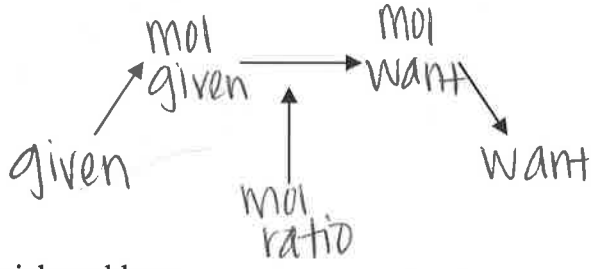
Name Key

Stoich Summary

Study this sheet, your review, notes, and old homeworks to prepare for your test. This sheet will provide an outline on how to solve the three main types of problems we had in this unit.

Plain Ole' Stoich:

- You will know it is this type of problem if there is **one** given and **one** want.
- Remember, stoichiometry connects two different compounds or elements in a chemical equation.
- All or your units MUST cancel or you are doing it incorrectly.
- Make sure your GFM is correct. Go one number after the decimal.
- If the chemical name is written out instead of the formula (and you aren't sure about how to GET the formula), you should look for the equation. Use that as the guide for the formula. It will have to be in the equation for you to use it. Be careful here!
- Find your mole ratio or mole bridge from the balanced equation's coefficient. If the equation is not balanced, BALANCE it first!!!
- For sig figs, look at units of given.
- Use this picture as a guide:



Example stoich problem:

____ Cu + 2 $AgNO_3$ → ____ $Cu(NO_3)_2$ + 2 Ag

How many grams of copper are needed to react with 4.37 g silver nitrate?

g: 4.37g $AgNO_3$
w: ? g Cu
2 mol $AgNO_3$ = 1 mol Cu

$$4.37\text{g } AgNO_3 \left| \frac{1\text{mol } AgNO_3}{169.9\text{g } AgNO_3} \right| \frac{1\text{mol Cu}}{2\text{mol } AgNO_3} \left| \frac{63.5\text{g Cu}}{1\text{mol Cu}} \right. = \boxed{0.817\text{g Cu}}$$

Limiting Reactant:

- It is this type of problem if you have **2 givens** and both of the givens are **REACTANTS** and you are **looking for the amount of product**.
- Work the problems out and solve for the same "want". The one that produces the <u>least</u> amount of product is the limiting reactant and determines that total amount produced.
- To determine how much of the excess reactant is left, use the given amount of the **limiting reactant** and convert it to the other reactant. Make sure the units for the excess amount match the given amount. Subtract the number you calculate from the given amount of excess. *(I know this sounds confusing... it will make more sense when we work it out)*

Sample problem on back…

Example problem LR problem:

How many mols of $BaSO_4$ form if a solution containing 0.024 mol of $BaCl_2$ is mixed with a solution containing 0.040 mol of Na_2SO_4? (used in x-ray's)

__ $BaCl_2$ + __ Na_2SO_4 → __ $BaSO_4$ + 2 __ NaCl

g: 0.024 mol $BaCl_2$
g: 0.040 mol Na_2SO_4
w: ? mol $BaSO_4$
1 mol $BaCl_2$ = 1 mol $BaSO_4$
1 mol Na_2SO_4 = 1 mol $BaSO_4$

$$0.024\ \text{mol}\ BaCl_2 \left| \frac{1\ \text{mol}\ BaSO_4}{1\ \text{mol}\ BaCl_2} \right. = 0.024\ \text{mol}\ BaSO_4$$

$$0.040\ \text{mol}\ Na_2SO_4 \left| \frac{1\ \text{mol}\ BaSO_4}{1\ \text{mol}\ Na_2SO_4} \right. = 0.040\ \text{mol}\ BaSO_4$$

0.024 mol $BaSO_4$

Limiting Reagent $BaCl_2$

Left over mols of Excess Reagent 0.016 g Na_2SO_4

g: 0.024 mol $BaCl_2$
w: ? mol Na_2SO_4
1 mol $BaCl_2$ = 1 mol Na_2SO_4

$$0.024\ \text{mol}\ BaCl_2 \left| \frac{1\ \text{mol}\ Na_2SO_4}{1\ \text{mol}\ BaCl_2} \right. = 0.024\ \text{mol}\ Na_2SO_4$$

↑ used

$0.040 - 0.024 = 0.016$ g Na_2SO_4 left

Percent Yield:

- It is this type of problem if there are **2 numbers given** to you and you see the key word "**percent yield**" in the problem.
- You will immediately write "given, want, and actual".
- Your actual is going to be the amount that is produced, yielded, given off, obtained, etc.
- The want will have the EXACT same units as the actual…but you are solving for the amount.
- The given will be the other number that is given to you.
- Once you find your "want", it becomes your "theoretical" for the next part of the problem.
  - $\frac{\text{Actual}}{\text{Theoretical}}$ X 100 = Percent Yield

Example PY problem:

What is the percent yield of this reaction if 23 g of CH_4 (R) produces 200g of HCl (P)?

__ CH_4 + 4 Cl_2 → __ CCl_4 + 4 HCl

g: 23g CH_4
w: ? g HCl
actual: 200g HCl
1 mol CH_4 = 4 mol HCl

$$23\text{g}\ CH_4 \left| \frac{1\ \text{mol}\ CH_4}{16.0\ \text{g}\ CH_4} \right. \left| \frac{4\ \text{mol}\ HCl}{1\ \text{mol}\ CH_4} \right. \left| \frac{36.5\ \text{g}\ HCl}{1\ \text{mol}\ HCl} \right. = 210\text{g}\ HCl$$

Percent Yield 95% yield

$$\frac{A}{T} \times 100 = \frac{200\text{g}}{210\text{g}} \times 100 = 95\%\ \text{yield}$$