Breath in Motion

Trace air, show gas exchange, and model a changing chest.

HAP.12.1 "Design and use models to illustrate the functions of the organs of the respiratory system."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each organ or structure that air passes through, then number them in the order inhaled air reaches them. Circle the words that describe how the chest changes during inhalation and exhalation.

A Sprint for the Bus

1. During a sprint to catch the bus, Maya breathes faster. Air enters through her nose, where the nasal passages warm, moisten, and filter it. The air then passes through the pharynx and larynx into the trachea. The trachea divides into two bronchi, one leading toward each lung. Within the lungs, each bronchus branches into narrower bronchioles that end in clusters of tiny air sacs called alveoli. This branching route helps air reach many gas exchange surfaces. In a model, arrows through these connected parts could show the direction of inhaled air without suggesting that air travels through blood vessels.

2. Air does not rush in because the lungs pull it like a vacuum cleaner. When Maya inhales, her diaphragm contracts and moves downward while muscles between her ribs lift the rib cage. The chest cavity gets larger, pressure inside the lungs falls below outside air pressure, and air flows inward. Her lungs expand with the chest because the lung surfaces are coupled to the chest wall by thin, fluid-filled membranes. On exhaling at rest, the diaphragm relaxes and rises, the rib cage lowers, and elastic lungs recoil. Chest volume decreases, pressure rises, and air flows out along the same branching airways.

3. Each alveolus has a thin wall and lies beside tiny blood vessels called capillaries. Oxygen moves from the air in the alveoli across these thin walls into the blood. Carbon dioxide moves in the opposite direction, from the blood into the alveoli, and leaves when Maya exhales. Red blood cells carry much of the oxygen away to body tissues, which use it to release energy from food. A useful model can show an air route, a separate blood route, and opposite arrows for the two gases at their point of exchange. It should not show blood flowing inside the airways.

2 ANSWER WITH EVIDENCE

Use the passage

1. A model sends inhaled air from the trachea directly to the alveoli. Which two branching structures must be added, and in what order?

2. A model shows the diaphragm moving down during inhalation but the rib cage moving inward. How should the rib-cage arrow change, and how do these motions move air?

3. At an alveolus, a model shows oxygen moving from blood to air and carbon dioxide moving from air to blood. How should the two arrows point instead?

4. A classmate draws one tube for both air and blood after the trachea. What separate routes should the model show near the alveoli?

3 YOUR TURN

Your own words

In two panels, design a model of one inhale and one exhale. Across the panels, label the diaphragm, ribs, trachea, bronchi, bronchioles, alveoli, and a capillary; show motion and air-flow arrows in both panels and opposite gas-exchange arrows in one panel. Add a brief note explaining one helpful feature and one limit of your model.

ANSWER KEY

Breath in Motion

PART 1 · READ AND MARK

Underline each organ or structure that air passes through, then number them in the order inhaled air reaches them. Circle the words that describe how the chest changes during inhalation and exhalation. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	A model sends inhaled air from the trachea directly to the alveoli. Which two branching structures must be added, and in what order?	**Add the bronchi, then the bronchioles, between the trachea and alveoli.**
2	A model shows the diaphragm moving down during inhalation but the rib cage moving inward. How should the rib-cage arrow change, and how do these motions move air?	**The rib-cage arrow should point up and outward. Along with the descending diaphragm, this enlarges the chest cavity, lowers pressure inside the lungs, and draws air in.**
3	At an alveolus, a model shows oxygen moving from blood to air and carbon dioxide moving from air to blood. How should the two arrows point instead?	**Oxygen should point from the alveolus into the blood. Carbon dioxide should point from the blood into the alveolus.**
4	A classmate draws one tube for both air and blood after the trachea. What separate routes should the model show near the alveoli?	**Air travels through branching airways to the alveoli. Blood travels through capillaries beside the alveoli, where gases cross between air and blood.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Inhale panel: The ribs have arrows up and outward, and the diaphragm has an arrow down. Air arrows enter the trachea and continue through the bronchi and bronchioles to the alveoli. Beside an alveolus, an oxygen arrow points into a labeled capillary, and a carbon dioxide arrow points toward the alveolus. Exhale panel: The ribs have arrows down and inward, the diaphragm has an arrow up, and air arrows point from the alveoli through the bronchioles, bronchi, and trachea to the outside. Note: The arrows help show how chest motion changes air flow. The drawing cannot show all the tiny branches and air sacs in a real lung.

Accept models that show the correct air route, opposite chest motions and air flow in the two panels, and gas exchange between an alveolus and a nearby capillary. The stated limit should identify something the student's simplified model leaves out or cannot show accurately.