



CAMBRIDGE
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Chemistry

For the IB Diploma

> Chapter 2

The nuclear atom

> The nucleus of an atom is extremely small

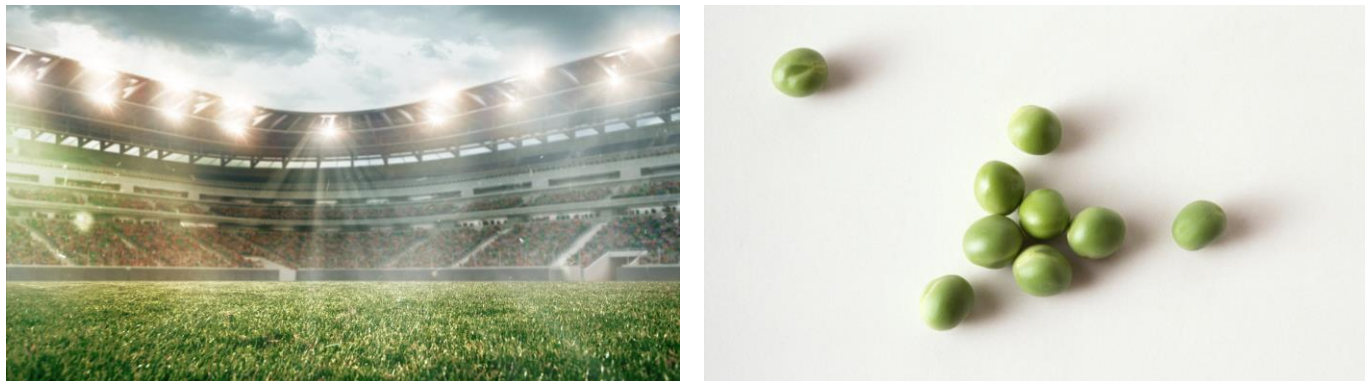


Figure 2.1: If the atom is the size of a football stadium, the nucleus is about the size of a pea.

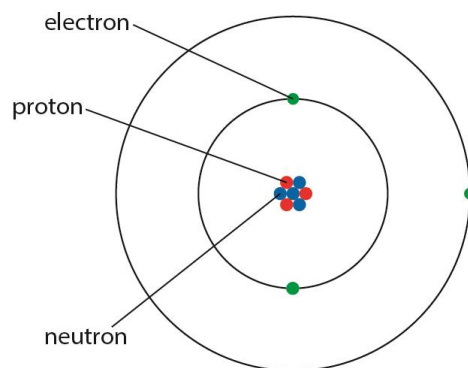


Figure 2.2: A simple representation of a lithium atom (not to scale).

> The symbol of an atom

Mass number (A) is the total number of protons plus neutrons in the nucleus of an atom.

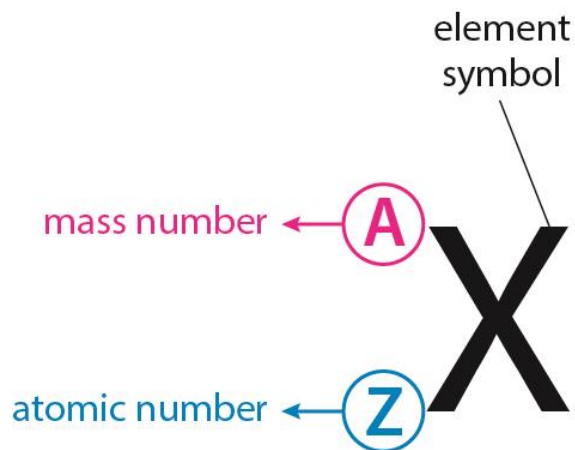


Figure 2.3: The nuclear symbol for an atom.

Atomic number (Z) is the number of protons in the nucleus of an atom.

The relative mass and charge of subatomic particles

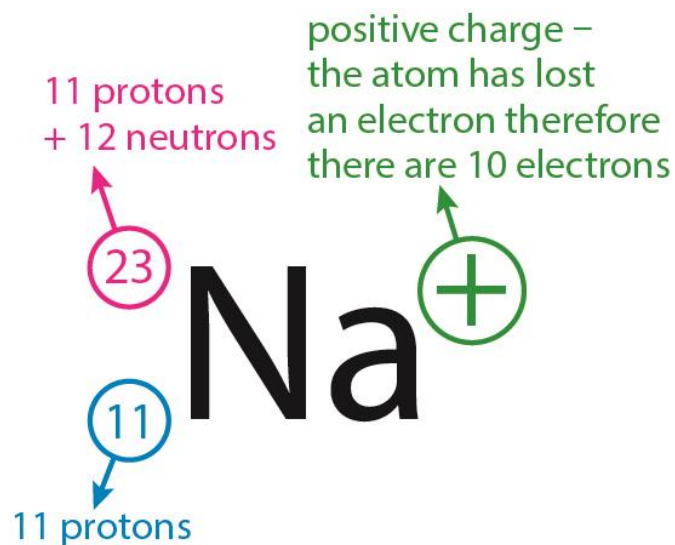
Particle	Relative mass	Relative charge
Proton	1	1+
Neutron	1	0
Electron	5×10^{-4}	1-

