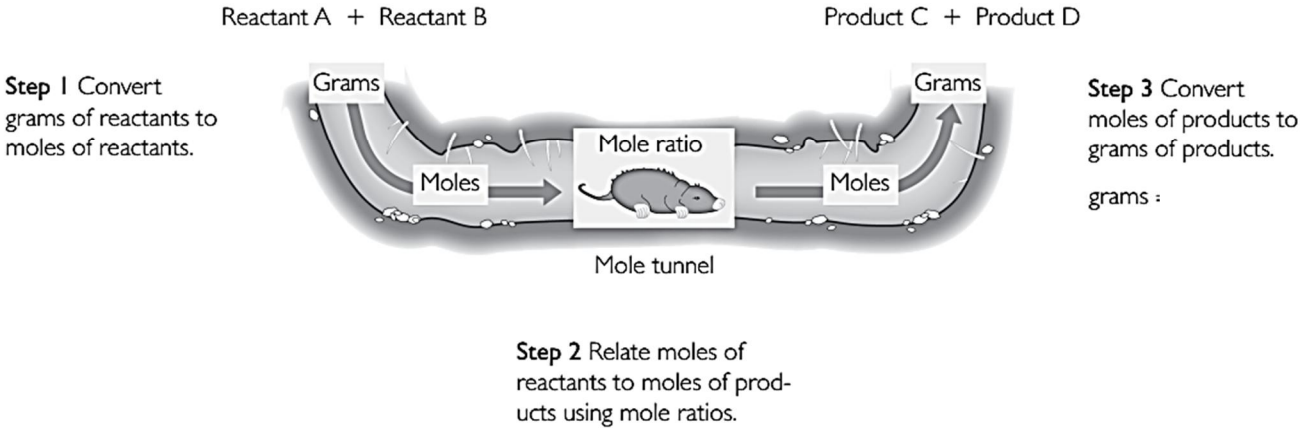
Chemistry
Ms. Ye

Name _____
Date _____Block_____

The Mole Tunnel



<u>Stoichiometry Problems: Given Grams, Find Grams</u>

SHOW YOUR WORK USING DIMENSIONAL ANLAYSIS

***Hints:

- Start with your "given" value and convert to the substance you're trying to find
- Include your units when setting up the dimensional analysis problem
- Remember, the **<u>coefficients</u>** in the balanced equation tells you the relative number of **<u>moles</u>** of substance

Use the following equation for solving all problems: **$4\ Al + 3\ O_2 \dashrightarrow 2\ Al_2O_3$**

1) If you were given 74.00 grams of Al, how many grams of Al_2O_3 would be produced?

Given | convert to moles | use balanced equation | convert to grams

$$X \ \frac{\quad}{\quad} \ X \ \frac{\quad}{\quad} \ X \ \frac{\quad}{\quad} =$$

2) If had 64.00 grams of O_2, how many grams of Al would be needed to react with that oxygen?

3) How many grams of Al_2O_3 would be produced in the reaction described in #2?

4) If you wanted to produce 4.00 grams of Al_2O_3 how many grams of O_2 would be needed for the reaction?

5) If 6.54 grams of Al were used in the reaction, how many grams of O_2 would be needed?

6) You decide that you want to make a sample of Al_2O_3 with a mass of 450.0 grams. How many grams of Al would you need?

Answers:
1) 139.8 grams Al_2O_3 2) 71.95 grams Al 3) 135.9 grams Al_2O_3 4) 1.88 grams O_2 5) 5.82 grams O_2
6) 238.2 grams Al

Limiting Reactant & Percent Yield

% yield = $\frac{\text{actual yield}}{\text{theoretical yield}}$ x 100

Theoretical yield = smallest mass **calculated** from the mass of two reactants
Actual yield = mass determined from an **experiment** (will be given in a word problem)

1. Determine the % yield based on the following information:
   a) actual yield = 33.5g, theoretical yield = 40.0g

   b) actual yield = 1.45g, theoretical yield = 2.04g

2. Acrylonitrile, C_3H_3N, is the starting material for the production of a kind of synthetic fiber acrylic and can be made by the reaction: **$4\ C_3H_6 + 6\ NO \rightarrow 4\ C_3H_3N + 6\ H_2O + 1\ N_2$**

   a) What mass of C_3H_3N can be made from 21.6g of C_3H_6?

Given | convert to moles | use balanced equation | convert to grams

$$X \frac{\quad}{\quad} X \frac{\quad}{\quad} X \frac{\quad}{\quad} =$$

   b) What mass of C_3H_3N can be made from 21.6g of nitrogen monoxide?

Given | convert to moles | use balanced equation | convert to grams

$$X \frac{\quad}{\quad} X \frac{\quad}{\quad} X \frac{\quad}{\quad} =$$

   c) What is the theoretical yield? (the smallest mass from either a) or b)

   d) If the quantities in a & b are combined, identify the limiting reactant and excess reactant

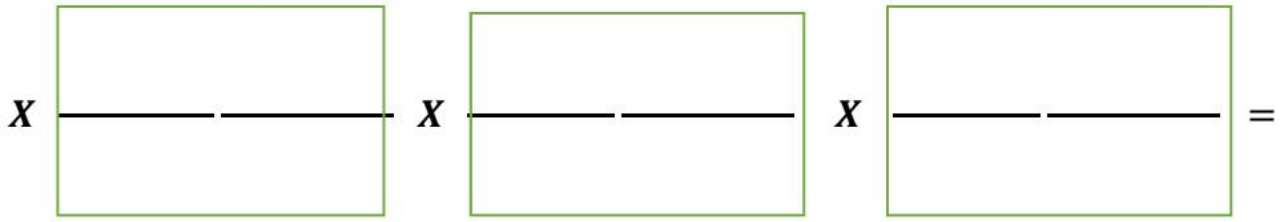
   e) If 23.5g of C_3H_3N is *actually* made in this process, what is the % yield?

3. Consider the reaction of ammonium nitrate reacting with sodium phosphate.

____NH_4NO_3 + ____Na_3PO_4 → ____$(NH_4)_3PO_4$ + ____$NaNO_3$

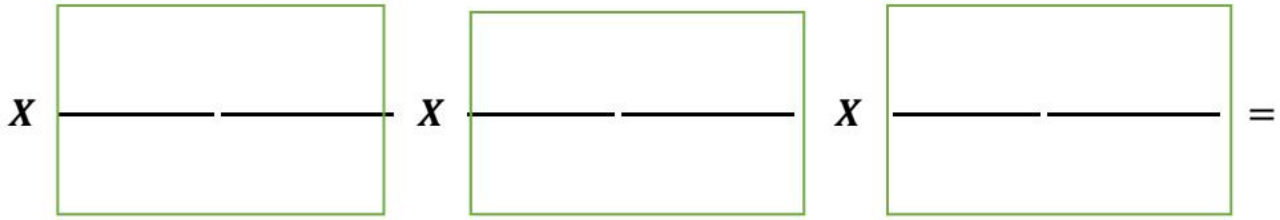
a) What is the mass of sodium nitrate formed from of 30.0g of ammonium nitrate?

Given convert to moles use balanced equation convert to grams



b) What is the mass of sodium nitrate formed from 50.0g of sodium phosphate?

Given convert to moles use balanced equation convert to grams



c) What is the theoretical yield? (the smallest mass from either a) or b)

d) If the quantities in a & b are combined, identify the limiting reactant and excess reactant

e) If 25.6g of sodium nitrate are *actually* formed, what is the % yield?