ATOMS AND MOLECULES

MOLE CONCEPT

Mole: Mole is the measurement in chemistry. It is used to express the amount of a chemical substance.

One mole is defined as the amount of substance of a system which contains as many entities like, atoms, molecules and ions asthere are atoms in 12 grams of carbon - 12".

Avogadro number: The number of the particles present in one mole of any substance is equal to 6.022×10^{23}. This is called Avogadro's number or Avogadro's constant.
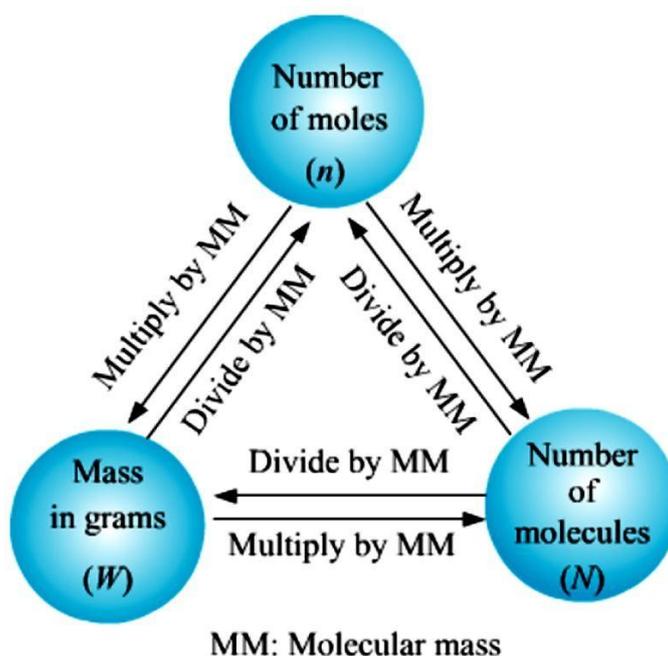
Number of particles in 1 mole:

1 mole of hydrogen atoms represents 6.022×10^{23} hydrogen atoms.

1 mole of hydrogen molecules represents 6.022×10^{23} hydrogen molecules.

1 mole of water molecules represents 6.022×10^{23} water molecules.

Conversion of moles to mass and vice-versa

MM: Molecular mass

The key concept used in these kind of problems is that a mole of any substance contains gram formula mass or molecular mass of that substance i.e. molecular mass of <u>Hydrogen</u> is 2 a.m.u.

So mass of 1 mole of hydrogen which is also known as molar mass will be 2 g. Similarly if we have 2 moles of hydrogen, it will weigh 2x2 grams = 4 grams.
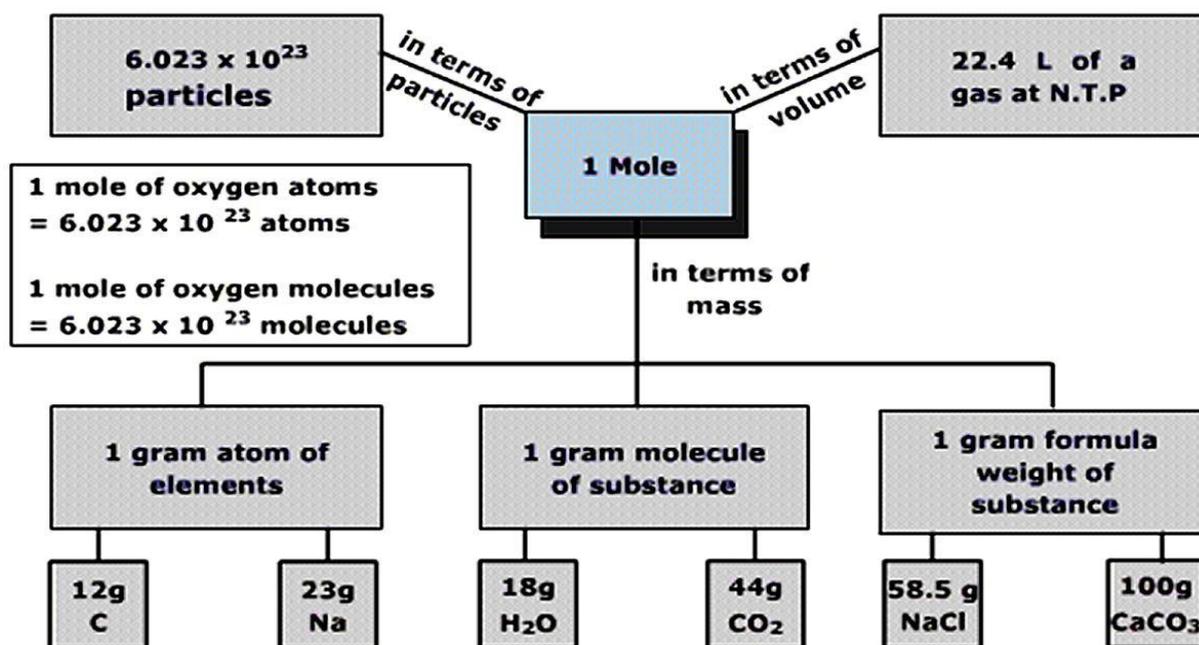
MOLE CONCEPT CALCULATION

This is the most basic and the most used calculation that a student comes across while solving a mole concept problem. Most of the times, moles or number of atoms or molecules are given in the question and the mass is needed to be calculated. In that case proceed as shown in the above example. In rest of the cases, mass will be given and moles or number will be needed to be calculated. In those questions also, proceed by:

STEP 1:- Establishing relationship between molar mass and the number (N_A)

or moles of that particular entity (atom, molecule or ion).

STEP 2:- Use unitary method to calculate what is asked in the question.

NOTE: – When we say oxygen gas weighs 32 gram then we mean to say that 1 mole of oxygen molecule (O_2) weighs 32 grams and not 1 mole of oxygen atom which is O. This is because in natural form, oxygen exists as O_2 molecule.

6.023 x 10^{23} particles				22.4 L of a gas at N.T.P

in terms of particles — 1 Mole — *in terms of volume*

1 mole of oxygen atoms = 6.023 x 10^{23} atoms

1 mole of oxygen molecules = 6.023 x 10^{23} molecules

in terms of mass

1 gram atom of elements	1 gram molecule of substance	1 gram formula weight of substance
12g C / 23g Na	18g H_2O / 44g CO_2	58.5 g NaCl / 100g $CaCO_3$

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