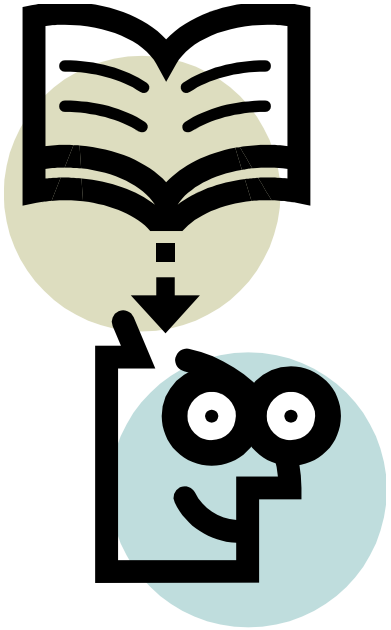
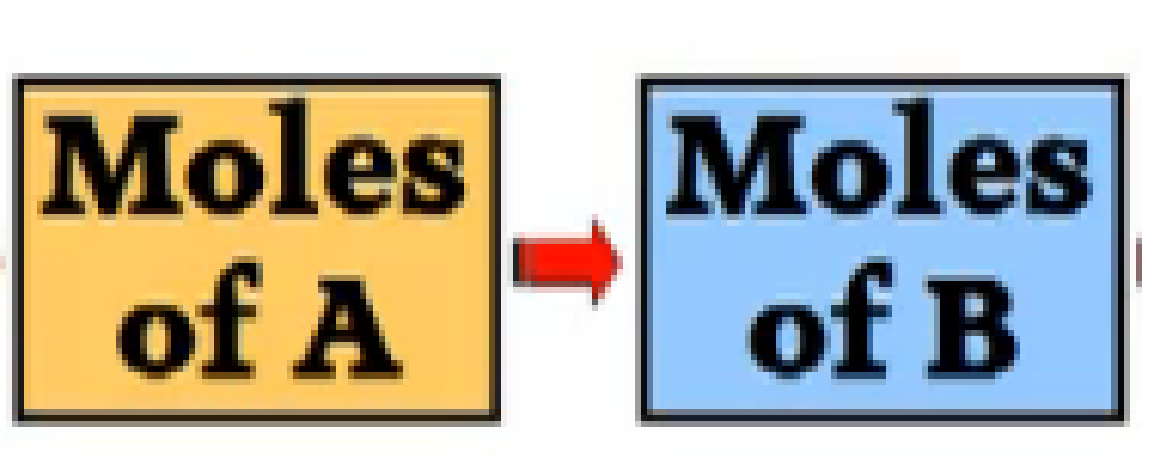
AGENDA



- Introduce the three types of stoichiometry problems
- Practice with Mass to mass stoichiometry problems

Learning Goal: Calculate mass to mass stoichiometry problems

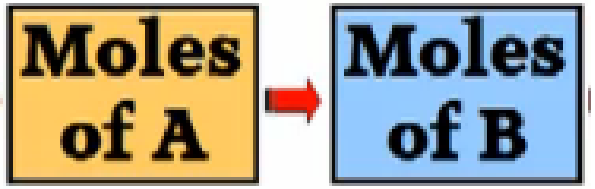


Review

Mole: Mole ratio

Moles of substance A to moles of substance B

Mole – Mole Conversions



When N_2O_5 is heated, it decomposes:

$$2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$$

a. How many moles of NO_2 can be produced from 4.3 moles of N_2O_5?

$$2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$$

4.3 mol ? mol

Units match

$$\frac{4.3 \text{ mol } N_2O_5}{} \quad \frac{4 \text{ mol } NO_2}{2 \text{ mol } N_2O_5} = 8.6 \text{ moles } NO_2$$

b. How many moles of O_2 can be produced from 4.3 moles of N_2O_5?

