Name: _____ **Date:** _____

Stellar Matter Phase Transitions College Quiz

Evaluate thermodynamic transitions and intermolecular forces through varying pressures and temperatures found in interstellar nebulae and planetary cores.

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1. At the critical point of a substance, such as Xenon, what phenomenon occurs to the physical boundaries between phases?

A. The meniscus between liquid and gas disappears as densities equalize.
B. The solid phase becomes less dense than the liquid phase.
C. Triple point equilibrium is reached through sublimation.
D. The substance transitions into a non-Newtonian fluid.

2. Supercritical fluids possess the low viscosity characteristic of a gas while maintaining the high dissolving power of a liquid.

A. True
B. False

3. Metals like Gallium have a remarkably low melting point; however, what describes the state of 'Metallic Hydrogen' predicted in Jupiter's core?

A. A high-pressure degenerate gas
B. An amorphous solid with low conductivity
C. A liquid state where protons exist in a sea of electrons
D. A crystalline solid with covalent bonding

4. Applying the Clausius-Clapeyron equation, what happens to the boiling point of a refrigerant like R-134a when the ambient pressure is significantly reduced?

A. The boiling point increases due to higher kinetic energy requirements.
B. The boiling point decreases as vapor pressure reaches ambient pressure sooner.
C. The substance undergoes deposition into a solid state immediately.
D. The molar heat of vaporization becomes zero.

5. Which term describes a solid that lacks a long-range ordered crystalline structure, such as Obsidian or certain polymers?

A. Isotropic crystal
B. Allotropic solid
C. Amorphous solid
D. Polycrystalline matrix

6. The triple point of a substance represents the unique temperature and pressure where all three common phases coexist in thermodynamic equilibrium.

A. True

B. False

7. In the context of intermolecular forces, why does Glycerol exhibit exceptionally high viscosity compared to Ethanol?

A. Glycerol molecules are non-polar and experience London dispersion forces.
B. Glycerol has three hydroxyl groups, leading to extensive hydrogen bonding networks.
C. Glycerol is a purely ionic liquid at room temperature.
D. Glycerol has a lower molar mass, increasing its molecular velocity.

8. What is the term for the process where a gas transitions directly into a solid, such as the formation of Iodine crystals on a cold surface?

A. Sublimation
B. Condensation
C. Vaporization
D. Deposition

9. As temperature increases, the surface tension of a liquid generally increases due to higher kinetic energy of the surface molecules.

A. True
B. False

10. Which of the following describes the 'Bose-Einstein Condensate' state of matter observed at near-absolute zero temperatures?

A. A state where atoms behave as a single quantum mechanical entity.
B. A high-energy ionized gas found in lightning strikes.
C. A liquid that flows with zero resistance (superfluidity).
D. A crystal structure held together by gravitational forces.