Name _____ Date _____ Class _____

13 INTERPRETING GRAPHICS

Use with Section 13.4

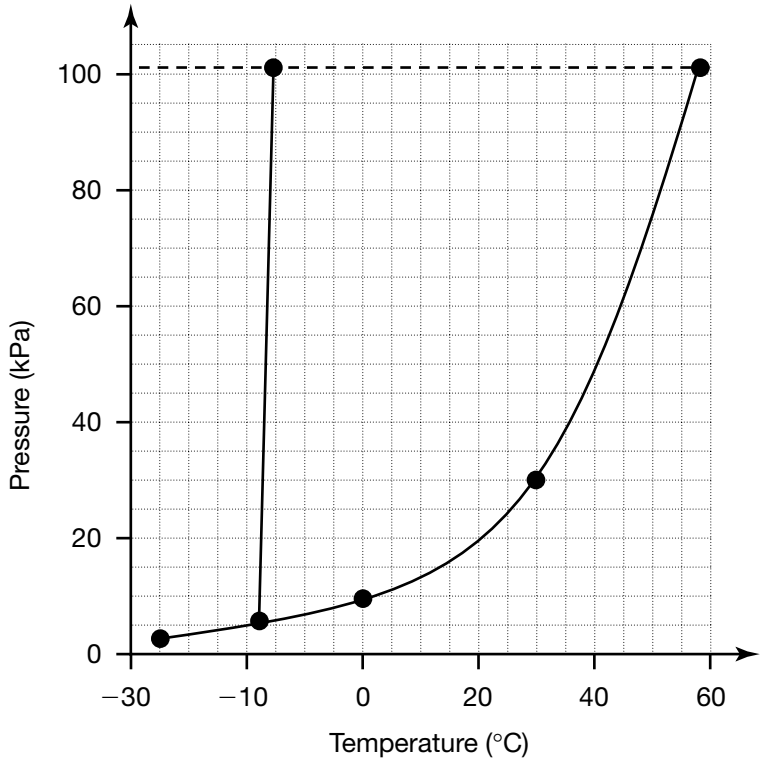

Figure 1 Phase diagram for bromine (Br_2). Note that the scale on the *x*-axis is distorted to emphasize some of the graph's features.

At standard temperature and pressure, bromine is a red liquid. Bromine sublimes when the temperature is −25°C and the pressure is 101.3 kPa.

1. Label each region of the graph as solid, liquid, or vapor.

2. Label the triple point, normal melting point, and normal boiling point on the graph and estimate their temperature values. Include an estimate of the pressure for the triple point.

Normal melting point = _____

Normal boiling point = _____

Triple point = _____

3. Use the letter *A* to label the line that gives the conditions for equilibrium between solid and liquid phases of bromine, the letter *B* to label the curve that gives the conditions for equilibrium between liquid and vapor phases of bromine, and the letter *C* to label the curve that gives the conditions for equilibrium between solid and vapor phases of bromine.

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4. Describe how the melting point of bromine changes with the external pressure. Based on the slope of the melting-point curve in the phase diagram, would you characterize the solid phase of bromine as more dense or less dense than the liquid phase of bromine?

_____

_____

_____

5. What is the boiling point of bromine when the external pressure is 75 kPa?

_____

6. Explain the significance of the triple point.

_____

_____

_____

7. Place direction arrows labeled *S*, *V*, and *M* on the phase diagram to indicate where sublimation, vaporization, and melting occur, respectively.

Circle the correct word in the parentheses in each of the following sentences.

8. Bromine vapor at 15°C (condenses, sublimes) when the pressure is raised to 50 kPa.

9. Bromine liquid at 70 kPa (vaporizes, freezes) when the temperature is decreased to −15°C.