A Fast Break Breath

Follow oxygen and carbon dioxide through five body processes

HAP.12.3 "Identify the five mechanics of gas exchange: pulmonary ventilation, external respiration, transport gases, internal respiration, and cellular respiration."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the name of each of the five mechanics of gas exchange in the passage. Number them 1 through 5 in the order oxygen encounters them on its way to a muscle cell.

What Happens During a Fast Break?

1. During a fast break, Maya sprints the length of the basketball court. Her diaphragm contracts, her chest expands, and air enters her lungs. When she breathes out, her diaphragm relaxes and air moves back outside. This movement of air into and out of the lungs is **pulmonary ventilation**. Air reaching tiny lung sacs, called alveoli, does not itself deliver oxygen to a leg muscle. At the alveoli, oxygen diffuses across a thin wall into nearby blood, while carbon dioxide diffuses from blood into the sacs. This exchange between air and blood is **external respiration**.

2. The blood leaving Maya's lungs carries oxygen toward her working legs. Most oxygen rides on hemoglobin inside red blood cells. Carbon dioxide from her tissues travels back toward the lungs, mostly as bicarbonate dissolved in plasma. The bloodstream's job here is to **transport gases**. At tiny vessels in Maya's leg muscles, oxygen leaves the blood and enters the tissue, while carbon dioxide moves from the tissue into the blood. This exchange between blood and body tissues is **internal respiration**. Blood flow links the exchange in her lungs to the exchange in her legs.

3. Inside a leg muscle cell, mitochondria use oxygen to help release usable energy from nutrients. This chemical process, **cellular respiration**, produces carbon dioxide, which can eventually be exhaled. Maya can breathe faster during the fast break, but faster airflow alone does not mean that oxygen has reached her cells. The gas must cross the lung wall, travel in blood, and cross into her tissues before cells can use it. Each stage happens in a different place or involves a different action. Mixing up air movement, gas exchange, blood transport, and energy release hides how her body keeps her moving.

2 ANSWER WITH EVIDENCE

Use the passage

1. At a swim meet, Eli inhales deeply. Then oxygen passes from his lung air sacs into nearby blood. Name the two mechanics in order. Which one involves oxygen crossing a wall?

2. After a runner's blood leaves her lungs, it carries oxygen toward her calf. Which mechanic is this, and what carries most of the oxygen?

3. In a drummer's hand, oxygen leaves the blood and enters muscle tissue. Which mechanic is this? How does its location differ from external respiration?

4. A dancer's muscle cell uses oxygen to release energy from nutrients and produces carbon dioxide. Name the mechanic. Why is it not internal respiration?

3 YOUR TURN

Your own words

Imagine carrying a heavy backpack up a flight of stairs. Write five numbered sentences that follow oxygen from the air to energy release in a leg cell. Name one mechanic in each sentence, say where it happens, and include carbon dioxide where it is produced, exchanged, or transported.

ANSWER KEY

A Fast Break Breath

PART 1 · READ AND MARK

Underline the name of each of the five mechanics of gas exchange in the passage. Number them 1 through 5 in the order oxygen encounters them on its way to a muscle cell. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	At a swim meet, Eli inhales deeply. Then oxygen passes from his lung air sacs into nearby blood. Name the two mechanics in order. Which one involves oxygen crossing a wall?	**Pulmonary ventilation comes first, followed by external respiration. Oxygen crosses the wall during external respiration.**
2	After a runner's blood leaves her lungs, it carries oxygen toward her calf. Which mechanic is this, and what carries most of the oxygen?	**This is transport gases. Most oxygen is carried by hemoglobin inside red blood cells.**
3	In a drummer's hand, oxygen leaves the blood and enters muscle tissue. Which mechanic is this? How does its location differ from external respiration?	**This is internal respiration, which occurs between blood and body tissues. External respiration occurs between air in the lungs and blood.**
4	A dancer's muscle cell uses oxygen to release energy from nutrients and produces carbon dioxide. Name the mechanic. Why is it not internal respiration?	**This is cellular respiration, a chemical process inside a cell. Internal respiration is the exchange of gases between blood and tissue.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

1. During pulmonary ventilation, I draw air into my lungs and later breathe carbon dioxide out. 2. During external respiration, oxygen moves from my lung air sacs into blood, while carbon dioxide moves from blood into the sacs. 3. As my blood transports gases, it carries oxygen toward my leg and carbon dioxide toward my lungs. 4. During internal respiration in my leg, oxygen moves from blood into muscle tissue, while carbon dioxide moves into blood. 5. During cellular respiration inside a leg muscle cell, oxygen helps release energy from nutrients, and carbon dioxide is produced.

Accept equivalent wording for the five mechanics if each process and location are correct. For the open task, look for oxygen moving through the stages in order and carbon dioxide described at the relevant stages.