1. In the chemistry lab, you produce 10.0 grams of hydrogen gas from the following chemical reaction:

$$\mathbf{2HCl\ (aq) + Zn\ (s) \rightarrow H_2\ (g) + ZnCl_2\ (aq)}$$

a) What is the molar mass of HCl and $H_2$?

b) How many moles of $H_2$ are in 10.0 g?

c) How many moles of Zn are needed to produce 10.0 g of $H_2$?

d) How many grams of Zn are needed to produce the 10.0 g of $H_2$?

e) How many moles of $ZnCl_2$ are produced?

f) How many grams of $ZnCl_2$ are produced?

2. A container with 100.0 mL of water has 25.0 grams of glucose ($C_6H_{12}O_6$) dissolved in it. When yeast is added to the solution, ethyl alcohol (or ethanol, $C_2H_5OH$) and carbon dioxide gas are produced.

a) Write out the unbalanced chemical equation for this reaction.

b) Write out the unbalanced chemical equation for this reaction.

c) Calculate the molar mass for glucose, ethanol and carbon dioxide.

d) How many moles of glucose are in the water before the yeast is added?

e) How many moles of ethanol are produced when this reaction runs to completion?

f) How many grams of ethanol are produced in the completed reaction?

g) How many grams of carbon dioxide are produced in the completed reaction?

3. In a CH100 lab (not yours), copper(II) hydroxide precipitate is produced from 10.0 grams of copper(II) sulfate:

$$\mathbf{2NaOH(aq) + CuSO_4(aq) \rightarrow Na_2SO_4(aq) + Cu(OH)_2(s)}$$

a) Calculate the molar mass of each reactant and product in this reaction.

b) How many moles of copper(II) sulfate are consumed during this chemical reaction?

c) How many "molecules" of copper(II) sulfate (numerical quantity not moles) are consumed in this reaction?

d) Using the coefficients of this reaction, determine how many moles of sodium hydroxide are reacted in this chemical process?

e) How many moles of copper(II) hydroxide and sodium sulfate are produced by this reaction?

f) How many molecules (numerical quantity not moles) of copper(II) hydroxide and sodium sulfate are produced by this reaction?

g) How many grams of copper(II) hydroxide and sodium sulfate are produced by this reaction?

h) What is the % mass of each element in copper(II) hydroxide?