$$2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$$

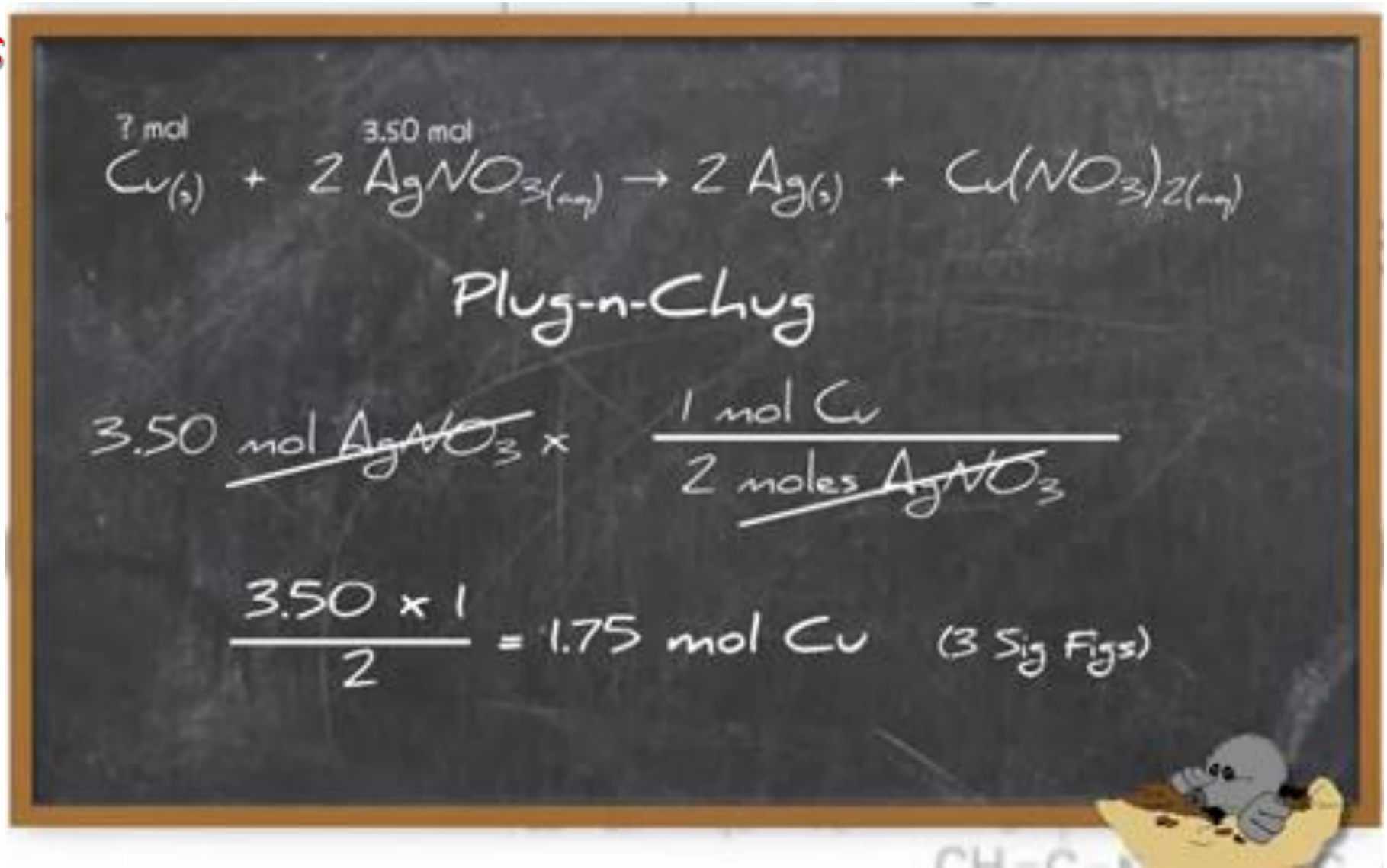
4.3 mol ? mol

$$\frac{4.3 \text{ mol } N_2O_5}{} \quad \frac{1 \text{ mol } O_2}{2 \text{ mol } N_2O_5} = 2.2 \text{ mole } O_2$$

BACK

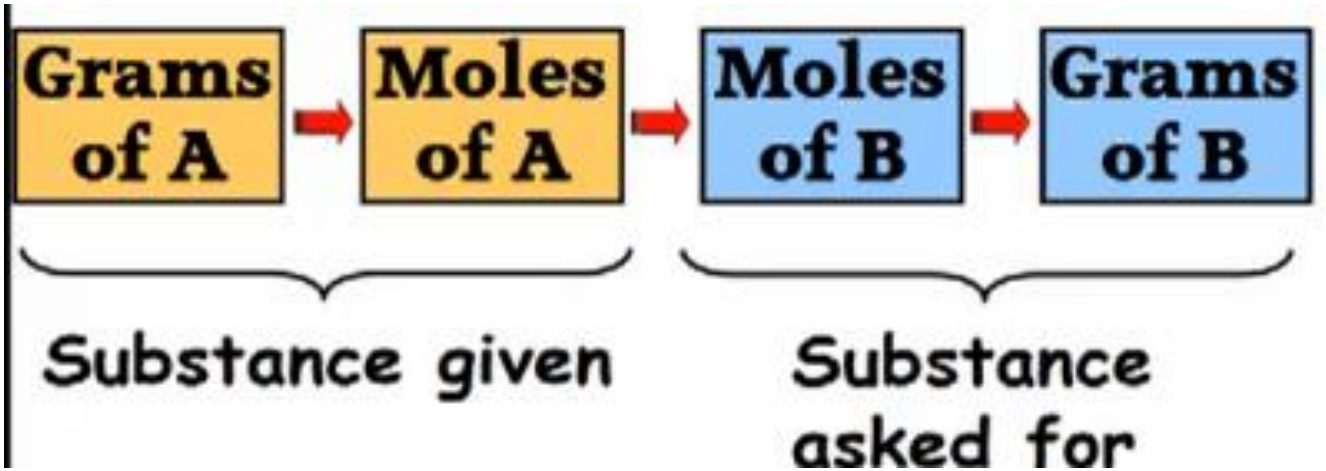
How many copper is needed to react with 3.5 moles of silver nitrate?

