Water

SECTION 5 REVIEW

23. Describe the structure of a water molecule.

24. List at least eight physical properties of water.

PRACTICE PROBLEMS

25. Which contains more molecules of water: 5.00 cm^3 of ice at 0°C or 5.00 cm^3 of liquid water at 0.°C? How many more? What is the ratio of the numbers of molecules in these two samples?

26. a. What volume and mass of steam at 100.°C and 1.00 atm would release the same amount of energy during condensation as 100. cm^3 of liquid water would release during freezing?

b. What do you note, qualitatively, about the relative volumes and masses of steam and liquid water required to release the same amount of heat? (Hint: See Sample Problem A)

MIXED REVIEW

27. Find the molar enthalpy of vaporization for a substance, given that 3.21 mol of the substance absorbs 28.4 kJ of energy as heat when the substance changes from a liquid to a gas.

28. Water's molar enthalpy of fusion is 6.009 kJ/mol. Calculate the amount of energy as heat required to melt 7.95×10^5 g of ice.

29. A certain substance has a molar enthalpy of vaporization of 31.6 kJ/mol. How much of the substance is in a sample that requires 57.0 kJ to vaporize?

30. Given that water has a molar enthalpy of vaporization of 40.79 kJ/mol, how many grams of water could be vaporized by 0.545 kJ?

31. Calculate the amount of energy released as heat by the freezing of 13.3 g of a liquid substance, given that the substance has a molar mass of 82.9 g/mol and a molar enthalpy of fusion of 4.60 kJ/mol.

32. What volume and mass of steam at 100.°C and 760. torr would release the same amount of energy as heat during condensation as 65.5 cm^3 of liquid water would release during freezing?

33. The following liquid-vapor system is at equilibrium at a given temperature in a closed system.

$$\text{liquid} + \text{energy} \rightleftarrows \text{vapor}$$

Suppose the temperature is increased and equilibrium is established at the higher temperature. How does the final value of each of the following compare with its initial value? (In each case, answer either higher, lower, or the same.)

a. the rate of evaporation

b. the rate of condensation

c. the final concentration of vapor molecules

d. the final number of liquid molecules

34. Given a sample of water at any point on curve AB in **Figure 16,** what effect would each of the following changes have on that sample?

a. adding energy at constant pressure

b. decreasing the volume at constant temperature

c. removing energy at constant pressure

d. increasing the volume at constant temperature

35. Using the phase diagram for CO_2, describe all the phase changes that would occur when CO_2 is heated from –100°C to –10°C at a constant pressure of 6 atm.

CO_2 Phase Diagram