A

Activation energy
The minimum amount of combined total kinetic energy a colliding pair of ions, atoms or molecules require for a chemical reaction to occur. It may be thought of as the size of the energy barrier that has to be overcome to form the transition state.

Active site
The region of an enzyme, usually a pocket or groove, that binds the substrate molecule(s) and catalyses a reaction.

Active transport
An energy-requiring process that involves the transport of ions or molecules across a cell membrane, usually in the direction of increasing concentration (that is, against a concentration gradient).

Acyclic
Molecules that have an open-chain molecular structure rather than a ring-shaped structure.

Acyl group
A group of atoms fitting the general formula, RCO-, where R is typically a benzene ring or alkyl group.

Acylation
The introduction of an acyl group into an organic molecule.

Addition
A reaction in which two (or more) molecules combine together to form a single molecule. Alkenes undergo addition reactions which involve atoms and/or groups of atoms adding to opposite faces of a carbon-carbon double bond. They are characteristic of unsaturated compounds, such as the alkenes and carbonyl compounds.

Addition polymerisation
A type of polymerisation which occurs when alkene-based monomers undergo repeated addition reactions to form a single molecule.

Adsorption
The accumulation, usually temporarily, of gases, liquids, or solutes on the surface of a solid or liquid through the formation of weak intermolecular interactions.

Aerobic
Containing or requiring molecular oxygen.

Air pollutant
a substance present in sufficient concentration in the air to produce a harmful effect on humans or other animals, vegetation or materials

Alcohols (monohydric)
A homologous series of organic compounds containing the functional group –OH and the general formula $C_nH_{2n+1}OH$.

Aldehydes
A homologous series of compounds with the general formula, RCHO, where the –CHO group (the aldehyde group) consists of a carbonyl group attached to a hydrogen atom. R is an alkyl or aryl group.

Algal bloom
Rapid growth of algae on the surface of freshwaters in response to a supply of nitrogen and/or phosphorus, leading to depletion of light and oxygen below the water surface.

Alginates
Salts of alginic acid, a hydrophilic colloidal carbohydrate which is extracted from marine kelp.

Alkali
An alkali is a strong base which is soluble in water. Alkalis are Group 1 metal hydroxides, aqueous solution of ammonia, aqueous solution of amines and barium hydroxide.

Alkali metals
The group of very reactive metals in Group 1 of the Periodic Table. They react with water to release hydrogen gas and form strongly alkaline solutions:

Alkaline earth metals
The group of reactive metals in Group 2 of the Periodic Table. They all react with water to give suspensions of their hydroxides.

Alkaline solution
An alkaline solution is an aqueous solution that has an excess of hydroxide ions.

Alkaloid
nitrogen containing organic compound of plant origin whose structure consists of a tertiary amine group heterocyclic rings such as cocaine, codeine, caffeine and morphine

Alkanals (aldehyde)
A homologous series of compounds with the general formula, RCHO, where the –CHO group (the aldehyde or alkanal group) consists of a carbonyl group attached to a hydrogen atom.

Alkanes
Saturated hydrocarbons which have the general formula C_nH_{2n+2}(if acyclic).

Alkanoic (carboxylic) acids
A homologous series of organic compounds with the general formula RCOOH. They can be formed by the oxidation of a primary alcohol or alkanal (aldehyde).

Alkanones (ketones)
A homologous series of compounds with the general formula RCOR', having two alkyl groups bonded to a carbonyl group.

Alkenes
Unsaturated hydrocarbons a carbon-carbon double bond and with the general formula C_nH_{2n} (if acyclic).

Alkylation
The introduction of an alkyl group into an organic molecule.

Alkyl group
A group, with the general formula C_nH_{2n+1}, obtained by removing a hydrogen atom from an alkane, and usually represented by R.

Alkynes
Unsaturated hydrocarbons with a carbon-carbon triple bond and with the general formula C_nH_{2n-2} (if acyclic).

Allotropy
The ability of an element to exist in different crystalline forms or allotropes.

Alloy
A mixture which is made up of two or more metals, or which contains metals and carbon.

Alpha helix
A right-handed helical conformation of a protein chain, held together by intra-molecular hydrogen bonding. It is a common protein secondary structure.

Alpha decay
Alpha decay is the emission of an alpha particle from the nucleus of a radioactive atom. Alpha decay results in a decrease of the atomic number by two and an increase in the mass number by four.

Alpha particle
An alpha particle ($^4_2He^{2+}$) is a helium nucleus or ion emitted by an atom undergoing alpha decay.

Amalgam
An alloy which contains mercury. They may be solid or liquid depending on their composition.

Amide (primary)
A homologous series of organic compounds with the general formula $RCONH_2$.

Amine
Organic compounds derived by replacing one or more of the hydrogen atoms in ammonia by alkyl groups. All are basic and react with acids to form amine salts.

α-Amino acid
A group of soluble organic compounds that possess a carboxylic acid group (-COOH) and a primary amine group ($-NH_2$) bonded to a common carbon atom. α-amino acids are the monomers of proteins. They are also known as 2-amino acids.

Amino group
The $-NH_2$ functional group found in primary amines and amino acids.

Amino-terminal residue (N-terminus)
The amino acid residue at one end of a polypeptide chain that contains a free amino group.

Ammine
A complex ion in which ammonia molecules act as ligands and are coordinated to a metal ion.

Amount
A physical quantity indicating the number of moles of a substance present in a sample.

Amphetamines
Synthetic amines which stimulate the central nervous system (brain and spinal cord) and make people feel more alert.

Amphiprotic
A solvent, for example, water, which undergoes self-ionisation and can act as both a proton donor and proton acceptor.

Amphoteric
A chemical species capable of accepting and donating protons, thus able to behave as both as an acid and a base.

Amphoteric oxide
An oxide of a metal that will react and dissolve in a solution of an acid and a solution of a strong base (alkali). They can react as both acidic and basic oxides.

Amylopectin
The water-soluble component of starch. It consists of highly branched chains of glucose molecules.

Amylose
The water-insoluble component of starch. It consists of between 100 and 1000 linear chains of glucose molecules.

Anabolic steroid
A group of synthetic hormones that promote the storage of protein and the growth of tissue, sometimes used by athletes to increase muscle size and strength.

Anaerobic
Lacking or not requiring molecular oxygen.

Analyte
A sample component whose concentration is being measured (i.e. analyzes).

Anaesthetic
A substance which reduces or removes the feeling of pain.

Analgesic
A drug used to alleviate the sensation of pain.

Anion
A negatively charged ion which migrates to the anode (positive electrode) during electrolysis.

Anode
The anode is where oxidation (the loss of electrons) occurs during an electrochemical process. In an electrolytic cell the anode is the positive electrode. In an electrochemical cell the anode supplies electrons since oxidation has occurred in that half cell. It is therefore the negative electrode of the cell.

Anodising
A process for protecting aluminium with a thin oxide layer formed in an electrolytic cell containing dilute sulfuric acid where the aluminium object is the anode..

Anomers (of a sugar)
Two stereoisomers which differ only in the configuration about the carbonyl carbon atom.

Antacids
Substances, basic in nature, used to reduce the pH of the gastric juice in the stomach with the aim of relieving indigestion.

Antibiotic
A substance or a semi-synthetic substance derived from a microorganism, usually a bacterium or fungus, and able in dilute solution to inhibit or kill another microorganism, usually a bacterium.

Antibody
A defence protein synthesised by the immune system.

Antifoulant coating
coating to hulls of ships below the water line to stop plants and marine life forms attaching to the hull

Antioxidant
A chemical compound or substance that inhibits oxidation.

Anti-pyretic
a drug that reduces fever

Antiviral
Natural or synthetic substance that kills viruses directly or prevents their replication.

Aqua-ions
Transition and aluminium metal ions in aqueous solution are bonded to six molecules of water to form octahedral complex ions. The bonds are co-ordinate (dative) covalent bonds from the water ligands.

Aqueous solution
A solution in which the water is the solvent.

Aromatic compound
A compound containing one (or more) benzene rings in its structure and typified by its propensity to undergo substitution reactions.

Arrhenius constant
A constant that appears in the Arrhenius equation in front of the exponential term. It is a term which includes the frequency of collisions and their orientation in space.

Arrhenius equation
An equation that relates the rate constants for a reaction obtained at different absolute temperatures to the activation energy of the reaction.

Arrhenius plot
A plot of the natural logarithm of the rate constant (y-axis) against 1/(absolute temperature) (x-axis). A straight line will be obtained with a gradient of $-\frac{E_a}{R}$. The value of the activation energy, Ea, will be in J mol-1.

Arrhenius temperature dependence
A rise in temperature results in an increase in the rate constant, thereby increasing the rate of reaction. For many reactions (with an activation energy ~50 kJ mol^{-1}) a rise in temperature of ten degrees Celsius leads to an approximate doubling of the initial rate. Reactions that follow this dependence are said to exhibit Arrhenius temperature dependence.

Arrhenius theory
The theory of acidity and alkalinity that defines an acid as a solution containing hydrogen ions as the positive ions and an alkali as a solution as one containing hydroxide ions as the only negative ions.

Aryl group
A group derived by removing a hydrogen atom from a benzene ring, or other aromatic structure.

Asymmetric carbon atom
A common term for a carbon atom that is attached to four different atoms or groups of atoms.

Asymmetric molecules
Molecules with no centres, axes or planes of symmetry. Asymmetric molecules are chiral and can exist as a pair of enantiomers or optical isomers.

Atactic
A polymer chain in which the substituents, or side chains, are randomly distributed along the chain.

Atmospheric pressure
The pressure exerted by the atmosphere on the surface of the Earth due to the weight of the atmosphere.

Atom
The smallest particle of an element that can take part in a chemical reaction. All atoms of the same element have the same number of protons in the nucleus.

Atomicity
The number of atoms in a molecule.

Atomic mass
The weighted average mass (according to relative abundances) of all the naturally occurring isotopes of an element compared with an atom of the $^{12}_{6}C$ carbon isotope which has a mass of exactly 12.

Atomic number
The number of protons in the nucleus of an atom.

Atomic radius
Half the distance of the closest approach of atoms in the crystal or molecule of a chemical element (for a particular allotrope).

Atomic theory
The theory that all substances are composed of atoms (that cannot be created or destroyed).

Atomisation
The process in which an element or compound is converted into gaseous atoms.

Atmosphere
The unit atmosphere is used to measure pressure. 1 atm = 101,325 Pa. It is, however, not an SI unit.

Aufbau principle
A principle that the order in which orbitals are filled with electrons is the order of increasing energy.

Autocatalysis
Autocatalysis occurs when the product of a reaction acts as a catalyst in the reaction and causes its rate to increase.

Auto-oxidation
The direct combination of a substance with molecular oxygen at ordinary temperature.

Avogadro constant, NA
The Avogadro constant (6.02×10^{23}) is the number of atoms in exactly 12 grams of carbon-12. It has units of per mol (mol^{-1}).

