

THE RETURN OF THE MOLE

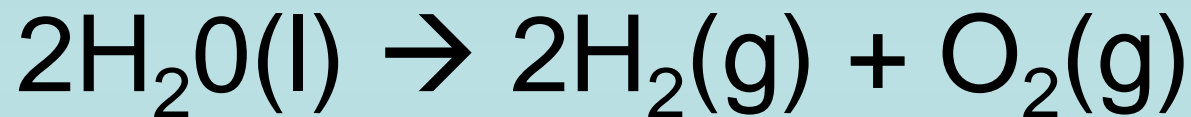
Sneak preview



Stoichiometry

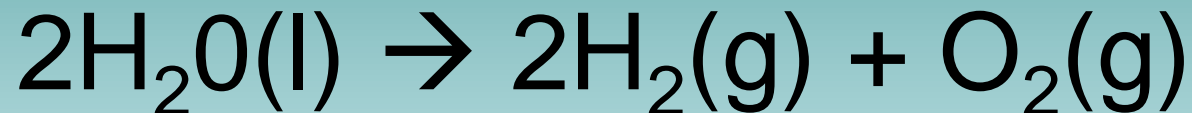
- Stoichiometry comes from the Greek words stoicheion meaning “*element*” and metron meaning “*measures*”
- In this section we will use balanced chemical equations to give us information about the reactants and the products.

How do you know the number of moles of reactants and products involved in a reaction?



The coefficients tell us how many moles of each reactant and product are involved in a reaction.

So in the following equation:



2 moles H_2O

2 moles H_2

1 mole O_2

Using this we can make MOLE RATIOS!

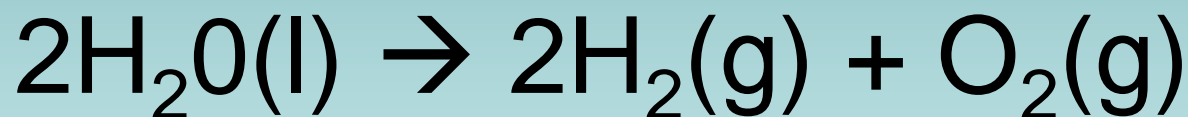
What is a MOLE RATIO?

It is a comparison of the number of moles of the compounds involved in a reaction.

If you know the number of moles of one substance in a balanced equation then you can find the number of moles of all other substances in the reaction!

What is a mole ratio?

-



2 moles H₂O

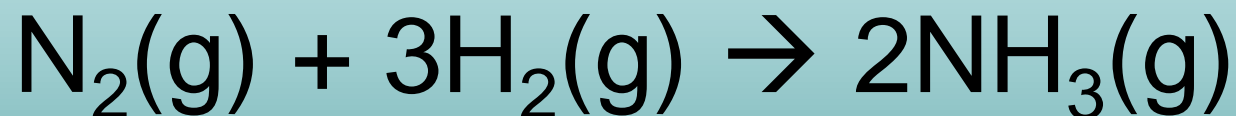
2 moles H₂

or 1 mole O₂

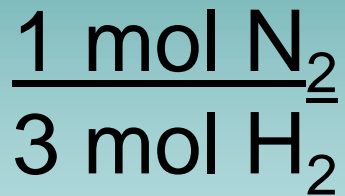
2 moles H₂O

Now you try

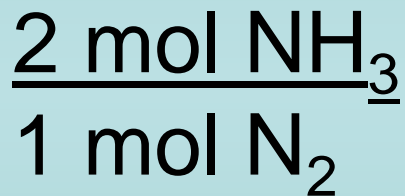
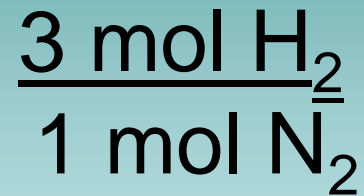
Using the equation below write out
the 6 mole ratios:



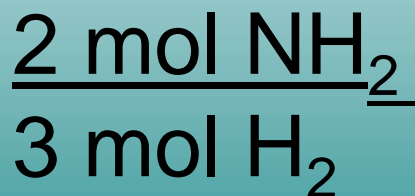
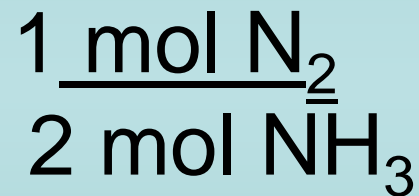
The Answers are...