S



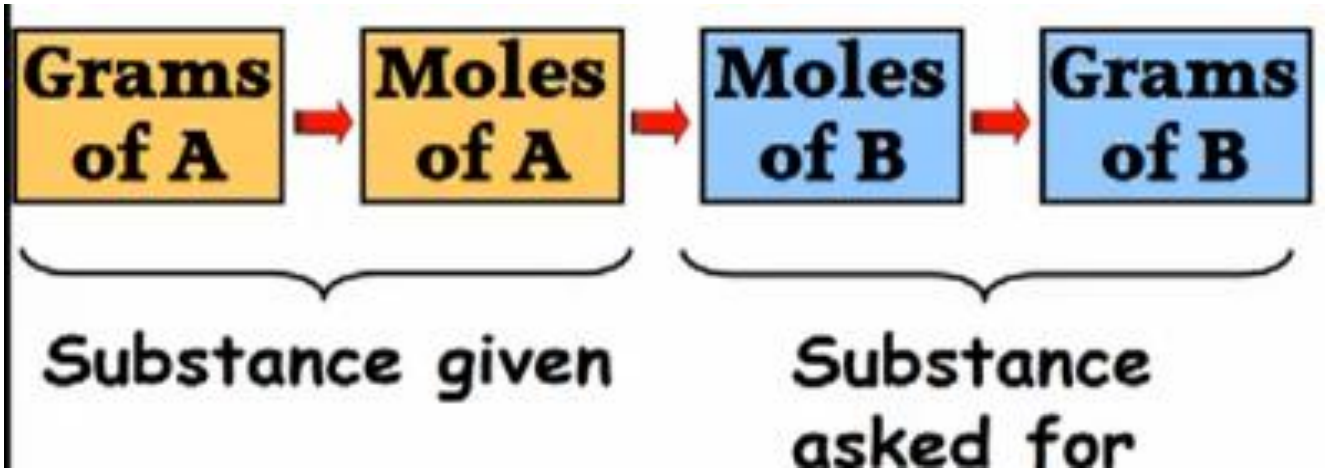
STOICHIOMETRY

the study of the mass and amount relationships between reactants and products in a chemical reaction.