Azeotrope
A mixture of liquids that will distil without changing in composition. When a mixture that forms a low-boiling point is distilled, the vapour has the composition of the azeotropic mixture.

Avogadro's law
The law states that at a specified temperature and pressure, equal volumes of (ideal) gases contain equal numbers of moles of particles. There is a directly relationship between the volume of gas, V, and the amount of particles, n: $V \alpha n$.

B

Back titration
A back titration typically consists of two consecutive acid-base titrations and is performed when an insoluble and slowly reacting reagent is treated with an excess of an acid or base. The excess acid or base is then titrated with base or acid solution of a primary standard.

Backward reaction
The backward reaction refers to the conversion of products into reactants in an equilibrium reaction.

Bacteriophage
A virus capable of replicating in a bacterial cell.

Bacterium

A single celled organism lacking a nucleus.

Bacterial infections
infections caused by bacteria include tetanus, tuberculosis (TB), cholera, typhoid fever, syphilis, gonorrhea.

Balanced equation
A summary of a chemical reaction using chemical formulas. The total number of any of the atoms or ions involved is the same on the reactant and product sides of the equation.

Balmer series
A series of lines in the emission spectrum of visible light emitted by excited hydrogen atoms. The lines correspond to the electrons falling down into the second lowest energy level, emitting visible light.

Barbituates
drugs which depress the central nervous system.

Base (DNA or RNA)
One of the nitrogen-containing compounds that occurs attached to the sugar component of DNA or RNA.

Base
A substance which neutralises an acid, producing a salt and water as the only products. Common bases are aqueous ammonia, amines, carbonate ions and the oxides and hydroxides of metals. In the Brønsted-Lowry theory a base is a proton acceptor; a Lewis base is an electron donor.

Base dissociation constant
The equilibrium constant for the reaction in which base reacts with water to produce the conjugate acid and hydroxide ions. It is a measure of the extent to which weak bases accept hydrogen ions in solution.

Base pair
two nucleotides in nucleic acid chains that are paired together by intermolecular hydrogen bonding between the bases.

Basic oxide
An ionic oxide, usually an oxide of a metal, that reacts with acids to form salts and water. Some basic oxides react with water to form alkaline or basic solutions.

Basic oxygen convertor
In the basic oxygen process scrap steel and a small amount of limestone are dissolved in molten iron. Pure oxygen is then blown into the molten mixture to remove impurities.

Base pair
Two nucleotides in nucleic acid chains that are paired together by intermolecular hydrogen bonding between the bases.

Batch process
A process which produces a specified amount of a product in a single operation.

Battery
A group of galvanic or electrochemical cells connected in series or in parallel.

Beer-Lambert law
The concentration of a substance in moles is proportional to the absorbance of a given wavelength of light by a solution of the substance (provided the solution is dilute). $A=\varepsilon cl$, where c is the concentration of the substance and l is the length of the radiation through the substance. T

Bergius process
A process formerly used for making hydrocarbon fuels from coal. A powdered mixture of coal, heavy oil and a catalyst was heated with hydrogen at high pressure.

Beta(-) particle
A high speed electron ejected from the nucleus following the decay of a neutron into a proton.

beta-lactam ring
heteroatomic four-membered ring structure consisting of one nitrogen atom and three carbon atoms

Beta sheet
An extended, zigzag arrangement of a protein chain; a common secondary structure held together by intramolecular hydrogen bonding.

Bidentate ligand
A ligand able to form two coordinate (dative) covalent bonds with a central metal atom or ion.

Bimolecular
An elementary step in a reaction involving the collision between two reactant species to form one large particle or two particles.

Bimolecular layer
A structure, such as a cell membrane, consisting of two molecular layers.

Binary compound
A compound that contains only two elements.

Binary liquid mixture
A mixture that consists of two miscible liquids which mutally dissolve in each other.

Biological oxygen demand (BOD)
This is the amount of oxygen taken up by bacteria that decompose organic waste in water. The BOD is calculated by keeping a sample of water containing a known amount of oxygen for five days at 20°C. The oxygen content is then measured again after this time. A high BOD value indicates the presence of a large number of micro-organisms, which suggests a high level of pollution. Unpolluted water has a very low BOD value.

Biogas
Methane gas produced by the action of bacteria on animal and plant wastes under anaerobic conditions (absence of oxygen).

Biotechnology
The use of microorganisms, such as bacteria or yeasts, or biological substances, such as enzymes, to perform specific industrial or manufacturing processes.

Blast furnace
A furnace in which iron oxide is reduced to iron by tradiationally using a very strong blast of air to produce carbon monoxide from coke, and then using this gas as the active reducing agent for the iron.

Bleach
A substance used to decolourise materials by a process of oxidation or reduction.

Bohr theory
A classical model of atomic structure with energy levels for electrons.

Boiling
The change of a liquid into a gas at constant temperature. This occurs when the vapour pressure of the liquid is equal to the external pressure exerted on the liquid. It is characterised by the appearance of bubbles of vapour throughout the liquid.

Boiling point
The temperature at which a liquid is converted to a gas at the same temperature; a liquid boils when the vapour pressure of the liquid equals the surrounding pressure.

Bomb calorimeter
A device used to measure energy changes (at constant volume) that occur when substances, for example, alcohols or hydrocarbons, are burnt in excess oxygen in a sealed container.

Bond angle
An angle formed by the location of three atoms or two covalent bonds in space. They are used to describe the shapes of molecules.

Bond enthalpy
The bond enthalpy is the amount of energy (in kiloJoules) required to break one mole of a particular covalent bond in the gaseous state into gaseous atoms (under standard thermodynamic conditions). It is a measure of the strength of the bond.

Bond length
The equilibrium distance between the nuclei of two atoms linked by a covalent bond or bonds.

Bond order
A theoretical index of the degree of bonding between two atoms relative to that of a normal single bond, that is, the bond provided by one localised electron pair. In the valence-bond theory it is a weighted average of the bond numbers between the respective atoms in the contributing structures.

Bonding pair
A pair of electrons (with opposite spins) located in the space between the nuclei of two adjacent atoms.

Born-Haber cycle
An energy or enthalpy cycle commonly used in calculating the lattice energies of ionic solids. It is a series of reactions (and the accompanying enthalpy changes) which, when summed, represents the hypothetical one-step reaction in which elements in their standard states are converted into crystals of the ionic compound (and the accompanying enthalpy changes) under standard thermodynamic conditions.

Boyle's law
The gas law stating that the product of pressure and volume (for a fixed mass of ideal gas at constant temperature) is a constant.

Brady's reagent
A solution of 2,4-dinitrophenylhydrazine in either hydrochloric or phosphoric acid. It is used to test for the carbonyl group in aldehydes or ketones and to identify the aldehyde or ketone via the formation of a 2,4-dinitrophenylhdrazone derivative with a characteristic melting point.

Breathalyser
An instrument for estimating the concentration of alcohol in the blood by measuring the concentration of ethanol in a sample of the air from the lungs.

Breeder reactor
A nuclear reactor in which fissionable fuel is produced while the reactor runs.

Brine
A concentrated aqueous solution of sodium chloride. It is used to make sodium hydroxide and sodium chlorate(I), a bleach.

Broad spectrum antibiotic
An antibiotic that is effective against a wide range of strains of bacteria.

Bromination
A reaction in which a bromine atom or a pair of bromine atoms is introduced into a molecule of benzene, alkane or alkene.

Bromine water
An aqueous solution of bromine that contains hydrated bromine molecules and bromic(I) acid. It is commonly used to test for the presence of a carbon-carbon double bond, which turns the yellow/orange solution colourless.

Brønsted-Lowry theory
A theory of acidity that describes an acid as a proton or hydrogen ion donor, and a base as a proton or hydrogen ion acceptor.

Buffer
A buffer is an aqueous solution consisting of a weak base and its conjugate acid that resists a change in pH when small amounts of either hydroxide ions (from a base) or hydrogen ions (from an acid) are added. Buffers typically consist of a weak acid and its corresponding salt (an acidic buffer) or a weak base and its corresponding salt (a basic buffer).

Buffer capacity
The ability of a buffer to absorb hydrogen ions or hydroxide ions without a significant change in pH. It is determined by the concentrations of the weak acid and its conjugate base.

By-products
Unwanted products of a chemical synthesis or manufacturing process.

C

Caffeine
A drug that exerts its central nervous system stimulant action by working inside nerve cells to increase their rates of cellular metabolism.

Calibration
A quantitative procedure performed in order to relate the known concentration of standard solutions of the analyte to the detector signal which is generated from the analyte in the unknown solutions.

Calibration curve
The relationship of instrument response (absorbance) as a function of concentration. Ideally, this should be a linear relationship, under conditions that obey Beer's Law, where absorbance = (slope x concentration) + intercept.

Calorie
A calorie is notionally the energy required to raise the temperature of 1 g of water by 1 °C.

Calorific value
The amount of heat released by a unit mass of a substance, for example, a food, (or of a unit volume of gas) being burnt.

Calorimeter
A piece of insulated apparatus for measuring the energy released or absorbed during a chemical reaction.

Capacity (of a galvanic cell)
The capacity of a cell or battery is measured by the number of amp-hours (Ah) of charge it can deliver.

Caramelisation
Caramelisation is the oxidation of sugar, a process used extensively in cooking for the resulting nutty flavour and brown colour. Caramelisation is a type of non-enzymatic browning reaction and as the process occurs, volatile chemicals are released producing the characteristic caramel flavour. Caramelisation is a complex, poorly understood process that produces hundreds of chemicals. The reactions occurring include: inversion, condensation, dehydration and fragmentation.

Carbocation
A carbocation is an organic ion with a positive charge on an electron deficient carbon atom. They are intermediates during nucleophilic substitution via an SN1 mechanism or electrophilic addition to alkenes.

Carbohydrate
Carbohydrates are organic compounds that contain the elements carbon, hydrogen and oxygen. The ratio of hydrogen to oxygen atoms is usually 2:1 and their formulas are of the form $C_x(H_2O)_y$.

Carbon cycle
The combined processes, including photosynthesis, combustion and respiration (including that in decomposition), by which carbon as a component of various compounds alternates between its major reservoirs the atmosphere, oceans, and living organisms.

Carbonyl
The functional group, >C=O, which occurs in aldehydes, ketones, amides and carboxylic acids. However, the characteristic properties of carbonyl compounds, for example, condensation reactions, are only exhibited in aldehydes and ketones

Carboxylic acid
(See alkanoic acid).

Carboxyl-terminal residue
The only amino acid residue at one end of a polypeptide chain that contains a free carboxyl group.

Carcinogen
A substance that causes or induces cancer.

Carrier gas
The inert gas used to carry the sample in gas chromatography (GC).

Cast iron
The solidified iron direct from the blast furnace. It is brittle, but very hard.

