Chapter 6

2. a) ionic interactions – such as $Na^+ \cdot Cl^-$

b) ion-dipole interactions – such as Na^+ w/ $\overset{\delta-}{O}(H)(H)\ \overset{\delta+}{H}$

c) dipole-dipole interactions – such as $\overset{\delta+}{H}\text{–}\overset{\delta-}{O}$ ... $\overset{\delta+}{H}\text{–}\overset{\delta-}{O}$

d) dispersion forces – temporary dipoles

7. H-bonding would be significant in b + d. Both have H-bond to an electronegative atom and unshared electrons on the electronegative atom.

8. Br_2 only has dispersion forces. HF + HCl are polar

9. HCl exhibits dipole interactions because it is polar. Br_2 is nonpolar + NaCl is ionic

12. a + d are ionic and should dissolve in water
b + c are non-ionic and nonpolar and should dissolve in benzene.

15. $P_1V_1 = P_2V_2$

a) $(150\text{ atm})(60.0\text{ L}) = (0.987\text{ atm})(x\text{ L})$

$$x = \frac{(150\text{ atm})(60\text{ L})}{0.987\text{ atm}} = 9118.5\text{ L} = \underline{\underline{9120\text{ L}}}$$

b) $$9120\text{ L} \cdot \frac{1\text{ min}}{8.00\text{ L}} = \underline{\underline{1140\text{ minutes}}}$$

18 $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

$\therefore V_1 = 5.90\,L$, $T_1 = 26^\circ C + 273 = 299\,K$

$V_2 = ?$, $T_2 = 78^\circ C + 273 = 351\,K$

$\therefore V_2 = \frac{V_1 T_2}{T_1} = \frac{5.90\,L \cdot 351\,K}{299\,K} = \underline{\underline{6.93\,L}}$

25 a) $\frac{2.12\,g}{1\,L} \cdot \frac{22.4\,L}{1\,mol} = 47.49\,g/mol$

b) $\frac{2.97\,g}{L} \cdot \frac{22.4\,L}{1\,mol} = 66.53\,g/mol$

28. a) volume will decrease

b) volume will decrease

c) volume will increase

30. a) A will have higher density

b) densities will be the same

c) B will have higher density

31 $pV = nRT \rightarrow V = \frac{nRT}{p}$ & $P = \frac{nRT}{V}$

a) $V = \frac{1.12\,mol \cdot \left(0.0821 \frac{L\,atm}{mol\,K}\right) \cdot 335\,K}{0.870\,atm} = 35.4\,L$

b) $P = \frac{4.64\,mol \cdot \left(0.0821 \frac{L\,atm}{mol\,K}\right) \cdot 302\,K}{3.96\,L} = \underline{\underline{29.1\,atm}}$

34 $PV = nRT \Rightarrow n = \frac{PV}{RT}$

$$n = \frac{(1.03\ \text{atm})(0.745\ \text{K})}{\left(0.0821 \frac{\text{L atm}}{\text{mol K}}\right)(309\ \text{K})} = 0.0302\ \text{mol CO} \cdot \frac{28.01\ \text{g CO}}{1\ \text{mol CO}} = 0.847\ \text{g CO}$$

36 $2H_2O \rightarrow 2H_2 + O_2$

$$1000\ \text{g } H_2O \cdot \frac{1\ \text{mol}}{18.00\ \text{g } H_2O} \cdot \frac{2\ \text{mol } H_2}{2\ \text{mol } H_2O} = 55.55\ \text{mol} \cdot \frac{22.4\ \text{L}}{1\ \text{mol}} = 1244\ \text{L } H_2$$

40 $PV = nRT$

$$n = \frac{PV}{RT} = \frac{(0.500\ \text{atm})(4.48\ \text{K})}{\left(0.0821 \frac{\text{L atm}}{\text{mol K}}\right)(273\ \text{K})} = 0.10\ \text{mol}$$

∴ a & d are incorrect

$$0.10\ \text{mol} \cdot \frac{6.02 \times 10^{23}\ \text{molecules}}{1\ \text{mol}} = 6.02 \times 10^{22}\ \text{molecules}$$ ∴ c is correct

$$0.10\ \text{mol} \cdot \frac{17.01\ \text{g}}{1\ \text{mol}} = 1.70\ \text{g}$$ ∴ b is incorrect

44 $PV = nRT$ $\quad P = 760\ \text{mm Hg} = 1\ \text{atm}$, $V = 8.00\ \text{L}$, $T = 298\ \text{K}$

$$n = \frac{PV}{RT} = \frac{(1\ \text{atm})(8.00\ \text{L})}{\left(0.0821 \frac{\text{L atm}}{\text{mol K}}\right)(298\ \text{K})} = 0.327\ \text{mol}$$

$$\frac{14.4\ \text{g}}{0.327\ \text{mol}} = 44.0\ \text{g/mol} = \text{molar mass}$$