

Mole Concept and Molar Mass

Bridging the Macroscopic and Microscopic Worlds

Everyday Counting



1 Dozen = 12 items



1 Score = 20 items



1 Gross = 144 items

Chemical Counting

1 Mole =
 $6.02214076 \times 10^{23}$
entities

KEY TAKEAWAY: To count entities at the microscopic level (atoms, molecules, electrons), we require a unit of a vastly different magnitude. The **mole** is simply the **chemist's dozen**.

Defining the Mole (SI Unit)

The mole (symbol: mol) is the 7th SI base unit for the amount of substance.

STANDARD: 1 mole of Carbon-12 weighs exactly 12 g.

MASS OF ONE ^{12}C ATOM (via mass spectrometer) = 1.992648×10^{-23} g

CALCULATION: $12 \text{ g/mol} \div 1.992648 \times 10^{-23} \text{ g/atom} = 6.0221367 \times 10^{23} \text{ atoms/mol}$

Avogadro Constant (N_A)

The fixed numerical value of entities in one mole.

Exactly $6.02214076 \times 10^{23} \text{ mol}^{-1}$

One Mole of Different Substances

Elements



1 mol of Hydrogen (H)
 $= 6.022 \times 10^{23}$ atoms

Covalent Compounds



1 mol of Water (H₂O)
 $= 6.022 \times 10^{23}$ molecules

Ionic Compounds



1 mol of Sodium Chloride (NaCl)
 $= 6.022 \times 10^{23}$ formula units

The mole always contains the same number of entities, no matter what the substance may be.
The specific type of entity depends on the chemical nature of the substance.



You've Learned the Theory. Let's Test Them Now.

$$E=mc^2$$



Turn theory into marks with **unlimited MCQs, smart analysis, and focused revision.**

Practice Now



At prep.topall.app

Key Highlights

- » Free Study Material, Videos & Infographics
- » Push Your Limits with Level-Based Challenges
- » Climb the Leaderboard Among Fellow Aspirants
- » Practice Unlimited MCQs for NEET & JEE
- » Get Clear Explanations, Not Just Marks
- » Track Your Performance Smarter



The Formula Bank

The Constant

$$1 \text{ mol} = 6.02214076 \times 10^{23} \text{ entities}$$

Mass to Moles

$$n = m / M$$

n = Amount of substance (moles)

m = Given mass of substance (grams)

M = Molar mass (g/mol)

Moles to Particles

$$N = n \cdot N_A$$

N = Total number of entities
(atoms/molecules)

n = Amount of substance (moles)

