Chemical Quantities (Stoichiometry)

Using Chemical Equations

Objectives

To understand the information given in a balanced equation

To use a balanced equation to determine relationships between moles of reactant and products

- A balanced chemical equation gives relative numbers (or moles) of reactant and product molecules that participate in a chemical reaction.
- For Example:

2 moles of water > 2 moles of hydrogen and 1 mole of oxygen
> The coefficients of a balanced equation give the relative numbers of molecules.

 $2H_2O \rightarrow 2H_2 + Q_2$

- B. The coefficients of a balanced equation give the relative numbers of molecules
- For Example:



Let's Review

Information Conveyed by the Balanced Equation for the Production of Methanol

$CO(g) + 2H_2 (g) \rightarrow CH_3OH(I)$

1 molecule CO + 2 molecules $H_2 \rightarrow 1$ molecule CH₃OH (*I*)

(6.022 x10²³) molecules CO + (6.022 x10²³) molecules H₂ \rightarrow (6.022 x10²³) molecule CH₃OH (*I*)

1 mol CO + 2 mol H₂ \rightarrow 1 mol CH₃OH (*I*)

Example:Relating Moles to Molecules in Chemical Equations

This is the combustion reaction for propane, a common fuel for cooking with gas grills, is represented by the unbalanced equation:

$C_{3}H_{8}(g) + O_{2}(g) \rightarrow C O_{2}(g) + H_{2}O(g)$

Give the balanced equation for this reaction, and state the meaning of the equation in terms of numbers of molecules and moles of molecules.

Example:Relating Moles to Molecules in Chemical Equations

$C_{3}H_{8}(g) + O_{2}(g) \rightarrow C O_{2}(g) + H_{2}O(g)$ Solution

Using the techniques explained in an earlier unit, we can balance the equation

 $C_{3}H_{8}(g) + 5O_{2}(g) \rightarrow 3CO_{2}(g) + 4H_{2}O(g)$

Example: Relating Moles to Molecules in Chemical Equations

 $C_{3}H_{8}(g) + 5O_{2}(g) \rightarrow 3CO_{2}(g) + 4H_{2}O(g)$ Solution

- This equation can be interpreted in terms of molecules as follows:
- 1 molecule of $C_3H_8 + 5$ molecules of $O_2 \rightarrow$ 3 molecules of $CO_2 + 4$ molecules of H_2O

Alternatively, it can be stated in terms of moles (of molecules):

1 mol C₃H₈ + 5 mol of O₂ \rightarrow

3 mol of CO₂ + 4 mol of H₂O Molar mass can be compared also (mass/grams) which will be explored in a future lesson.

The End