

Chapter 4 – Quick Revision Sheet

Structure of an Atom



Evolution of Atomic Models

In 1897, J. J. Thomson discovered the electron and proposed a positive sphere model. In 1911, Ernest Rutherford discovered the nucleus and proved atoms are mostly empty space. In 1913, Niels Bohr introduced fixed energy levels for electrons.

Concept flow: electron discovery → nucleus discovery → fixed energy shells.



Subatomic Particles

Atoms are made of electrons (negative, outside nucleus), protons (positive, inside nucleus), and neutrons (neutral, inside nucleus). Protons determine the identity of the element, neutrons add mass, and electrons decide chemical behavior.



Atomic Number and Mass Number

Atomic number (Z) equals the number of protons and defines the element. Mass number (A) equals protons plus neutrons. In a neutral atom, protons equal electrons. The number of neutrons is calculated using the simple relation: $A - Z$.



Bohr's Shell Rule

Electrons revolve in shells named K, L, M, and N. The maximum number of electrons in a shell is calculated by $2n^2$. The first shell holds 2 electrons, the second holds 8, and the outermost shell never exceeds 8 electrons. This arrangement, called electronic configuration, controls chemical behavior.



Isotopes and Isobars

Isotopes have the same atomic number but different mass numbers, meaning they differ in neutrons while behaving chemically similar; for example, Hydrogen exists in different forms based on neutron count. Isobars have the same mass number but different atomic numbers, meaning they are different elements with equal total nucleons.



Valency Simplified

Valency is the combining capacity of an atom and depends on outer shell electrons. If the outer shell has four or fewer electrons, valency equals that number; if it has more than four, valency equals eight minus that number. Atoms react to achieve a stable outer shell.

Rutherford's Gold Foil Experiment

When alpha particles were passed through a thin gold sheet, most passed straight through, some were deflected, and very few bounced back. This proved that atoms are mostly empty space with a concentrated nucleus at the center.

Formation of Ions

When an atom loses electrons, it becomes a positively charged ion (cation). When it gains electrons, it becomes a negatively charged ion (anion). Ion formation helps atoms achieve a stable outer shell configuration.

Writing Symbol of an Atom

The symbolic representation of an atom shows mass number at the top and atomic number at the bottom of the element symbol. This representation gives complete information about protons and neutrons in the atom.