Electron Configuartions

Models of the atom

An early model of the atom was the Bohr model (GCSE model) (2 electrons in first shell, 8 in second etc.) with electrons in spherical orbits. **E**arly models of atomic structure predicted that atoms and ions with noble gas electron arrangements should be stable.

Electrons are arranged on:

Principle energy levels numbered 1,2,3,4..
1 is closest to nucleus

Split into

Sub energy levels labelled s , p, d and f
s holds up to 2 electrons
p holds up to 6 electrons
d holds up to 10 electrons
f holds up to 14 electrons

Split into

Orbitals which hold up to 2 electrons of opposite spin

Principle level	1	2	3	4
Sub-level	1s	2s, 2p	3s, 3p, 3d	4s, 4p, 4d, 4f

An atom fills up the sub shells in order of increasing energy (note 3d is higher in energy than 4s and so gets filled after the 4s
1s→2s→2p→3s→3p→ 4s→3d→4p→5s→4d→5p

Shapes of orbitals
Orbitals represent the mathematical probabilities of finding an electron at any point within certain spatial distributions around the nucleus.

Each orbital has its own approximate, three dimensional shape.

It is not possible to draw the shape of orbitals precisely.

Writing electronic structure using letters and numbers

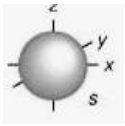
For oxygen $1s^2\ 2s^2\ 2p^4$

Number of electrons in sub-level

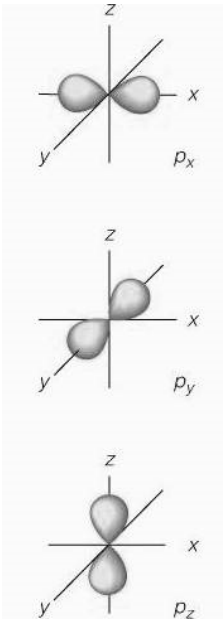
Number of main energy level

Name of type of sub-level

•s sublevels are spherical

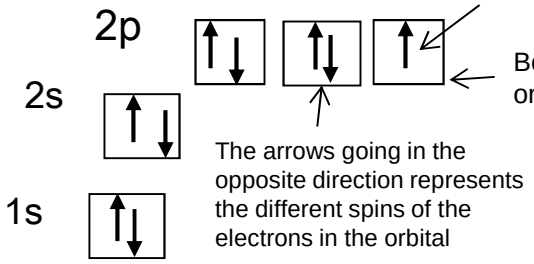


• p sublevels are shaped like dumbbells



Using spin diagrams

For fluorine



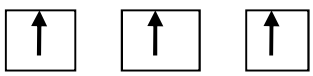
An arrow is one electron

Box represents one orbital

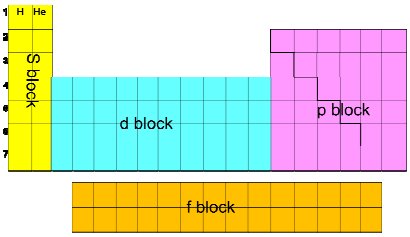
The arrows going in the opposite direction represents the different spins of the electrons in the orbital

When filling up sub levels with several orbitals, fill each orbital singly before starting to pair up the electrons

2p



The periodic table is split into blocks. A **s** block element is one whose outer electron is filling a s-sub shell



Electronic structure for ions

When a positive ion is formed electrons are lost
Mg is $1s^2\ 2s^2\ 2p^6\ 3s^2$ but Mg^{2+} is $1s^2\ 2s^2\ 2p^6$

When a negative ion is formed electrons are gained
O is $1s^2\ 2s^2\ 2p^4$ but O^{2-} is $1s^2\ 2s^2\ 2p^6$