Blood on the Move

Trace how cardiovascular structures support working muscles.

HS-AP8-3 "Investigate the primary structures of the cardiovascular system and explore their functional importance to maintaining homeostasis."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Number only the first mention of these structures in blood-flow order: left ventricle, body arteries, muscle capillaries, body veins, right atrium, right ventricle, pulmonary arteries, lung capillaries, pulmonary veins, left atrium. Underline what each numbered structure does to help maintain suitable conditions in the body; do not number the septum or repeated mentions.

A Runner's Blood Route

(1) At the start of a run, leg muscles need more oxygen and glucose to make energy. The heart's left ventricle contracts, pushing oxygen-rich blood into body arteries. These vessels branch into smaller vessels that deliver blood toward the working muscles. In muscle capillaries, thin walls allow oxygen and glucose to move into nearby cells; carbon dioxide moves from cells into the blood. Body veins return this blood toward the heart, and the right atrium receives it. Without this steady delivery and removal, muscle cells could not keep conditions suitable for continued activity.

(2) The right atrium passes blood to the right ventricle, which pumps it into pulmonary arteries leading to the lungs. In lung capillaries, carbon dioxide moves from blood into air spaces, while oxygen enters the blood. Pulmonary veins carry the oxygen-rich blood back to the left atrium. The left atrium sends it to the left ventricle so another trip can begin. These two connected circuits keep oxygen arriving and carbon dioxide leaving even as the muscles' needs change. The septum, a wall inside the heart, helps keep the two sides' blood streams separate.

(3) During the run, the nervous system signals the heart to beat faster, so more blood passes through the circuits each minute. More blood reaches muscle capillaries, supporting increased oxygen delivery and carbon dioxide removal. After the runner stops, demand falls and heart rate gradually slows. The cardiovascular system does not hold every value constant. Instead, changing blood flow helps keep oxygen supply and waste removal matched to the body's needs. If the right ventricle could not pump effectively, less blood would reach the lungs, reducing oxygen pickup and limiting oxygen delivery to active muscles.

2 ANSWER WITH EVIDENCE

Use the passage

1. Why must blood reach muscle capillaries, rather than stay in body arteries, to support the runner's muscles?

2. How do body veins and the right atrium work together to keep blood moving through the route?

3. Suppose less blood flows through the pulmonary arteries. What would happen to oxygen pickup in the lungs and oxygen delivery to muscles? Explain the connection.

4. How does a faster heartbeat during a run help muscle capillaries maintain conditions for activity?

3 YOUR TURN

Your own words

Imagine a student walking up several flights of stairs while carrying a backpack. In 4 to 5 sentences, explain how at least four named cardiovascular structures work together to supply the leg muscles and remove waste, then predict what would happen if one of those structures could not do its job.

ANSWER KEY

Blood on the Move

HIGH SCHOOL · HS-AP8-3

PART 1 · READ AND MARK

Number only the first mention of these structures in blood-flow order: left ventricle, body arteries, muscle capillaries, body veins, right atrium, right ventricle, pulmonary arteries, lung capillaries, pulmonary veins, left atrium. Underline what each numbered structure does to help maintain suitable conditions in the body; do not number the septum or repeated mentions. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Why must blood reach muscle capillaries, rather than stay in body arteries, to support the runner's muscles?	**The thin walls of muscle capillaries allow oxygen and glucose to enter muscle cells and carbon dioxide to enter the blood.**
2	How do body veins and the right atrium work together to keep blood moving through the route?	**Body veins return blood to the heart. The right atrium receives it and passes it to the right ventricle.**
3	Suppose less blood flows through the pulmonary arteries. What would happen to oxygen pickup in the lungs and oxygen delivery to muscles? Explain the connection.	**Less blood would reach lung capillaries to pick up oxygen, so less oxygen-rich blood would return to the heart for delivery to muscles.**
4	How does a faster heartbeat during a run help muscle capillaries maintain conditions for activity?	**More blood reaches muscle capillaries each minute, increasing oxygen delivery and carbon dioxide removal as the muscles' needs rise.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

As the student climbs, the left ventricle sends blood into body arteries that carry it toward the legs. In muscle capillaries, oxygen and glucose enter muscle cells, and carbon dioxide enters the blood. Body veins carry blood back to the right atrium, which passes it to the right ventricle. That ventricle sends blood toward lung capillaries, where carbon dioxide leaves and oxygen enters the blood. If lung capillaries were damaged, less oxygen could enter the blood, making it harder to supply the climbing muscles.

Accept other accurate routes that name at least four cardiovascular structures, explain their connected roles in delivery and waste removal, and give a plausible consequence of one structure failing.