N_A = Avogadro Constant

The Concept of Molar Mass

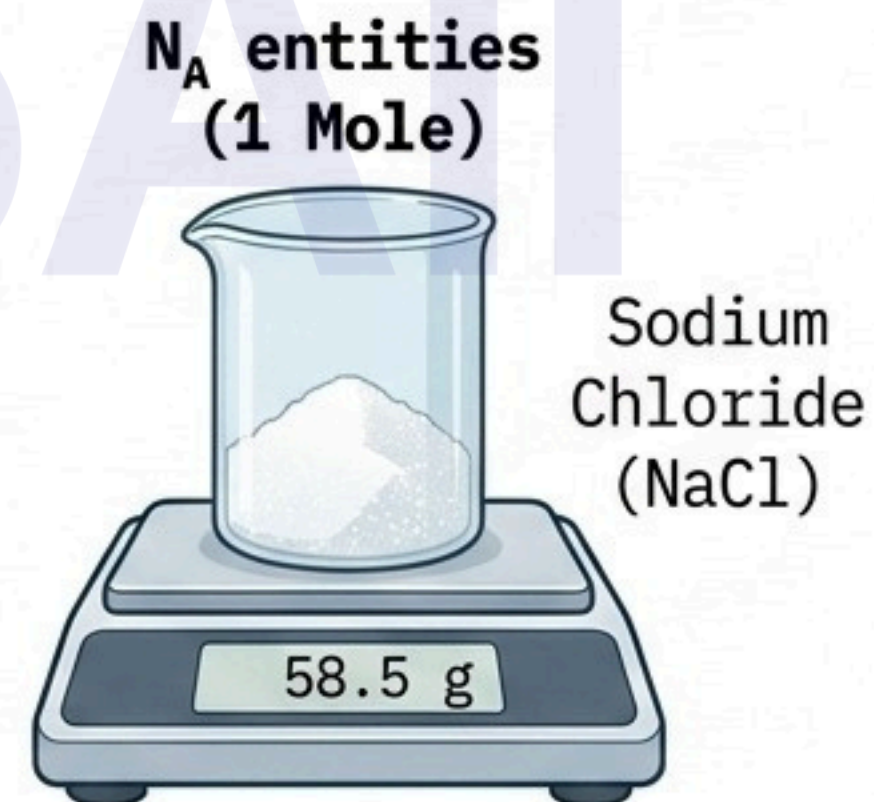
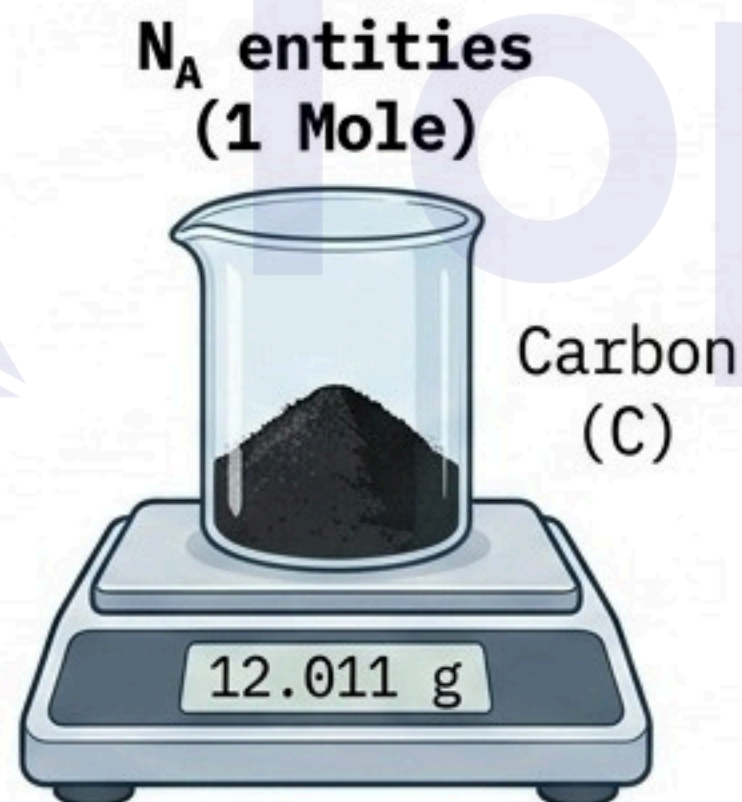
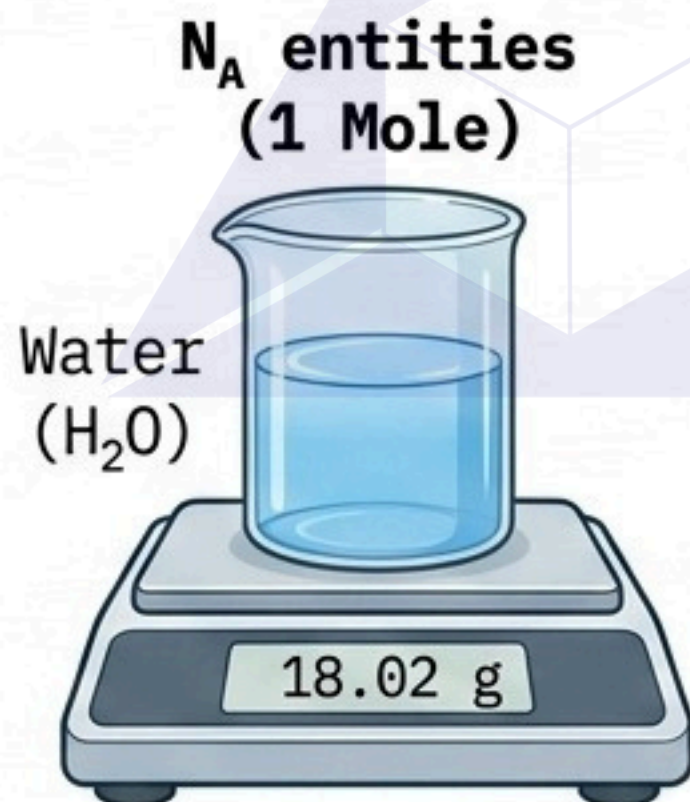


JEE TRAP ALERT

The Trap: Assuming that because two samples have the same number of moles, they must weigh the same.

The Reality: Equal moles = Equal particle count. It does NOT mean equal mass.

Scale of Equivalency



The mass of one mole of a substance in grams is its **molar mass**. It is numerically equal to its **atomic/molecular mass** in u.

Mini Application: The Two-Step Conversion

Problem: Calculate the total number of molecules in a 36.04 g sample of Water (H₂O).