Catalyst
A substance which, when present in relatively small amounts, increases the rate of a chemical reaction but which is not consumed during the overall process. The function of a catalyst is to provide a new reaction pathway with a lower activation energy.

Catalysis
A reaction process accelerated by the presence of a substance (a catalyst) which is neither consumed nor produced during the overall reaction.

Catalytic convertor
Part of the exhaust system of a modern car running on unleaded petrol. It consists of a platinum/rhodium catalyst in a honeycomb structure which converts carbon monoxide, nitrogen monoxide and unburnt hydrocarbons into carbon dioxide, nitrogen and dinitrogen oxide.

Catalytic cracking
Cracking carried out in the presence of a heated catalyst, for example, aluminium oxide (alumina) or silicon dioxide (silica).

Catalytic methanation
Methanation is used to remove residual carbon monoxide and carbon dioxide from synthesis gas. It involves passing the pressurised gas over a heated nickel catalyst.

Cathode
The cathode is where reduction (the gain of electrons) occurs during an electrochemical process. In an electrolytic cell the anode is the negative electrode. In an electrochemical cell the cathode consumes electrons since reduction has occurred in that half cell. It is therefore the positive terminal or pole of the cell.

Cation
A positively charged ion attracted to the cathode during electrolysis.

Cation exchange
The process by which a cation in a liquid phase exchanges with another cation present as the counter-ion of a negatively charged solid polymer (cation exchanger).

Cation exchange capacity
The cation exchange capacity (CEC) is a value given on a soil analysis report to indicate its capacity to hold cation nutrients.

Cell diagram
A shorthand form of summarising the electrodes and electrolytes present in an electrochemical cell. The cell diagram traces the path of the electrons. The reduced form of the metal to be oxidised at the anode is written first, followed by its oxidised form, then the oxidised form of the metal to be reduced at the cathode, and finally the reduced form of the metal at the cathode.

Cell potential
The cell potential is the potential difference between the two electrodes (in their standard states) of an electrochemical cell.

Celsius scale (of temperature)
This scale of temperature is based on a one hundred degree range between the normal melting point of pure ice (0 °C) and the normal boiling point of pure water (100 °C).

Chain reaction (chemical)
A chain reaction occurs when a reaction intermediate generated in one step reacts in such a way that this intermediate is regenerated.

Change of state
The inter-conversion of a substance between the solid, liquid and gaseous states.

Charge density (of a metal ion)
The ratio of the charge of a metal ion to its radius. The higher the charge density the greater its polarising power on neighbouring water molecules and the lower the pH of the resulting solution.

Charles' law
The gas law stating that the volume of a fixed mass (at constant pressure) of an ideal gas is directly proportional to absolute temperature.

Chemical compound
A substance formed by the chemical combination of two or more chemical elements in fixed proportions.

Chemical element
A substance which cannot be decomposed or broken down into simpler substances by chemical methods; all the atoms of an element contain the same number of protons.

Chemical environment
The chemical environment refers to the number and types of atoms a particular atom within a molecule is bonded to.

Chemical feedstock
The raw materials required for an industrial process.

Chemical library
A large collection of molecules prepared by conventional chemical synthesis or, more usually, combinatorial chemistry.

Chemical reaction
A change in which a new substance or substances are formed.

Chemical shift (δ)
The position of a resonance in the NMR spectrum relative to a standard such as TMS (tetramethylsilane).

Chemical symbol
A chemical symbol consists of one or two letters used to represent each element. The first (or only) letter is always a capital letter, the second a lower case.
Chemotherapy
The use of chemical agents in the treatment or control of disease, particularly cancer, or mental illness.

Chiral (asymmetric) centre
An atom, usually a carbon atom, in a molecule that is attached to four different atoms and/or functional groups.

Chiral molecule
A molecule that is non-superimposable on its mirror image.

Chiral auxillary
A chiral auxiliary is a chiral compound that is covalently attached to the substrate as a controlling factor in a diastereo-selective reaction and is subsequently cleaved from the product.

cis-
Used to describe geometric isomers of 1,2-disubstituted alkenes with functional groups or atoms which are on the same side of the molecule as each other.

***cis-trans* isomerism**
Cis-trans isomerism is a form of stereo-isomerism and describes the orientation of functional groups at the ends of a bond around which no rotation is possible.

Chlor-alkali industry
The chlor-alkali industry refers to the industrial electrolysis of brine which results in the production of sodium hydroxide and chlorine.

Chlorination
The addition of chlorine to drinking water in order to kill harmful bacteria. It also refers to a reaction in which a hydrogen atom in an organic molecule is replaced with a chlorine atom.

Chlorofluorocarbons (CFC)
Chloroflurocarbons are a group of compounds in which some or all of the hydrogen atoms of an alkane have been replaced (substituted) by chlorine and fluorine atoms. They are involved in ozone depletion.

Cholesterol
An important steroid; a key component of cell membranes and precursor for other steroids

Chromatography
A technique for analysing or separating mixtures of gases, liquids, or dissolved substances based upon differential solubility in two phases.

Chromatogram
A record obtained from chromatography.

Chromophore
A group of atoms responsible for absorbing electromagnetic radiation. They usually have delocalised π electrons.

Chromoprotein
One of a group of conjugated proteins, consisting of a combination of pigment (that is, a coloured prosthetic group) with a protein.

Closed system
A closed system is one in which matter and energy cannot be lost or gained from the system. It is a pre-requisite for the establishment of an equilibrium.

Coal
A brown or black deposit composed largely of carbon. It is a fossil fuel formed by the action of heat and pressure on the remains of plants buried under sediments.

Coal gasification
Coal gasification is a process for converting coal partially or completely to combustible gases. After purification, these gases - carbon monoxide, carbon dioxide, hydrogen, methane, and nitrogen - can be used as fuels.

Coal liquification
Coal liquification is a process for converting coal into liquid fuels. The basic process of liquification is that pulverised coal is mixed with a liquid to form a slurry mix which is combined with hydrogen in a reactor. This is treated with heat, pressure and chemical catalysts to produce liquids and gases which can be made into a variety of synthetic fuels.

Coefficient
The coefficients are the numbers that appear to the left of chemical formulas in a balanced equation.

Coenzyme
An organic co-factor required for the action of certain enzymes; often contains a vitamin as the component.

Cofactor
The inorganic complement of an enzyme reaction, usually a metal ion.

Coke
The material left behind when volatile components in coal have been removed by heating. It contains a very high percentage of carbon.

Colligative property
A colligative property is a physical property that depends on the number of solute species present, but not on their chemical identity.

Colloid
A colloid is a dispersion of small particles (less than 500 nm in diameter) of one material in another.

Collision theory
Collision theory is a simple model that accounts for the variation in the rate of reaction with temperature and concentration. It considers particles to be hard spheres that react with each other when they collide with sufficient kinetic energy.

Colorimeter
A device for measuring the concentration of coloured substances in solution by passing visible light through the solution.

Combinatorial Chemistry
the automated, parallel synthesis of a ibrary of chemical structures, usually drug leads. This is in contrast to the traditional approach of synthesising different compounds one at a time, manually.

Combined gas law
The gas law that combines absolute temperature, pressure and volume, but not the amount of gas.

Combustion
A highly exothermic and rapid chemical reaction in which a substance reacts with oxygen during burning.

Combustion analysis
Combustion analysis is a method for determining the empirical formula of a compound via a series of weighings before and after complete combustion.

Common ion effect
The common ion effect is an application of Le Chatelier's Principle. According to Le Chatelier's Principle the equilibrium will respond so as to counteract the effect of the added common ion. This means that the equilibria will shift so that the common ion will be reduced which means a shift to the left thus reducing the solubility of the slightly soluble salt system.

Competitive inhibition
A competitive inhibitor generally competes with the substrate for the enzyme's active site. The percentage of competitive inhibition at fixed inhibitor concentration can be decreased by increasing the substrate concentration. At high concentrations of the substrate it is possible to reach V_{max} even in the presence of the inhibitor; however, the value of KM is decreased.

Complementary colours
One of two colours so related to each other that when blended together they produce white light; so-called because each colour makes up to the other what it lacks to make it white.

Complete protein
A protein that provides all of the essential amino acids.

Completion
Complete consumption of at least one of the reactants in a chemical reaction. A reaction goes to completion if its limiting reactant or reagent is consumed.

Complex ion
A chemical species typically consisting of a metal ion, usually a transition metal ion, surrounded by a fixed number of ligands which form dative or coordinate covalent bonds with vacant orbitals in the metal ion.

Concentrated
A concentrated solution contains a relatively high concentration of solute.

Concentration
The ratio of the amount (or mass) of a substance dissolved in a given volume of solution. Concentrations of solution are typically expressed in g dm-3 or mol dm-3.

Condensation (chemical)
An addition reaction immediately followed by an elimination reaction.

Condensation polymerisation
A type of polymerisation which involves the elimination of small molecules, usually water.

Condensing
The change of a vapour into a liquid (at constant temperature); during this process latent heat is released to the surroundings.

Configuration
The spatial arrangement of atoms or functional groups within a molecule.

Conjugate acid
The chemical species formed when a proton or hydrogen ion is accepted by a base.

Conjugate acid-base pair
Two chemical species related to each other by the loss or gain of a single proton or hydrogen ion.

Conjugate base
The chemical species formed when an acid loses a proton or hydrogen ion.

Conjugated molecules
Conjugated molecules have double or triple bonds that are separated by one single bond. There is delocalisation of electrons in the π orbitals between the carbon atoms linked by the single bond.

Contact process
An industrial process for the manufacture of sulfuric acid. Sulfur dioxide and air are passed over a heated vanadium(V) oxide catalyst to produce sulfur trioxide which is then dissolved in sulfuric acid to form disulfuric acid which is diluted to produce sulfuric acid.

Continuous spectrum
An emission spectrum that exhibits all the wavelengths or frequencies of visible light.

Control rods
Rods of materials such as cadmium or boron steel that act as neutron absorbers and are used in nuclear reactors to control neutron flows and therefore rates of fission.

Convergence
Convergence occurs as the lines in an emission spectrum become progressively closer to each other (at higher frequency or smaller wavelength) and finally merge.

Cooling curve
A plot of temperature against time for a substance where heat energy is being lost to the surroundings.

Coordinate (dative) bond
A dative covalent bond is formed when one of the atoms supplies both electrons of the shared pair.

Coordination number
The number of ligands surrounding a central metal ion, or the number of nearest neighbours an atom, molecule or ion has in a crystal structure.

Co-polymer
A polymer formed from two or more different monomers.

Core electron
An inner electron in an atom; an electron not in the outer or valence shell.

Corrosion
The process by which a metal undergoes oxidation by air and water.

Coulomb
The SI unit of electrical charge. One coulomb of charge is passed around a circuit when a current of one Ampere is allowed to flow for one second.

