II) Measuring MOLECULAR MASSES ['Universally low masses'] of atoms / molecules

1) ATOMIC MASS

[Atomic mass unit (amu), Unified mass (u), dalton (Da)]

$$1\text{amu} = 1.66\times10^{-24}\text{g} = \frac{1}{12}\text{mass of } {}^{12}\text{C}$$

Ex : Mass of one H atom = 1.008 amu=1.6736×10^{-24} g

2) MOLECULAR MASS / MOLECULAR WEIGHT of a compound

Molecular mass of a compound is the sum of the atomic masses of all the atoms in the molecule.

Ex: Molecular mass(in amu) of one H_2O molecule = 2(1.008 amu) + 16.00amu = 18.02 amu.

Measuring MOLES ['Universally huge numbers'] in a substance:

1) MOLE (Unit: mol)

Amount of substance is measured interms of the SI unit **mole**.

One mole = 6.023×10^{23} = Avogadro Number (N_A) = no. of atoms in 12 g of ^{12}C

2) MOLAR MASS/ GRAM MOLAR MASS / GRAM MOLAR WEIGHT(GMW):

Molar Mass is the mass of substance in grams per mole.

Ex: Molar mass of H_2O = 18.02 g/mol = 18 g/mol

Gram Molar Weight is the molar mass measured in grams.

Ex: GMW of H_2O = 18.02g = Average mass of 1 mole of H_2O.

Formula 1: Number of moles $n = \frac{\text{g(weight of substance in grams)}}{\text{M(GMW in g)}}$ $\Rightarrow$ weight of substance = n×GMW

Formula 2: Number of molecules $= \frac{(\text{weight of substance in grams})\times N_A}{\text{M(GMW in g)}} = n\times N_A$

Number of molecules = No. of moles × Avogadro Number.

Note 1: **Molecularity** is applicable on very small entities like atoms, molecules with units amu, u.

Note 2: **Molar concept** is applicable on very big entities like moles with units g, kg.

Note 3: Though Mass and Weight are different entities, in practice both are used interchangeably.

BULLET MASTER'S

CHEM BEATS!

MOLES ARE CURRENCY OF CHEMISTRY

DOZEN vs MOLE

D-Mart Shopping లో…

ఒక Apple weight 100g అయితే weight of one dozen Apples= 1200g = 1.2 kg

In our Stoichiometry....

Mass of 1 H atom = 0.00000000000000000000000083 g అయితే

Mass of 1 mole = 602213670000000000000000 number of H atoms ≅ 1 g

Weight of 1 dozen Apples = 1200 g ;	Weight of 1 mole of H atoms ≅ 1g = 1.007 g
Weight of 2 dozen Apples = 2400g;	Weight of 1 mole of H_2 molecules = 2.016 g
Weight of 1 dozen Pens & Pencils=120g;	Weight of 1 mole of H_2O molecules=18.0153 g

Avogadro సంఖ్య ఎంత పెద్దదంటే?

భూమి మీద ఉన్న 3వేల మిలియన్ల మంది Avogadro సంఖ్యలో ఉన్న పరమాణువులను లెక్కించడానికి సెకనుకు ఒక పరమాణువు చొప్పున రోజుకు 8 గంటలు పనిచేస్తే మొత్తం 20 మిలియన్ల సంవత్సరాల సమయం పడుతుంది.