Topic 2 Atoms & Electrons & Bond

Electron valence

**Core shell electrons**: inaccessible electrons
Valence electrons: participate in chemical reaction, core electrons do not

Electron

Quantum: a quantum (quanta) is the minimum amount of any physical entity involved in an interaction
- n = principal energy level (PEL)
- l = sublevel
  - s — 1 orbital, 2 e
  - p — 3 orbitals, 6 e
  - d — 5 orbitals, 10 e
  - f — 7 orbitals, 14 e
- ml = orbital (ex, px, py, pz)
- ms = spin (↑ or ↓)

Aufbau principle: ground state is most stable; atom is constructed from the lowest energy level
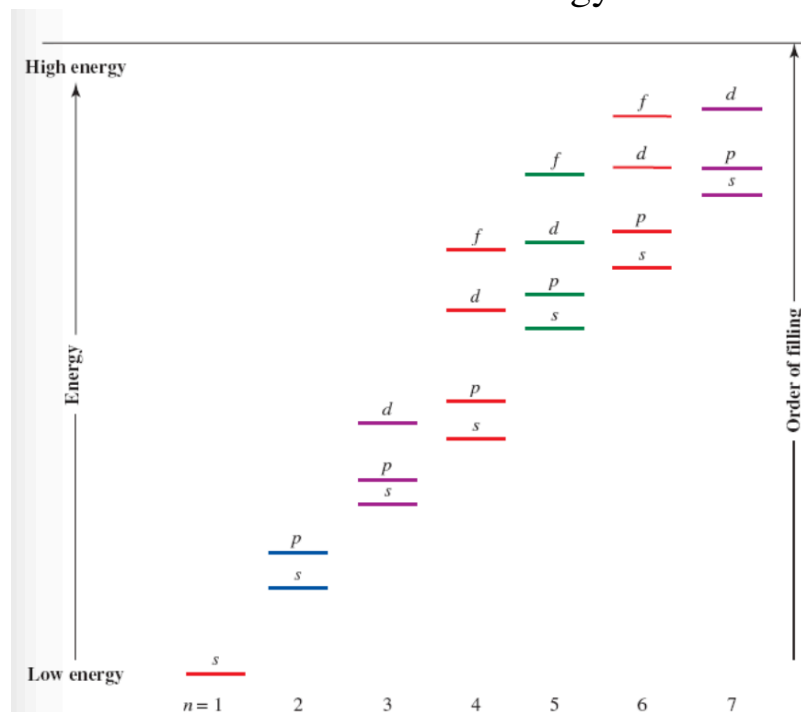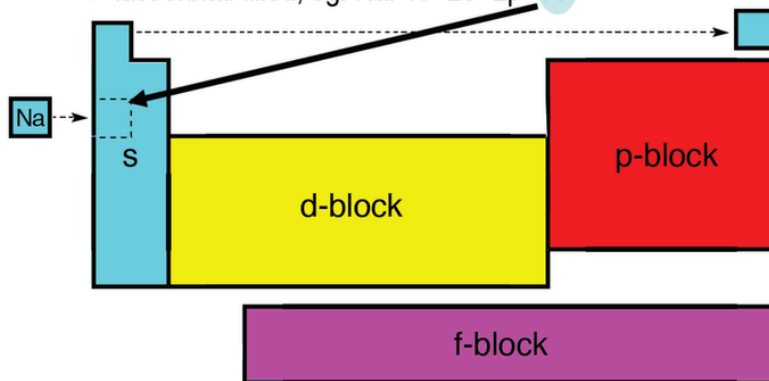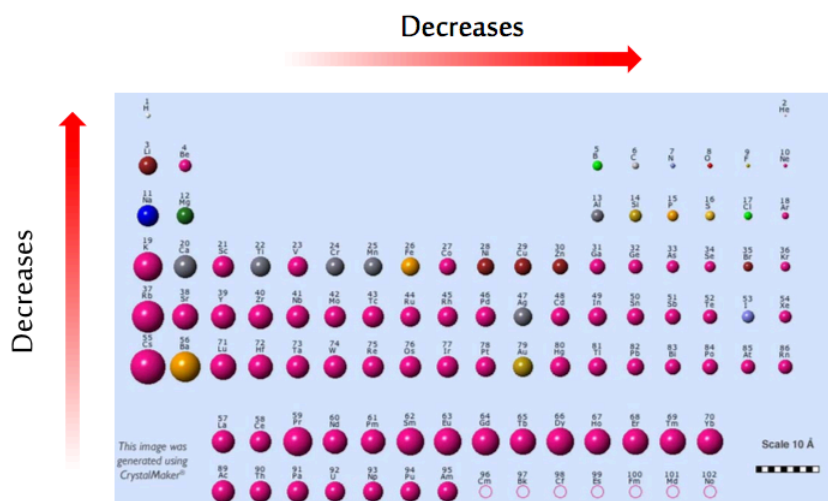

