
Unit 1 Atomic Structure and Periodicity (Paper 1 & 3)

1.1 Atomic Structure

Fundamental particles

Appreciate that knowledge and understanding of atomic structure has evolved over time.

Protons, neutrons and electrons: relative charge and relative mass.

An atom consists of a nucleus containing protons and neutrons surrounded by electrons.

Mass number and isotopes

Mass number (A) and atomic (proton) number (Z).

You should be able to:

- determine the number of fundamental particles in atoms and ions using mass number, atomic number and charge
- explain the existence of isotopes.

The principles of a simple time of flight (TOF) mass spectrometer, limited to ionisation, acceleration to give all ions constant kinetic energy, ion drift, ion detection, data analysis.

The mass spectrometer gives accurate information about relative isotopic mass and also about the relative abundance of isotopes.

Mass spectrometry can be used to identify elements.

Mass spectrometry can be used to determine relative molecular mass.

You should be able to:

- interpret simple mass spectra of elements
- calculate relative atomic mass from isotopic abundance, limited to mononuclear ions.

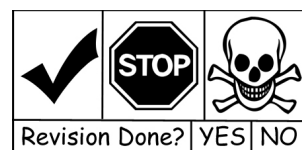
Electron Configuration

Electron configurations of atoms and ions up to $Z = 36$ in terms of shells and sub-shells (orbitals) s, p and d.

Ionisation energies.

You should be able to:

- define first ionisation energy
- write equations for first and successive ionisation energies
- explain how first and successive ionisation energies in Period 3 (Na–Ar) and in Group 2 (Be–Ba) give evidence for electron configuration in sub-shells and in shells.



1.2 Periodicity

Classification

An element is classified as s, p, d or f block according to its position in the Periodic Table which is determined by its proton number.

Physical properties of Period 3 elements

The trends in atomic radius, first ionisation energy and melting point of the elements

Na–Ar

The reasons for these trends in terms of the structure of and bonding in the elements.

You should be able to:

- explain the trends in atomic radius and first ionisation energy
- explain the melting point of the elements in terms of their structure and bonding.

