CHM151 Quiz 3 25 Pts Spring 2013 Name: Key

Due Monday February 25th at the beginning of class. Show all work to receive credit.

1. Name and give the formulas for six *strong acids*

2. Determine the oxidation number of each of the elements in $Cs_2Cr_2O_7$?

Cs +1 Cr +6 O -2

3. Identify the *reducing agent* in the following reaction

$2KBr + F_2 \rightarrow Br_2 + 2KF$

Reducing agent loses e's Br^- or KBr

4. Thorium metal is prepared by reacting thorium oxide with calcium as depicted below.

$ThO_2 + 2Ca \rightarrow Th + 2CaO$

What is the *reducing agent* in this process? Ca

What is oxidized in the process? Ca

5. How many grams of potassium chloride are needed to make 3.0 liters of a 2.0 M KCl solution?

$$3.0\ \cancel{L} \left| \frac{2.0\ \cancel{mol}\ KCl}{\cancel{L}} \right| \frac{74.55\ g}{\cancel{mol}} = 447.3\ g$$

450 g

6. What volume of concentrated nitric acid (15.0 M) is required to make 100. mL of a 3.0 M nitric acid solution?

$M_1 V_1 = M_2 V_2$

$(15.0\ M)\ V = (3.0\ M)(100.\ mL)$

$V_1 = 20.\ mL$

Key

7. The concentration of oxalate ion ($C_2O_4^{2-}$) in a sample can be determined by titration with a solution of permanganate ion (MnO_4^-) of known concentration. The net ionic equation for this reaction is

$$2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \rightarrow 2Mn^{2+} \quad 8H_2O + 10CO_2$$

A 30.00 mL sample of an oxalate solution is found to react completely with 21.93 mL of a 0.1725 M solution of MnO_4^-. What is the oxalate ion concentration in the sample?

$2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \rightarrow 2Mn^{2+} + 8H_2O + 10CO_2$

21.93 mL, 0.1725 mmol/L | 30.00 mL, ? mol/L

$$\frac{21.93\times10^{-3}\ \text{L}\ MnO_4^- \mid 0.1725\ \text{mol}\ MnO_4^- \mid 5\ \text{mol}\ C_2O_4^{2-}}{30.00\times10^{-3}\ \text{L}\ C_2O_4^{2-} \mid \text{L}\ MnO_4^- \mid 2\ \text{mol}\ MnO_4^-} = 0.3152\ \frac{\text{mol}\ C_2O_4^{2-}}{\text{L}\ C_2O_4^{2-}}$$

8. What volume (mL) of a 0.2450 M KOH(aq) solution is required to completely neutralize 55.25 mL of a 0.5440 M H_3PO_4(aq) solution?

$3KOH(aq) + H_3PO_4(aq) \rightarrow 3H_2O(l) + K_3PO_4(aq)$

? mL, 0.2450 mol/L | 55.25 mL, 0.5440 mol/L

$$\frac{55.25\ \text{mL}\ H_3PO_4 \mid 0.5440\ \text{mol}\ H_3PO_4 \mid 3\ \text{mol}\ KOH \mid 1000\ \text{mL}\ KOH}{1000\ \text{mL}\ H_3PO_4 \mid 1\ \text{mol}\ H_3PO_4 \mid 0.2450\ \text{mol}\ KOH} = 368.0\ \text{mL}\ KOH$$

9. 34.62 mL of 0.1510 M NaOH was needed to neutralize 50.0 mL of an H_2SO_4 solution. What is the concentration of the original sulfuric acid solution?

$2NaOH(aq) + H_2SO_4(aq) \rightarrow 2H_2O(l) + Na_2SO_4(aq)$

34.62 mL, 0.1510 mol/L | 50.0 mL, ? mol/L

$$\frac{34.62\ \text{mL}\ NaOH \mid 0.1510\ \text{mol}\ NaOH \mid 1\ \text{mol}\ H_2SO_4}{50.0\times10^{-3}\ \text{L}\ H_2SO_4 \mid 1000\ \text{mL}\ NaOH \mid 2\ \text{mol}\ NaOH} = 0.0523\ \frac{\text{mol}\ H_2SO_4}{\text{L}\ H_2SO_4}$$

10. A 110. mL solution of 0.340 M HCl(aq) is mixed with a solution of 330. mL of 0.150 M HNO_3(aq). The solution is then diluted to a final volume of 1.00 L. How many moles of H^+ are present in the final solution?

Both are strong acids so they are 100% ionized.

Find moles of H^+ from each and add values.

$$HCl: \frac{110.\ \text{mL} \mid 0.340\ \text{mol}\ HCl \mid 1\ \text{mol}\ H^+}{1000\ \text{mL} \mid 1\ \text{mol}\ HCl} = 0.0374\ \text{mol}\ H^+$$

$$HNO_3: \frac{330.\ \text{mL} \mid 0.150\ \text{mol}\ HNO_3 \mid 1\ \text{mol}\ H^+}{1000\ \text{mL} \mid 1\ \text{mol}\ HNO_3} = 0.0495\ \text{mol}\ H^+$$

$0.0374 + 0.0495 = 0.0869\ \text{mol}\ H^+$