Name: _____ **Date:** _____

Answer Key: Conquer the Change: 8th Grade Molecular Dynamics Challenge

Analyze kinetic energy shifts and molecular behavior in this high-stakes assessment of phase transitions and particle theory.

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1. Which of the following describes the molecular behavior of Gallium as it melts in a person's hand at 29.7°C?

Answer: A) Particles speed up and move from a fixed lattice to a fluid arrangement.

Melting occurs when thermal energy is absorbed, providing enough kinetic energy for particles to break free from their fixed positions in a solid lattice.

2. When solid iodine is heated and turns directly into a purple vapor without becoming a liquid, the process is known as _____.

Answer: B) Sublimation

Sublimation is the endothermic phase change where a substance transitions directly from a solid to a gas phase.

3. During a phase change, such as water boiling at 100°C, the temperature of the substance continues to rise as long as heat is applied.

Answer: B) False

During a phase change, the added energy is used to break intermolecular bonds rather than increasing kinetic energy, so temperature remains constant until the change is complete.

4. A balloon filled with Nitrogen gas is placed in a freezer. What happens to the gas particles inside the balloon?

Answer: A) They lose kinetic energy and move closer together, decreasing volume.

According to Charles's Law and Kinetic Molecular Theory, cooling a gas reduces the kinetic energy of particles, causing them to collide less frequently and occupy less space.

5. In a highly pressurized hydraulic system, the fluid used (such as mineral oil) is chosen because _____ are generally incompressible.

Answer: C) Liquids

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Liquids have particles that are already close together, making them nearly incompressible, which allows them to transmit force efficiently in hydraulic systems.

6. Which of the following describes the phase change of 'Deposition' in a natural environment?

Answer: C) Frost forming on a car windshield during a freezing night.

Deposition is the process where a gas changes directly into a solid, such as water vapor turning into ice crystals (frost) without becoming liquid water first.

7. Amorphous solids, like glass or wax, lack a distinct melting point and instead soften over a wide range of temperatures.

Answer: A) True

Unlike crystalline solids, amorphous solids do not have a regular repeating geometric pattern, which results in a gradual softening rather than a specific melting temperature.

8. The state of matter found in lightning bolts and stars, consisting of ionized gas with free-moving electrons, is called _____.

Answer: A) Plasma

Plasma is the fourth state of matter, created when gas is heated to the point that electrons are stripped from atoms, making it electrically conductive.

9. If you increase the altitude (lower atmospheric pressure), why does water boil at a lower temperature, such as 95°C instead of 100°C?

Answer: B) Less external pressure allows vapor bubbles to form more easily.

Boiling occurs when vapor pressure equals atmospheric pressure. At high altitudes, the atmospheric pressure is lower, so less kinetic energy (heat) is needed for vapor pressure to reach that point.

10. The viscosity of a liquid generally increases as the temperature of the liquid increases.

Answer: B) False

Viscosity (resistance to flow) usually decreases with temperature because the added thermal energy allows molecules to overcome intermolecular forces more easily.