Chem 101 practice problems:

Dear students,
Please practice problem solving using the following problems. Solve these *methodically* without skipping steps. No solutions or answers are given at this time. You may of course consult a periodic table when needed:

1) Write down the balanced equation for the <u>combustion</u> of methanol, CH_3OH.

2) What is the percent composition of water in copper(II) sulfate pentahydrate?

3) What is the empirical formula and name of the ionic compound with the following % composition: %N = 35.0%   % H = 5.0%   %O = 60%

4) Consider the thermal decomposition of a metal oxalate: $XC_2O_4(s)$ which becomes the metal carbonate XCO_3 upon heating:

$XC_2O_4(s)$ - - - > $XCO_3 + CO(g)$

If 64.0 mg of the metal oxalate is heated and only 50.0 mg of the metal carbonate remains, what is the metal, X?

5) This reaction produces sulfuric acid:

$2 SO_2 + O_2 + 2 H_2O \rightarrow 2 H_2SO_4$

If 100. g SO_2 , 20.0 g O_2 and 25.0 g H_2O are mixed and the reaction proceeds to completion, which reactant is limiting?

6) Suppose that the synthesis reaction forming ammonia gas from nitrogen gas and hydrogen gas has a 75% yield. How many grams of nitrogen gas would you need to add to an excess amount of hydrogen gas to obtain 920. kg of ammonia?

7) If 5.40 g of aluminum powder (Al, 27.0 g/mole) reacts with 5.00 g of oxygen gas (O_2, 32.0 g/mole), to form aluminum oxide (Al_2O_3) what are the masses of all the chemical species present after the reaction goes to completion?

8) a) Complete and balance the following neutralization reaction:
Carbonic acid, H_2CO_3 , reacts with sodium hydroxide to form…
b) Write down the net ionic equation for this same reaction.

9) 2 moles of phosphoric acid is mixed with 3 moles sodium hydroxide. If the reaction goes to completion, what is the limiting reactant?

10) Titration of 25.0 mLs of HNO_3 requires 20.0 mLs of 0.400 M NaOH to reach the equivalence point. What is the concentration of the original solution of HNO_3?

11) Titration of 25.0 mLs of H_2SO_4 requires 20.0 mLs of 0.400 M NaOH to reach the equivalence point. What is the concentration of the original solution of H_2SO_4?