Name: _____ **Date:** _____

Answer Key: Supercritical Fluids and Phase Diagrams: 9th Grade Chemistry Quiz

Enthalpy of fusion, vapor pressure curves, and triple point analysis. Students evaluate the energetic and molecular transitions of matter in complex environments.

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1. At the critical point of a substance, the distinction between the liquid phase and the gas phase disappears. What is the resulting state called?

Answer: B) Supercritical Fluid

Beyond the critical temperature and pressure, the densities of the liquid and gas phases are identical, creating a supercritical fluid that exhibits properties of both.

2. The specific temperature and pressure where all three phases (solid, liquid, and gas) coexist in thermodynamic equilibrium is known as the _____.

Answer: B) Triple Point

The triple point is a unique condition on a phase diagram where the chemical potential of the substance is equal in all three phases.

3. True or False: For most substances, an increase in external pressure will raise the melting point, but for water (H2O), it actually lowers it.

Answer: A) True

Due to the hydrogen bonding and crystal structure of ice, liquid water is denser than solid ice; therefore, increasing pressure favors the more compact liquid phase.

4. During a phase change, such as boiling, why does the temperature of the substance remain constant despite the continuous addition of heat?

Answer: C) The energy is utilized to overcome intermolecular forces of attraction.

This is known as latent heat. The energy is used to break the attractive forces holding particles together rather than increasing their average kinetic energy (temperature).

5. The phase transition from a gas directly to a solid, bypassing the liquid state, is called _____.

Answer: C) Deposition

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Deposition is an exothermic process where thermal energy is released, allowing gas molecules to organize directly into a solid lattice.

6. True or False: According to the Kinetic Molecular Theory, individual gas particles are assumed to have a significant volume and experience strong attractive forces with one another.

Answer: B) False

The Ideal Gas model assumes particles have negligible volume and no significant attractive/repulsive forces; these only become relevant in 'Real Gas' scenarios at high pressure or low temperature.

7. Which of the following describes the behavior of molecules in a 'viscous' liquid compared to a non-viscous one?

Answer: B) The molecules exhibit high intermolecular friction and resistance to flow.

Viscosity is the measure of a fluid's resistance to deformation or flow, often caused by complex molecular shapes or strong intermolecular attractions.

8. The pressure exerted by a gas in thermodynamic equilibrium with its condensed phases at a given temperature in a closed system is the _____.

Answer: C) Vapor Pressure

Vapor pressure is a measure of the tendency of a substance to change into the gaseous or vapor state, and it increases with temperature.

9. If you move a sample of boiling water from sea level to the top of Mount Everest, what happens to the boiling point temperature?

Answer: C) It decreases because the atmospheric pressure is lower.

Boiling occurs when vapor pressure equals atmospheric pressure. At high altitudes, atmospheric pressure is much lower, so water reaches its vapor pressure limit at a lower temperature.

10. True or False: Evaporation is a cooling process because the highest-energy particles escape the liquid, leaving behind particles with lower average kinetic energy.

Answer: A) True

Evaporative cooling occurs because the 'hottest' molecules leave the system, thereby reducing the average temperature of the remaining liquid.