

# ATOMIC STRUCTURE

## AT A GLANCE

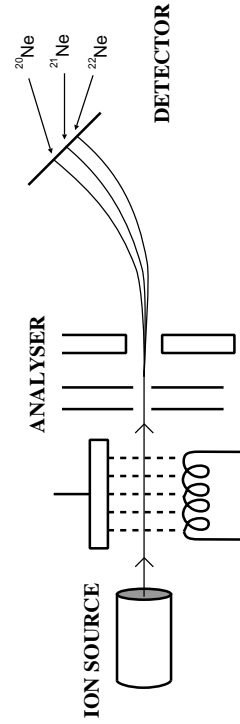
ATOMS	Particle	Mass	Charge	Position
	Proton	1	+1	nucleus
	Neutron	1	0	nucleus
	Electron	1/1836	-1	outside nucleus

ISOTOPES	same atomic number (Z) and different mass number (A)	Mass number (protons + neutrons)	Atomic number (protons)
		23	11
	or		
	same protons and different neutrons.		

**Na**

## MASS SPECTROMETER



- Gaseous atoms undergo **ionisation** by electron bombardment
  - Charged particles can be **accelerated** by an electric field
  - Charged particles will be **deflected** by a magnetic or electric field
- The radius of the path depends on mass/charge ratio ( $m/z$ )  
 Heavier ions with **larger**  $m/z$  values are deflected less  
 If an ion acquires a 2+ charge it will be deflected more.
- Ions **detected** by electric or photographic methods

*Mass spectra can also be used to find relative molecular mass*

## ELECTRONIC CONFIGURATIONS

- electrons exist in different energy levels ( $n = 1, 2, 3, 4$  etc.)
- energy levels can be split into sub levels
- each level contains orbitals (s, p, d, or f)
- each orbital can hold up to 2 electrons

Principal level (n)	Number of sub-levels	Type of Orbital	Number of Orbitals	Total number of Electrons
n = 1	1	1s	1	2 = 2
n = 2	2	2s, 2p	1 + 3 = 4	2 + 6 = 8
n = 3	3	3s, 3p, 3d	1 + 3 + 5 = 9	2 + 6 + 10 = 18
n = 4	4	4s, 4p, 4d, 4f	1 + 3 + 5 + 7 = 16	2 + 6 + 10 + 14 = 32

## Filling energy levels

**Rules** Electrons enter the lowest energy orbital available.

Orbitals can hold a max. of 2 electrons provided they have opposite spin.

Orbitals of the same energy remain singly occupied before pairing up. This is due to the repulsion between electron pairs.

**Order** Orbitals are not filled in numerical order (e.g. 4s is filled before 3d) due to principal energy levels getting closer together further from the nucleus.

