CHEM 1104 Exam 2. October 10, 2007

Name_____ Note: You must show all work for credit.

I certify that I have neither given nor received unauthorized aid on this assignment.

Useful information: $M = \frac{moles}{L}$ **, LEO says GER**

(1)(6 points) A flask containing 5.00 g of C and 14.1 g of Fe_2O_3 were reacted according to the following equation.

$$Fe_2O_3 + 3C \rightarrow 3CO_2 + 2Fe$$

(a) Which reagent is the limiting reagent?

(b) How much Fe should form?

(c) If the amount of Al_2O_3 formed was 3.62 g, what is the % yield?

(2)(2 points) How would you make a 500.0 mL, 0.100 M solution of NaClO from a 7.80 M stock solution?

(3)(4 points) If it takes 22.1 mL of 0.98 M H_2SO_4 to fully react with the $NaHCO_3$ (according to the unbalanced reaction below) in a 15.00 mL sample of water. How much $NaHCO_3$ was present (in grams)?

$$NaHCO_3 + H_2SO_4 \rightarrow Na_2SO_4 + H_2O + CO_2$$

(4)(4 points) Aspirin is acetylsalicylic acid. It is derived from salicylic acid which is found in willow tree bark. The elemental composition of aspirin (in mass %) is 60.00% C, 4.49% H, and 35.52% O. What is the empirical formula for aspirin?

(5)(4 points) Write the net acid-base reactions for the following neutralizations

(a) $HBr(aq) + Ca(OH)_2(aq)$ ---->

(b) $HCl(aq) + NH_3(aq)$ ----->

(6)(4 points) Write the balanced molecular, ionic and net ionic equations for the following reactions

(a) $MnCl_{2(aq)} + K_2CO_{3(aq)}$ ---->

(b) $NaOH_{(aq)} + FeSO_{4(aq)}$ ---->

(7)(4 points) Complete the following neutralization reactions and balance them for complete neutralization (all acidic protons neutralized, all basic units neutralized).

(a) $H_2SO_{3(aq)} + NaOH_{(aq)}$ ---->

(b) $H_2SO_4(aq) + NH_{3(aq)}$ ---->

(8)(2 points) Label the following strong electrolytes, weak electrolytes, or nonelectrolytes

(a) PCl_3

(b) HF

(c) NaOH

(d) $MgCl_2$

(9)(2 points) Name the following compounds
(a) $Mg(OH)_2$

(b) HClO

(c) HCl

(d) NH_3

(10)(4 points) Break the following reaction into an oxidation and a reduction 1/2 reaction. Show all work and the oxidation states of the species being oxidized and reduced. You don't have to balance the 1/2 reactions.

$$S_2O_3^{2-} + H_2O_2 \rightarrow H_2O + SO_4^{2-}$$

(11)(6 points) Balance the following half-reactions in base

(a) $NO_3^- \rightarrow NO_2^-$

(b) $Na \rightarrow Na^+$

(12)(4 points) Balance the following oxidation-reduction reaction in base

$Na + NO_3^- \rightarrow NO_2^- + Na^+$

(13)(4 points) Construct an activity series based on the following experimental results

$Fe^{2+}(aq) + 2K(s) \text{ ----> } 2K^+ + Fe(s)$

$Ti(s) + Au^{3+}(aq) \text{ -----> } Ti^{3+}(aq) + Au(s)$

$Ti\ (aq) + Fe^{2+}(s) \text{-----> NR}$

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(14)(4 points) Name a reagent that you could use to separate the Ni^{2+} and Ag^{+} from a solution of $Ni(NO_3)_2$ and $AgNO_3$ by a precipitation. Write out the precipitation reaction and list which metal will be in the precipitate and which will be left in solution.