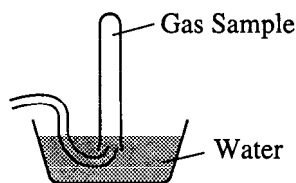


1994 B



A student collected a sample of hydrogen gas by the displacement of water as shown by the diagram above. The relevant data are given in the following table.

GAS SAMPLE DATA	
Volume of sample	90.0 mL
Temperature	25°C
Atmospheric Pressure	745 mm Hg
Equilibrium Vapor Pressure of H <sub>2</sub> O (25°C)	23.8 mm Hg

- Calculate the number of moles of hydrogen gas collected.
- Calculate the number of molecules of water vapor in the sample of gas.
- Calculate the ratio of the average speed of the hydrogen molecules to the average speed of the water vapor molecules in the sample.
- Which of the two gases, H<sub>2</sub> or H<sub>2</sub>O, deviates more from ideal behavior? Explain your answer.

1988 D

The normal boiling and freezing points of argon are 87.3 K and 84.0 K, respectively. The triple point is at 82.7 K and 0.68 atmosphere.

- Use the data above to draw a phase diagram for argon. Label the axes and label the regions in which the solid, liquid and gas phases are stable. On the phase diagram, show the position of the normal boiling point.
- Describe any changes that can be observed in a sample of solid argon when the temperature is increased from 40 K to 160 K at a constant pressure of 0.50 atmosphere.
- Describe any changes that can be observed in a sample of liquid argon when the pressure is reduced from 10 atmospheres to 1 atmosphere at a constant temperature of 100 K, which is well below the critical temperature.
- Does the liquid phase of argon have a density greater than, equal to, or less than the density of the solid phase? Explain your answer, using information given in the introduction to this question.