Air on the Move

Model how heat and pressure change air density

6.8.b "Develop and use a model that illustrates how differences in heat and pressure affect density and the relationship between density and convection."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline one sentence that links heating to density, and circle one sentence that links increased pressure to density. Number the four movements of the convection loop in the order air moves, starting above the pavement.

A Loop Above the Parking Lot

1. On a clear morning, sunlight heats a dark parking lot faster than the nearby grass. The air just above the pavement gains heat. Its particles move faster and spread farther apart, so the same amount of air fills more space. That makes it less dense than cooler air over the grass. Density means how much matter is packed into a given space. A light ribbon held above the pavement might flutter upward as the warmer air rises. The ribbon reveals motion, not individual air particles.

2. Imagine trapping air inside a bicycle pump with its opening blocked. When you push the handle, the trapped air has less room, even though no air escapes. The crowded particles collide more often with the pump walls, raising the pressure. Since the same amount of air now takes up less space, its density rises. If the handle is allowed to move back, the air expands, and its density falls. Pressure changes can therefore change air density even when no heat is added.

3. Above the parking lot, warm, less dense air rises. Higher up, some of it cools and moves sideways toward the grass. It can sink where it becomes denser than nearby air. Cooler, denser air near the ground then flows from over the grass toward the pavement, replacing the air that rose. These connected movements form a convection loop. A model can use arrows to show movement and dots to show particle spacing. As air rises, surrounding pressure drops, allowing the air to expand. Both heat and pressure affect density.

2 ANSWER WITH EVIDENCE

Use the passage

1. How would you use dots in two equal-sized boxes to compare air above the warm pavement with air above the cooler grass? Explain your model.

2. In a model of the blocked bicycle pump, how would you show the air before and after the handle is pushed? Include pressure and density.

3. Trace the four movements in the parking-lot convection loop, starting above the pavement.

4. As air rises and surrounding pressure drops, how should a particle model change? What happens to the air's density?

3 YOUR TURN

Your own words

Draw a two-panel model: in the first panel, show a convection loop in a room with a heater by one wall and a cool window across the room; in the second, compare the same amount of air in a blocked pump before and after its handle is pushed. Use arrows, particle dots, and labels for heat, pressure, and density where they apply, then write one sentence explaining why the room air moves in a loop.

ANSWER KEY

Air on the Move

GRADE 6 · 6.8.b

PART 1 · READ AND MARK

Underline one sentence that links heating to density, and circle one sentence that links increased pressure to density. Number the four movements of the convection loop in the order air moves, starting above the pavement. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How would you use dots in two equal-sized boxes to compare air above the warm pavement with air above the cooler grass? Explain your model.	**Show fewer, more widely spaced dots in the pavement box. Warm air spreads out, so it is less dense than the cooler air.**
2	In a model of the blocked bicycle pump, how would you show the air before and after the handle is pushed? Include pressure and density.	**Show the same number of particles crowded into less space after the push. Both pressure and density are higher.**
3	Trace the four movements in the parking-lot convection loop, starting above the pavement.	**Warm air rises, moves sideways toward the grass, sinks as it cools, then flows near the ground toward the pavement.**
4	As air rises and surrounding pressure drops, how should a particle model change? What happens to the air's density?	**Show the particles spreading farther apart as the air expands. Its density decreases.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Panel 1: Label the heater side warm and less dense, with dots farther apart. Draw arrows up from the heater, across the ceiling, down by the cool window, and along the floor toward the heater. Label the window side cool and denser, with dots closer together. Panel 2: Draw the same number of dots in a large pump space before the push and a smaller space after the push. Label the squeezed air higher pressure and higher density. The room air forms a loop because warmer, less dense air rises while cooler, denser air sinks and flows toward the heater.

Accept models that show particle spacing or particles per equal-sized area to represent density. In the room model, arrows should connect rising warm air, sinking cool air, and return flow along the floor.