

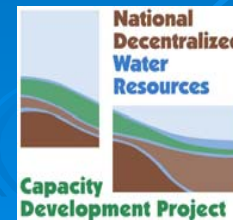
Fundamental Concepts: Stoichiometry

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Stoichiometry Defined

- Analysis of the quantities and ratios of products and reactants in a chemical reaction
- Determines how much of a particular chemical will be needed as reactant or produced by the chemical reaction

Moles and Molecular Weight

➤ Mole:

➤ a group of 6.02×10^{23} molecules

➤ Molecular Weight:

➤ the mass of one mole of that material

➤ M = number of moles (moles)

➤ m_{total} = total mass (g or kg)

➤ MM = Molecular weight (g/mole)

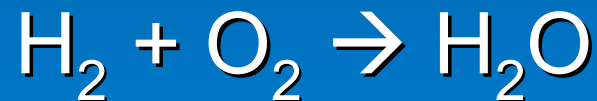
$$M = \frac{m_{\text{total}}}{MM}$$

Balancing Equations

- Determining the ratios between chemicals
- Each atom present in the reactants will also be present in the products
- Each mole present in the reactants will also be present in the products

Example

- formation of water H_2O from the combustion of diatomic hydrogen H_2 and diatomic oxygen O_2
- The unbalanced equation is:



Example

- The unbalanced equation has the following summary table:

	Reactants	Products
H	2 moles	2 moles
O	2 moles	1 mole

Example

- Try to equilibrate the number of moles of oxygen
- Multiply the number of moles of oxygen in water by two
- The revised equation takes the form:



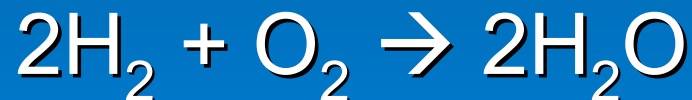
Example

➤ The equation is still unbalanced

	Reactants	Products
H	2 moles	4 moles
O	2 moles	2 mole

Example

- Try to equilibrate the number of moles of hydrogen
- Multiply the number of moles of diatomic hydrogen by two
- The revised equation takes the form:



Example

➤ The equation is now balanced

	Reactants	Products
H	4 moles	4 moles
O	2 moles	2 mole

Limiting Reagents

- The exact ratio of each reactant may not occur in many instances, so there may be several chemicals that do not get used completely
- The first chemical to run out, causing the reaction to stop, is called the **limiting reagent**
- The initial mass of the limiting reagent must be the one considered when doing stoichiometric analysis