

Stoichiometry & the Mole



Dimensional Analysis Review

- How many seconds are in 5.0 hours?

Stoichiometry

- **Stoichiometry** is just a long word for changing units in chemistry
- If you can do Dimensional Analysis, you can do stoichiometry



The Mole

- Chemists need a convenient method for counting accurately the number of atoms, molecules, or formula units in a sample of a substance.
- The _____, commonly abbreviated mol, is the SI base unit used to measure the _____ of a substance.

The Mole

- A mole of anything contains _____ representative particles.
- This is called _____
- A representative particle is any kind of particle such as _____, _____, _____, or _____.

Conversion Factor #1

Conversion factor: $\frac{6.02 \times 10^{23} \text{ representative particles}}{1 \text{ mole}}$

Mole – Representative Particle Calculations

- Calculate the number of atoms in 3.50 moles of copper

Mole – Representative Particle Calculations

- How many moles of MgO are in 9.72×10^{23} molecules of MgO?

Mole – Mass Relationship

- The mass in grams of one mole of any pure substance is called its _____.
- The molar mass of any element is numerically equal to its atomic mass and has the units _____.

Conversion Factor # 2

$\frac{1 \text{ mole}}{\text{Molecular weight (g)}}$

The molecular mass comes from the periodic table!

Calculating Molecular Mass

- What is the molecular mass of $(\text{C}_3\text{H}_5)_2\text{S}$?

Mole – Mass Calculations

- What is the mass of 4.21 moles of iron (III) oxide?

Mole – Mass Calculations

- How many moles of $\text{Ca}(\text{OH})_2$ are in 325 grams?

Mass – Particle Conversions

- How many atoms of gold are in 25.0 g of gold?

Stoichiometry

- Using the methods of **stoichiometry**, we can measure the amounts of substances involved in chemical reactions and relate them to one another.

Conversion Factor # 3

Moles A
Moles B

The #'s in from if A & B MUST come from the balanced chemical equation

Mole – Mole Relationship

- How many moles of Fe_2O_3 will I form from 5.0 mol of Fe?

Mass – Mole Relationship

- How many g of NaCl will be produced from 1.25 mol of chlorine gas reacting with sodium?

Mass – Mass Relationships

- Ammonium nitrate decomposes into dinitrogen monoxide gas and water. Determine that amount of water produced if 25.0 g of ammonium nitrate decomposes.
- $\text{NH}_4\text{NO}_3 \rightarrow \text{N}_2\text{O} + 2 \text{H}_2\text{O}$

Steps

1. Write the balanced chemical equation
2. Start with your given
3. Cross out until you get what you want
4. Check significant digits, units, and circle your answer

Conversion Factors

$\frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ particles}}$

$\frac{1 \text{ mol}}{\text{mw in grams}}$

$\frac{\# \text{ mol A}}{\# \text{ mol B}}$