

5. A balanced chemical equation does not tell about changes such as precipitation, change in colour, evolution of heat, light and sound energy during the chemical change.

1.2 RELATIVE ATOMIC MASSES (ATOMIC WEIGHTS) AND MOLECULAR MASSES (MOLECULAR WEIGHTS)

Introduction

1. An individual atom or a molecule is very small and light in weight and hence, it cannot be weighed directly.
2. By using indirect methods, absolute mass of an atom was determined. It was found:
 - (a) Mass of 1 atom of hydrogen = 1.6735×10^{-24} g.
 - (b) Mass of 1 atom of oxygen = 26.454×10^{-24} g.

As the above masses are (i) very small (ii) has inconvenient figures, therefore, it was not possible to express the mass of an atom or a molecule in grams.

3. Thus, to overcome the above difficulty, the mass of an atom of an element or a molecule of a compound was related to the mass of a lightest atom. The mass so obtained is called **relative mass**.

4. **Hydrogen atom** (being the lightest amongst the naturally occurring elements) was initially chosen as the standard unit and masses of other atoms or molecules were compared with it.

However, adopting hydrogen as a standard unit mass ran into difficulty, because it was discovered that hydrogen has *three isotopes* (${}^1_1\text{H}$; ${}^2_1\text{H}$ and ${}^3_1\text{H}$) and their relative atomic mass works out *1.008 rather than 1*.

5. Thus, the search started for some other standard whose mass is *one unit*. It was found that mass of a carbon atom is 12. Thus, 1/12 mass of a carbon atom works out 1. Thus, 1/12 mass of ${}^{12}_6\text{C}$ isotope of carbon was chosen as the standard atomic mass for comparing atomic masses of other elements.

6. **Atomic mass unit (amu)**

One twelfth the mass of an isotope of a carbon atom ${}^{12}_6\text{C}$ is called **atomic mass unit**.

On the basis of the above unit, the atomic mass of *carbon atom is 12 amu*.

It must be remembered that *amu is only a number and has no units*.

- (a) **Relative atomic mass [RAM] or Atomic weight.**

- (i) **Definition with respect to Hydrogen**

It is the number that represents, how many times one atom of an element is heavier than one atom of hydrogen, whose weight has been taken as unity.

$$\text{RAM} = \frac{\text{Mass of one atom of an element}}{\text{Mass of one atom of hydrogen taken as unity}}$$