

(1) Separating Techniques - Key Vocabulary

Soluble— A substance can dissolve.

Insoluble—A substance cannot dissolve.

Solvent— The liquid solute dissolves in.

Solute—The substance that dissolves.

Solution— Formed when a solute dissolves in a solvent

Pure substance—Consists of one element or compound. Can determine purity through melting point checked against known values, or chromatography (single peak).

Impure substance— Contains more than one element

Fractional Distillation—Separates a mixture of liquids.

Distillation—Separates substances with different boiling points.

Crystallisation—Separates a soluble solute from a solvent.

Filtration—Separates an insoluble solid from a solution.

Paper Chromatography—Mobile phase = solvent being used, and the stationary phase = paper.

Thin Layer Chromatography— Mobile phase = solvent e.g. water or ethanol, stationary phase = silica or aluminium powder thin layer.

Gas Chromatography—Mobile phase = An unreactive gas, stationary phase = silica or aluminium powder or dense gel

(2) Bonding

Simple Covalent Molecules:

- Formed when a two non metals react, sharing electrons to fill outer shell.
- Low melting and boiling points—weak intermolecular forces.
- Cannot conduct electricity—no charged particles present.

Ionic Compounds:

- Formed when a metal reacts with a non metal.
- Transfer of electrons from the metal atom to the non metal atom.
- Forms a giant ionic lattice held together by electrostatic forces.
- High melting and boiling points— strong electrostatic forces.
- Can conduct electricity when molten or dissolved as ions are free to move.

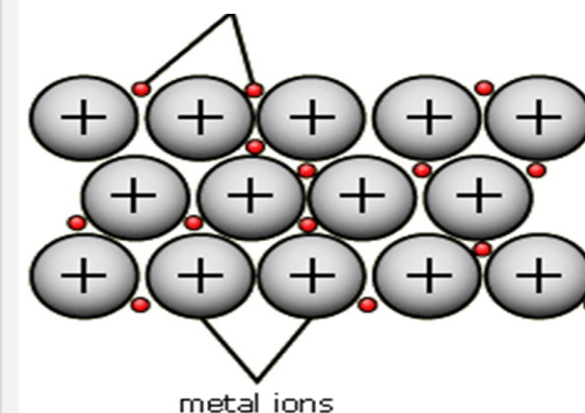
Metallic Bonding:

- Electrostatic attraction between positive metal ions and sea of delocalised electrons

Giant Covalent Structure—Consist of many non-metal atoms joined by covalent bonds arranged in a regular repeating pattern. High melting and boiling points due to lots of strong covalent bonds present.

(3) Structure of Metals

delocalised electrons



- Positive metal ions (cations.)
- Surrounded by a sea of delocalised negatively charged electrons.
- Electrostatic attraction between the positive metal ions and delocalised negatively charged electrons.

Delocalised electrons means metals are good conductors of heat and electricity. Ions arranged in layers which can move over each other allow metals to be malleable and ductile. Strong electrostatic forces mean metals have high melting and boiling points

(4) Allotropes of Carbon

Diamond

Structure: 4 carbons covalently bonded to each carbon

Properties: Doesn't conduct electricity, hard, high melting and boiling points

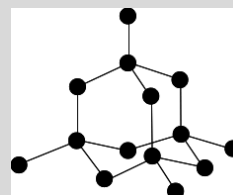
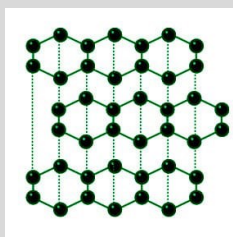
Uses: Jewellery, saw blades, cutting tools

Graphite

Structure: 3 carbons covalently bonded to each carbon in a flat hexagonal arrangement, layers held together by weak intermolecular forces.

Properties: Layer can slide over one another—slippery. Delocalised electrons—can conduct electricity.

Uses: Pencil lead, lubricants, blast furnace linings, electrolysis electrodes, anti-corrosion coating



(4) Allotropes of Carbon & Nanoparticles

Fullerene (Bucky ball/Buckminster fullerene)

Structure: Made of 60 carbons covalently bonded to one another in a spherical structure.

Properties: Slippery, substances can be inserted inside.

Uses: Medical drug delivery, lubricants

Fullerene (Nanotube)

Structure: A sheet of graphene rolled into a tube.

Properties: Strong, electrically conductive

Uses: Catalysts in some reactions, nanotechnology

Graphene

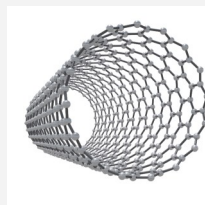
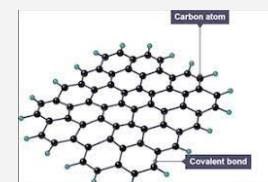
Structure: A single layer of graphite

Properties: Strong, electrically conductive

Uses: electronics, composites

Nanoparticles

- Between 1 to 100 nanometres in diameter.
- $1 \text{ nm} = 1 \times 10^{-9} \text{ m}$
- Very high volume to surface area ratio giving them unique chemical properties.
- Uses: Medicines, sun cream, cosmetics, electronics and catalysts
- Risks: It is possible for nanoparticles to enter our cells and no one knows the long term effect this may have. More research is needed.



(6) The periodic table

- Mendeleev ordered the periodic table in terms of atomic mass and chemical properties
- He left gaps for undiscovered elements
- When they were found they had the properties Mendeleev predicted.
- The modern periodic table is arranged in order of atomic number (proton number). Group 0 were discovered and added later

Periods—The rows in the periodic table showing number of shells.

Groups—The columns in the periodic table showing the number of electrons in the outer shell.

Non-metals—Dull, usually low melting and boiling points, brittle, poor conductors (right side of periodic table)

Metals—Shiny, solid at room temperature mostly, malleable, ductile and good conductors of electricity (left side of periodic table)

Relative atomic mass— mean mass of an atom of an element compared to 1/12 the mass of a carbon-12 atom.

Relative formula mass—mean mass of a unit of substance compare

Electronic Structure:

Shell 1 = 2 electrons, Shell 2 & 3 = 8 electrons, Shell 4 = 18 electrons



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