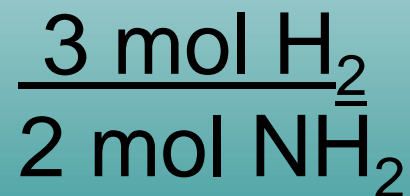
or

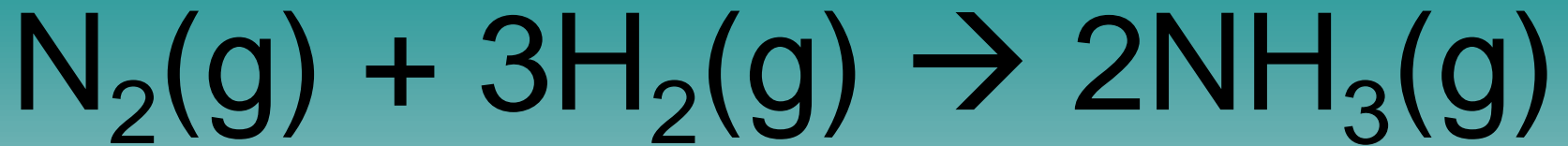


or



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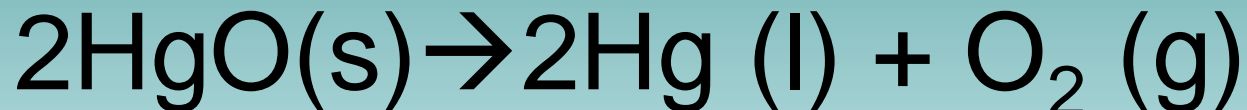


For every 3 moles of H_2 you will get 2 moles NH_3 ...

So if you had 6 moles of H_2 how many moles of NH_3 would you have?

$$6 \text{ mol H}_2 \times \frac{2 \text{ mol NH}_3}{3 \text{ mol H}_2} = 4 \text{ mol NH}_3$$

Practice



- Write out all the possible mole ratios
- How many moles of O_2 can be produced if you have 11 moles of HgO ?

The Answers are...



$$\frac{2 \text{ mol HgO}}{2 \text{ mol Hg}} \quad \text{or} \quad \frac{2 \text{ mol Hg}}{2 \text{ mol HgO}}$$

$$\frac{2 \text{ mol HgO}}{1 \text{ mol O}_2} \quad \text{or} \quad \frac{1 \text{ mol O}_2}{2 \text{ mol HgO}}$$

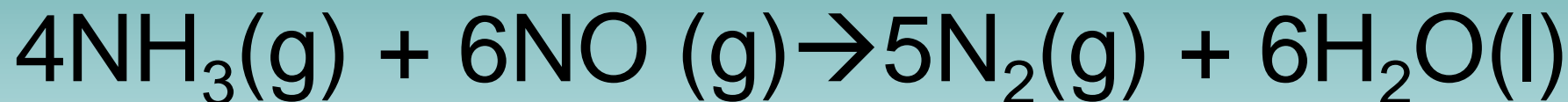
$$\frac{2 \text{ mol Hg}}{1 \text{ mol O}_2} \quad \text{or} \quad \frac{1 \text{ mol O}_2}{2 \text{ mol Hg}}$$



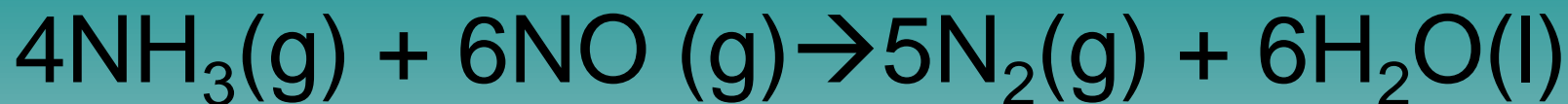
2. How many moles of O_2 can be produced if you have 11 moles of HgO ?

$$11 \text{ mol HgO} \times \frac{1 \text{ mol O}_2}{2 \text{ mol HgO}} = 5.5 \text{ mol O}_2$$

Practice



3. Write out all the possible mole ratios
4. How many moles of H_2O can be produced if you have 20 moles of NO ?



4. How many moles of H_2O can be produced if you have 20 moles of NO ?

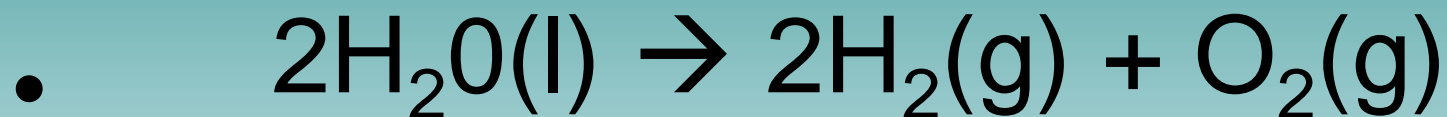
$$20 \text{ mol NO} \times \frac{6 \text{ mol H}_2\text{O}}{6 \text{ mol NO}} = 20 \text{ mol H}_2\text{O}$$

