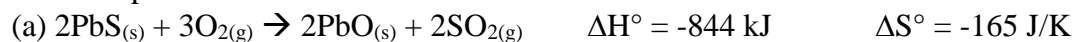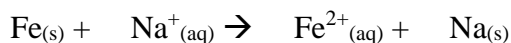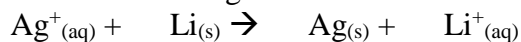# AP Chemistry – Wrappin' Up Unit 4 – 39

Name _____Per ___

1. Through titration 15.0 mL of 0.1008 M sodium hydroxide is needed to neutralize a 0.2053 g sample of an organic acid. What is the molar mass of the acid if it is monoprotic?

2. An elemental analysis of the acid in question 1 indicates that it is composed of 5.89% H, 70.6% C and 23.5% O by mass. What is its molecular formula?

3. From the given values for ΔH° and ΔS°, calculate ΔG° for each of the following reactions at 298K. If the reaction is not spontaneous under standard conditions, at what temperature, if any, would the reaction become spontaneous?

(a) $2PbS_{(s)} + 3O_{2(g)}$ → $2PbO_{(s)} + 2SO_{2(g)}$ ΔH° = -844 kJ   ΔS° = -165 J/K

(b) $2POCl_{3(g)}$ → $2PCl_{3(g)} + O_{2(g)}$ ΔH° = 572 kJ   ΔS° = 179 J/K

4. Consider the following oxidation-reduction reactions in aqueous solution:

$Ag^+_{(aq)} + Li_{(s)} \rightarrow Ag_{(s)} + Li^+_{(aq)}$

$Fe_{(s)} + Na^+_{(aq)} \rightarrow Fe^{2+}_{(aq)} + Na_{(s)}$

$K_{(s)} + H_2O_{(l)} \rightarrow KOH_{(aq)} + H_{2(g)}$

(a) Balance each of the reactions. This is more difficult than you might think. Make up a spectator ion to help you see more clearly what is occurring in each reaction.
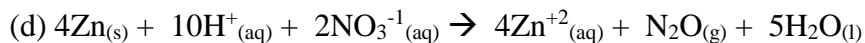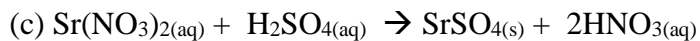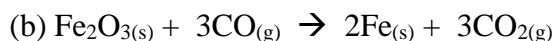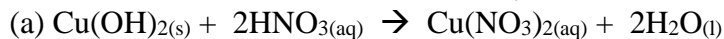(b) Calculate $\Delta H°$ for each of the reactions.

(c) Based on the values you obtain for $\Delta H°$, which of the reactions would you expect to be favorable? Which would you expect to be unfavorable?

(d) Use the activity series to predict which of these reactions should occur. Are these results in accord with your conclusion in part (c) of this problem?

5. A dilute aqueous solution of an organic compound soluble in water is formed by dissolving 2.35 g of the compound in water to form 0.250 L solution. The resulting solution has an osmotic pressure of 0.605 atm at $25°C$. Assuming that the organic compound is a nonelectrolyte, what is its molar mass?

6. Which of the following are redox reactions? For those that are, indicate which element is oxidized and which is reduced. For those that are not, indicate whether they are precipitation or acid-base reactions.

(a) $Cu(OH)_{2(s)} + 2HNO_{3(aq)} \rightarrow Cu(NO_3)_{2(aq)} + 2H_2O_{(l)}$

(b) $Fe_2O_{3(s)} + 3CO_{(g)} \rightarrow 2Fe_{(s)} + 3CO_{2(g)}$

(c) $Sr(NO_3)_{2(aq)} + H_2SO_{4(aq)} \rightarrow SrSO_{4(s)} + 2HNO_{3(aq)}$

(d) $4Zn_{(s)} + 10H^+_{(aq)} + 2NO_3^{-1}{}_{(aq)} \rightarrow 4Zn^{+2}{}_{(aq)} + N_2O_{(g)} + 5H_2O_{(l)}$

7. Write balanced molecular and net ionic equations for the reactions of:

(a) aqueous hydrochloric acid with solid nickel

(b) aqueous sulfuric acid with solid iron

(c) aqueous hydrobromic acid with solid magnesium

(d) aqueous acetic acid with solid zinc

8. Suppose you prepare 500 mL of a 0.10 M solution of $NiSO_4$ and then you spill some solution on the lab table. What happens to the concentration of the solution left in the container? Explain.

9. A certain volume of a 0.50 M solution contains 4.5 g of $NiSO_4$. What mass of $NiSO_4$ is present in the same volume of a 2.50 M solution?