3 types of Stoichiometry problems

1. Moles to Moles (1 step)
2. Moles to Mass / Mass to Moles (1 step)
3. Mass to Mass (3 steps)

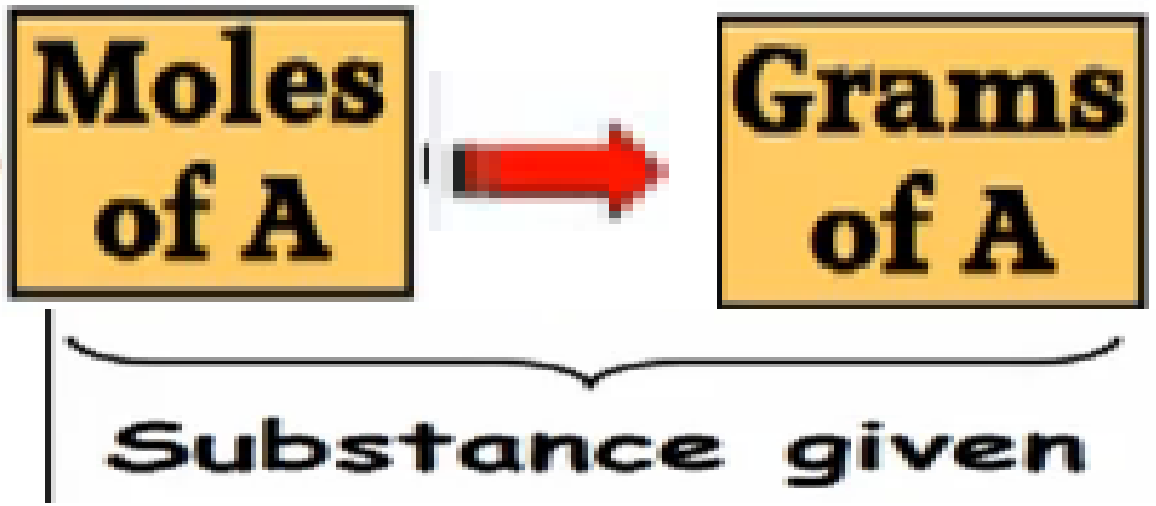


Moles to Mass

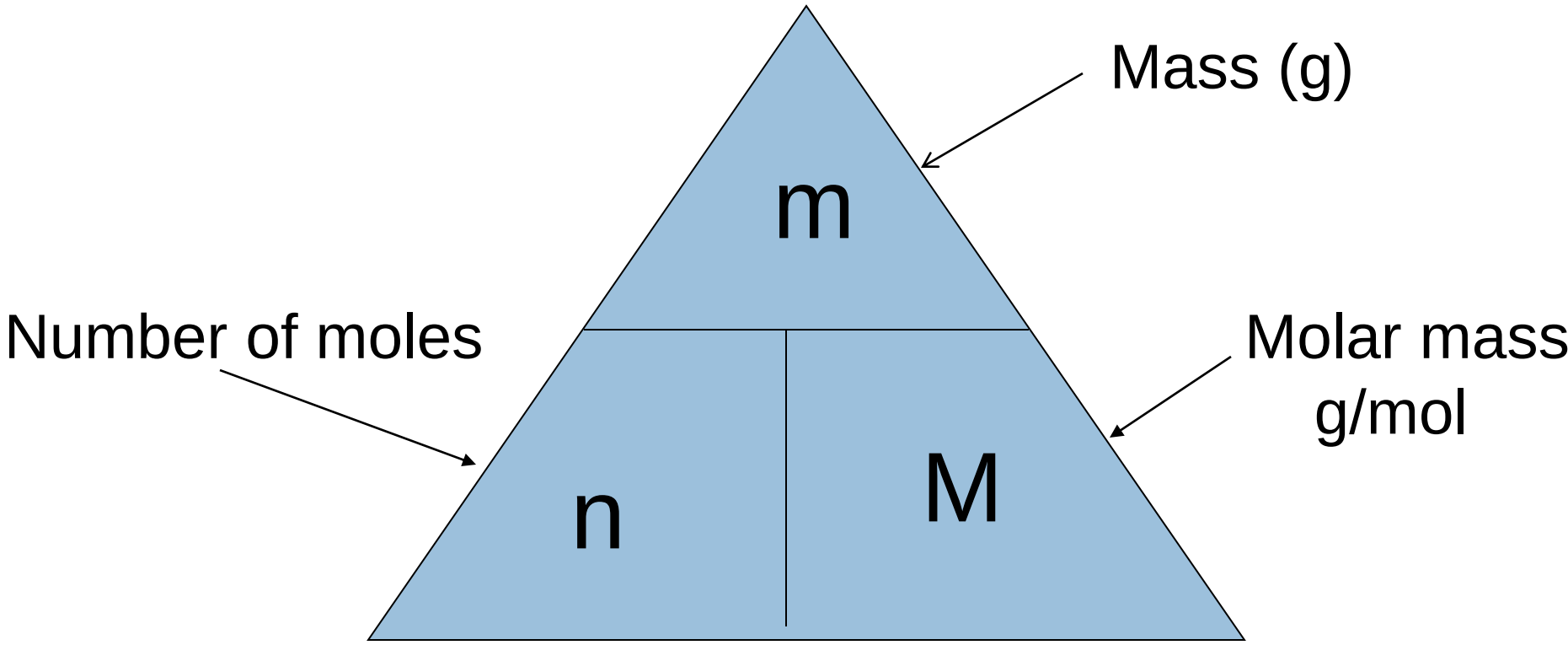
A + B → C + D

Small quantity to big quantity

Calculate the mass of # mol of substance A.



Molar mass Triangle



Moles to Mass

Moles (mol) →x molar mass → mass (g)

Calculate the mass of 0.900 mol of NH3

Given

N=0.900 mol

Calculate:

n= m/M

m=17.04 g/mol x 0.900 mol

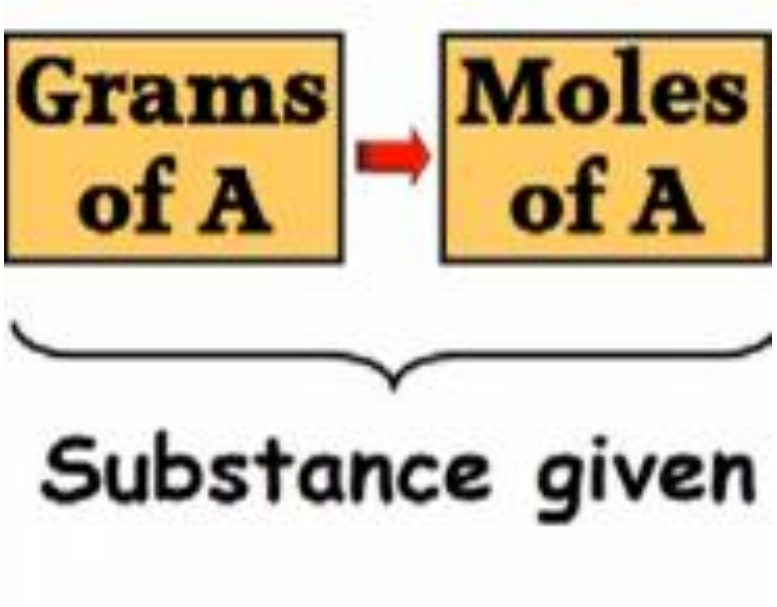
m=15.336 g

The mass of 0.99 mol of carbon dioxide is 15.336 g

BACK

Mass to Moles

Grams → Moles
(big quantity to small quantity)
How many moles of A are in grams of A?



Mass to Moles

Mass (g) → / molar mass → mol

How many moles of oxygen are in 5g of O?

Given:

M= 5g

M=16.00g/16mol

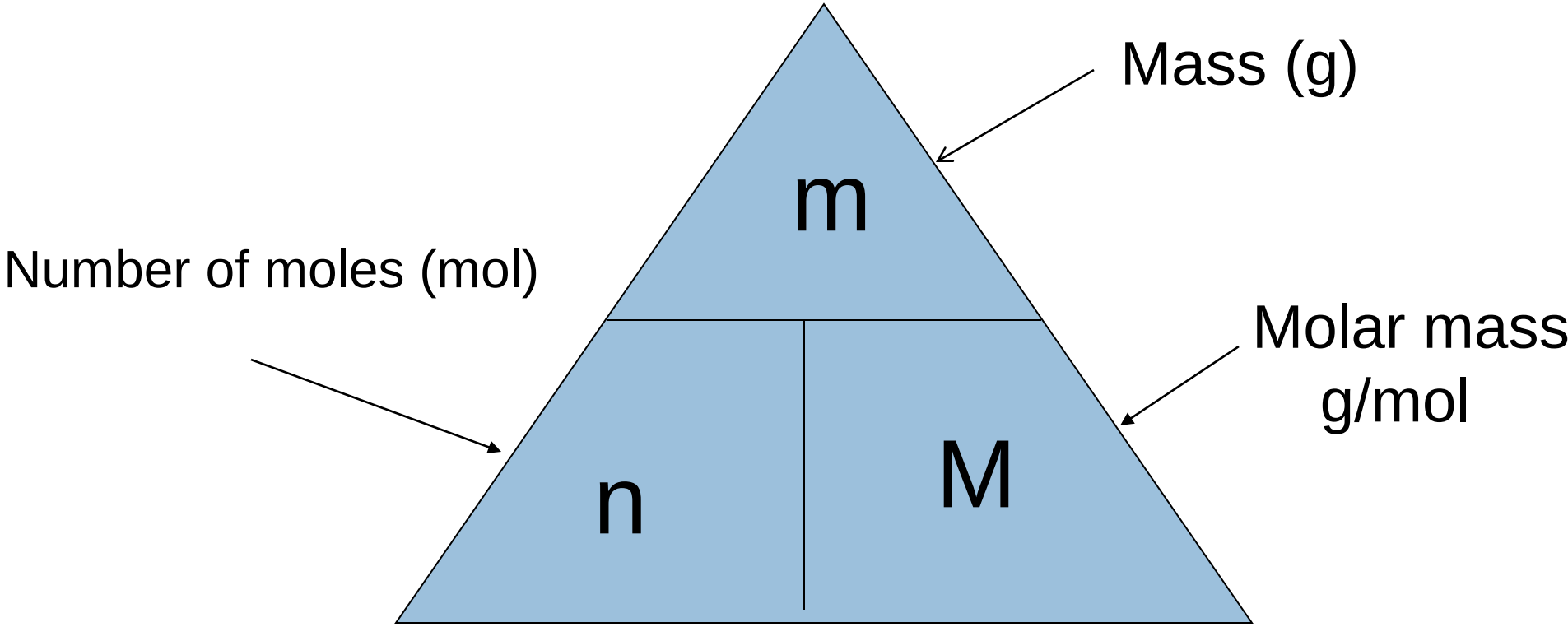
Calculate:

n=m/M

n=5/16.00

n=0.3125 mol

Molar mass Triangle



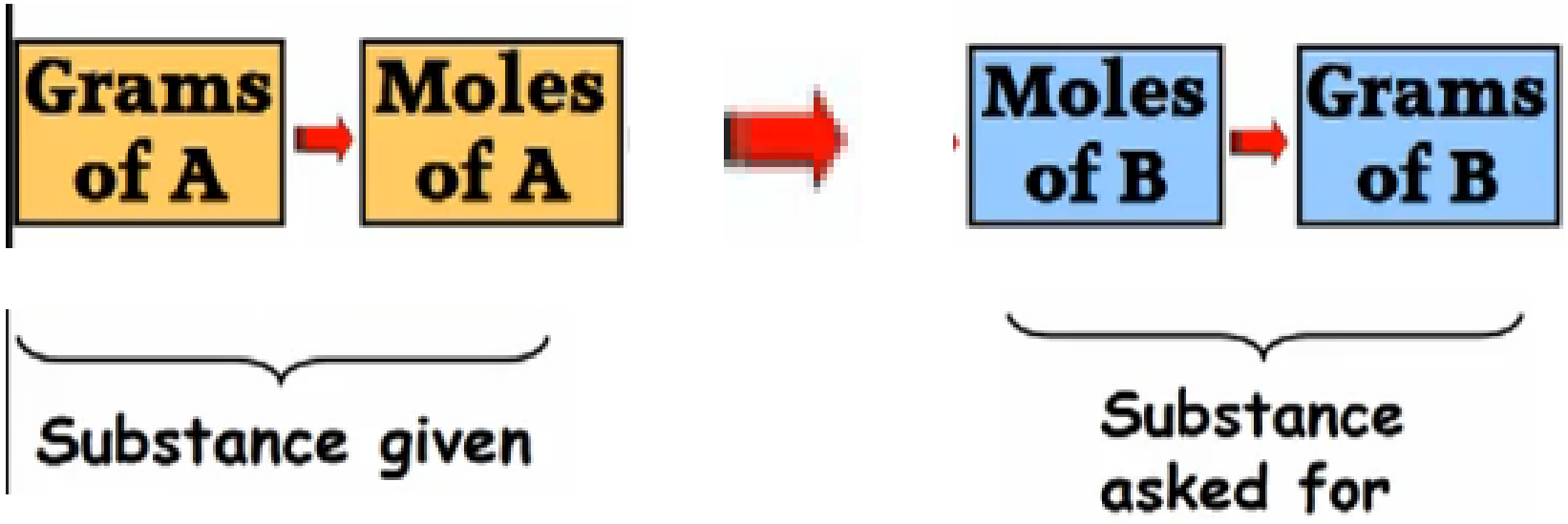
Cover up the letter you are solving to get the correct equation:

M=m/n n=m/M m= M x n

1 mole = 6.2x 1023 atoms/molecule entities

BACK

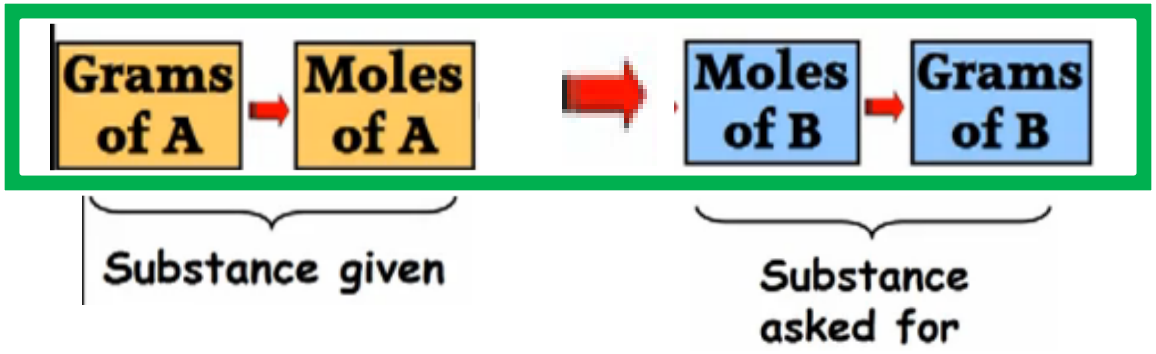
Mass to Mass
Grams to Grams



IN A BALANCED EQUATION!!

Stoichiometry: mass to mass problems

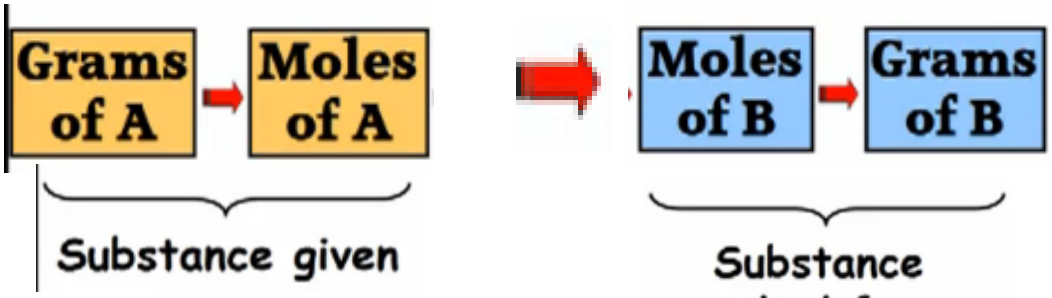
STEPS in the problem



1) Balance the equation
2) Write down the given information
3) Convert to moles
4) Find the mole ratio
5) Convert to mass