Periodic table

"Blocks"
❑ name of block
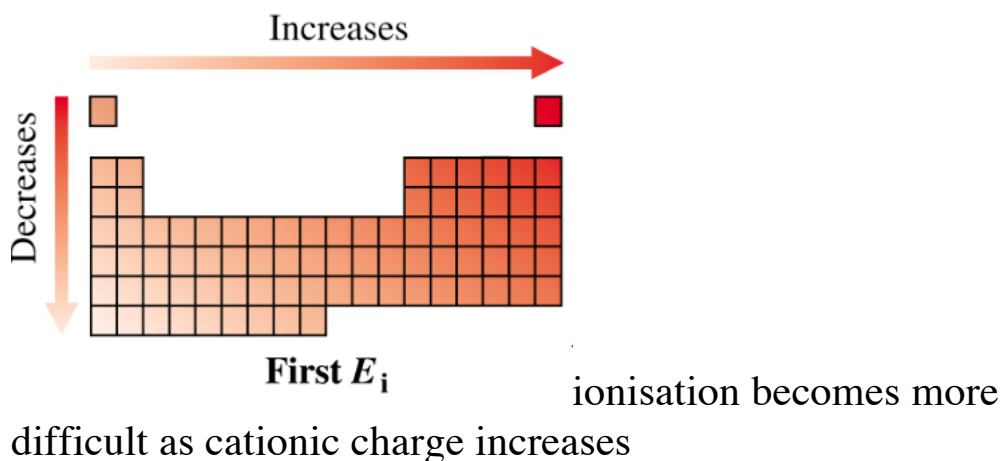➢ last orbital filled, eg. Na: $1s^2\ 2s^2\ 2p^6\ 3s^1$

Atomic radii

Size of ions
• cation (+) is smaller than neutral state
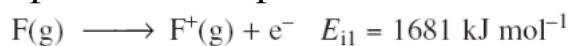• anion (-) is larger than neutral state

First ionisation energy = minimum of energy needed to remove an electron from a neutral atom

Electronegativity trends

ionisation becomes more difficult as cationic charge increases

Electron affinity
- energy change when an e- is added to an atom in gas phase to form an anion (-)
- tends to become more negative from left to right across a period in the periodic table

$$F(g) \longrightarrow F^+(g) + e^- \quad E_{i1} = 1681 \text{ kJ mol}^{-1}$$

$$F(g) + e^- \longrightarrow F^-(g) \qquad E_{EA} = -322 \text{ kJ mol}^{-1}$$

VSEPR

Valance shell electron pair repulsion theory: molecular shape is determined by repulsions between pairs of electrons.
To minimise repulsions, electron pairs around an inner atom within a molecule will be situated as far apart as possible.

VSEPR geometry

Number of sets of electron pairs	Geometry of sets of electron pairs
2	Linear
3	Trigonal planar
4	Tetrahedral
5	Trigonal bipyramidal
6	Octahedral

Repulsions in the order: LP-LP > BP-LP > BP-BP (lone pairs LP, bonding pairs BP)