

Definitions and Concepts for Edexcel Chemistry IGCSE

Topic 1 - Principles of Chemistry

Definitions marked by "" are for separate sciences only*

Definitions have been taken, or modified from the [Edexcel Specification for IGCSE Chemistry, 4CH1, Issue 2, April 2018](#)

***Anion:** A negatively charged ion.

***Anode:** The positive electrode. It is where negatively charged ions lose electrons in oxidation reactions. It is the electrode where oxygen is produced unless the solution contains halide ions - then the halogen is produced.

Atom: The smallest part of an element that can exist. All substances are made up of atoms. Atoms contain a positively charged nucleus surrounded by negatively charged electrons.

Atomic nucleus: Positively charged object composed of protons and neutrons at the centre of every atom with one or more electrons orbiting it.

Atomic number: The number of protons in the nucleus.

***Cathode:** The negative electrode. It is where positively charged ions gain electrons in reduction reactions. It is the electrode where hydrogen is produced if the metal in the electrolyte is more reactive than hydrogen.

***Cation:** A positively charged ion.

Chromatography: A process used to separate substances in a mixture. It involves a mobile phase and a stationary phase.

Compound: A substance made up of two or more types of atoms chemically combined together.

Conductor: A material that contains charged particles which are free to move to carry electrical or thermal energy.

Covalent bond: A shared pair of electrons between two non-metals.

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Crystallisation: A separation technique to obtain soluble solids from solutions. The process involves heating the solution until crystals start to form, leaving the solution to cool and then filtering the formed crystals from the solution.

Diamond: A giant covalent structure which is made up of carbon atoms, each of which form four covalent bonds with four other carbon atoms.

***Electrode:** A solid conductive material through which electricity can flow. Positive and negative electrodes are used in electrolysis to conduct electricity.

***Electrolysis:** The splitting up of an ionic compound using electricity. The electric current is passed through a substance causing chemical reactions at the electrodes which lead to the decomposition of the materials.

***Electrolyte:** A solution containing free ions from a molten or aqueous ionic substance. The ions are free to move to carry charge.

Electron: Negatively charged subatomic particle which orbits the nucleus at various energy levels. Very small relative mass (negligible).

Electron shell: Different energy levels in atoms, occupied by electrons.

Electrostatic forces: The strong forces of attraction between oppositely charged ions.

Element: A substance made up of only one type of atom.

Empirical formula: The simplest whole number ratio of atoms of each element in a compound.

Filtration: A separation technique used to separate an insoluble solid from a solution.

Fractional distillation: A process used to separate a mixture of liquids. The liquids have different boiling points so can be separated into different fractions within a fractionating column.

Fullerenes: Molecules of carbon atoms with hollow shapes. The structures are based on hexagonal rings of carbon atoms but they may also contain rings with five or seven carbon atoms. Examples include Graphene and C_{60} .

Gas: The state of matter where the particles have the most energy. The particles in a gas are relatively spread out and move randomly in all directions.

Giant covalent structure: A molecular structure containing many atoms covalently bonded together. The strong covalent bonds mean that giant covalent structures have high melting points.



Graphite: A giant covalent structure which is made up of carbon atoms each of which form three covalent bonds with three other carbon atoms, forming layers of hexagonal rings which have no covalent bonds between the layers. There is one delocalised electron per carbon atom which is free to move to carry charge.

Group (periodic table): A column of the periodic table. Elements in the same group have similar chemical properties.

Inert: Unreactive. Inert electrodes are used in electrolysis to prevent the electrode material affecting the reactions. The noble gases are also described as being inert.

Intermolecular forces: The forces which exist between molecules. The strength of the intermolecular forces impact physical properties like boiling/melting point.

Ion: An atom or molecule with an electric charge due to the loss or gain of electrons.

Ionic bond: The bond formed between the oppositely charged ions when a metal atom loses electron(s) to form a positively charged ion and a non-metal gains these electron(s) to form a negatively charged ion.

Ionic compound: Chemical compound formed of oppositely charged ions, held together by strong electrostatic forces.

Isotope: Atoms of the same element with the same number of protons but a different number of neutrons.

Lattice: A repeating regular arrangement of atoms/ions/molecules. This arrangement occurs in crystal structures.

