Breath in Motion

Trace how moving chest structures change airflow.

HS-AP11-2 "Observe the anatomical structures and explain the physiological processes involved in inspiration & expiration."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the structures that move and circle the words that describe their movements. For each description of breathing in or out, write 1 beside the chest-volume change, 2 beside the pressure change, and 3 beside the airflow change.

A Breath on the Stairs

1. At the bottom of a stairwell, you take a deep breath before climbing. Air enters through your nose or mouth, travels down the trachea, passes through branching bronchi, and reaches tiny air sacs called alveoli. Your lungs sit inside a chest cavity bounded by ribs and a dome-shaped diaphragm beneath them. During inspiration, the diaphragm contracts and flattens downward. The external intercostal muscles between the ribs also contract, lifting the rib cage up and outward. The chest cavity expands, and the lungs expand with it. Pressure inside the lungs falls below outside air pressure, so air flows inward.

2. At the top of the stairs, you stop and breathe out quietly. The diaphragm relaxes and rises toward its dome shape. The external intercostal muscles relax, allowing the rib cage to move down and inward. As the chest cavity becomes smaller, the stretched lungs recoil and lose volume. Air pressure inside the lungs rises above the pressure outside, pushing air out through the bronchi, trachea, and nose or mouth. The alveoli do not pump air themselves. Instead, pressure differences created by changes in chest size move air in and out of them.

3. If you begin climbing again, your breathing becomes deeper and faster to support working muscles. A forceful exhalation differs from a quiet one: abdominal muscles contract and push the diaphragm upward, while internal intercostal muscles contract and pull the rib cage down and inward. These actions shrink chest volume further, raising pressure inside the lungs and driving air outward more strongly. The alveoli provide a large surface where oxygen enters blood and carbon dioxide leaves blood, but this gas exchange does not drive airflow. To predict airflow at any moment, compare pressure inside the lungs with pressure outside.

2 ANSWER WITH EVIDENCE

Use the passage

1. During the deep breath before climbing, how do the diaphragm and rib cage move, and how do those movements cause air to enter the lungs?

2. When the person breathes out quietly at the top of the stairs, what happens to the chest cavity and lung pressure? Explain why air leaves.

3. How does forceful exhalation use muscles differently from quiet exhalation, and what effect does this have on airflow?

4. Trace the route air takes from outside the body to the alveoli during inspiration. What pressure difference moves it along that route?

3 YOUR TURN

Your own words

Draw two side-by-side sketches of the chest, one during a deep inhalation and one during a forceful exhalation. Label the diaphragm, rib cage, and lungs, add arrows showing movement and airflow, and write one caption for each sketch explaining how the change in chest volume affects pressure.

ANSWER KEY

Breath in Motion

HIGH SCHOOL · HS-AP11-2

PART 1 · READ AND MARK

Underline the structures that move and circle the words that describe their movements. For each description of breathing in or out, write 1 beside the chest-volume change, 2 beside the pressure change, and 3 beside the airflow change. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	During the deep breath before climbing, how do the diaphragm and rib cage move, and how do those movements cause air to enter the lungs?	**The diaphragm contracts and moves downward, while the rib cage moves up and outward. Chest and lung volume increase, lowering lung pressure below outside pressure, so air flows in.**
2	When the person breathes out quietly at the top of the stairs, what happens to the chest cavity and lung pressure? Explain why air leaves.	**The diaphragm rises and the rib cage moves down and inward, making the chest cavity smaller. The lungs recoil, raising lung pressure above outside pressure, so air flows out.**
3	How does forceful exhalation use muscles differently from quiet exhalation, and what effect does this have on airflow?	**Quiet exhalation occurs as the diaphragm and external intercostal muscles relax. During forceful exhalation, abdominal and internal intercostal muscles contract, shrinking chest volume further and driving air out more strongly.**
4	Trace the route air takes from outside the body to the alveoli during inspiration. What pressure difference moves it along that route?	**Air moves through the nose or mouth, trachea, and bronchi to the alveoli. It flows inward because pressure inside the lungs is lower than outside air pressure.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Inhalation panel: The diaphragm is flattened with a downward arrow, the rib cage has up-and-out arrows, the lungs are expanded, and an arrow points into the airway. Caption: Greater chest volume lowers lung pressure below outside pressure, so air enters. Forceful exhalation panel: The diaphragm has an upward arrow, the rib cage has down-and-in arrows, the lungs are smaller, and an arrow points out of the airway. Caption: Smaller chest volume raises lung pressure above outside pressure, so air leaves.

Accept equivalent descriptions of the muscle and rib movements. Sketches should connect each change in chest volume to the correct pressure difference and direction of airflow.