Chemistry 105 Exam 3

Name_____

By submitting this exam, I certify that I have neither given nor received unauthorized aid.

Useful information:

(1) Name the following acids and bases.

(a) HNO_3

(b) NH_3

(c) H_2SO_3

(d) $Mg(OH)_2$

(2) Write an equation for the reaction of H_2SO_4 with an equal number of moles of NH_3. Write the molecular equation with phase labels as well as the net acid-base reaction.

(3) Write the net acid-base reaction for the following neutralizations

(a) $HNO_{2(aq)} + NaOH_{(aq)}$ ------->

(b) $HBr_{(aq)} + Ca(OH)_{2(aq)}$ ---->

(4) Classify the following as weak or strong acids or bases

(a) H_2SO_4

(b) $NaHCO_3$

(c) HBr

(d) HCH_3COO

(5) Complete the following neutalization reactions and balance them for a complete neutralization (all acidic protons neutralized, all basic units neutralized).

(a) $H_3PO_{4(aq)} + Ca(OH)_{2(aq)}$ ------->

(b) $HF_{(aq)} + LiOH_{(aq)}$ ------>

(6) List the oxidation state for each element in the following compounds

(a) $KMnO_4$

(b) H_2ClO_3

(7) Predict which of the following reactions will occur and which will not based on the activity series. Indicate which metal is the more reactive metal.

(a) $Cu^{2+}_{(aq)} + Sn_{(s)} \text{-----> } Sn^{2+}_{(aq)} + Cu_{(s)}$

(b) $Cr^{3+}_{(aq)} + 3Ag_{(s)} \text{------> } 3Ag^{+}_{(aq)} + Cr_{(s)}$

(8) Break the following reaction into it's half reactions. Label the half reactions as oxidations or reduction. Include the electrons. Show all work.

$$Bi(OH)_3(s) + Sn(OH)_3^-{}_{(aq)} \text{----> } Bi(s) + Sn(OH)_6^{2-}$$

(9) Balance the following equation by the half-reaction method.

$$CrCl_{6(aq)} + Fe_{(s)} \text{--------> } CrCl_{3(aq)} + FeCl_{2(aq)}$$

(10) Answer the following questions concerning molarity.

(a) How many moles of HCl are present in 25.50 mL of a 0.263 M solution of HCl?

(b) How many mL of 3.57 M NaCl is needed to deliver 0.821 moles of NaCl?

(11) If 35.87 mL of 0.100 M HCl was needed to neutralize 30.0 mL of a Na_2CO_3 solution. How many moles of Na_2CO_3 were present initially? What was the concentration of the Na_2CO_3 solution?

$$Na_2CO_{3(aq)} + 2\ HCl \text{ --------> } H_2O_{(l)} + CO_{2(g)} + CaCl_{2(aq)}$$

(12) A 125 mL solution of $Cu(NO_3)_2$ was treated with sodium carbonate to precipitate copper carbonate. If 0.735 g of $CuCO_3$ was recovered, what was the concentration of the $Cu(NO_3)_2$ solution?

$$Na_2CO_{3(aq)} + Cu(NO_3)_{2(aq)} \text{---------} > CuCO_{3(s)} + 2NaNO_{3(aq)}$$

Extra Credit: When Na is added to water, what reaction occurs (write it out). What type of reaction is this?