Liquid: The state of matter where the particles are arranged randomly and close together. The particles are able to move past each other.

***Malleable:** Capable of being deformed and moulded into various shapes. Metals are malleable since the uniform layers of atoms can slide over each other.

Mass number: The total number of protons and neutrons in the nucleus.

***Metallic bond:** The bonds present in metals between the positive metal ions and negatively charged delocalised electrons.

Metals: Elements that react to form positive ions. Found to the left and towards the bottom of the periodic table.

Mixture: Contains at least two different elements or compounds which are not chemically bonded together. Mixtures may melt or boil over a range of temperatures.



Mobile phase: The fluid (gas or liquid) which moves through the chromatography system, carrying the mixture which is to be separated.

***Molar volume:** The volume occupied by one mole of gaseous molecules.

***Molar volume at RTP:** The volume occupied by one mole of molecules of any gas at room temperature and pressure (RTP). The molar volume at RTP is 24 dm^3 .

Mole: Standard unit for measuring amounts of chemicals. The mole is the unit for amount of substance. The symbol for the unit mole is mol.

Molecular formula: The actual ratio of atoms of each element present in a compound.

Molecule: A group of at least two atoms held together by covalent bonds.

Noble gases: The elements in Group 0 of the periodic table. They have a stable full outer shell of electrons which makes them very unreactive.

Neutron: Neutral subatomic particle present in the nucleus of the atom. Relative mass of 1.

Non-metals: Elements that react to form negative ions. Found towards the right and top of the periodic table.

Oxidation: A reaction involving the gain of oxygen. Oxidation is the loss of electrons.

Paper chromatography: A type of chromatography which uses paper as the stationary phase and a solvent as the mobile phase. The solvent carries the mixture up the paper where the substances in the mixture then separate, depending on how soluble they are in the mobile phase.

Percentage yield: The percentage ratio of the actual yield of product from a reaction compared with the theoretical yield.

$$\text{Percentage yield} = \frac{\text{Actual yield}}{\text{Theoretical Yield}} \times 100$$

Period (periodic table): A row of the periodic table. Elements in the same period have the same number of electron shells.

Periodic table: Table of elements arranged in order of increasing atomic number and such that elements with similar properties are in the same column (group).

Proton: Positively charged subatomic particle present in the nucleus of the atom. Relative mass of 1.

Pure substance: The chemistry definition of a pure substance is a substance which contains only one compound or element. Pure substances have fixed melting and boiling points.



Reduction: A reaction involving the loss of oxygen. Reduction is the gain of electrons.

Relative atomic mass: An average value that takes account of the abundance of the isotopes of the element.

Relative formula mass: The sum of the relative atomic masses of the atoms in the numbers shown in the formula. It is numerically equal to the mass of one mole of a substance in grams.

R_f value: A value used in chromatography which is calculated as the distance travelled by the dissolved substance divided by the distance travelled by the solvent. It can be used to identify substances within a mixture.

Saturated solution: A solution which contains the maximum amount of solute that can be dissolved in the solvent. If any more solute is added, it will not dissolve in the solution.

Simple distillation: A separation technique used to separate a liquid from a solution. The solution is heated so that only the liquid with the lowest boiling point evaporates. This gas is then condensed in a condenser before being collected as a liquid.

Simple molecules: Molecules containing a fixed number of atoms covalently bonded together. Simple molecular structures have low boiling points since they have weak intermolecular forces which are easy to overcome.

Solid: The state of matter where the particles hold a regular arrangement and have the least amount of energy.

Solute: A substance which is dissolved in a solvent to create a solution.

Solution: A homogeneous mixture in which a solute is dissolved in a solvent.

Solvent: A substance which dissolves a solute.

***Solubility:** The maximum mass of a solute which can be dissolved in 100 g of solvent.

State symbols: The symbols used in chemical equations to denote the states of the chemicals reacting: (s) - solid, (l) - liquid, (g) - gas, (aq) - aqueous solution.

Stationary phase: The nonmoving phase which the mobile phase passes over during chromatography.

Subatomic particles: Particles smaller than an atom. Protons, neutrons and electrons are the three most common subatomic particles.

Water of crystallisation: Water molecules forming part of a crystal structure.

