Name: _____ **Date:** _____

Answer Key: State of the Plate: 6th Grade Molecular Motion Challenge

Evaluate how kinetic energy drives phase shifts in industrial manufacturing and deep-sea environments as you master complex matter transitions.

---

1. Engineers designing high-altitude weather balloons must account for the Kinetic Molecular Theory. As a balloon rises into the thinning atmosphere, why does the volume of the gas inside increase?

Answer: B) Reduced external pressure allows internal particle collisions to expand the container.

According to Boyle's Law and Kinetic Molecular Theory, as external pressure decreases, the constant collisions of gas particles against the interior walls push outward more effectively, increasing volume.

2. When a specialized fire suppression system releases liquid nitrogen, the substance immediately turns into a gas, absorbing massive amounts of heat. This specific transition is called _____.

Answer: C) Vaporization

Vaporization is the phase change from liquid to gas; this endothermic process requires the absorption of thermal energy from the surroundings.

3. Amorphous solids, such as glass or certain plastics, lack a highly ordered repeating geometric internal structure compared to crystalline solids.

Answer: A) True

Unlike crystalline solids (like quartz), amorphous solids have particles arranged randomly, which is why they soften gradually rather than having a distinct melting point.

4. In the process of 'Freeze-Drying' food, water is removed by turning ice directly into water vapor without it ever becoming a liquid. Which phase change is being utilized?

Answer: B) Sublimation

Sublimation occurs when a solid gains enough energy to bypass the liquid phase and enter the gas phase directly, often under low-pressure conditions.

5. If you reduce the _____ of a gas while keeping the temperature constant, the particles will collide with the walls of the container more frequently, increasing the pressure.

Answer: B) Volume

Name: _____ **Date:** _____

Decreasing volume crowds the particles into a smaller space, leading to more frequent collisions, which is the definition of increased pressure in a gas.

6. Which of the following scenarios best demonstrates an 'exothermic' phase change, where energy is released into the environment?

Answer: D) Both B and C

Freezing (lava to rock or water to ice) requires particles to lose kinetic energy and slow down; this energy is released into the surroundings.

7. During a phase change, such as water boiling, the temperature of the substance continues to rise even while the state is changing.

Answer: B) False

During a phase change, the temperature remains constant because the added energy is used to break intermolecular bonds rather than increase the speed (temperature) of the particles.

8. A substance that has a definite volume but takes the shape of its container is characterized by particles that are close together but can _____ past one another.

Answer: B) Slide

This describes the liquid state; particles remain in contact due to attractive forces but have enough energy to flow or slide around each other.

9. In the cold upper atmosphere, water vapor can turn directly into ice crystals to move from a gas to a solid. This is known as:

Answer: C) Deposition

Deposition is the phase transition where a gas transforms into a solid without passing through the liquid phase, often seen in the formation of frost or snow.

10. Viscosity is a physical property of liquids that describes their resistance to flowing; for example, honey has a higher viscosity than water.

Answer: A) True

Viscosity depends on the strength of the attraction between particles; higher attraction leads to 'thicker' liquids that flow more slowly.