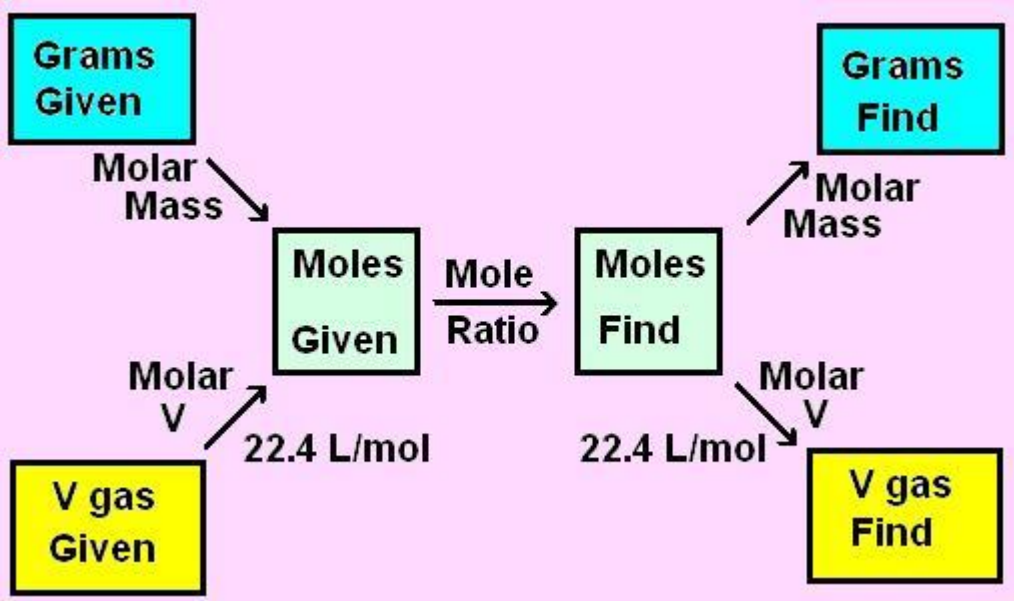
CHM 130 Stoichiometry Worksheet

The following flow chart may help you work stoichiometry problems. Remember to pay careful attention to what you are given, and what you are trying to find.



1. Fermentation is a complex chemical process of making wine by converting glucose into ethanol and carbon dioxide:

$$C_6H_{12}O_6(s) \rightarrow 2\ C_2H_5OH\ (l) + 2\ CO_2(g)$$

A. Calculate the mass of ethanol produced if 500.0 grams of glucose reacts completely.

B. Calculate the volume of carbon dioxide gas produced at STP if 100.0 grams of glucose reacts.

C. If 17.5 moles of ethanol were produced, how many moles of glucose were there in the beginning?

2. Consider the reaction of zinc metal with hydrochloric acid, HCl(aq).
   A. Write the equation for this reaction, then balance the equation.

   B. Calculate the moles of HCl needed to react completely with 8.25 moles of zinc.

   C. Calculate the grams of zinc chloride produced if 0.238 grams of zinc react completely.

   D. Calculate the volume of hydrogen gas produced at STP if 25.0 grams of HCl react completely.

3. If you dissolve lead(II) nitrate and potassium iodide in water they will react to form lead(II) iodide and potassium nitrate.

   A. Write the equation for this reaction, then balance the equation.

   B. Calculate the grams of lead(II) iodide that can be produced from 5.00 moles of potassium iodide.

   C. Calculate the grams of lead(II) iodide that can be produced from 75.00 grams of potassium iodide.

4. Write then balance the combustion reaction for propane gas, C_3H_8.

   A. If 5.00 grams of propane burn completely, what volume of carbon dioxide is produced at STP?

   B. If 75.0 L of steam are produced at STP, what mass of propane must have burned?

   C. If 34.2 grams of propane are completely combusted, how many moles of steam will that produce?

CHM 130 Stoichiometry Worksheet KEY

1. Fermentation is a complex chemical process of making wine by converting glucose into ethanol and carbon dioxide:

$$\mathbf{C_6H_{12}O_6(s) \rightarrow 2\ C_2H_5OH\ (l) + 2\ CO_2(g)}$$

A. Calculate the mass of ethanol produced if 500.0 grams of glucose reacts completely.

$$500.0\text{ g } C_6H_{12}O_6\left(\frac{1\text{ mol } C_6H_{12}O_6}{180.18\text{ g } C_6H_{12}O_6}\right)\left(\frac{2\text{ mol } C_2H_5OH}{1\text{ mol } C_6H_{12}O_6}\right)\left(\frac{46.08\text{ g } C_2H_5OH}{1\text{ mol } C_2H_5OH}\right) = 255.7\text{ g } C_2H_5OH$$