[STEP 1: MASS → MOLES]

Formula: $n = m / M$

Molar mass (M) of H₂O = 18.02 g/mol

$n = 36.04 \text{ g} / 18.02 \text{ g/mol}$

$n = 2.00 \text{ mol}$

[STEP 2: MOLES → MOLECULES]

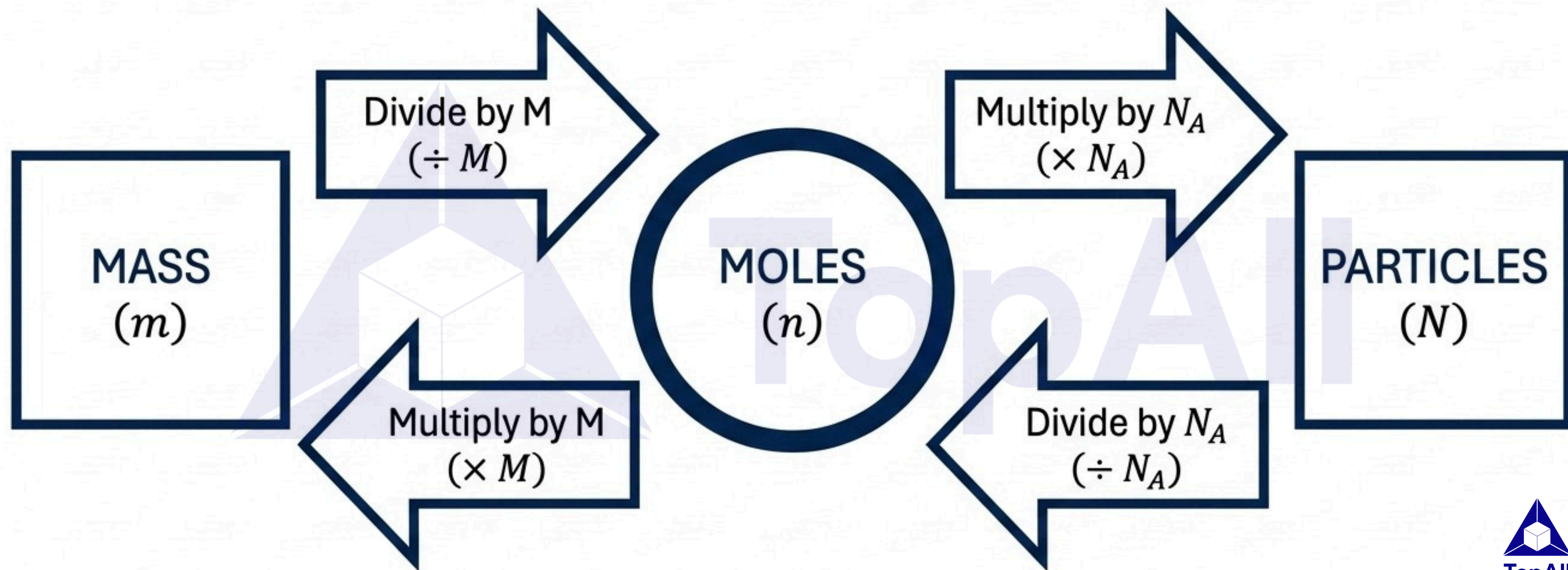
Formula: $N = n \times N_A$

$N = 2.00 \text{ mol} \times (6.022 \times 10^{23} \text{ molecules/mol})$

$N = 1.2044 \times 10^{24} \text{ molecules}$

KEY TAKEAWAY: Always calculate moles first. You cannot convert directly from grams to molecules.

Revision Map: The Master Conversion Triangle



The Golden Rule of Stoichiometry: Moles act as the central routing hub. Every quantitative calculation in physical chemistry requires passing through the Mole concept first.



You've Learned the Theory.

Now Let's Test It.

Reading notes gets you knowledge.

Practicing MCQs gets you marks.

That's exactly what TopAll Pro is built for.

Try TopAll Pro Now

What TopAll Pro Does Differently

-  **Stuck? Snap it. Solve it. — Doubts AI**
Photo → step-by-step solution in seconds, 24/7
-  **Your AI Coach finds your blind spots**
Concept-level weakness detection — not just chapter-level
-  **4.5 Lakh+ questions. Never run out.**
13× more content than any other prep app in India
-  **Build your own test in 60 seconds**
Pick a chapter, set difficulty — AI does the rest instantly.
-  **AI Recommendation that helps you improve**
AI Recommendation Analysis your Tests and tell you where you need to improve.



Practice the moment you finish studying
Jump in while the concept is still fresh in your head

4.5L+
MCQs

1.5L+
Students

AI Powered
In-Depth Analysis