Reminders for conversions

- Always write out the units
- Cross out your units



How do we use molar mass?



$$\frac{1 \text{ mol } \underline{\text{H}_2\text{O}}}{18 \text{ g } \text{H}_2\text{O}} \quad \text{or} \quad \frac{18 \text{ g } \underline{\text{H}_2\text{O}}}{1 \text{ mol } \text{H}_2\text{O}}$$

$$\frac{1 \text{ mol } \underline{\text{H}_2}}{2 \text{ g } \text{H}_2} \quad \text{or} \quad \frac{2 \text{ g } \underline{\text{H}_2}}{1 \text{ mol } \text{H}_2}$$

$$\frac{1 \text{ mol } \underline{\text{O}_2}}{32 \text{ g } \text{O}_2} \quad \text{or} \quad \frac{32 \text{ g } \underline{\text{O}_2}}{1 \text{ mol } \text{O}_2}$$

Molar mass problem:



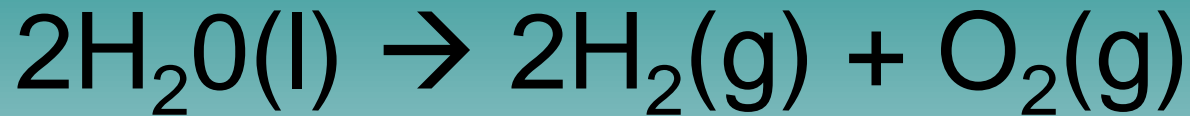
Using equation above, if you had 27.0 g H₂O,
how many moles of H₂O would you produce?

$$\frac{27.0 \text{ g H}_2\text{O}}{1} \times \frac{1 \text{ mol H}_2\text{O}}{18.0 \text{ g H}_2\text{O}} \times = 1.5 \text{ moles H}_2\text{O}$$



Molar mass of H₂O

Now you try:



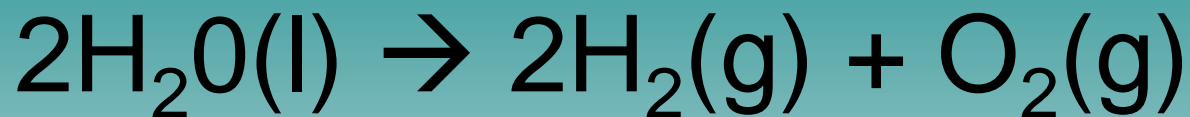
Using equation above, if you had 25.0 g H₂, how many moles of H₂ would you produce?

$$\frac{25.0 \text{ g H}_2}{1} \times \frac{1 \text{ mol H}_2}{2.0 \text{ g H}_2} \times = 12.5 \text{ moles H}_2$$



Molar mass of H₂

Now one more step..



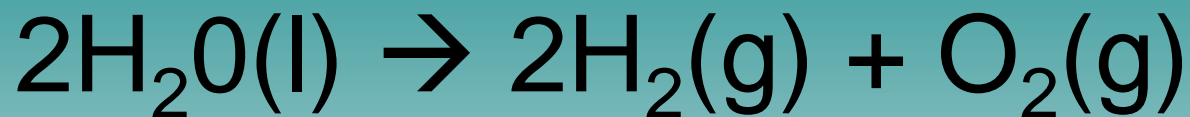
Using equation above, if you had 27.0 g H₂O,
how many moles of O₂ would you produce?

$$\frac{27.0 \text{ g H}_2\text{O}}{1} \times \frac{1 \text{ mol H}_2\text{O}}{18.0 \text{ g H}_2\text{O}} \times \frac{1 \text{ moles O}_2}{2 \text{ moles H}_2\text{O}} = 0.75 \text{ moles O}_2$$

Molar mass of H₂O

MOLE RATIO

Now you try..



Using equation above, if you had 27.0 g H₂O,
how many moles of H₂ would you produce?

$$\frac{27.0 \text{ g H}_2\text{O}}{1} \times \frac{1 \text{ mol H}_2\text{O}}{18.0 \text{ g H}_2\text{O}} \times \frac{2 \text{ moles H}_2}{2 \text{ moles H}_2\text{O}} = 1.5 \text{ moles O}_2$$

Molar mass of H₂O

MOLE RATIO

Reminders for conversions

- Always write out the units
- Cross out your units
- Start Stoichiometry worksheet--A