Calculate the number of subatomic particles for the following ions

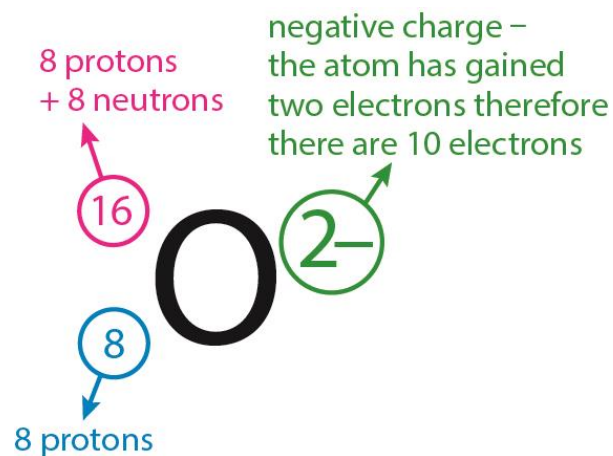
Ion	Atomic number	Mass number	Protons	Neutrons	Electrons
Li ⁺					
F ⁻					
S ²⁻					
Ba ²⁺					

> Working out the numbers of protons, neutrons and electrons

in cations



in anions



> Properties of isotopes of an element

- Isotopes have identical CHEMICAL properties
- Isotopes have slightly different PHYSICAL properties
- Heavy water (D_2O) has a melting point of $3.79\text{ }^\circ\text{C}$, and a boiling point of $(101.4\text{ }^\circ\text{C})$
- $^1\text{H}_2$ boiling point: $-253\text{ }^\circ\text{C}$
- $^2\text{H}_2$ boiling point: $-250\text{ }^\circ\text{C}$

> The mass spectrometer

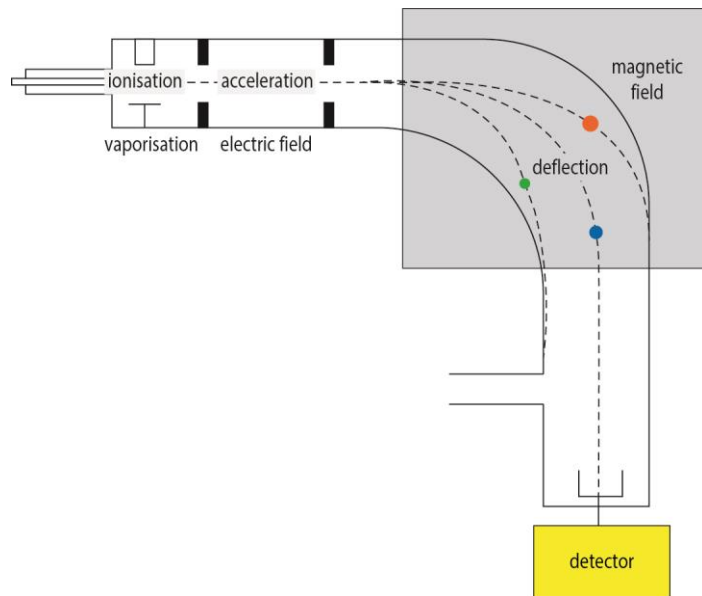


Figure 2.4: Illustration of a mass spectrometer set-up.

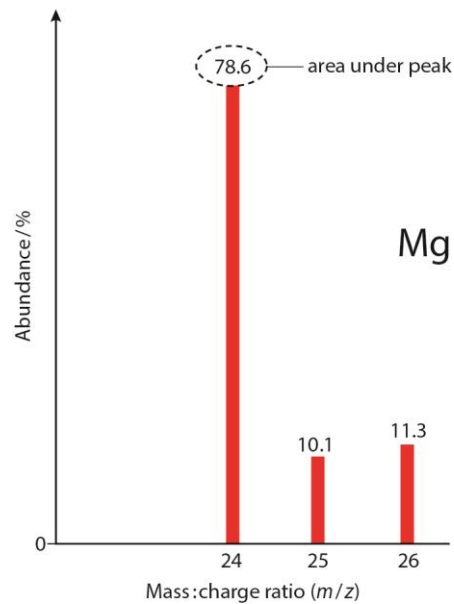


Figure 2.5: The mass spectrum of magnesium showing the amounts of the different isotopes present.