

Name: _____ Date: _____

Answer Key: Molecular Mayhem: Mastery of Matter for 7th Grade

Can you predict how pressure reshapes a gas or why gallium melts in your hand? Analyze kinetic energy and phase transitions through challenging chemical scenarios.

1. A scientist is observing a sample of Gallium (Ga) that is transitioning from a solid to a liquid in her palm. During this endothermic phase change, what is happening to the kinetic energy and potential energy of the molecules?

Answer: B) Potential energy increases while kinetic energy remains constant.

During a phase change, the temperature (average kinetic energy) remains constant because the energy being added is used to overcome intermolecular forces, increasing the potential energy.

2. In a high-pressure environment like the deep ocean, the boiling point of a liquid will ____ compared to its boiling point at sea level.

Answer: C) Increase significantly

Boiling occurs when vapor pressure equals atmospheric pressure. Higher external pressure requires more kinetic energy (heat) for the liquid molecules to escape into the gas phase.

3. Amorphous solids, such as glass or obsidian, lack a specific, repeating geometric internal structure compared to crystalline solids.

Answer: A) True

Unlike crystalline solids like quartz or salt, amorphous solids have disordered molecular arrangements and do not have a sharp, distinct melting point.

4. Which of the following scenarios best demonstrates the concept of deposition in a natural environment?

Answer: B) The formation of sub-zero ice crystals directly from water vapor on a windowpane.

Deposition is the phase change where a gas turns directly into a solid without becoming a liquid first, such as frost forming from humid air.

5. When a gas is compressed into a smaller volume at a constant temperature, the molecules strike the walls of the container more frequently, resulting in an ____ in pressure.

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Answer: B) Increase

According to Boyle's Law, as volume decreases, the frequency of molecular collisions increases, which elevates the pressure.

6. Plasma, the most common state of matter in the universe, is distinct from gas because its particles are ionized and can conduct electricity.

Answer: A) True

Plasma consists of positively charged ions and free electrons, making it highly conductive and responsive to magnetic fields, unlike neutral gases.

7. Consider a substance in a sealed container. If the attractive forces between the particles are moderately strong but the particles can still slide past one another, the substance is in which state?

Answer: B) Liquid

Liquids have enough kinetic energy to move fluidly, but not enough to fully overcome the intermolecular attractions that keep them in a fixed volume.

8. In the process of _____, molecules at the surface of a liquid gain enough kinetic energy to enter the gas phase at temperatures well below the boiling point.

Answer: C) Evaporation

Evaporation is a surface level cooling process that occurs at various temperatures, unlike boiling which occurs throughout the entire liquid at a specific temperature.

9. Adding thermal energy to a substance always results in an immediate increase in the measurable temperature of that substance.

Answer: B) False

During a phase change, the temperature remains constant even though thermal energy is being added, because the energy is being used to break bonds rather than speed up particles.

10. Explain why a balloon filled with air shrinks when placed in a freezer, based on the Kinetic Molecular Theory.

Answer: A) The gas particles lose kinetic energy and collide with the walls less forcefully.

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Lower temperatures reduce the average kinetic energy of gas molecules. Slower collisions result in lower internal pressure, allowing the flexible balloon to contract.