

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## Answer Key: Wrangle Molecular Motion: Kinetic Theory Quiz for College Chemistry

Examine intermolecular forces and phase equilibria through real-world applications like butane storage and nitrogen liquefaction for lab review.

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**1. When storing butane in a common lighter, the fuel remains a liquid despite butane being a gas at standard pressure. Which factor is responsible for this phase retention?**

**Answer:** B) High pressure forcing molecules into closer proximity

Increasing pressure reduces the space between gas particles, allowing intermolecular forces to overcome kinetic energy and transition the substance into a liquid state.

**2. The constant, random motion of particles suspended in a fluid (liquid or gas) resulting from collisions with fast-moving molecules is known as \_\_\_\_ motion.**

**Answer:** C) Brownian

Brownian motion describes the erratic movement of particles in a fluid, providing empirical evidence for the existence of atoms and molecules in constant motion.

**3. True or False: Amorphous solids, such as glass or certain polymers, lack the long-range periodic order found in crystalline solids.**

**Answer:** A) True

Unlike crystals which have a repeating lattice structure, amorphous solids have disordered molecular arrangements, often referred to as supercooled liquids.

**4. Which of the following describes the process of 'Enthalpy of Fusion' in a laboratory setting?**

**Answer:** B) Energy required to change a substance from solid to liquid

The enthalpy of fusion is the heat energy absorbed by a substance to transition from a solid to a liquid at constant pressure.

**5. In the context of phase diagrams, the \_\_\_\_ point represents the unique temperature and pressure at which all three phases (solid, liquid, and gas) coexist in equilibrium.**

**Answer:** C) Triple

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The triple point is a specific thermodynamic state where the three phases are in stable equilibrium.

**6. True or False: According to the Kinetic Molecular Theory, the average kinetic energy of gas particles is directly proportional to the Kelvin temperature.**

**Answer:** A) True

Temperature is a measure of the average kinetic energy; as the Kelvin temperature increases, the speed of the particles increases.

**7. During the process of freeze-drying (lyophilization) used in food science, water is removed from food through which phase change?**

**Answer:** D) Sublimation

In freeze-drying, the substance is frozen and then the pressure is reduced to allow the frozen water to transition directly from solid to gas (sublimation).

**8. A substance that has properties of both a gas and a liquid at temperatures and pressures above its critical point is called a \_\_\_\_\_ fluid.**

**Answer:** A) Supercritical

Supercritical fluids can effuse through solids like a gas and dissolve materials like a liquid, making them useful in industrial decaffeination.

**9. True or False: Evaporation is a cooling process because the molecules with the highest kinetic energy are the ones that escape the liquid surface.**

**Answer:** A) True

As high-energy molecules escape, the average kinetic energy of the remaining molecules decreases, resulting in a temperature drop.

**10. Which property of liquids explains why a needle can be made to float on the surface of water if placed carefully?**

**Answer:** B) Surface Tension

Surface tension is caused by cohesive forces between liquid molecules, creating a 'film' that can support small, dense objects.