Covalent bonding
A chemical bond formed by the sharing of one or more pairs of electrons (with paired spins) between two atoms. Covalent bonds are typically formed between two or more non-metals in molecules and giant covalent structures. The strength of the bond stems from the electron density located between the two nuclei.

Covalent radius
The covalent radius is half of the inter-nuclear distance between two covalently bonded atoms. If the two atoms in the covalent bond are identical, then the covalent radius is equivalent to half the covalent bond length.

Cracking
The process of breaking down long chain alkanes into smaller alkanes and alkenes using heat, usually in the presence of a catalyst.

Critical point
The temperature and pressure at which the liquid and gaseous phases of a pure stable substance are in equilibrium. A liquid does not exist above the critical temperature, and heating a liquid in a container to a temperature above its critical point will result in the disappearance of the physical surface between the two phases.

Cross linking
The existence of covalent bonds between adjacent chains in a polymer, thus strengthening the material.

Crude oil or petroleum
A mixture of hydrocarbons formed originally from marine animals, found beneath the ground trapped between layers of sedimentary rock. It is obtained by drilling.

Curly arrow
An arrow used to show the notional movement of a pair of electrons in a reaction mechanism. The tail of the arrow shows where the electrons come from and the head where they go to.

Current
The rate of flow of electric charge or electrons through a conductor. It is measured in coulombs per second or Amperes.

Cyclic
Molecules having atoms arranged in a ring or closed-chain structure.

Cyclisation
The formation of a cyclic compound from a straight chain compound.

Cyclo-alkane
An alkane containing a ring.

Cystine
A molecule resulting from the enzyme-controlled oxidation reaction between the sulfhydryl (–SH) groups of two adjacent cysteine molecules.

D

Dalton's law of partial pressures
The total pressure a mixture of ideal gases exerts is the sum of the partial pressures of all the component gases.

Daniell cell
A voltaic or galvanic cell consisting of a copper cathode immersed in 1 mol dm^{-3} copper(II) sulfate solution and a zinc anode immersed in 1 mol dm^{-3} zinc sulfate. They are connected via as salt bridge and an external circuit. It has a standard potential of 1.10 V and is named after JF Daniell, who first constructed the first cell of this type.

Dative covalent bond
A dative covalent bond is formed when one of the atoms supplies both electrons of the shared pair.

d-block metals
A group of transition metals located between groups 2 and 3/13 of the Periodic table. The majority of the d-block metals have two s electrons and d-electrons in the inner shell.

d-d transition
An electronic transition between two d-orbitals. Such transitions are responsible for the colours of many transition metal ions.

Deactivating group
In Organic chemistry, it is a substituent that when present in a benzene ring makes the resulting molecule undergo electrophilic substitution at a slower rate than benzene itself.

Degenerate orbitals
A group of orbitals with the same energy.

Dehydrating agent
A substance that removes water or the elements of water from a compound.

Dehydration
The removal of water or elements of water (that is, hydrogen and oxygen in a 2:1 ratio) to form a new compound.

Deliquescence
The property shown by some salts of absorbing sufficient water from the atmosphere to form a solution.

Delocalisation (of electrons)
Molecules or ions that have p orbitals extending over three or more atoms. Metallic bonding involves the delocalisation of valence electrons between all the ions within a crystal.

Denaturation
Partial or complete unfolding of a protein chain (or nucleic acid). The process is usually reversible and is brought about by heat and a variety of chemicals.

Density
Density is defined as mass per unit volume.
$\text{Density} = \frac{\text{mass}}{\text{volume}}$.

Deoxyribonucleic acid
A large nucleotide polymer having a double helical structure with complementary bases on the two strands. Its major functions are protein synthesis and the storage and transport of genetic information.

Depressant
A drug that reduces excitability and calms a person by producing functional slowing of the brain or spinal cord.

Deprotonation
The loss of a proton from a chemical species.

Desalination
The removal of dissolved salts from an aqueous solution.

Designer drug
A drug with properties and effects similar to a known hallucinogen, steroid or narcotic but having a slightly altered chemical structure, created in order to evade restrictions against illegal substances.

Detection Limit
The minimum amount of an analyte that can be detected reliably.

Detergent
Water-soluble mixtures that can emulsify grease and via this action remove dirt.

Deuterium
The isotope of hydrogen having a single neutron in the nucleus.

Diaphragm cell
An industrial electrolytic cell in which a porous diaphragm is used to separate the electrodes thereby allowing electrolysis of sodium chloride solution, without allowing the products to react.

Diatomic molecule
A molecule containing two atoms of the same element covalently bonded together.

Diffusion
The spontaneous movement of gas or liquid particles from a region where they are at high concentration to a region where they are at low concentration.

Dilute
A dilute solution contains a relatively low concentration of solute.

Dilution
The process of adding more solvent, usually water, to a solution to lower the concentration.

Dimer
A molecule formed by the bonding of two identical monomers. The bonds will be relatively strong hydrogen bonds or covalent bonds.

Dimerisation
The linking together of two molecules.

Dioxins
Toxic chemicals formed during the high temperature combustion of chloro-organic matter. They persist in the environment and contain chlorine atoms bonded to benzene rings.

Dipolar ion
An ion whose positive and negative charges are separated from each other

Dipole
A pair of separated opposite electrical charges located on a pair of atoms within a molecule.

Dipole-dipole forces
The weak intermolecular forces that exist between non-polar molecules when they are arranged so that the positive and negative ends can interact.

Diprotic
An acid which contains two replaceable hydrogen atoms per molecule. (Also known as dibasic).

Directing effect
In Aromatic Chemistry, this is the ability of substituent functional groups to direct further substitution to certain positions on the benzene ring during the electrophilic substitution of benzene derivatives.

Disaccharide
A carbohydrate consisting of two covalently joined monosaccharide units.

Discharge
the conversion of ions to atoms or molecules during electrolysis.

Displacement reaction
A redox reaction in which a more reactive element displaces a less reactive element from a solution of its ions or salt, often in aqueous solution.

Displacement Reactions (halogens)
A redox reaction in which a more reactive halogen displaces a less reactive halogen in the form of its halide (or salt).

Disproportionation
The simultaneous oxidation and reduction of a single chemical element to produce two products.

Dissociation
The splitting of a molecule into two or more smaller fragments, which could be atoms, molecules, ions of radicals.

Dissociation (of an acid)
The breakdown of an acid molecule into ions in the presence of water.

Distillation
The process of boiling a liquid and condensing the vapour.

Disulfide bridge
A covalent bond (-S-S-) formed (in the presence of an enzyme) between two protein adjacent chains by the reaction between sulfhydryl groups (-SH) of two cysteine residues.

Diuretic
A substance that leads to an increase in the discharge of urine.

DNA profiling
The distinctive pattern of fragments of DNA obtained by restriction enzyme digestion and electrophoretic separation of minisatellite DNA from individual people.

Doping
The incorporation of impurities within the crystal lattice of silicon so as to increase its conductivity.

d orbitals
There are five d orbitals (each of a different shape) in every shell beginning with the third shell.
d-orbital splitting
A splitting caused by the ligands of the d orbitals of the transition metal ion in a complex ion.

Double bond
A covalent bond in which two pairs of bonding electrons are shared by a pair of adjacent atoms. One of the bonds is a pi bond; the other is a sigma bond.

Double helix
The coiled structure of double-stranded DNA in which strands linked by hydrogen bonds form a spiral or helical configuration, with the two strands oriented in opposite directions.

Double reciprocal plot
(see Lineweaver-Burke plot)

Drug
A substance intended for use in the diagnosis, cure, mitigation, treatment, or prevention of disease. They affect natural chemical processes occurring within the body.

Dry cell
A battery in which the electrolyte is in the form of a paste.

Ductility
The ability of metals to be drawn out under tension and stretched into wires.

Dynamic equilibrium
A physical or chemical equilibrium is described as dynamic because although there is no change in macroscopic properties the forward and backward reactions are occurring (at equal rates).

E

Effective nuclear charge
The actual nuclear charge exerted on a particular electron, equal to the actual nuclear charge minus the effect of electron-electron repulsion.

Efflorescence
The process where water of crystallisation is lost by a hydrated salt stored in an open container.

Electrical conductivity
A measure of the ability of a substance to conduct an electric current due to the presence of charged particles, either ions or delocalised valence electrons, which are free to move.

Electrochemical cell
Electrochemical cells include galvanic and electrolytic cells. They produce a potential difference (voltage) from a redox reaction.

Electrochemical series
A 'reactivity series' for metals based on standard electrode potential data, which is a measure of the energetic tendency of a metal to form positive ions. The elements are arranged in order of increasingly negative electrode potentials, that is, increasing reducing power.

Electrochemistry
The study of electrolysis, electrochemical cells and the properties of ionic solutions.

Electrode
A conductor which dips into the electrolyte of an electrolytic or voltaic cell and allows the current (electrons) to flow to and from the electrodes. Electrodes may be inert, functioning only to transfer electrons, or may be active and be involved in the cell reactions.

Electrolysis
A process in which chemical decomposition of a substance, known as the electrolyte, is caused by the passage of an electric current.

Electrolyte
An electrolyte is an ionic compound, a salt, alkali or acid, which will conduct electricity when it is melted or dissolved in water. An electrolyte will not conduct electricity when solid.

Electromagnetic wave
A wave of oscillating electric and magnetic fields that can move through space.

Electromagnetic spectrum
The entire range of electromagnetic radiation or waves including, in order of decreasing frequency, cosmic-ray photons, gamma rays, x-rays, ultraviolet radiation, visible light, infrared radiation, microwaves, and radio waves.

Electron
Negatively charged particle present in all atoms and located in shells, or energy levels, located outside the nucleus.

Electron affinity (first)
The enthalpy change when one mole of gaseous atoms accepts a mole of gaseous electrons under standard thermodynamic conditions.

Electron bombardment
The process of forming positive ions from atoms (and molecules) in a mass spectrometer by bombarding them with electrons of high kinetic energy. The colliding electron ejects a valence electron and both electrons leave the atom.

Electron carrier
A protein that can reversibly lose or gain electrons; involved in the transfer of electrons from glucose to oxygen.

Electron configuration
A short hand method for describing the arrangement of electrons in the shells or main energy levels of an atom.

Electron deficient compound
A molecule or ion where some atoms do not have filled outer or valence shells.

Electronegativity
A measure of the tendency of an atom in a molecule to attract a pair of shared electrons towards itself. The difference in electronegativities of two atoms in a covalent bond gives an indication of the bond's polarity.

Electron transition
The movement of electrons from one orbital to another.

Electrons-in-boxes notation
A notation system in which atomic orbitals are regarded as boxes into which electrons are placed.

Electron transfer chain
The movement of electrons from the break down products of glucose to oxygen via the respiratory (electron transfer) chain.

Electroplating
Electroplating is the electrolytic process of coating a metal with a thin layer of another metal by electrolysis.

Electrophile
An electrophile is a chemical species that can act as an electron pair acceptor or Lewis acid.

