

## Chapter 14 Study Questions

1. Discuss the differences between the states of matter (gas, liquid, solid) with respect to: a) distance between the particles, b) mobility of the particles, c) shape of the substance, and d) attractive forces between the particles.
2. List the types of intermolecular attractive forces in order of increasing strength.
3. Is the heat of vaporization endothermic or exothermic? Why?
4. Define boiling point in terms of vapor pressure.
5. For each of the following sets, indicate the substance with the highest boiling point:
  - a)  $C_2H_6$ ,  $C_8H_{18}$ , or  $C_4H_{10}$
  - b) HF, HCl, or HBr
  - c)  $CH_3-O-CH_3$  or  $CH_3-CH_2-O-H$
  - d)  $H_2O$ ,  $C_3H_8$ , or MgO
  - e)  $CH_3-CH_2-CH_3$  or  $CH_3-O-CH_3$
  - f) Cs or  $CH_3-O-H$
6. For each of the following types of solids, describe its structure and the nature of the forces holding it together:
  - a) ionic
  - b) covalent (molecular)
  - c) metallic
  - d) network covalent
7. List the substance types in (7) in order of increasing melting point.
8. Which of the types of substances in (7) conduct electricity as solids? as liquids?
9. Classify the following substances according to the types in (7):
  - a)  $NH_3$
  - b)  $SiO_2$
  - c) sodium oxide
  - d) magnesium
  - e)  $O_2$
  - f) Rb
  - g)  $KNO_3$
  - h) carbon disulfide
10. List the following substances in order of *increasing* vapor pressure:  $CO_2$ ,  $SiO_2$ , or  $TiO_2$ .
11. The heat of fusion of ethanol is 26.1 cal/g. Calculate the number of moles of ethanol needed to produce 1.31 kilojoules when it freezes.

## Summary of Chapter 14: Liquids and Solids

Differences between gas, liquid, solid

heating/cooling curve

heat of fusion and heat of vaporization

calculating the heat needed to melt or boil a given amount of a substance

sublimation

intramolecular forces and intermolecular forces

Intermolecular forces:

London dispersion forces, dipole forces, hydrogen bonds

Relationship between interparticle forces and melting pt, boiling pt, vapor pressure

vapor pressure

boiling point

Properties of the following types of solids (nature of particles, electrical conductivity, melting points, solubility, examples): molecular, network covalent, ionic, metallic