Name: _____ **Date:** _____

Molecular Chaos vs. Lattice Order: 11th Grade Chemistry Challenge

Students analyze intermolecular force competition and phase boundary behavior during this rigorous summative assessment for advanced chemistry learners.

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1. Supercritical fluids, such as carbon dioxide handled at 31.1°C and 72.9 atm, exhibit a unique physical state. Which statement best evaluates their molecular behavior?

A. They possess the density of a liquid but the diffusivity of a gas.
B. They maintain a definitive meniscus between the liquid and gas phases.
C. The kinetic energy is insufficient to overcome London dispersion forces.
D. The substance undergoes sublimation regardless of pressure changes.

2. True or False: In a closed system at the triple point of water, the rate of sublimation is exactly equal to the rate of deposition.

A. True
B. False

3. The phase diagram of ___ is anomalous because the solid-liquid boundary curve has a negative slope, meaning the melting point decreases as pressure increases.

A. Methane
B. Water
C. Ammonia
D. Iron

4. Considering the Clausius-Clapeyron relation, how does an increase in the molar enthalpy of vaporization change the slope of the vapor pressure curve?

A. It results in a more gradual, linear slope at all temperatures.
B. It indicates the substance is likely a non-polar noble gas.
C. It creates a steeper increase in vapor pressure for a given temperature rise.
D. It has no measurable effect on the boiling point of the substance.

5. A substance that lacks a long-range periodic crystalline structure but possesses the mechanical rigidity of a solid is classified as a/an ___ solid.

A. Covalent Network
B. Amorphous
C. Ionic
D. Polycrystalline

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

A. True

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B. False

7. In the context of the Van der Waals equation, what does the 'a' constant correct for regarding the behavior of non-ideal gases?

A. The actual volume occupied by the gas molecules themselves.
B. The frequency of collisions with the container walls.
C. The attractive intermolecular forces between the gas molecules.
D. The ionization energy required to turn the gas into a plasma.

8. In a heating curve for a pure substance, the plateau during the transition from liquid to gas represents the ___, where added energy breaks intermolecular bonds rather than increasing temperature.

A. Specific Heat Capacity
B. Enthalpy of Fusion
C. Enthalpy of Vaporization
D. Critical Temperature

9. True or False: Surface tension in a liquid decreases as temperature increases because kinetic energy better opposes the inward intermolecular cohesive forces.

A. True
B. False

10. Which of the following conditions would most likely cause a real gas to deviate significantly from the Ideal Gas Law (PV=nRT)?

A. Standard Temperature and Pressure (STP).
B. High temperature and low pressure.
C. Low temperature and high pressure.
D. A situation where molar mass is extremely low, such as with Hydrogen.