Electrophilic addition (in alkenes)
An addition reaction initiated by the rate determining attack of an electrophile on the pi electrons of the carbon-carbon double bond.

Electrophilic substitution
A reaction involving the substitution of an atom or group of atoms in benzene (or derivative) with an electrophile as the attacking species.

Electrophoresis
Movement of charged ions in response to an electrical field. It is often used to separate mixtures of ions, proteins, or nucleic acids.

Electrostatic forces of attraction
A usually strong force of attraction between particles with opposite charges.

Electrostatic precipitation
The removal of very fine particles suspended in a gas by electrostatic charging and subsequent precipitation onto a collector in a strong electric field.

Elementary steps
Most reactions occur in a series of steps each of which involves one or two reacting particles (atoms, ions or molecules). They are reactions in which no reaction intermediates (other than transition species) have been detected.

Elimination
A reaction in which atoms or small molecules are removed from a single molecule, usually to give a double bond, or between two molecules.

Ellingham diagrams
Diagrams that explain how standard free energies of formation of metal oxides vary with temperature. They allow prediction of the conditions required for metal extraction from oxide ores.

Elution
The process of removing an absorbed material (the adsorbate) from an adsorbent by washing it with a liquid (the eluent). The solution consisting of the adsorbate dissolved in the eluent is the eluate.

Emission spectroscopy
The study of spectra produced by excited gaseous atoms or molecules.

Empirical formula
A formula for a compound which shows the simplest ratio of atoms present.

Enantiomer
A compound whose molecular structure is not superimposable on its mirror image.

Endocrine glands
Groups of cells specialised to synthesise hormones and release them into the blood stream.

Endothermic
A reaction in which heat energy is absorbed from the surroundings when a reaction occurs. There is a fall in temperature when the reaction occurs or heat energy has to be continually supplied to make the reaction occur. In endothermic reactions, there is more enthalpy or potential energy in the bonds of the products than there were in the bonds of the reactants.

End point
The end point is where the indicator changes colour suddenly.

Energy Levels
The allowed energies of electrons in an atom (and molecules), which correspond to the shells. Electrons fill the energy levels, or shells, starting with the one closest to the nucleus.

Enthalpy
The amount of heat energy possessed by a chemical substance. It is stored in the chemical bonds as potential energy. When substances react, the difference in the enthalpy between the reactants and products (at constant pressure) can be measured.

Enthalpy change of combustion
The enthalpy change that occurs when one mole of a compound is completely combusted (burned) in excess oxygen under standard thermodynamic conditions (with no change in volume).

Enthalpy change of formation
The enthalpy change that occurs when one mole of a compound is formed under standard thermodynamic conditions from its elements in their standard states.

Enthalpy change of neutralisation
The enthalpy change that occurs when one mole of acid undergoes complete neutralisation with a base under standard thermodynamic conditions.

Enthalpy change of solution
The enthalpy change when one mole of a substance is dissolved in a solvent to infinite dilution (in practice, to form a dilute solution) under standard conditions.

Enthalpy level diagram
A diagram that traces the relative changes in the enthalpy or potential energy of a chemical system during the course of a reaction.

Enthalpy of atomisation
The enthalpy change when a substance is dissociated into one mole of gaseous atoms under standard thermodynamic conditions.

Enthalpy of hydrogenation
The enthalpy change when hydrogen is added across a multiple bond.

Enthalpy of vaporization
The enthalpy change that occurs when one mole of a pure liquid is vaporised at its boiling point.

Entropy
A thermodynamic function that measures randomness or disorderness in a chemical system and can be used to predict the direction of physical and chemical changes. It can also be interpreted as corresponding to the number of ways of arranging particles in a chemical system or a measure of how energy is distributed among particles. It is defined as the heat absorbed divided by the absolute temperature.

Entropy change
The change in entropy that accompanies a physical or chemical change is given by the sum of the entropies of the products minus the sum of the entropies of the reactants.

Enzyme
A globular protein that catalyses a specific biochemical reaction.

Equilibrium
Equilibrium is said to occur for a reversible reaction when the rate of the forward reaction is equal to the rate of the back ward reaction and consequently there are no changes in the concentrations of reactants and products. It is also where the Gibbs free energy, of the system is minimised with the system maintained at constant temperature and pressure.

Equilibrium constant
The value obtained when equilibrium concentrations of the chemical species are substituted in the equilibrium expression. The value indicates the equilibrium position.

Equilibrium expression
The expression obtained by multiplying the product concentrations and dividing by the multiplied reactant concentrations, with each concentration raised to the power by the coefficient in the balanced equation.

Equilibrium position
A particular set of equilibrium concentrations of reactants and products.

Equivalence point
The point in an acid-base titration where the acid and base have been added in stoichiometric amounts, so that neither is present in excess. If a suitable indicator is chosen it will correspond to the end point.

Essential amino acids
Amino acids that cannot be synthesised by humans and must be obtained from the diet.

Ester
Organic compounds formed by the condensation reaction between alcohols and acids. Esters formed from carboxylic acids have the general formula RCOOR'.

Esterification
The reaction between an acid and alcohol to form an ester and water.

Ether
An organic compound containing the group -O-.

Evaporation
Evaporation occurs at the surface of the liquid and involves a liquid changing into a gas at a temperature below the boiling point of the liquid.

Excess
A reactant is said to be present in excess when after the reaction is complete, some of that reactant remains unreacted.

Excited state
The state of an atom or molecule when one ore more of its electrons is raised to a higher energy level above the stable ground state.

Exothermic
A reaction in which heat energy is released to the surroundings from the reactants. The bonds of the products contain less enthalpy or potential energy than the bonds of the reactants.

F

Faraday
A unit of electrical charge (in Coulombs) equal to the charge required to discharge one mole of a unipositive ion. It is the charge carried by one mole of electrons.

Faraday constant
The quantity of electricity (in coulombs) transferred by one mole of electrons.

Faraday's laws of electrolysis
The amount of a chemical product formed is directly proportional to the quantity of electrons passed. The amount of chemical product formed (for a constant quantity of electricity) is proportional to the relative atomic mass of the ion and its charge.

Fat
A solid ester composed of glycerol (propane-1,2,3-triol) and fatty acids.

Fatty acid
A long chain carboxylic acid which is chemically combined with glycerol (propane-1,2,3-triol) to form fats and oils.

Feedstock
The raw material(s) for a process in the chemical industry.

Fermentation
The conversion of sugars to ethanol and carbon dioxide by yeast under anaerobic conditions.

Fertilisers
A group of chemicals that supply plants with the mineral salts they need for growth.

Fibrous protein
Insoluble proteins that serve in a protective or structural role.

Fingerprint region
The region of the infrared spectrum of a substance between 910 and 1430 cm^{-1} where the pattern of peaks is characteristic of that compound, even though all the peaks may not be known.

First order reaction
A reaction in which the initial rate of reaction is directly proportional to the concentration of one of the reacting substances.

Fischer-Tropsch process
The catalytic hydrogenation of carbon monoxide in the ratio 2:1 hydrogen to carbon monoxide at 200 °C to produce hydrocarbons, especially motor fuel.

Fission (nuclear)
The splitting of a nucleus of an element with a high atomic number into two or more smaller atoms with lower atomic numbers.

Flame Test
An analytical technique in which a small sample of a metal salt is introduced into a hot Bunsen flame on a clean platinum or nichrome wire. The flame vaporises part of the sample which excites some of the atoms, which emit light at wavelengths characteristic of the metal ion in the salt.

Flocculation
The process of aggregating suspended solids in water into larger insoluble clumps.

Formula mass
The formula mass is the sum of the atomic masses of the elements in the formula of an ionic compound.

Formula unit
The symbols used in equations and calculations to represent elements and compounds with giant structures.

Forward reaction
The forward reaction refers to the conversion of the reactant into products in an equilibrium reaction.

Fossil fuel
Non-renewable fuels, such as coal, oil and natural gas, formed underground over geological periods of time from the decaying remains of plants and animals.

Fraction
A mixture of liquids with similar boiling points collected by fractional distillation.

Fractional distillation
Distillation to separate volatile chemical substances in which the products are collected in a series of separate fractions, each with a higher boiling point than the previous fraction.

Freezing
The change of a liquid into a solid at constant temperature.

Freezing point
The temperature at which a liquid turns to a solid.

Free radical
A species with one or more unpaired electrons, often produced by photolysis. They act as highly reactive intermediates in atmospheric chemistry.

Frequency
The number of complete waves passing a point per second.

Friedel-Crafts reaction
A method for substituting an alkyl or acyl group into a benzene ring and forming a C-C bond. It involves the reaction between benzene (or other aromatic compound) with a halogenoalkane or acyl chloride in the presence of a so-called halogen carrier.

Fuel cell
A device which converts chemical energy directly into electrical energy. A gaseous fuel, usually hydrogen or a hydrocarbon, and oxygen are passed over porous electrodes where combustion occurs This is accompanied by the production of an electric current.

Fuels
Chemicals that burn in air or oxygen and release heat energy.

Fullerenes
A group of cage-like hollow molecules composed of hexagonal and pentagonal groups of an even number of carbon atoms.

Functional group
A functional group is an atom or group of atoms (other than hydrogen) that imparts specific physical and chemical properties of a homologous series of organic compounds.

Functional group isomerism
Functional group isomerism is a form of structural isomerism where molecules with the same molecular formula have different functional groups.

Fusion (nuclear)
The forming of a nucleus from two nuclei of lower atomic number. The process releases large amounts of energy and only takes place at very high temperatures.

G

Galvanic cell
(See voltaic cell).

Gamma waves/radiation (or rays)
High energy electromagnetic radiation of high frequency and extremely short wavelength emitted by changes in the nuclei of atoms.

Gas
A state of matter in which there are little attractive forces operating between the particles. The individual particles move at high velocity in straight lines (until they collide with each other or the walls of the container).

Gas chromatography
A technique for separating or analysing mixtures in the gaseous phase using a carrier gas as an eluent.

Gas-liquid chromatography
A form of partition or adsorption chromatography in which the mobile phase is a gas and the stationary phase a liquid. Solid and liquid samples are vaporized before being introduced to the column.

Gas laws
The various laws that describe the physical behaviour of gases.

Gateway drug
A habit-forming substance whose use may lead to the abuse of drugs that are more addictive or more dangerous.

Gene
A segment of a DNA molecule that contains the genetic code for a protein molecule.

General anaesthetic
An anesthetic that affects the entire body and causes loss of consciousness and insensitivity to pain.

Geometric isomerism
Geometric isomerism occurs in alkenes when there is restricted rotation about a carbon-carbon double bond. It can also occur in ring system where there is restricted rotation about a carbon-carbon single bond.

Geothermal energy
The use of hot water or steam located deep underground, often under pressure, to generate electricity.

Giant covalent structure
A regular arrangement, usually three dimensional, of covalently bonded atoms that extends throughout the substance.

