Take Home Exam, Ch 1 – 4 and Reaction Products

1. a. ammonium oxalate
   b. chlorous acid/hydrochloric acid
   c. calcium sulfite
   d. silver cyanide
   e. mercury (II) bromide
   f. potassium chromate
   g. iron (II) hydroxide hexahydrate
   h. tetraiodine nonoxide
   i. Na_2HPO_4
   j. CsH
   k. $Ba(CH_3COO)_2$
   l. Ni_3N_2
   m. SnS_2
   n. As_4O_{10}
   o. $Mg(OH)_2$
   p. $Al(SCN)_3$

2. %C= (12.01*17)/(12.01*17+1.01*25+14.01)= 204.2/(204.2+25.2+14.01)
   = 204.2/243.4= 83.89% ~ 83.71%
   %H= 25.2/243.4= 10.4% ~ 10.42%
   %N= 14.01/243.4= 5.756%~ 5.61%
Close Enough
If $C_{87}H_{29}N_5$

3. $Al_2O_3(s) + 3C(s) + 3Cl_2(g) \rightarrow 2AlCl_3(s) + 3CO(g)$
(1.0052g Al_2O_3 x 1 mol Al_2O_3)/102.0g = $9.88*10^{-3}$ mol Al_2O_3
(0.5483g C x 1 mol C)/12.01g = $45.65*10^{-3}$ mol C
(1.794g Cl_2 x 1 mol Cl_2)/70.90g = $25.30*10^{-3}$ mol Cl_2 (1 mol Al_2O_3)/(3 mol Cl_2)
= $8.433*10^{-3}$ mol Al_2O_3 needed
Therefore Cl_2 is the limiting reactant
($25.30*10^{-3}$ mol Cl_2 x 2 mol $AlCl_3$ x 133.4g)/(3 mol Cl_2 x 1 mol $AlCl_3$) = 2.250g
→ 95% = 2.138g or 2.1 g $AlCl_3$

4. _ UF_6 + _ $H_2O \rightarrow U_xO_yF_z + H_aF_b$
a. (0.970g gas x 95g F x 1 mol F)/(100g gas x 19.00g F) = 0.0485 mol F
   (0.970g gas x 5g H x 1 mol H)/(100g gas x 1.01g H) = 0.0480 mol H
   Therefore the ratio is 1:1, so the empirical formula = HF
b. (4.267g UF_6 x 1 mol UF_6 x 6 mol F)/(352.03g x 1mol) = 0.07273 mol F original compound
gas: (0.0485 mol F)/(0.07273 mol F) = 66.7% in gas or 922/1382
solid: 33.3% in solid or 460/1382
c. (4.267g UF_6 x 1 mol UF_6 x 1 mol U)/(352.03g x 1 mol UF_6)
= 0.01212 mol U/ 0.01212 ~ 1
(0.07273 mol F x 0.333) = 0.02422 mol F/0.01212= 1.998 ~ 2
(0.0480 mol H x 1 mol H)/(2 mol H) = 0.0240 mol O/0.01212= 1.98 ~ 2
Answer: $U_1F_2O_2$
d. $1UF_6 + 2H_2O \rightarrow 1UF_2O_2 + 4HF$

5. a. $PCl_3 + H_2O \rightarrow H_3PO_3 + Cl^- + H^+$

b. $Na_2C_2 + H_2O \rightarrow C_2H_2 + Na^+ + OH^-$
c. $CaO + P_4O_{10} \rightarrow Ca_3(PO_4)_2$
$[Ca^{2+} + O^{2-} + H^+ + OH^- \rightarrow Ca^{2+} + OH^-]$
$[P^{5+} + O^{2-} + H^+ + OH^- \rightarrow H^+ + PO_4^{3-}]$
d. $SO_2 + Ca^{2+} + OH^- \rightarrow CaSO_3 + H_2O$
e. $Na^+ + OH^- + Na^+ + H_2PO_4^- \rightarrow Na^+ + H_2O + HPO_4^{2-}$
f. $H^+ + NO_3^- + (Ca^{2+} + O^{2-}) \rightarrow H_2O + Ca^{2+}$