Name =

1A Exam 2 Spring 2014 50pts
Hagerman
(end Chapter 2, Chapter 3, Chapter 4 with no redox/dilutions)

All work & calculations must be shown – all units & names must be shown in your work. (No work = no credit) Be neat & clear. Take your time and good luck!

$1\ mol = 6.022 \times 10^{23}$ "things"

1. Give the name of the following compounds – proper spelling is required! 6 pts

   a. $Fe_3(PO_4)_2$ (+2, −3) iron (II) phosphate

   b. SO_3 sulfur trioxide

   c. HNO_2 nitrous acid

2. Give the balanced chemical formula for the following compounds. 6 pts

   a. Copper (II) oxide

   $Cu^{2+}\ O^{2-} \quad CuO$

   b. Potassium nitride

   $K^+\ N^{3-} \quad K_3N$

   c. Hydrosulfuric acid

   $H^+\ S^{2-} \quad H_2S$

3. Calculate the number of oxygen atoms in 5.93 grams of $Cr(PO_4)_2$. ($Cr(PO_4)_2$ = 241.94g/mol) 4 pts

$$5.93g\ Cr(PO_4)_2 \times \frac{mol\ Cr(PO_4)_2}{241.94g} \times \frac{8\ mol\ O}{1\ mol} \times \frac{6.022 \times 10^{23}\ at}{1\ mol\ O}$$

$$= 1.18 \times 10^{23}\ atoms$$

4. Calculate the grams of sulfur hexafluoride in 4.67×10^{28} molecules of sulfur hexafluoride. (S = 32.1 g/mol, F = 19.0g/mol) 4 pts

$$4.67\times10^{28}\text{ molecules } SF_6 \times \frac{1\text{ mol } SF_6}{6.022\times10^{23}\text{ molecules}} \times \frac{146.1\text{ g}}{\text{mol}} =$$

$1.13\times10^{7}\text{ g}$

5. Complete the following for the reaction between an aqueous potassium carbonate solution and hydrobromic acid. Any potassium containing product is aqueous. You should know what to do with everything else! All phases must be shown in the molecular equation.

a. Balanced Molecular Equation 3 pts

$$K_2CO_3(aq) + 2HBr(aq) \rightarrow 2KBr(aq) + H_2O(l) + CO_2(g)$$

b. Balanced Net Ionic Equation 2 pts

$$2H^+ + CO_3^{2-} \rightarrow H_2O + CO_2$$

6. Write the balanced single replacement reaction when liquid chlorine reacts with aqueous potassium bromide. Assume a reaction occurs. 3 pts

$$Cl_2(l) + 2KBr(aq) \rightarrow 2KCl(aq) + Br_2(l)$$

7. A 50.6 g sample of $Mg(OH)_2$ is reacted with 45.0 g of HCl according to the reaction: $Mg(OH)_2 + 2\ HCl \rightarrow MgCl_2 + 2\ H_2O$.
($Mg(OH)_2$ = 58.3197 g/mol, HCl = 36.46 g/mol, H_2O = 18.0 g/mol)

a. Calculate the theoretical yield of water produced. (a calculation must be shown for each reactant) 6 pts

$$50.6\text{g } Mg(OH)_2 \text{ (excess)} \times \frac{1\text{mol } Mg(OH)_2}{58.3197\text{g}} \times \frac{2\text{mol } H_2O}{1\text{mol } Mg(OH)_2} \times \frac{18.0\text{g}}{\text{mol}} = 31.23\text{g } H_2O$$

$$45.0\text{g } \underline{HCl} \times \frac{1\text{mol } HCl}{36.46\text{g}} \times \frac{2\text{mol } H_2O}{2\text{mol } HCl} \times \frac{18.0\text{g}}{\text{mol}} = \boxed{22.22\text{g } H_2O}$$

(LR)

T. YIELD

b. Who is the limiting reactant? **HCl**

2 pts

c. Calculate the mass of excess reactant USED.

$$45.0\text{g } HCl \times \frac{1\text{mol } HCl}{36.46\text{g}} \times \frac{1\text{mol } Mg(OH)_2}{2\text{mol } HCl} \times \frac{58.3197\text{g}}{\text{mol}} = \boxed{35.89\text{g}}$$

2 pts

d. Calculate the mass of excess reactant LEFTOVER.

$$50.6\text{g} - 35.89\text{g} = \boxed{14.71\text{g}}$$

2 pts

8. Calculate the mass in grams of magnesium chloride (95.2g/mol) produced from the reaction of 15.0mL of a 6.0M HCl solution with excess magnesium hydroxide, given:

$Mg(OH)_2 + 2\ HCl \rightarrow MgCl_2 + 2\ H_2O$

15.0mL g?
6.0M

5 pts

$$0.0150L \times \frac{6mol\ HCl}{L} \times \frac{1mol\ MgCl_2}{2mol\ HCl} \times \frac{95.2g}{mol} = 4.284g$$

9. Determine the empirical formula given the following: 0.89 grams of potassium, 1.18 grams of chromium, and 1.27 grams of oxygen.

5 pts

$$0.89g\ K \times \frac{mol}{39.0983g} = \frac{0.02276314mol}{0.0226940l} = 1$$

$$1.18g\ Cr \times \frac{mol}{51.9961g} = \frac{0.0226940l\ mol}{0.0226940l} = 1$$

$$1.27g\ O \times \frac{mol}{15.9994g} = \frac{0.079377798\ mol}{0.0226940l} = 3.5$$

$\times 2$

$K_2Cr_2O_7$