Giant structure
A lattice, usually three-dimensional, of ions or atoms in which the bonding (ionic, covalent or metallic) extends throughout the substance.

Gibbs free energy
A thermodynamic function equal to the enthalpy minus the product of the entropy and the absolute temperature. A negative sign indicates that the reaction is spontaneous under standard conditions. It is the energy available to do work.

Gibbs free energy of reaction
The Gibbs free energy of a reaction is defined as the sum of the Gibbs free energies of formation of the products minus the sum of the Gibbs free energies of formation of the reactants.

Global warming
The increase in the temperature of the Earth's atmosphere since the Industrial Revolution. It is believed to be a consequence of rising levels of greenhouse gases, especially carbon dioxide which are enhancing the Greenhouse effect.

Globular protein
Soluble proteins with a globular or rounded shape.

Glycosidic bond
The covalent bond, -O-, formed between two reacting sugar molecules, or the bond between the sugar and base in a nucleotide, in the presence of enzymes.

Graham's law of diffusion
Gases diffuse at a rate that is inversely proportional to the square root of their density or molar mass (at constant temperature and pressure).

Gravimetric analysis
A method of quantitative analysis for finding the composition and formulas of compounds based on accurate weighing of reactants and products.

Greenhouse effect
A heating effect occurring in the atmosphere because of the presence of greenhouse gases that absorb infrared radiation.

Greenhouse gases
Greenhouse gases are molecules that contribute to the greenhouse effect and global warming by absorbing infrared energy emitted or reflected from the surface of the Earth.

Group
A column of the Periodic table which contains elements with similar chemical properties. Atoms of elements in the same group have the same number of electrons in their outer or valence shell.

H

Haber Process
The industrial manufacture of ammonia from nitrogen and hydrogen, carried out at high pressure and moderate temperature in the presence of an iron catalyst.

Heme
An iron complex found in the protein hemoglobin.

Haemoglobin
A quaternary protein composed of four polypeptide chains combined with a haem group. It can bond and transport oxygen molecules from the lungs to body tissues.

Half cell
An electrode in contact with a solution of ions.

Half-equation
The two parts of a redox reaction, one describing the oxidation and the other reduction.

Half life (of a chemical reaction)
The time taken for the reactant concentration (in a chemical reaction) of the reactants to reach a value which is the mean or average of its initial and final values.

Half life (of a radioactive sample)
The time take for the radioactivity emitted by a sample of a radioactive isotope to fall to half its original value. The value will be constant for a particular isotope and unaffected by changes in temperature or pressure.

Halide ions
The halide ions are chloride (Cl-), fluoride (F-) bromide (Br-) and iodide (I-). The halides are salts that contain a metal ion combined with the halide ions.

Hallucinogens
Drugs which affect the brain and cause people to experience hallucinations.

Halogen carrier
An electron deficient metal halide that acts as a Lewis acid during electrophilic substitution.

Halogenoalkane
A homologous series of organic compounds in which one or more of the hydrogen atoms of an alkane have been replaced by halogen atoms.

Halogenoarenes
Halogenoarenes are compounds formed by replacing one or more hydrogen atoms in an arene with halogen atoms.

Halogens
A group of reactive non-metals in Group 7 of the Periodic Table. They are composed of diatomic molecules.

Heat capacity
The heat capacity is the amount of heat energy required to raise the temperature of a substance by one degree kelvin (or Celsius).

Heat energy
The energy transferred between two objects due to a temperature difference between them. The source of heat energy is the movement of atoms, ions and molecules, that is their kinetic energy.

Heating curve
A plot of temperature against time for a substance where heat energy is added at a constant rate.

Heavy metals
Heavy metals are toxic and metals, such as cadmium, mercury and lead, which have relatively high relative atomic masses.

Heavy water
Heavy water is the common name for deuterium oxide, D_2O or $^2_1H_2O$.

Herbicide
A substance designed to kill plants.

Hertz
The SI unit of frequency (units of s^{-1} or Hz).

Hess's law
It states that the total enthalpy change for a reaction is independent of the route taken.

Heterogeneous catalyst
Heterogeneous catalysis occurs when the catalyst and the reactants are in different phases (or states).

Heterogenous equilibrium
An equilibrium system where the reactants and products are in more than one phase.

Heterolytic fission
The cleavage of a covalent bond so that one of the atoms or groups separates with both bonding electrons and becomes negatively charged, leaving the other atom or group positively charged.

High-pressure liquid chromatography
A technique in which the sample is forced through the chromatography column under pressure. It is sometimes known as High Performance Liquid Chromatography.

Homogenous catalysis
Heterogeneous catalysis occurs when the catalyst and the reactants are in the same phase (or states).

Homogeneous equilibrium
An equilibrium system where the reactants and products are in the same phase.

Homologous series
A homologous series of organic compounds follow a regular structural pattern and have the same general molecular formula and differ only by the addition of $–CH_2-$ groups.

Homolytic fission
The breaking of a covalent bond so that one electron from the bond is left on each fragment. It results in the formation of two free radicals.

Hormone
A chemical substance produced in small amounts by endocrine glands and then carried in the blood to a target organ or tissue.

Hund's rule
A rule that states that the electronic configuration in orbitals of the same energy will have the minimum number of paired electrons. Electrons with parallel spins are lower in energy than a corresponding pair with opposed spins.

Hydrate
A salt associated with a definite number of molecules of water.

Hydrated ion
Ions dissolve in water and attract the polar molecules of water and become associated with a definite number of water molecules.

Hydration
A reaction where an unsaturated molecule adds a molecule of water, or where water molecules interact with ions in aqueous solution.

Hydride
A compound of hydrogen and one other element.

Hydrocarbons
Organic compounds containing only hydrogen and carbon atoms.

Hydrocracking
A process by which the hydrocarbon molecules of crude oil or petroleum are broken into simpler molecules, by the addition of hydrogen under high pressure and in the presence of a catalyst.

Hydrofluorocarbons
Hydrofluorocarbons (HFCs) are compounds containing carbon, hydrogen, and fluorine and because they contain no chlorine atoms they do not directly affect stratospheric ozone. However, they are efficient absorbers of infrared radiation.

Hydrogenation
The addition of hydrogen across a multiple bond.

Hydrogen bonding
An unusually strong dipole-dipole force that occurs among molecules in which hydrogen is bonded to nitrogen, fluorine and oxygen.

Hydrolysis
A chemical reaction involving the reaction of a molecular compound with water. Covalent bonds are broken during the reaction and the elements of water are added to the chemical fragments.

Hydrophobic
Used to describe molecules or functional groups that are poorly soluble or insoluble in water.

Hydrophic interactions (of a protein)
The association of the non-polar groups within the center of a folding protein, driven by the tendency of the surrounding water molecules to maximise their entropy.

Hydrophilic
Used to describe molecules or functional groups that are soluble in water.

Hydroxyl group
The –OH group covalently bonded in a molecular structure. Found in alcohols, alkanoic acids and some inorganic acids.

Ideal gas
An ideal gas is a hypothetical substance that consists of molecules or atoms that occupy almost no space and have virtually no attractive forces operating between them, or between themselves and the walls of the container. All collisions between the molecules or atoms are perfectly elastic. An ideal gas obeys the gas laws exactly under all conditions.

Ideal gas constant
The ideal gas constant is the constant that appears in the ideal gas equation. It is formed by combining all the constants from Boyle's Law, Charles's Law and Avogadro's Law.

Ideal gas equation
It is an equation relating the temperature, pressure, volume and amount of an ideal gas. It is frequently used in experimental work to determine the molar masses of gases.

Immiscible liquids
Immiscible liquids are liquids which do not mix (e.g. oil and water).

Incomplete protein
A protein that does not provides all of the essential amino acids.

Indicator (acid-base)
A substance which changes colour over a particular pH range. They are used to detect the end point during titrations.

Indicator range
The pH range – usually 2 pH units – over which an acid-base indicator changes colour completely.

Induced dipole
A force induced in one molecule by the approach of another molecule which has a dipole, whether temporary or permanent.

Inductive effect
The effect of a functional group or atom in an organic molecule in attracting sigma electrons towards itself, or in repelling them. This results in the formation of a dipole in the molecule.

Inert
A chemical is described as inert if it has little or no tendency to react under given circumstances.

Inhibitor
A substance that slows down the rate of a reaction.

Initial rate method
An experimental method for determining the order of a chemical reactions and its rate equation.

Initiation
The first elementary step in a free radical reaction. It involves the homolytic cleavage of a bond, typically by ultraviolet radiation or high temperature, to generate free radicals.

Interferons
A group of naturally occurring anti-viral compounds.

Interhalogen
A covalent compound formed by the reaction between two different halogens. A molecule containing atoms of different halogens.

Intermediate
A chemical species that is neither a reactant nor a product but is formed and consumed during the overall chemical reaction. Intermediates never appear in a rate expression.

Intermolecular forces
The weak attractive forces operating between molecules.

Internal resistance
The resistance of a cell or a battery.

Intramolecular forces
Forces operating within molecules. They are usually covalent bonds, though hydrogen bonding can occur intra-molecularly. They do not normally break during melting or boiling.

Iodine number
The amount of iodine in grams which 100 grams of a fat or oil can absorb; it is inversely related to the amount of unsaturated fatty acids present in the fat or oil.

Ion
An ion is charged particle formed by the loss or gain of electrons from an atom (simple ion), or a group of atoms (polyatomic ions).

Ion channel
A membrane-bound protein that provides a path for the regulated transport of a specific ion across a cell membrane.

Ion exchange
The exchange of ions of the same charge between an aqueous solution and a solid (in the form of a resin) in contact with it.

Ion exchange chromatography
In ion exchange chromatography, charged substances are separated via column materials that carry an opposite charge.

Ionic bond
A bond formed when electrons are transferred from a metal atom to one or more non-metal atoms. It is the result of electrostatic forces of attraction between oppositely charged ions.

Ionic bonding
A strong electrostatic force of attraction between oppositely charged ions arranged into a lattice. Ionic bonding typically involves the transfer of one, or more electrons, between a metal atom and one ore more non-metal atoms.

Ionic equation
The simplified equation for a reaction involving ionic substances. Only those ions that actually participate in the reaction are included in the ionic equation; spectator ions are not included.

Ionic product constant of water
The product of the concentrations of hydrogen and hydroxide ions in water under standard thermodynamic conditions.

Ionic radius
A measure of the radius of an ion in the crystalline form of a compound.

Ionisation energy (first)
The energy required to remove one mole of electrons from one mole of isolated gaseous atoms to form one mole of unipositive ions under standard thermodynamic conditions.

Isoelectric point (of an amino acid)
The pH at which an amino acid in solution has no overall electrical charge. At this pH the amino acid does not move when placed in an electric field.

Isoelectronic
Two atoms or ions that have the same number of electrons are described as isoelectronic.