An automobile airbag is inflated with nitrogen produced from the decomposition of sodium azide, NaN_3 (**Figure 4**):

The mass of nitrogen in a fully inflated airbag is 87.5 g. What mass of sodium azide is required to produce this mass of nitrogen?



$$2\ NaN_3(s) \rightarrow 2\ Na(s) + 3\ N_2(g)$$

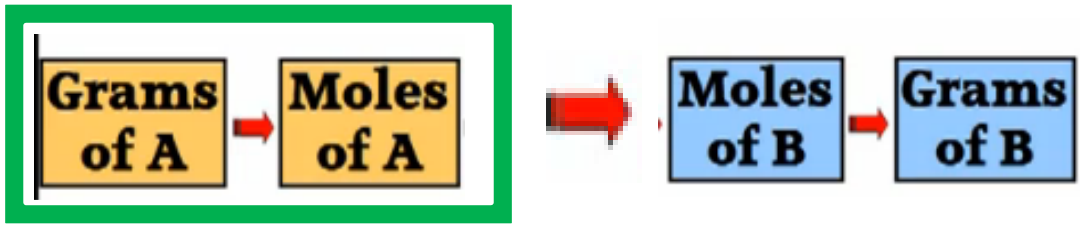
m_{NaN_3} | 87.5 g

65.02 g/mol | 28.02 g/mol

STEP 2: mass of A to moles of A

B A

$$2\ NaN_3(s) \rightarrow 2\ Na(s) + 3\ N_2(g)$$



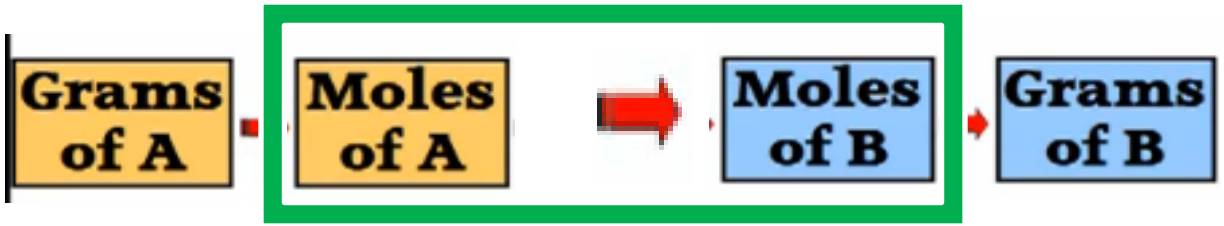
A $$n_{N_2} = 87.5\ \text{g} \times \frac{1\ \text{mol}_{N_2}}{28.02\ \text{g}}$$

$$n_{N_2} = 3.1228\ [\text{2 extra digits carried}]$$

STEP 3: moles of A to moles of B

B A

$$2\ NaN_3(s) \rightarrow 2\ Na(s) + 3\ N_2(g)$$



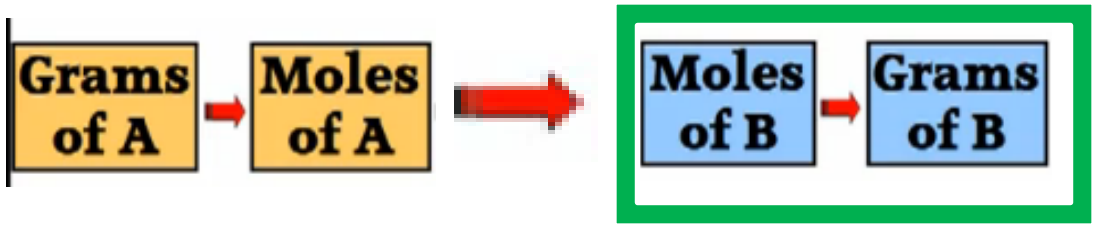
B $$n_{NaN_3} = 3.1228\ \text{mol}_{N_2} \times \frac{2\ \text{mol}_{NaN_3}}{3\ \text{mol}_{N_2}}$$