B. Calculate the volume of carbon dioxide gas produced at STP if 100.0 grams of glucose reacts.

$$100.0\text{ g } C_6H_{12}O_6\left(\frac{1\text{ mol } C_6H_{12}O_6}{180.18\text{ g } C_6H_{12}O_6}\right)\left(\frac{2\text{ mol } CO_2}{1\text{ mol } C_6H_{12}O_6}\right)\left(\frac{22.4\text{ L } CO_2}{1\text{ mol } CO_2}\right) = 24.9\text{ L } CO_2$$

C. If 17.5 moles of ethanol were produced, how many moles of glucose were there in the beginning?

$$17.5\text{ mol } C_2H_5OH\left(\frac{1\text{ mol } C_6H_{12}O_6}{2\text{ mol } C_2H_5OH}\right) = 8.75\text{ mol } C_6H_{12}O_6$$

2. Consider the reaction of zinc metal with hydrochloric acid, HCl(aq).

A. Write the equation for this reaction, then balance the equation.

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

B. Calculate the moles of HCl needed to react completely with 8.25 moles of zinc.

$$8.25\text{ mol Zn}\left(\frac{2\text{ mol HCl}}{1\text{ mol Zn}}\right) = 16.5\text{ mol HCl}$$

C. Calculate the grams of zinc chloride produced if 0.238 grams of zinc react completely.

$$0.238\text{ g Zn}\left(\frac{1\text{ mol Zn}}{65.39\text{ g Zn}}\right)\left(\frac{1\text{ mol } ZnCl_2}{1\text{ mol Zn}}\right)\left(\frac{136.29\text{ g } ZnCl_2}{1\text{ mol } ZnCl_2}\right) = 0.496\text{ g } ZnCl_2$$

D. Calculate the volume of hydrogen gas produced at STP if 25.0 grams of HCl react completely.

$$25.0\text{ g HCl}\left(\frac{1\text{ mol HCl}}{36.46\text{ g HCl}}\right)\left(\frac{1\text{ mol } H_2}{2\text{ mol HCl}}\right)\left(\frac{22.4\text{ L } H_2}{1\text{ mol } H_2}\right) = 7.68\text{ L } H_2\text{ gas}$$

3. If you dissolve lead(II) nitrate and potassium iodide in water they will react to form lead(II) iodide and potassium nitrate.
   A. Write the equation for this reaction, then balance the equation.

$$\mathbf{Pb(NO_3)_2(aq) + 2\ KI(aq) \rightarrow PbI_2(s) + 2\ KNO_3(aq)}$$

   B. Calculate the grams of lead(II) iodide that can be produced from 5.00 moles of potassium iodide.

$$5.00 \text{ mol KI} \left(\frac{1 \text{ mol } PbI_2}{2 \text{ mol KI}}\right)\left(\frac{461.0 \text{ g } PbI_2}{1 \text{ mol } PbI_2}\right) = 1.15 \times 10^3 \text{ g } PbI_2$$

   C. Calculate the grams of lead(II) iodide that can be produced from 75.00 grams of potassium iodide.

$$75.00 \text{ g KI} \left(\frac{1 \text{ mol KI}}{166.00 \text{ g KI}}\right)\left(\frac{1 \text{ mol } PbI_2}{2 \text{ mol KI}}\right)\left(\frac{461.0 \text{ g } PbI_2}{1 \text{ mol } PbI_2}\right) = 104.1 \text{ g } PbI_2$$

4. Write then balance the combustion reaction for propane gas, C_3H_8.

$$\mathbf{C_3H_8(g) + 5\ O_2(g) \rightarrow 3\ CO_2(g) + 4\ H_2O(g)}$$

   A. If 5.00 grams of propane burn completely, what volume of carbon dioxide is produced at STP?

$$5.00 \text{ g } C_3H_8 \left(\frac{1 \text{ mol } C_3H_8}{44.11 \text{ g } C_3H_8}\right)\left(\frac{3 \text{ mol } CO_2}{1 \text{ mol } C_3H_8}\right)\left(\frac{22.4 \text{ L } CO_2}{1 \text{ mol } CO_2}\right) = 7.62 \text{ L } CO_2$$

   B. If 75.0 L of steam are produced at STP, what mass of propane must have burned?

$$75.0 \text{ L } H_2O \left(\frac{1 \text{ mol } H_2O}{22.4 \text{ L } H_2O}\right)\left(\frac{1 \text{ mol } C_3H_8}{4 \text{ mol } H_2O}\right)\left(\frac{44.11 \text{ g } C_3H_8}{1 \text{ mol } C_3H_8}\right) = 36.9 \text{ g } C_3H_8$$

   C. If 34.2 grams of propane are completely combusted, how many moles of steam will that produce?

$$34.2 \text{ g } C_3H_8 \left(\frac{1 \text{ mol } C_3H_8}{44.11 \text{ g } C_3H_8}\right)\left(\frac{4 \text{ mol } H_2O}{1 \text{ mol } C_3H_8}\right) = 3.10 \text{ mol steam}$$