

Phase Diagram Statement Analysis

<https://gemini.google.com/app/380c764eecb31c97>

Response: Analyzing the given phase diagram and evaluating each statement step-by-step:

- **Statement (a):** Gases are significantly less dense than liquids under almost all standard conditions, meaning the number of molecules per unit volume is higher in the liquid phase, not the gas phase. Thus, **(a) is incorrect.**
- **Statement (b):** The liquid-gas boundary line represents equilibrium conditions where liquid and gas co-exist. Along this line, for a specific temperature, liquid and gas co-exist. Therefore, **(b) is incorrect.**
- **Statement (c):** Below the triple point pressure, the solid-gas boundary line (sublimation curve) exists. Along this line, solid and gas co-exist at given pressures. Therefore, **(c) is incorrect.**
- **Statement (d):** At the triple point, all three phases (solid, liquid, gas) are in dynamic equilibrium with each other. Dynamic equilibrium between the liquid phase and gas phase means the rate of condensation (gas $\rightarrow$ liquid) is equal to the rate of vaporization (liquid $\rightarrow$ gas). Thus, **(d) is correct.**

Only **(d)** is correct.
