of each vessel type, circle what that feature helps the vessel do, and write A, C, or V beside each matched pair for artery, capillary, or vein. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How do an artery's walls help move blood toward a working leg?	**Thick muscle and elastic tissue let the walls stretch and recoil, helping move blood under high pressure.**
2	Why are capillaries suited to exchanging materials with leg muscles? Name two features and the materials that move in each direction.	**Capillaries have one-cell-thick walls and run close to muscle cells. Oxygen and nutrients move into the tissue; carbon dioxide and other wastes move into the blood.**
3	Blood in leg veins is at lower pressure than blood in arteries. How do the veins' valves and nearby muscles help it return to the heart?	**Leg muscles squeeze the veins, while one-way valves help prevent blood from slipping backward.**
4	Pulmonary arteries carry oxygen-poor blood, but pulmonary veins carry oxygen-rich blood. How does each vessel's direction of flow explain its name?	**Pulmonary arteries carry blood away from the heart to the lungs. Pulmonary veins carry blood from the lungs toward the heart.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

On the hill, the heart pushes blood into arteries, whose thick, elastic walls handle high pressure and help keep blood moving toward the legs. Smaller arteries feed capillaries close to active muscle cells. Their one-cell-thick walls let oxygen and nutrients pass into the muscles and carbon dioxide pass into the blood. Veins then carry this blood toward the heart at lower pressure. As the student walks, leg muscles squeeze the veins, and one-way valves limit backward flow. Sitting still earlier provided less of this muscle-squeezing help.

Accept other accurate descriptions of artery walls, capillary exchange, and vein valves that connect structure to function. The final task should distinguish the increased muscle-squeezing help during walking from sitting still.