

Chemistry 105 Exam 3

Name Key

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

Useful information:

(1) Name the following acids and bases.

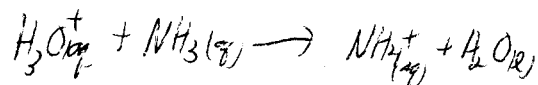
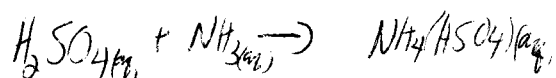
(a) HNO_3 nitric acid

(b) NH_3 ammonia

(c) H_2SO_3 sulfurous acid

(d) $\text{Mg}(\text{OH})_2$ magnesium hydroxide

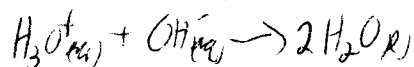
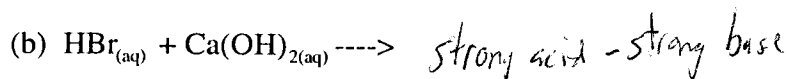
(2) Write an equation for the reaction of H_2SO_4 with an equal number of moles of NH_3 . Write the molecular equation with phase labels as well as the net acid-base reaction.



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

(a) $\text{HNO}_2(\text{aq}) + \text{NaOH}(\text{aq}) \rightarrow$ weak acid strong base





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

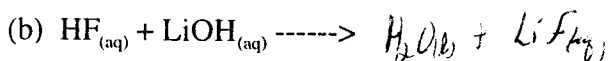
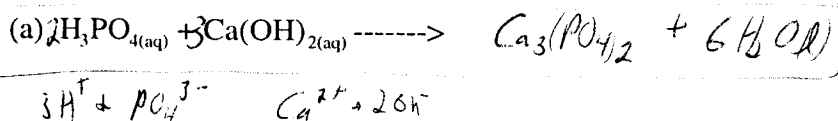
(a) H_2SO_4 strong acid

(b) NaHCO_3 weak base

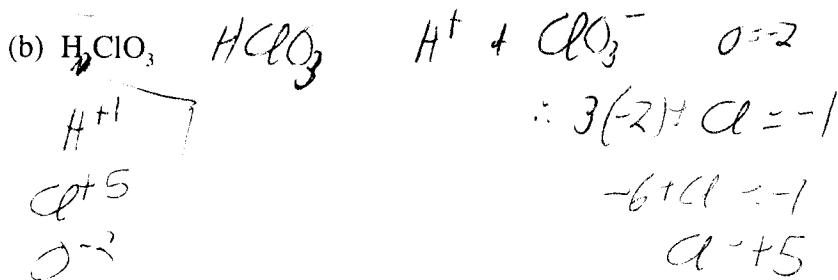
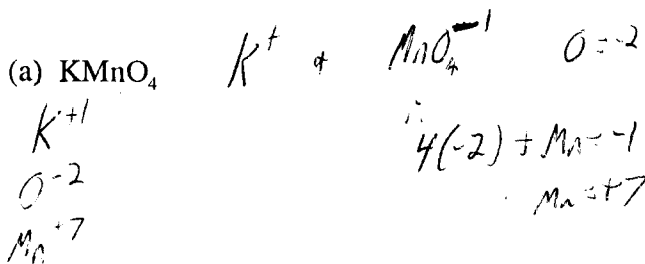
(c) HBr strong acid

(d) HCH_3COO weak acid

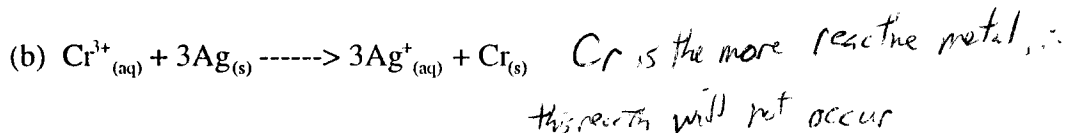
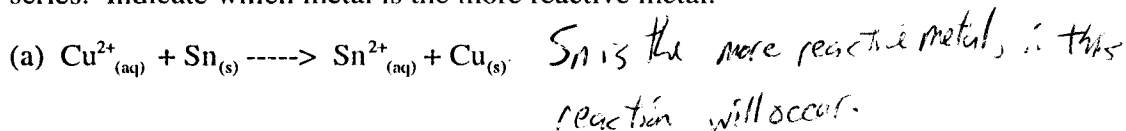
(5) Complete the following neutralization reactions and balance them for a complete neutralization (all acidic protons neutralized, all basic units neutralized).



