NS J2 (pg 1 of 1) Solving Stoichiometry Problems

Name________________________Per____

First it is important to realize that there is no substitute for reading the problem carefully. There will be several numbers in each problem, (some of which may not even be necessary) and you must be sure and use the appropriate numbers at the appropriate times.

No Naked Numbers

Each number in all of these problems should have three labels associated with it.

1. the units (g, mole, etc)
2. the identity label – who the substance is (H_2O , carbon dioxide, Al, lead, etc)
3. descriptive words since often there is more than one amount of a substance in a problem – (amount started with, amount produced, amount needed, amount theoretically produced, experimental amount, etc)

For you to have success you need to keep track of the labels on every number both at the start of the problem and throughout the problem. If you lose track of who's who, you are likely to use the wrong number at the wrong time.

A Typical Plan for Solving Stoichiometry Problems

There is a basic pattern to all stoichiometry problems, with variations depending on what information is given and what questions must be answered.

A. You must start with a balanced equation. (If you need more help with that go back to Unit G.)

B. Convert the units of any starting substances into moles. (Since the stoichiometric LINK – coefficients from the balanced equation – is in moles, you must work the problem in moles.)

C. Reread the problem to determine the information that you need to calculate. Use the stoichiometric LINK to convert from a known substance to a desired substance that you need to answer the question.
   - Note that the LINK is set up with the ***known*** substance on the ***bottom*** (so the known substance will cancel out) and with the **desired** substance on the **top**.

D. If necessary, convert any answers back into grams.

Note: If the problem gives info in moles then skip step B and if the problem asks for an answer in moles then skip step E.
It is best to do all your calculations on the calculator without clearing then round only the final answer.

Sample Problem #1

Solid iron reacts with oxygen to produce iron(III) oxide. If you wanted to produce 2.5 moles of iron(III) oxide, what mass of oxygen must react?

step A. balanced equation: $4\,Fe + 3\,O_2 \rightarrow 2\,Fe_2O_3$

Solve:
$$2.5\,mol Fe_2O_3 \times \frac{3 O_2}{2 Fe_2O_3} \times \frac{32\,g O_2}{1\,mol O_2} = 120\,g O_2 needed$$

Steps in the dimensional analysis: B. C. D.

step B. No need to change to moles, you are already in moles.
step C. Change from Fe_2O_3 to O_2 using the coefficients from the balanced equation.
step D. Change from moles of O_2 back to grams of O_2 using the molar mass of O_2.

Sample Problem #2

Lithium hydroxide is used in space vehicles to remove exhaled carbon dioxide from the living environment by forming solid lithium carbonate and liquid water. What *theoretical* mass of gaseous carbon dioxide should be absorbed by 1.00. kg of lithium hydroxide?

step A. balanced equation: $2\,LiOH + CO_2 \rightarrow Li_2CO_3 + H_2O$

Notice that the starting info is given in kilograms, so it should be converted to grams.

Solve:
$$1000\,g LiOH \times \frac{1\,mol LiOH}{23.95\,g LiOH} \times \frac{1 CO_2}{2 LiOH} \times \frac{44\,g CO_2}{1\,mol CO_2} = 919\,g CO_2 should\ be\ produced$$

Steps in the dimensional analysis: B. C. D.

step B. Change to moles using the molar mass of LiOH
step C. Change from moles of LiOH to moles of CO_2 using the coefficients from the balanced equation.
step D. Change from moles of CO_2 back to grams of CO_2 using the molar mass of CO_2.