AP Chemistry Midterm Review

1. 47.0 grams of sodium hydroxide reacts with 47.0 g of hydrochloric acid.

   (A) Write a balanced chemical equation for the reaction.(not net ionic)
   (B) What is the limiting reactant?
   (C) What is the theoretical yield in grams of sodium chloride?
   (D) If 63.5 grams of sodium chloride are produced in the lab, what is the percent yield?

2. Calculate the molar solubility of SrF_2 in each of the following solutions.
   Ksp of $SrF_2 = 7.9 \times 10^{-10}$

   (A) pure water
   (B) 0.100 M $SrNO_3$
   (C) 0.200 M NaF

3. At 800K hydrogen iodide can decompose into hydrogen and iodine gases:

   $2HI\ (g) \leftrightarrow I_2\ (g) + H_2\ (g)$ Kc = 0.0169 at 800K

   If initially a sealed 1.00L flask at 800K contains only 0.00305 mol of HI,

   (A) What is the initial partial pressure of HI in the flask?
   (B) What are the molarities at equilibrium of the hydrogen and iodine gases?
   (C) What is the total pressure in the flask at equilibrium?
   (D) What are the total moles in the flask at equilibrium?

4. The equation for the reaction between iodide and bromate ions in acidic solution is
   $6\ I^-(aq) + BrO_3^-(aq) + 6\ H^+(aq) \rightarrow 3\ I_2(aq) + Br^-(aq) + 3\ H_2O(l)$

Experiment	Initial $[I^-]$ (mol L^{-1})	Initial $[BrO_3^-]$ (mol L^{-1})	Initial $[H^+]$ (mol L^{-1})	Rate of Disappearance of BrO_3^- (mol L^{-1} s^{-1})
1	0.0020	0.0080	0.020	8.89×10^{-5}
2	0.0040	0.0080	0.020	1.78×10^{-4}
3	0.0020	0.0160	0.020	1.78×10^{-4}
4	0.0020	0.0080	0.040	3.56×10^{-4}
5	0.0015	0.0040	0.030	7.51×10^{-5}

   (A) Determine the order of the reaction for each reactant listed below.
   (show your work or explain your reasoning)
   (i) I^-
   (ii) BrO_3^-
   (iii) H^+

   (B) Write the rate law for the reaction.
   (C) Calculate the value of the rate constant, *k*, for the reaction. *Include the units*.
   (D) What is the rate of formation of I_2 for experiment 4 if the rate is based upon the disappearance of BrO_3^- ?

5. $CuS_{(s)} + NO_3^-{}_{(aq)} \rightarrow Cu^{2+}{}_{(aq)} + NO_{2\,(g)} + S_{(s)}$

(A) Balance the above redox reaction in acidic solution.
(B) What species is being oxidized? What species is being reduced?
(C) What mass of CuS (s) is needed to react completely with 10.5 mL of 2.00 M KNO_3 solution?

Important things to review/remember…not a complete list, but pretty close to it…

a. Significant figures
b. Polyatomic ions
c. Solubility rules
d. Naming rules
e. Strong acids and bases
f. Diatomic molecules
g. Alkanes and alkyls
h. Amines
i. Mole, gram, particles conversions
j. Percent composition, empirical and molecular formulas
k. Percent yield and percent error
l. Molarity formula and finding moles from concentration and volume
m. Dilution formula
n. Net ionic equations
o. Oxidation numbers and redox
p. Two requirements for an "effective" collision
q. Factors that increase reaction rate
r. Graphs for zero, first, and second order reactants
s. Effect of changing concentration of 1st and 2nd order reactants
t. Reaction path diagrams: identifying reactants, products, activated complex, and activation energy
u. Endothermic vs. exothermic
v. Reaction mechanisms: how to identify catalyst and intermediate
w. Rate constant (k) units
x. Ideal gas law
y. Conditions to make a gas behave more ideally
z. Relationship between pressure, volume, temperature, and number of moles of a gas
aa. Equilibrium definition and writing Kc and Kp expressions
bb. Formula for converting between Kc and Kp
cc. Le Chatelier's principle and shifts
dd. Manipulating K values: reversing equations, multiplying by coefficients, adding equations to get overall equation
ee. Common ion effect and its effect on molar solubility
ff. How to determine if a precipitate will form
gg. Acid/Base definitions and ionization equations
hh. pH, pOH, $[H^+]$, $[OH^-]$, Kw formulas
ii. How to determine if a salt is acidic, basic, or neutral
jj. ICE problems: Kc, Kp, Ksp, Ka, and Kb

What did the chemist say when he found two isotopes of helium???

HeHe. ☺