CHAPTER 14
Liquids and Solids

1. Which of the following is most likely to be a solid at room temperature?
   a. HF  
   b. N\textsubscript{2}  
   c. Na\textsubscript{2}S  
   d. NH\textsubscript{3}  

2. Which of the following should have the lowest boiling point?
   a. HF  
   b. N\textsubscript{2}  
   c. Na\textsubscript{2}S  
   d. NH\textsubscript{3}  

3. Order the intermolecular forces (dipole-dipole, London dispersion, ionic, and hydrogen bonding) from 
   **weakest to strongest**.
   a. dipole-dipole, ionic, London dispersion, hydrogen bonding  
   b. dipole-dipole, London dispersion, ionic, hydrogen bonding  
   c. hydrogen bonding, dipole-dipole, London dispersion, ionic  
   d. London dispersion, dipole-dipole, hydrogen bonding, ionic  
   e. London dispersion, ionic, dipole-dipole, hydrogen bonding

   Identify the major attractive force in each of the following molecules (you can use an answer more than once).

4. H\textsubscript{2}S  
5. HF  
6. N\textsubscript{2}  
7. Na\textsubscript{2}S  
8. NH\textsubscript{3}  

   a. dipole-dipole  
   b. London dispersion  
   c. ionic  
   d. hydrogen bonding  
   e. none of these

9. The intermolecular forces called hydrogen bonding will not exist between molecules of
   a. H\textsubscript{2}  
   b. H\textsubscript{2}O  
   c. HF  
   d. NH\textsubscript{3}  

10. At 1 atm of pressure and a temperature of 0°C, which phase(s) of H\textsubscript{2}O can exist?
    a. ice and water  
    b. ice and water vapor  
    c. ice only  
    d. water only  
    e. water vapor only

11. The normal freezing point of water is
    a. 0°F  
    b. 273 K  
    c. 32°F  
    d. 373 K  
    e. none of these

12. The normal boiling point of water is
    a. 0°F  
    b. 273 K  
    c. 32°F  
    d. 373 K  
    e. none of these

13. The bonds between hydrogen and oxygen in a water molecule can be characterized as
    a. dispersion forces  
    b. hydrogen bonds  
    c. intermolecular forces  
    d. intramolecular forces  
    e. London forces
14. When a water molecule forms a hydrogen bond with another water molecule, which atoms are involved in the interaction?
   a. a hydrogen from one molecule and a hydrogen from the other molecule
   b. a hydrogen from one molecule and an oxygen from the other molecule
   c. an oxygen from one molecule and an oxygen from the other molecule
   d. two hydrogens from one molecule and one oxygen from the other molecule
   e. two hydrogens from one molecule and one hydrogen from the other molecule

15. Choose the state of water in which the water molecules are farthest apart on average.
   a. steam (vapor)       b. liquid       c. ice (solid)       d. all the same

16. The process of evaporation happens when which of the following occurs?
   a. A solid becomes a liquid.
   b. A liquid becomes a solid.
   c. A liquid becomes a gas.
   d. A gas becomes a liquid.
   e. A solid becomes a gas.

17. The P_{vap} for water at 100.0°C is
   a. 85 torr       b. 760 torr       c. 175 torr       d. More information is needed

18. As the atmospheric pressure around a liquid decreases, the boiling temperature of the liquid
   a. increases.
   b. decreases.
   c. stays the same.
   d. may increase or decrease depending on the liquid.
   e. none of these

19. Which of the following has the highest melting temperature?
   a. H_2O       b. CO_2       c. S_8       d. MgF_2       e. P_4

20. Name the type of crystalline solid formed by potassium bromide.
   a. molecular solid       b. atomic solid       c. ionic solid

21. Name the type of crystalline solid formed by copper.
   a. molecular solid       b. atomic solid       c. ionic solid

22. Name the type of crystalline solid formed by SiO_2.
   a. molecular solid       b. atomic solid       c. ionic solid