CHM151 Quiz 3a 25 Pts Fall 2009 Name: Key

SHOW ALL WORK TO RECEIVE CREDIT.

Atomic masses: **H 1.008, C 12.01, Rh 102.9, S 32.07, O 16.00, Na 22.99, K 39.01, Cr 52.00,**

1. (6 Pts) One step in the isolation of pure rhodium metal (Rh) is the precipitation of rhodium(III) hydroxide from a solution containing rhodium(III) sulfate according to the following balanced chemical equation:

$Rh_2(SO_4)_3(aq) + 6NaOH(aq) \rightarrow 2Rh(OH)_3(s) + 3Na_2SO_4(aq)$

1.70 g ?g

If 1.70 g of rhodium(III) sulfate reacts with excess sodium hydroxide, what mass of rhodium(III) hydroxide may be produced?

$$\frac{1.70\text{ g } Rh_2(SO_4)_3}{} \left| \frac{\text{mol } Rh_2(SO_4)_3}{494.0\text{ g } Rh_2(SO_4)_3} \right| \frac{2\text{ mol } Rh(OH)_3}{1\text{ mol } Rh_2(SO_4)_3} \left| \frac{153.93\text{ g}}{\text{mol } Rh(OH)_3} \right. = 1.06\text{ g } Rh(OH)_3$$

2. (6 Pts) How many grams of potassium are present in 16.4 g of $K_2Cr_2O_7$?

$$\frac{16.4\text{ g } K_2Cr_2O_7}{} \left| \frac{78.20\text{ g K}}{294.2\text{ g } K_2Cr_2O_7} \right. = 4.36\text{ g K}$$

* either make a ratio as above or work as a %

3. (7 Pts) Sulfur trioxide, SO_3, is made from the oxidation of SO_2, and the reaction is represented by the equation

$2SO_2 + O_2 \longrightarrow 2SO_3$

23g ?g

If a 23-g sample of SO_2 gives 18 g of SO_3. Determine the percent yield of SO_3 is.

$$\frac{23\text{g } SO_2}{} \left| \frac{\text{mol}}{64.06\text{g}} \right| \frac{2\text{ mol } SO_3}{2\text{ mol } SO_2} \left| \frac{80.06\text{ g } SO_3}{\text{mol } SO_3} \right. = 28.7\text{ g } SO_3 \text{ (theoretical yield)}$$

Now: $\frac{\text{actual}}{\text{theo}} \times 100 = \%$ $\frac{18\text{ g}}{28.7\text{ g}} \times 100 =$ **63% yld**

4. (6 Pts) A particular compound contains, by mass, 41.4% carbon, 3.47% hydrogen, and 55.1% oxygen. Determine the empirical formula of this compound.

Assume 100g:

C: $\frac{41.4\text{ g C}}{} \left| \frac{\text{mol}}{12.01\text{ g}} \right. = 3.45 \div 3.44 = 1$

H: $\frac{3.47\text{ g}}{} \left| \frac{\text{mol}}{1.01\text{ g}} \right. = 3.44 \div 3.44 = 1$

O: $\frac{55.1\text{ g}}{} \left| \frac{\text{mol}}{16.00\text{ g}} \right. = 3.44 \div 3.44 = 1$

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CHM151 Quiz 3B 25 Pts Fall 2009 Name: Key

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Atomic masses: **H 1.008, C 12.01, O 16.00, F 19.00, S 32.07, Na 22.99, K 39.01, Cr 52.00, Rh 102.9**

1. (6 Pts) A particular compound contains, by mass, 25.5% carbon, 40.4% fluorine, and 34.1% oxygen. Determine the empirical formula of this compound.

Assume: 100g

C: $\frac{25.5\text{ g}}{12.01\text{ g/mol}} = 2.12 \div 2.12 = 1$

F: $\frac{40.4\text{ g}}{19.00\text{ g/mol}} = 2.13 \div 2.12 = 1$

O: $\frac{34.1\text{ g}}{16.00\text{ g/mol}} = 2.13 \div 2.12 = 1$

CFO

2. (7 Pts) Sulfur trioxide, SO_3, is made from the oxidation of SO_2, and the reaction is represented by the equation

$2SO_2 + O_2 \longrightarrow 2SO_3$

17g g

A 17-g sample of SO_2 gives 18 g of SO_3. The percent yield of SO_3 is ____.

$17\text{ g } SO_2 \times \frac{1\text{ mol } SO_2}{64.06\text{ g } SO_2} \times \frac{2\text{ mol } SO_3}{2\text{ mol } SO_2} \times \frac{80.06\text{ g } SO_3}{1\text{ mol } SO_3} = 21.2\text{ g } SO_3$

$\%\text{ yld} = \frac{\text{Actual}}{\text{theo.}} \times 100 = \frac{18}{21.2} \times 100 = 85\%$

3. (6 Pts) One step in the isolation of pure rhodium metal (Rh) is the precipitation of rhodium(III) hydroxide from a solution containing rhodium(III) sulfate according to the following balanced chemical equation:

$Rh_2(SO_4)_3(aq) + 6NaOH(aq) \rightarrow 2Rh(OH)_3(s) + 3Na_2SO_4(aq)$

6.00g ?g

If 6.00 g of rhodium(III) sulfate reacts with excess sodium hydroxide, what mass of rhodium(III) hydroxide may be produced?

$6.00\text{ g } Rh_2(SO_4)_3 \times \frac{1\text{ mol } Rh_2(SO_4)_3}{494.0\text{ g } Rh_2(SO_4)_3} \times \frac{2\text{ mol } Rh(OH)_3}{1\text{ mol } Rh_2(SO_4)_3} \times \frac{153.93\text{ g } Rh(OH)_3}{1\text{ mol } Rh(OH)_3} = 3.74\text{ g } Rh(OH)_3$

4. (6 Pts) How many grams of potassium are present in 17.7 g of $K_2Cr_2O_7$?

$17.7\text{ g } K_2Cr_2O_7 \times \frac{78.20\text{ g K}}{294.2\text{ g } K_2Cr_2O_7} = 4.70\text{ g K}$