Particles at Work

Use particle motion and attractions to explain changes in matter.

PS.2.c "the kinetic molecular theory is used to predict and explain matter interactions."

NAME ______________________ DATE ____________

1 READ AND MARK

Read it twice

YOUR JOB Underline each statement that names particle motion, and circle each statement that links particle behavior to an observable result. Your marks should show how kinetic molecular theory explains matter interactions.

What Particles Predict

1 Kinetic molecular theory describes matter as tiny particles that are always moving. In a solid, particles vibrate in fixed positions and stay close because attractions hold them together. In a liquid, particles remain close but slide past one another. In a gas, particles are far apart and move freely in straight paths until they collide. These motions and spaces help explain why solids keep their shape, liquids flow, and gases spread to fill a container.

2 Temperature measures the average kinetic energy of particles. When a sealed flask of air is warmed, its particles move faster. They strike the flask walls more often and with greater force, so the gas pressure rises if the flask cannot expand. Cooling has the opposite effect. The particles move more slowly, and wall collisions become less frequent and less forceful. This particle model predicts changes that cannot be seen directly, such as pressure inside a bicycle tire on a hot day.

3 Particle attractions also help predict a change of state. A puddle can evaporate even below its boiling point. Some liquid water particles at the surface have enough kinetic energy to overcome attractions and enter the air as gas. If the water is heated, more particles have enough energy to escape each second, so evaporation speeds up. In contrast, gas particles lose kinetic energy when cooled. If attractions pull them close enough, they condense into liquid droplets. The theory connects energy, motion, attractions, and observable changes.

2 ANSWER WITH EVIDENCE

Use the passage

1. Using the particle model, compare a solid and a gas in both particle spacing and motion.

2. A sealed flask of air is warmed, but its volume does not change. Use particle collisions to explain why its pressure rises.

3. Why can liquid water evaporate even when it is below its boiling point?

4. What happens to gas particles as they cool that can lead to condensation?

3 YOUR TURN

Your own words

Imagine a tied balloon of air sitting in a cool room, then being placed in a warm car. Write exactly 3 sentences that predict the balloon's visible change and explain it with particle kinetic energy, wall collisions, and pressure.

Particles at Work

PART 1 · READ AND MARK

Underline each statement that names particle motion, and circle each statement that links particle behavior to an observable result. Your marks should show how kinetic molecular theory explains matter interactions. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Using the particle model, compare a solid and a gas in both particle spacing and motion.	**In a solid, particles stay close together and vibrate in fixed positions. In a gas, particles are far apart and move freely until they collide.**
2	A sealed flask of air is warmed, but its volume does not change. Use particle collisions to explain why its pressure rises.	**Warming makes the particles move faster. They hit the flask walls more often and with greater force, which raises the pressure.**
3	Why can liquid water evaporate even when it is below its boiling point?	**Some water particles at the surface have enough kinetic energy to overcome attractions and enter the air as gas.**
4	What happens to gas particles as they cool that can lead to condensation?	**They lose kinetic energy and move more slowly. Attractions can then pull the particles close enough to form liquid droplets.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The balloon will become larger in the warm car. Air particles gain average kinetic energy and move faster. They collide with the balloon walls more often and more forcefully, raising the inside pressure until the flexible balloon expands.

Accept equivalent explanations that correctly connect temperature to average kinetic energy, particle motion, collisions, attractions, or state changes. For the open response, accept a prediction of balloon expansion supported by faster particles and increased or stronger collisions.