Isomers
Isomers are compounds with the same molecular formula but different molecular structures and physical and/or chemical properties.

Isomerism
Isomerism is the existence of two or more molecules having the same molecular formula, but with different bonding arrangements of atoms or orientation of their atoms in space.

Isotactic
A polymer chain in which the substituents, or side chains, are distributed on the same side of the chain.

Isotope
Two or more atoms of the same element with different numbers of neutrons (and therefore different relative isotopic masses).

Isotopic abundance
The proportions of the different isotopes of an element.

Joule
The SI unit for energy. Symbol J.

Kekulé structure
A representation of a hypothetical localised structure of benzene or a benzene derivative in which there is a six-membered ring with alternate double and single bonds.

Kelvin scale
A temperature scale starting from absolute zero (-273 °C) using degrees the same size or magnitude as degrees Celsius.

Kinetic energy (of particles in a gas)
The energy due to the motion of gas particles; it depends on the mass of the gas particle (atom or molecule) and the square of its velocity (speed in a specified direction).

Kinetics
The quantitative study of the dependence of reaction rate on variables, such as concentration, pressure and temperature.

Kinetic stability
If two chemicals react relatively slowly because the activation energy is relatively high, then the system shows kinetic stability.

Kinetic theory
A theory which explains the physical properties of solids, liquids and gases in terms of the movement of particles (atoms, ions or molecules). The theory also accounts for the changes that occur during a change in state.

Knocking
A knocking noise made by a petrol engine in car, as a result of premature fuel combustion.

Latent heat
The heat needed to bring about a change in state.

Lattice
A regular, repeating three dimensional arrangement of atoms, molecules or ions within a crystal.

Lattice enthalpy
The amount of energy required to dissociate one mole of an ionic compound to its gaseous ions (under standard thermodynamic conditions).

Law of conservation of mass
Mass is not lost or gained during a chemical reaction – the total mass of the reactants equals the total mass of the products.

LD_{50}
LD stands for "Lethal Dose". LD_{50} is the amount of a substance, given all at once, which causes the death of 50% (one half) of a group of test animals. The LD_{50} is one way to measure the short-term poisoning potential (acute toxicity) of a material.

Lead acid battery
A battery (used in cars) in which the anode is lead, the cathode is lead coated with lead(IV) oxide and the electrolyte is sulfuric acid.

Lean burn engine
Lean combustion engines were designed to enhance fuel efficiency without sacrificing power or drive-ability. All engines burn a mixture of air and fuel, but a lean-burn engine has a higher air-to-fuel ratio than conventional engines. This can mean significant savings in petrol, and thus in emissions, such as carbon dioxide.

Leaving group
An atom or group of atoms which breaks away from a molecule during a substitution or an elimination reaction.

Le Chatelier's principle
Le Chatelier's principle states that if a change is imposed on a reaction at equilibrium, the position of the equilibrium will shift in a direction that reduces the effect of that change.

Lethal dosage
The size of dosage that will typically cause death.

Lewis acid
A chemical species that can accept an electron pair to form a dative or coordinate covalent bond.

Lewis base
A chemical species that can donate an electron pair to form a dative or coordinate covalent bond.

Lewis (electron dot) structure
A diagram of a molecule showing how the valence electrons are arranged among the atoms in the molecule.

Ligand
A molecule or negative ion that donates a pair of electrons to a central metal ion to form a dative or coordinate covalent bond. Ligands are Lewis acids.

Ligand exchange/substitution
The process where one or more ligands in a complex ion are replaced, often reversibly, by one another.

Line spectrum
An emission spectrum that has only certain wavelengths or frequencies of visible light. The lines arise from excited electrons falling back to lower energy levels within the atom.

Limiting reactant
The reactant that is completely consumed, or used up, when a reaction goes to completion.

Lineweaver-Burke equation
An algebraic rearrangement of the Michealis-Menten equation which allows its maximum rate, V_{max} and the Michaelis-Menten constant, K_m, by extrapolating the substrate concentration, [S], to infinity.

Liquid
A state of matter in which particles are loosely attracted by intermolecular forces. A liquid always take up the shape of the walls of its container and its particles are not arranged into a lattice.

Lipids
Biological compounds, for example, fats, oils and steroids, which are soluble in organic solvent, but essentially insoluble in water.

Local anaesthetic
An anesthetic that numbs a local area of the body whilst the patient remains conscious.

Localised electrons
Electron pairs forming covalent bonds between two atoms. They are not free to move through a structure.

Lock-and-key hypothesis
A model for the mechanism of enzyme activity postulating that the shapes of the substrate and the enzyme are such that they fit together as a key fits into a specific lock.

Lone pair (of electrons)
A lone or non-bonding pair of electrons are pairs of outer or valence shell electrons which are not used to form covalent bonds within the molecule. Lone pairs affect the shape of a molecule and can be used to form dative or coordinate covalent bonds.

Low level radioactive waste
Radioactive waste which, because of its low radioactivity, does not require shielding during normal transport or handling.

Lysergic acid diethylaminde (LSD)
a drug that is a powerful hallucinogen

Lysis
Destruction of a cell's cell membrane or of a bacterial cell wall, releasing the cellular contents and killing the cell. This often occurs during viral infections.

M

Macromolecule
A very large molecule, usually with a molar mass in the tens of thousands.

Macroscopic properties
Macroscopic properties are properties of substances in bulk that can be observed, for example, colour, or easily measured, for example, pressure of a gas.

Magnetic resonance imaging (MRI)
The use of a nuclear magnetic resonance spectrometer to produce electronic images of specific atoms and molecular structures in solids, especially human cells, tissues, and organs. Because it uses radio frequencies the technique is non invasive.

Malleability
The ability of metals to be bent and beaten into thin sheets.

Markovnikov's rule
A rule that predicts the major and minor products when a hydrogen halide or interhalogen adds across the double bond in an unsymmetrical alkene. The rule states that the major product will be the one in which the hydrogen atom (or less electronegative atom of the interhalogen) attaches itself to the carbon atom with the larger number of hydrogen atoms.

Mass defect
The amount by which the mass of an atomic nucleus is less than the sum of the masses of its constituent particles.

Mass number
The mass number is the sum of the protons and neutrons in the nucleus of the atom or ion.

Mass spectrometer
An instrument in which gaseous atoms are ionised and then accelerated into a magnetic field where the ions are separated according to their mass.

Mass spectrometry
Analysis of individual molecules according to their elemental composition and usually giving information about molar mass, as well as structures of component parts of the molecules.

Mass spectrum
The output plot from the mass spectrometer, which is a bar graph of abundance against mass/charge ratio.

Maxwell-Boltzmann energy distribution curve
A curve describing the distribution of velocities ('speeds') or kinetic energies among the atoms or molecules of an ideal gas. It is often used to explain the effects of a temperature change or the presence of a catalyst on the rate of a chemical reaction.

Mechanism
A detailed description in terms of bond breaking, bond making and intermediate formation that occurs during the series of elementary steps by which an overall chemical reaction occurs.

Medicine
A substance or preparation used in treating disease or to give relief from the symptoms of the disease. It also refers to the practice and study of disease treatment.

Melting
The change of a solid into a liquid at constant temperature.

Melting point
The temperature at which a solid is converted to a liquid at the same temperature.

Mercury cathode cell
An electrolytic cell with a flowing mercury cathode used in the industrial production of chlorine from concentrated sodium chloride solution.

Metal
Chemical elements which are shiny solids and are good conductors of heat and electricity when solid. They form positive ions (cations). They are located on the left hand side of the Periodic Table and possess one, two or three electrons in the outer shell which take part in chemical bonding.

Metallic bonding
Metallic bonding, found in metals and mixtures of metals (known as alloys), consists of a lattice of cations surrounded by delocalised or mobile valence electrons.

Metalloid
Elements which show some of the physical properties of metals, but the chemical properties of non-metals.

Metallo-protein
A protein that possesses one or more metal ions.

Michaelis-Menten constant
The substrate concentration at which an enzyme-catalysed reaction occurs at one half of its maximum rate.

Michaelis-Menten equation
The equation describing the relationship of the initial rate of an enzyme-controlled reaction and the concentration of the substrate. It takes the form of a hyperbolic curve.

Michaelis-Menten kinetics
Kinetic behaviour, exhibited by enzymes, in which the initial rate of an en enzyme-catalysed reaction shows a hyperbolic dependence on substrate concentration.

Mineral
A naturally occurring inorganic chemical (element or compound) which is used as a raw material in the chemical industry.

Miscible liquids
Liquids that mix in all proportions, for example, ethanol and water.

Mobile phase
A liquid or gas which percolates through or along the stationary phase during chromatography.

Moderator
A substance, such as water or graphite, that is used in a nuclear reactor to decrease the speed of fast neutrons and increase the likelihood of fission.

Molar extinction coefficient
Absorbance of light per unit path length (usually the centimetre) and per unit concentration (moles per cubic decimetre).

Molar gas volume
One mole of an ideal gas occupies 22.4 cubic decimetres at 0 ^{o}C (273 K) and one atmosphere pressure.

Molar mass
The mass in grams of one mole of molecules or the formula units of an ionic compound. It is numerically equal to the relative molecular or atomic mass of a substance, but has units of g mol-1.

Molarity
The amount in moles of solute per volume of solution in cubic decimetres.

Mole
The measure of the amount of a substance. One mole of a substance has a mass equal to its formula mass in grams. One mole of a substance contains 6.02 x 1023 (Avogadro's constant) of atoms, ions or molecules.

Molecular ion
The unipositive ion formed by the unfragmented molecule losing one electron following electron bombardment.

Molecularity
The molecularity indicates the number of chemical species or particles participating in the rate determining step of the mechanism.

Molecular orbitals
Molecular orbitals are formed in molecules when atomic orbitals combine and merge when atoms bond together. Sigma and pi bonds are molecular orbitals.

Mole fraction
A measure of the amount of a component in a mixture. The mole fraction of a component is the ratio of the amount of a particular substance over the total amount of all the substances in a mixture.

Molecular covalent (simple molecular)
A substance consisting of molecules arranged into a lattice held together by intermolecular forces.

Molecular equation
An equation representing a reaction in solution showing the reactants and products in undissociated or unionised form, whether they are strong or weak electrolytes and (acids, salts and bases.

Molecular formula
A chemical formula which shows the actual number of atoms of each element present in a molecule of a covalent compound.

Mole fraction
This is the number of moles of a substance divided by the total number of moles of all the components present in the mixture.

Molecular mass
The molecular mass is the sum of the atomic masses of the elements in the formula of a covalent compound.

Molecule
A group of atoms held together by covalent bonds.

Monochromatic radiation
Electromagnetic radiation with a single wavelength.

Monodentate ligand
A ligand that forms one dative covalent bond to a central metal ion.

Monomer
A small molecule, a large number of which can be polymerised via the formation of covalent bonds to form a polymer.

