Vessels in Motion

Model how changing vessel walls affect blood flow and storage

HS-AP8-4 "Create a model of vasoconstriction and vasodilation to demonstrate the structural and functional difference between arteries and veins."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline wall and valve features, circle changes in lumen size, and write A or V beside each effect on arterial flow or venous blood storage.

Two Routes for Blood

1. Imagine sending water through two kinds of flexible tubing, one built to handle strong pulses and the other built to bring liquid back at lower pressure. Blood vessels have different jobs too, but their walls are living tissue, not rubber. Arteries carry blood away from the heart under relatively high pressure. Their walls have a thick layer of smooth muscle and elastic tissue that helps them handle each heartbeat. Veins return blood toward the heart at lower pressure. Their walls are thinner and have less smooth muscle. Many veins in the legs contain one-way valves that limit backward flow.

2. To model vasoconstriction, picture a ring of smooth muscle tightening around a vessel. Its opening, called the lumen, becomes narrower. To model vasodilation, let the ring relax and the lumen widen. These changes occur in both arteries and veins, although their effects differ. In small arteries and arterioles, narrowing raises resistance to blood flow through that route; widening lowers resistance. Their muscular walls make these changes in lumen size possible. A model must show that the wall moves, rather than suggesting that blood itself pushes the wall shut or pulls it open.

3. In veins, narrowing can reduce the amount of blood they hold and help move blood toward the heart. Widening lets veins hold more blood, so less may return to the heart at that moment. Leg vein valves help prevent backward flow, especially when gravity opposes the trip upward. Valves are not pumps, and a narrow lumen alone does not guarantee faster blood flow. A useful model should separate wall motion from the flow it influences. It should also show how a thick-walled artery handles high-pressure delivery while a thinner-walled vein supports low-pressure return.

2 ANSWER WITH EVIDENCE

Use the passage

1. In a model, why should an artery have a thicker wall than a vein?

2. A model's small artery narrows when its wall tightens. Name the change and explain its effect on resistance.

3. A leg vein model has a movable wall and a one-way flap. If the wall tightens, what does the wall do, and what does the flap do?

4. If both vessels in a model widen, how does that change resistance in a small artery and blood storage in a vein?

3 YOUR TURN

Your own words

Design two side-by-side panels for a movable paper model, one for a small artery and one for a leg vein. In each panel, sketch and label the wall and lumen at rest, constricted, and dilated; show what moves and label one functional effect of each change.

ANSWER KEY

Vessels in Motion

PART 1 · READ AND MARK

Underline wall and valve features, circle changes in lumen size, and write A or V beside each effect on arterial flow or venous blood storage. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	In a model, why should an artery have a thicker wall than a vein?	**The artery's thicker muscle and elastic tissue help it handle high-pressure pulses. A vein returns blood at lower pressure and has a thinner wall.**
2	A model's small artery narrows when its wall tightens. Name the change and explain its effect on resistance.	**The change models vasoconstriction. Narrowing the lumen raises resistance to blood flow through that route.**
3	A leg vein model has a movable wall and a one-way flap. If the wall tightens, what does the wall do, and what does the flap do?	**The tightening wall narrows the lumen and can help move blood toward the heart. The flap represents a valve that limits backward flow.**
4	If both vessels in a model widen, how does that change resistance in a small artery and blood storage in a vein?	**Widening lowers resistance in the small artery and lets the vein hold more blood.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Artery panel: Three openings sit inside a thick, movable wall of muscle and elastic tissue. The resting opening is medium-sized. Arrows show the wall tightening around a smaller opening, labeled “constricted: higher resistance,” and relaxing around a larger opening, labeled “dilated: lower resistance.” Vein panel: Three openings sit inside a thinner movable wall with a one-way valve. Arrows show the wall tightening around a smaller opening, labeled “constricted: holds less blood,” and relaxing around a larger opening, labeled “dilated: holds more blood.”

Accept models that show wall motion changing lumen size in both vessels and distinguish arterial resistance from venous blood storage. A leg vein valve should be shown as limiting backward flow, not pumping blood.