Definitions and Concepts for Edexcel Chemistry A-level

Topic 1: Atomic Structure and the Periodic Table

Atomic Number: Number of protons in the nucleus of an atom.

Mass Number: Sum of number of protons and neutrons in the nucleus of an atom.

Nuclear charge: Total charge of all the protons in the nucleus. It has the same value as the atomic number. Increases as you go across the periodic table.

Isotopes: Atoms of the same element with the same number of protons but different number of neutrons in the nucleus, e.g. ^{35}Cl and ^{37}Cl.

Relative Atomic Mass: Average mass of an atom of an element, relative to 1/12th of the mass of an atom of carbon-12.

Relative Isotopic Mass: Average mass of an atom of an isotope relative to 1/12th of the mass of an atom of carbon-12.

Relative Molecular Mass: Average mass of a molecule relative to 1/12th of the mass of an atom of carbon-12.

Quantum shells: Same as electron shells. They specify the energy level of an electron.

First Ionisation Energy: The energy required to remove 1 mole of electrons from each atom in 1 moles of gaseous atoms to from 1 mole of gaseous 1+ ions

$$\text{e.g. } O_{(g)} \rightarrow O^{+}_{(g)} + e^{-}$$

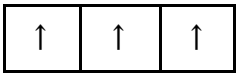
Second Ionisation Energy: The energy required to remove 1 mole of electrons from each ion in 1 moles of gaseous 1+ ions to form 1 moles of gaseous 2+ ions (could be asked for any successive ionisation energy)

$$\text{e.g. } O^{+}_{(g)} \rightarrow O^{2+}_{(g)} + e^{-}$$

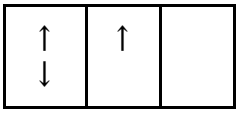
Orbital: A region in an atom that can hold up to two electrons with opposite spins.

Periodicity: Trends in element properties with increasing atomic number.

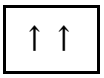
Hund's rule: When electrons fill the orbitals, they occupy them singly before they pair up, e.g. in case of $2p^3$ configuration, we would observe the following arrangement of electrons within the $2p$ orbitals:



and not:



Pauli Exclusion Principle: Electrons within the same orbital must have opposite spins. The following arrangement violates the Pauli Exclusion Principle:



Aufbau Principle: As the atomic number increases, the electrons are added to the orbitals in order of increasing orbital energy until all electrons are accommodated. Notable exceptions: Cr, Cu.

Shielding: A decrease in the nuclear charge experienced by an outer shell electron caused by electron-electron repulsion between the outer shell electron and electrons from adjacent quantum shells.