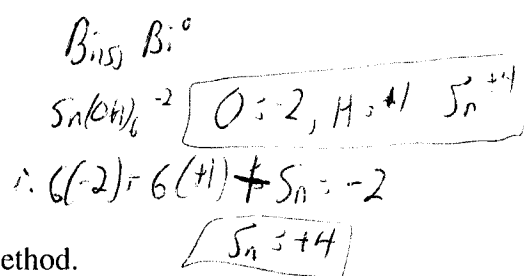
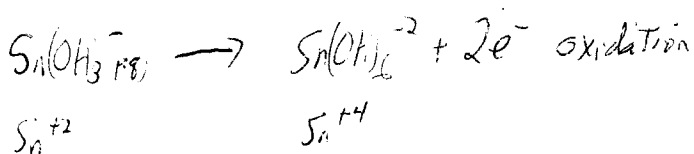
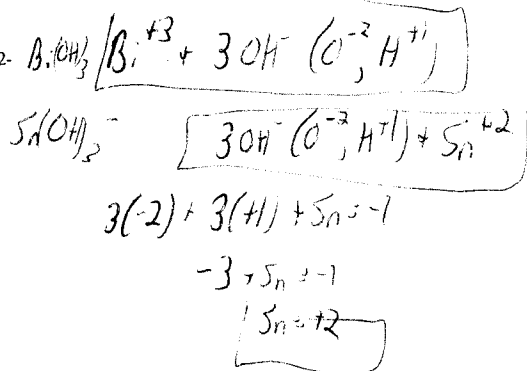
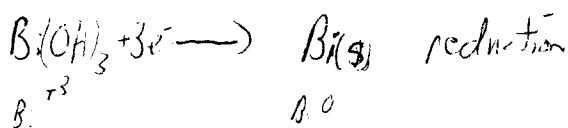
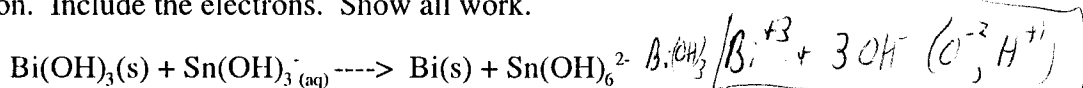
(6) List the oxidation state for each element in the following compounds



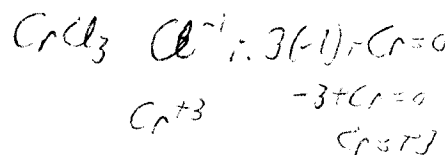
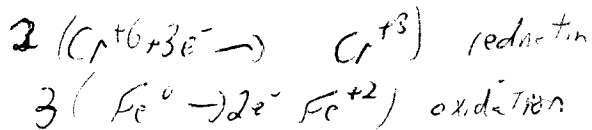
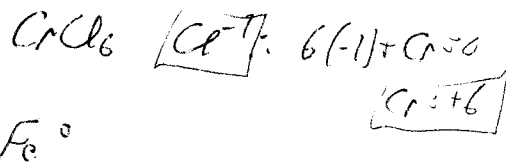
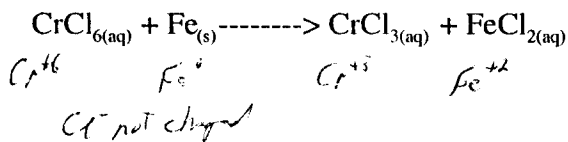
(7) Predict which of the following reactions will occur and which will not based on the activity series. Indicate which metal is the more reactive metal.



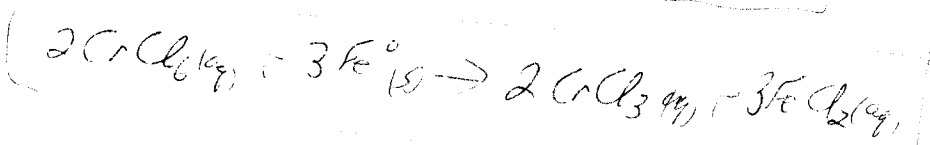
(8) Break the following reaction into its half reactions. Label the half reactions as oxidations or reduction. Include the electrons. Show all work.



