

Stoichiometry

Definition

stoichiometry

Using Balanced Equations

What does a balanced equation actually mean?

Write and balance the equation for the following reaction:

	Iron	+	Oxygen	→	Iron (III) oxide
Equation:		+		→	
# of Atoms:		+		→	
Mole Ratio:		+		→	

Why can you only compare moles and not mass?

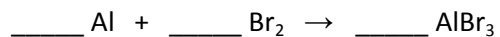
Example

Propane, C_3H_8 , undergoes a combustion reaction. Interpret the equation in terms of molecules, mole ratios, and mass.

	C_3H_8	+		\rightarrow		+	
Molecules:		+		\rightarrow		+	
Mole Ratio:		+		\rightarrow		+	
Mass:		+		\rightarrow		+	

Mole Ratios

mole ratio



What are the mole ratios for this equation?

Mole-to-Mole Conversion

A reaction is only useful if you can vary the amount that you start with or the amount that you produce. Stoichiometry simply tells us that the ratio between each reactant and product must remain the same. Considering the previous reaction, what happens if we start with 1 mol of Al?

1. How many moles of bromine will we need to react with 1 mol of aluminum?
2. How many moles of aluminum bromide will be produced from 1 mol of aluminum?

Example

Potassium reacts with water to form potassium hydroxide and hydrogen gas.

1. Write and balance this reaction.
2. If 0.793 mol of potassium is used, how many moles of potassium hydroxide will be produced?
How many moles of hydrogen gas?

Mole-to-Mass Conversion

If you start with a known number of moles for a reactant, how could you find the mass of another product or reactant?

Why must it be calculated in this way?

Example

	Sodium	+	Chlorine	→	Sodium chloride
Equation:		+		→	
Mass (g):		+	1.32 g	→	
Moles:		+		→	

Mass-to-Mass Conversion

In the laboratory you will work almost exclusively with mass because it is an easily measurable quantity. You must also be able to know exactly how much of a substance is needed or produced by a chemical reaction. To do this you will need to convert from mass of one reactant to the mass of another reactant or product.

How would you do this?

Example

	Hydrogen	+	Oxygen	→	Water
Equation:		+		→	
Mass (g):	14.2 g	+		→	
Moles:		+		→	

Steps for Stoichiometric Calculations

1. Write a balanced chemical equation to determine the mole ratios.
2. Determine the moles of a given substance. Convert from mass if necessary.
3. Determine the moles of the unknown substance from the moles of the given substance.
4. If necessary, determine the mass of the unknown substance from the moles of the unknown substance.