$$n_{NaN_3} = 2.0819\ \text{mol}$$

STEP 4: moles of B to mass of B

B A

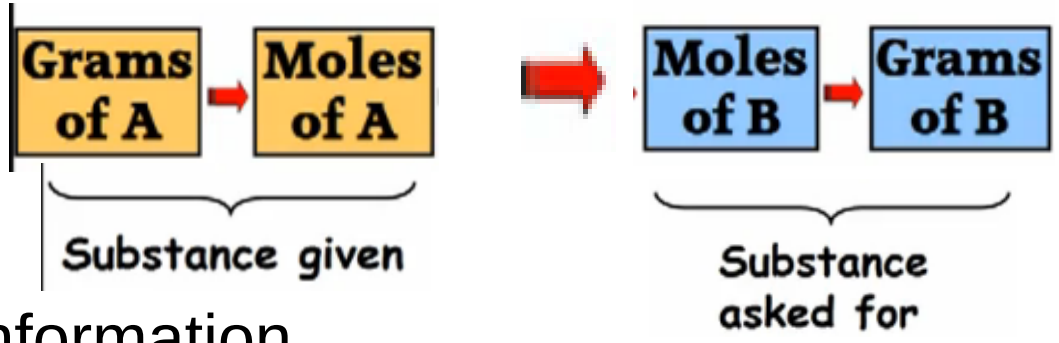
$$2\ NaN_3(s) \rightarrow 2\ Na(s) + 3\ N_2(g)$$



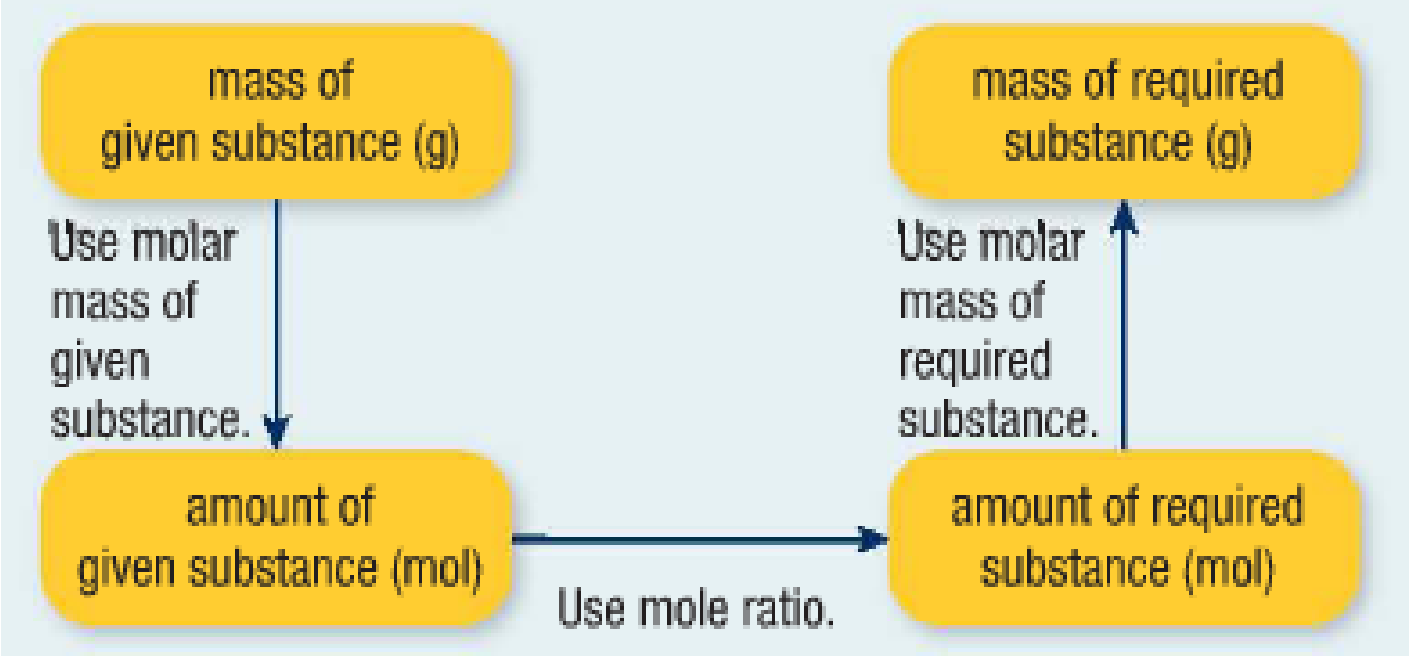
B $$m_{NaN_3} = (2.0819\ \cancel{mol_{NaN_3}})\left(\frac{65.02\ g}{1\ \cancel{mol_{NaN_3}}}\right)$$

$$m_{NaN_3} = 135\ g$$

Summarizes the steps in the problem



1) Balance the equation
2) Write down the given information
3) Convert to moles
4) Find the mole ratio
5) Convert to mass



Why can't we just throw in random amounts of reactants and react them together?

Stoichiometric Amounts:

Predicted amount of reactant, relative to another reactant, that will react according to the balanced equation.

HOMEWORK:

1. FINISH in class worksheet
2. TRY Mass-Mass problem set Q 1-3
3. REMINDER: QUIZ next THUR(mass-mass stoichiometry)

STILL CONFUSED?
LOOK AT sample problems
MGH Pg. 301-303