Atoms are so small that their mass is not measured in grams but in **atomic mass** units.

The atoms of each type of element have a **relative atomic mass (RAM).**

The element carbon is the atom that the mass of all other atoms is compared to. **Carbon has a RAM of 12.**

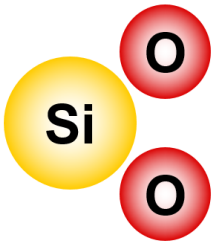

Relative atomic mass = 12


The **relative atomic mass** ($A_r$) of an element is the mass of one of its atoms relative to 1/12 the mass of one atom of carbon-12.

$$\text{relative atomic mass } (A_r) = \frac{\text{average mass of an atom} \times 12}{\text{mass of one atom of carbon-12}}$$

**Scientists needed a more effective way to measure the mass of an atom. They decided to use the mass of a carbon-12 atom as the basis to measure the masses of all other atoms. They define the relative atomic mass of the carbon-12 atom as 12 and work everything out from there. This is known as the carbon-12 standard.**

A single grain of sand contains millions of atoms of silicon and oxygen.



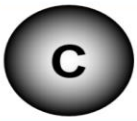

**millions of these atoms join to form each tiny grain of sand**

Each atom must therefore have an extremely small mass.

Atoms are so small that their mass is not measured in grams but in **atomic mass** units.

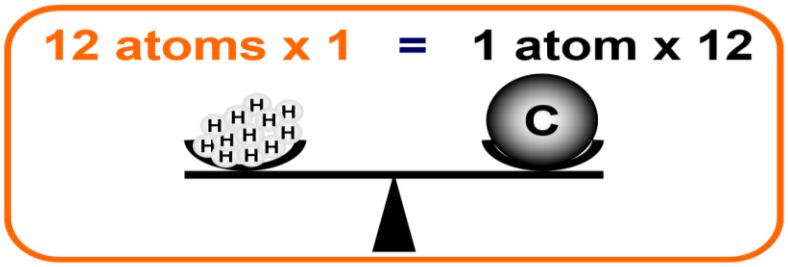
The atoms of each type of element have a **relative atomic mass (RAM).**

The element carbon is the atom that the mass of all other atoms is compared to. **Carbon has a RAM of 12.**

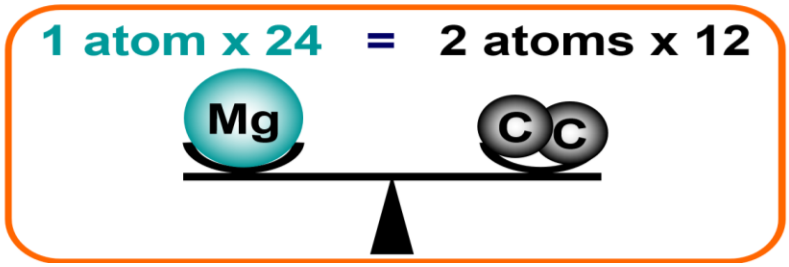



Relative atomic mass = 12

The lightest atom is hydrogen. It has $\frac{1}{12}$ the mass of carbon and so has a RAM of 1.




Magnesium is twice as heavy as carbon. It has a RAM of 24.




Many elements are a mixture of isotopes. The RAM given in the periodic table takes account of this.

**To calculate the RAM of a mixture of isotopes, multiply the percentage of each isotope by its atomic mass and add them together.**

For example, chlorine exists as two isotopes: chlorine-35 (75%) and chlorine-37 (25%).

RAM of chlorine = (75% x 35) + (25% x 37)
= (0.75 x 35) + (0.25 x 37)
= 26.25 + 9.25
**= 35.5**

# What is relative atomic mass?

Definition

**Relative atomic mass (RAM or $A_r$ )** is the *weighted average* of the masses of an element's isotopes compared to $\frac{1}{12}$ of the mass of a carbon-12 atom.

All elements have isotopes, but some isotopes are more abundant than others. On a periodic table, the number we see for an atom's relative atomic mass is an average of the masses of the isotopes of an element. This average includes a percentage of how often an isotope occurs in nature. This is called the **percentage abundance**.

# RFM

RFM stands for **relative formula mass** (Mr). This is the sum of the RAMs of all the elements in a molecule. i.e. it is the mass of the molecule. These two measurements are used in Chemistry because it is more accurate.