



Leaving Cert Chemistry

Free Notes

**Mass Spectrometry &
Chromatography**

Mass spectrometry & Chromatography:

Atomic mass:

This is a number which gives:

- 1) Number of protons in the nucleus of an atom
- 2) Number of electrons orbiting the nucleus

Note: Henry Moseley using x – rays showed the importance of the atomic number

Mass number: This gives the total number of protons and neutrons in the nucleus of an atom.

Note: Mass number – atomic number = number of neutrons

Q) How many protons, electrons, neutrons in the following?

1) $^{37}\text{Cl}^-$ > protons = 17, electrons = 18 and neutrons = 20

17

2) $^{24}\text{Mg}^{2+}$ > protons = 12, electrons = $12 - 2 = 10$ and neutrons 12

12

4) $^{16}\text{O}^{2-}$ > protons = 8, electrons = $8 + 2 = 10$ and neutrons 8

8

Isotopes: Atoms of an element which have the same atomic number but different mass number
e.g. carbon 12 and 14

Why mass numbers are different:

- There are a different number of neutrons in the nucleus of their atoms

Q) Define relative atomic mass (Ar)

This is the average mass of all the isotopes in an element measured relative to the carbon – 12 isotopes

Q) Explain why (Ar) values do not have to be whole numbers

(e.g)

5

B

10.81 > relative atomic mass

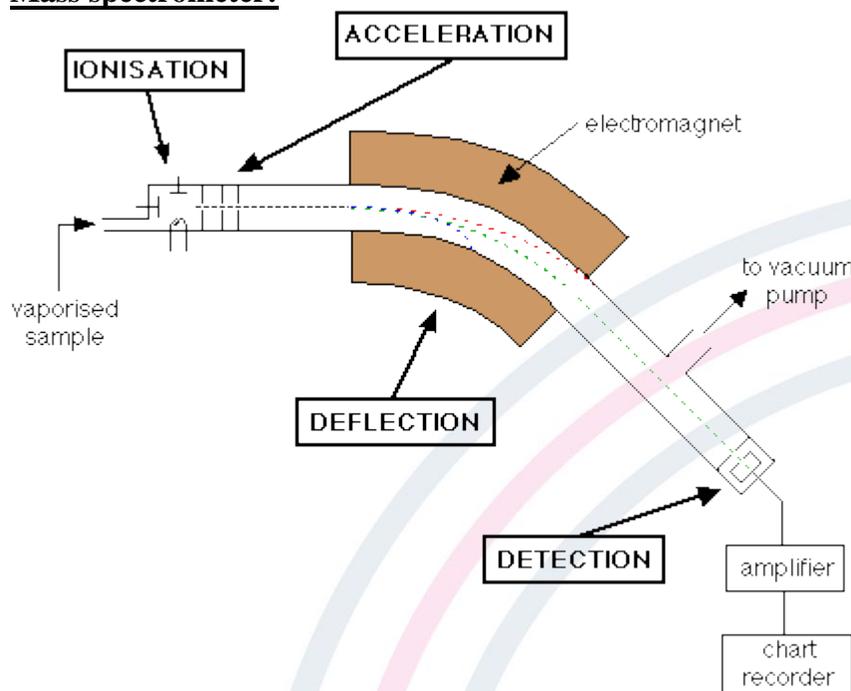
- Ar values represent the average mass of all the isotopes in an element.
- Averages do not have to be whole numbers.

Q) Mg contains 79% of ^{24}Mg , 10% ^{25}Mg and 11% ^{26}Mg . Calculate the relative atomic mass of the magnesium atom.

$$A_r = \frac{(79 \times 24) + (10 \times 25) + (11 \times 26)}{100}$$

$$= 24.32$$

Mass spectrometer:



Q) On what principle does the mass spectrometer work?

- ✚ Charged particles i.e. ions moving in a changing magnetic field experiences a force.
- ✚ As a result of this force, the particles are deflected according to their mass.

Q) Outline the fundamental processes that occur in a mass spectrometer.

- 1) **Vaporisation** – The sample is vaporized by means of a heater in a sample inlet.
- 2) **Ionisation** – atoms are converted into positive ions by bombarding them with electrons from an electron gun (source)
- 3) **Acceleration** – the positive ions are accelerated forward and concentrated into a narrow beam. This is done by means of an electron field.
- 4) **Separation** - Once in the changing magnetic field, the ions experiences a force and is deflected according to their mass. Lighter ions are deflected more than heavier ions.

5) **Detection** – the different ions are detected when they strike the detector. An electric current is produced and this is proportional to the number of ions in a particular type producing it.

Q) Give 3 applications of a mass spectrometer.

- 1) To separate the different isotopes in and atom and their relative abundance
- 2) To analyse waste gases from dumps.
- 3) To analyse water for heavy metals.

For more comprehensive Leaving Cert Chemistry Revision Notes Click Here.... [Leaving Cert Chemistry Notes](#)