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



put in Cl's



(10) Answer the following questions concerning molarity.

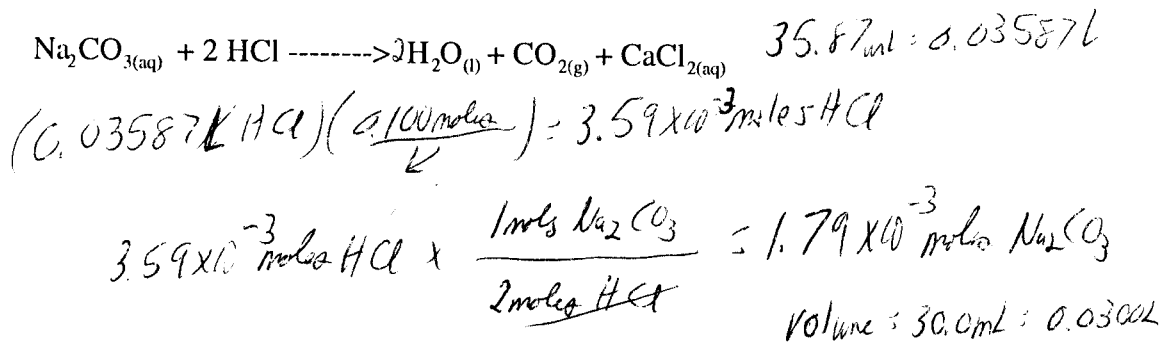
(a) How many moles of HCl are present in 25.50 mL of a 0.263 M solution of HCl?

$$25.50 \text{ mL} = 0.0255 \text{ L}$$
$$0.0255 \text{ L} \times \frac{0.263 \text{ moles}}{\text{L}} = 6.71 \times 10^{-3} \text{ moles HCl}$$

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

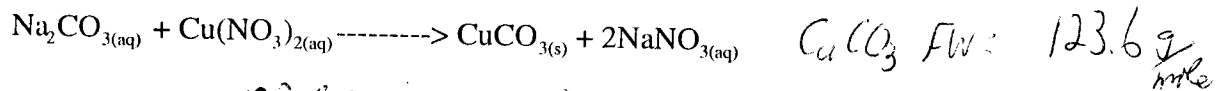
$$0.821 \text{ moles} \div \frac{3.57 \text{ moles}}{\text{L}} = 0.230 \text{ L} = 230 \text{ mL NaCl solution}$$

(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?



$$M = \frac{\text{moles}}{\text{L}} \quad \therefore \quad \frac{1.79 \times 10^{-3} \text{ moles}}{0.0300 \text{ L}} = \boxed{5.98 \times 10^{-2} \text{ M}} \text{ Na}_2\text{CO}_3$$

(12) A 125 mL solution of $\text{Cu}(\text{NO}_3)_2$ was treated with sodium carbonate to precipitate copper carbonate. If 0.735 g of CuCO_3 was recovered, what was the concentration of the $\text{Cu}(\text{NO}_3)_2$ solution?

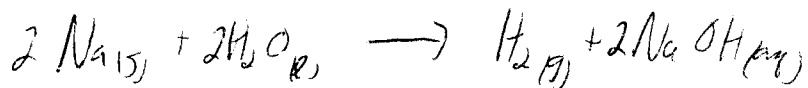


$$0.735 \text{g} \div \frac{123.6 \text{g}}{\text{mole}} = 6.09 \times 10^{-3} \text{ moles CuCO}_3$$

$$6.09 \times 10^{-3} \text{ moles CuCO}_3 \times \frac{1 \text{ mole Cu}(\text{NO}_3)_2}{1 \text{ mole CuCO}_3} = 6.09 \times 10^{-3} \text{ moles Cu}(\text{NO}_3)_2$$

$$M = \frac{\text{moles}}{L} \quad \therefore \frac{6.09 \times 10^{-3} \text{ moles Cu}(\text{NO}_3)_2}{0.125 \text{ L}} = 0.0487 \text{ M Cu}(\text{NO}_3)_2$$

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



this is a redox reaction

