CHAPTER 10 REVIEW ANSWER KEY

1. LDF is the attraction between molecules or atoms that have a temporary dipole caused by the uneven distribution of electrons. All substances have LDF, however, it is the only attractive force between nonpolar molecules or noble gas atoms. It is very weak, but increases in strength as T decreases or the size of the molecule increases.

2. D-D is the attraction between (polar) molecules that have a permanent dipole caused by the asymmetry of the molecule’s geometry. These are much stronger than LDF, but also increase in strength as T decreases or the molecule’s size increases (greater polarity in the molecule).

3. Hydrogen bonding is a specialized version of D-D in which a hydrogen atom is bonded directly to an extremely electronegative atom like N, O or F. In hydrogen-bonding, the electron pair between the hydrogen atom and the N, O or F spends virtually all the time near the electronegative atom, leading to a very small positive pole that is able to get very close to the negative pole on a different molecule. Stronger attractions give these molecules much higher boiling points than ordinary D-D.

4. Increased temperature gives all molecules and atoms greater kinetic energy and the IMAF’s are not able to hold on as tightly to each other. Increased T = decreased strength of all IMAF’s. Increased molar mass (size of molecules) will increase the IMAF because the molecules have more area to use to form attractive forces.

5. Increased strength of IMAF = higher bp, stronger surface tension, stronger capillary action = all because the molecules hold on tighter to each other. Increased strength of IMAF’s = decreased vapor pressure because the molecules hold on tighter to each other and do not evaporate as easily, thus, the pressure of the gas produced is less.

6. see quiz, homework, etc.

Sample Questions

1. a) ionic  (K+ and Cl-; metal and nonmetal)
   b) high bp
   c) not malleable  (IMAF is localized between the ions)
   d) ionic
   e) not as solid, but would as liquid or aqueous.

2. a) H-bonding
   b) relatively low VP due to strength of IMAF
   c) relatively high (but not nearly as high as ionic, network or metallic)
   d) molecular
   e) no
   f) relatively high

3. a) LDF
   b) relatively high VP due to weakness of IMAF
   c) relatively low
   d) molecular
   e) no
4. a) atomic metallic  
b) yes (IMAF is delocalized among the atoms)  
c) high bp  
d) metallic solid  
e) yes – electrons are delocalized and free to move across the metal

5. a) D-D  
b) between water’s and CO2’s – middleish  
c) between water’s and CO2’s – middleish  
d) molecular  
e) no  
f) less than H2O

6. B

7. A. CSe2 due to larger size of atoms  
B. Mg – metallic  
C. H2O – hydrogen bonding  
D. CBr4 – larger size of atoms  
E. NaCl – ionic

8. LDF

9. A is true. B is true.

10. \[
\frac{\ln \left( \frac{x}{153} \right)}{153} = \frac{15300}{8.3145} \left( \frac{1}{298} - \frac{1}{358} \right)
\]

\[
\frac{\ln \left( \frac{x}{153} \right)}{153} = 1.035
\]

\[
\frac{x}{153} = 2.82
\]

\[
x = 430 \text{ mmHg}
\]

11. \[
\frac{\ln \left( \frac{7160}{153} \right)}{153} = \frac{15300}{8.3145} \left( \frac{1}{298} - \frac{1}{x} \right)
\]

\[
1.603 = 1840 \left( \frac{1}{298} - \frac{1}{x} \right)
\]

\[
8.71 \times 10^{-4} = \frac{1}{298} - \frac{1}{x}
\]

\[
-0.00248 = -\frac{1}{x}
\]

\[
x = 4102 \text{ k}
\]

\[ = 4.43 \times 10^5 \text{ J} \]

13. a) II only
b) II, III and IV
c) changes from I to II to IV
d) changes from IV to III to II

14. a) 40C
b) Z has highest boiling point ...
c) ...therefore, it takes the most energy to break the IMAF’s, so it must have the strongest IMAF’s
d) 55C
e) 0.5 atm

15. Metals like Cu can conduct electricity because the electrons holding the metal atoms together are delocalized and free to move around the metal as needed (called sea of electrons). Ionic substances like CuCl2 cannot conduct electricity as solids because the ions are trapped in one place and not free to move around UNLESS they are melted into liquids or dissolved in water. As liquids or aq, the ions are free to move around and can conduct electricity.