Monoprotic
An acid which contains one replaceable hydrogen atom per molecule, sometimes also known as monobasic.

Monosaccharide
A sugar that cannot be hydrolysed to simpler sugars.

Multiple bond
A double or triple covalent bond between atoms in a molecule.

Mutation
A change in the nucleotide sequence of a gene.

N

Naphtha
A general term used to describe a light hydrocarbon fraction from crude oil distillation with a boiling point between 40 °C and 150 °C. It is an important feedstock used to manufacture other substances.

Narcotic
A drug that doses dulls the senses, relieves pain, and induces profound sleep but in excessive doses causes stupor, coma, or convulsions.

Narrow spectrum antibiotic
An antibiotic that is only effective against a small number of bacterial strains.

Natural gas
Gas obtained from underground deposits and often associated with crude oil or petroleum. It contains a high percentage of methane.

Neutralisation
A chemical reaction between an acid and a base to produce a salt and water only.

Neutral solution
An aqueous solution that is neutral has a pH of seven and contains the same concentrations of hydrogen and hydroxide ions.

Neutron
A neutral particle found in the nucleus of all atoms (except that of the most abundant isotope of hydrogen). It has approximately the same mass as the proton.

Nitration
A type of reaction in which a nitro group ($-NO_2$) is introduced into an aromatic compound, usually via the use of a nitrating mixture.

Nitrating mixture
A 1:2 molar mixture of concentrated nitric and sulfuric acids used to nitrate some aromatic organic compounds. The mixture produces the electrophilic nitronium cation, NO_2^+, via an acid-base reaction.

Nitrile
A compound of the form RCN, where R is an alkyl group or aryl group. Nitriles can be hydrolysed to carboxylic acids.

Nitronium ion
The nitronium ion, NO_2^+, is formed in a nitrating mixture and used to nitrate aromatic compounds. It is a powerful electrophile.

Nitrosamines
A group of organic compounds which contain the functional group NNO and some of which are powerful carcinogens.

Noble gas configuration
An octet of electrons in the valence shell or a pair of electrons in the first shell.

Noble gases
A group of very unreactive gases found in Group 0, 8 or 18 of the Periodic Table. They exist as single atoms and all have filled outer or valence shells.

Nomenclature
Naming rules for compounds.

Non-competititive inhibition
A type of enzyme inhibition not reversed by increasing the substrate concentration.

Non-electrolyte
A substance which, when dissolved in water, gives a non-conducting solution due to the absence of ions.

Non-metal
Chemical elements that are typically poor conductors of heat and electricity. They form covalent bonds and/or form negative ions (anions).

Non-polar molecule
A non-polar molecule is a symmetrical molecule whose individual dipoles sum or cancel to zero.

Normal boiling point
The temperature at which the vapour pressure of a liquid is exactly one atmosphere.

n-type semiconductor
A n-type semiconductor is formed when the impurities added to silicon donate electrons which enter the unoccupied energy level.

Nuclear binding energy
The net energy required to decompose a molecule, an atom, or a nucleus into its component protons, neutrons and electrons.

Nuclear charge
The nuclear charge is the total charge of all the protons in the nucleus.

Nuclear energy
The energy released during nuclear fusion or fission.

Nuclear magnetic resonance
The absorption of radio waves by nuclei with an odd nucleon number.

Nucleon
A particle in a nucleus, either a neutron or proton.

Nucleophile
A nucleophile is a species which contains a lone pair of electrons that can be donated to an electron deficient centre.

Nucleophilic addition
A type of reaction in which the rate determining step is the attachment of a nucleophile to a positive (electron-deficient) part of the molecule (often a C=O bond in a carbonyl compound).

Nucleophilic substitution
A reaction involving the substitution of an atom or group of atoms with as the attacking species.

Nucleoside
A compound consisting of a purine or pyrimidine base covalently bonded to ribose or deoxyribose.

Nucleotide
A monomer of the nucleic acids composed of a five-carbon sugar (a pentose), a nitrogen-containing base, and phosphoric(V) acid

Nucleus
The central part of an atom containing protons and frequently neutrons.

Nuclide
The general term for a unique atom.

Nylon
A polymer with a long chain of carbon atoms to which amide groups (-NH-CO-) are combined at regular intervals. There is extensive hydrogen bonding between the chains.

O

Octane number
A numerical representation of the antiknock properties of motor fuel, compared with a standard reference fuel, such as iso-octane (2,2,4-trimethylpentane), which has an octane number of 100.

Octet
A set of eight electrons in the valence shell.

Octet rule
Atoms (other than hydrogen) typically fill their valence or electron shell with eight electrons (an octet) when they form compounds.

Oil
A liquid ester composed of glycerol (propane-1,2,3-triol) and fatty acids.

Opiates
A drug, hormone, or other chemical substance having sedative or narcotic effects similar to those containing opium or its derivatives.

Optical isomerism
Optical isomerism typically occurs when a molecule has no plane of symmetry and can exist in left- and right-handed forms that are non-superimposable mirror images of each other. The molecule must possess a chiral centre. Optical isomers rotate plane-polarised light.

Optically active
A compound that is able to rotate plane-polarised light.

Optimum pH and temperature
The characteristic pH and temperature at which an enzyme has maximum activity.

Oral contraceptive
A pill, typically containing estrogen or progesterone, that inhibits ovulation and thereby prevents conception. Also called the birth control pill.

Orbit
The circular path of an electron around the nucleus (in the Bohr theory).

Orbital
A region in space in which an electron may be found in an atom or molecule. Each atomic orbital can hold up to a maximum of two electrons with opposite spins.

Order of a reaction (individual)
The order of a reaction, with respect to a particular reactant, indicates how the rate of a chemical reaction is affected by the changes of concentration in a particular reactant. It is the exponent in the rate expression with respect to a particular reactant. The order can only be determined experimentally; it cannot be deduced from the stoichiometric equation.

Ore
A naturally occurring mineral from which a metal can be extracted.

Organic Chemistry
Organic Chemistry is the study of carbon containing compounds with the exception of the elements itself and its oxides.

Overall order
The sum of the individual orders with respect to each of the reactants in the rate expression.

Oxidant
(see oxidising agent).

Oxidation
Oxidation involves an increase in oxidation number or loss of electrons.

Oxidation number
A number (usually an integer), positive or negative, given to indicate whether an element has been reduced or oxidised during a redox reaction.

Oxide
A compound of oxygen with another element where the oxygen has the oxidation number (-2).

Oxidising agent
A chemical or substance that brings about oxidation; it accepts electrons from the reactant or one of the reactants. In the reaction the oxidising agent itself is reduced.

Oxy acid
An acid in which the acidic proton, or replaceable hydrogen, is covalently bonded to an oxygen atom.

Ozone
A colourless and toxic gas with the chemical formula O_3. It is produced in the stratosphere by the action of high-energy ultra-violet radiation on oxygen molecules, producing oxygen atoms. These oxygen atoms then react with oxygen molecules to form ozone. It is also produced in the lower atmosphere by the action of ultraviolet radiation on nitrogen dioxide, to produce oxygen atoms which can then react with oxygen molecules to give ozone.

Ozone depletion
The production of a region of lower concentration ('hole') in the ozone layer by the action of chlorine atoms released from chlorofluorocarbons (CFC's), which destroy ozone by reactions on the surface of ice crystals.

Ozone layer
A layer of ozone in the stratosphere (between 15 – 30 km) which prevents harmful ultra-violet radiation from reaching the earth's surface.

Paper chromatography
Chromatography carried out using a special grade of filter paper as the stationary phase.

Parallel synthesis
A single-batch method that uses a mixture of reagents at each step of a synthesis to generate a large number of different products.

Parenteral
A drug taken into the body or administered in a manner other than through the digestive tract, as by intravenous, subcutaneous or intra-muscular injection.

Partial pressure
The pressure a gas in a mixture of gases would exert on the container if it were the only gas in the container. It is equal to the mole fraction of the gas multiplied by the total pressure.

Particle
The term particle (in the context of kinetic theory) refers to atoms, molecules or ions.

Particulates
Particulates are any type of solid particle or droplet in the air in the form of haze, smoke or dust, which can remain suspended in the air or atmosphere for extended periods.

Partition
The distribution of a solute between two immiscible solvents.

Pascal
The SI unit of pressure, abbreviated to Pa. One pascal is equivalent to a force of one newton on one square metre.

Pauling scale
A common measure of electronegativity which runs from 0 (least electronegative or most electropositive) to 4 (most electronegative or least electropositive).

p-block element
An element where the valence electrons are in the p-shell. P-block elements are in groups 3, 4, 5, 6, 7 and 8 in the Periodic Table.

Penicillin
An antibiotic derived from the mould Pencillium notatum. They produce their effects by disrupting synthesis of the bacterial cell wall.

Peptide
A bond formed between the amino group of an amino acid and the carboxyl group of another (in the presence of enzymes), with the elimination of water.

Peptide bond
An amide bond resulting from the condensation reaction between the amine group of one amino acid and the carboxylic acid group of another.

Percentage composition
The percentage by mass of each of the elements in a compound.

Percentage yield
The actual or experimental yield as a percentage of the theoretical yield.

Period
A row in the Periodic Table which contains elements with same number of shells, but with an increasing number of electrons in the outer or valence shell.

Periodicity
The regular repetition of chemical and physical properties as you move across and down the Periodic Table.

Periodic Table
A table of the chemical elements arranged in order of increasing atomic (proton) number to show the similar chemical properties of elements with similar electron configurations.

PAN (peroxyacetyl nitrate)
Peroxyacetyl nitrate is an important by-product in the photochemical production of ozone, and acts as a reservoir for nitrogen dioxide.

Pharmaceutical
a drug which leads to an improvement in health; medicine

Pharmacology
the scientific study of the interactions of drugs with the different cells found in the body.

Phase
A physically or chemically distinct part of a chemical equilibrium. A phase is homogenous throughout and is separated from other phases by a phase boundary.

Phase equilibrium
An equilibrium in which the amounts of the phases are fixed, with transfer from one phase to another feasible.

Phenol
A group of organic compounds in which a hydroxyl group is bonded directly to one of the carbon atoms of a benzene ring.

Phenolphthalein
A common acid-base indicator, used for strong acid/strong base and weak acid.strong base titrations. It is colourless in acid solution, pink in alkaline solution.

Phenyl
The group $-C_6H_5$.

Photochemical reaction
A reaction initiated by light.

Photochemical smog
A form of local atmospheric pollution found in large cities in which oxides of nitrogen and unburnt hydrocarbons react in the presence of light to produce a range of harmful products including ozone and PAN.

Photolysis
The splitting of molecules into fragments (often free radicals) by light, usually ultraviolet radiation.

Photon
A 'packet' or quantum of light, or other electromagnetic radiation.

pH
The pH of a solution is the negative logarithm (to the base 10) of the hydrogen ion or proton concentration (in mol dm^{-3}).

pH probe
An electrode that can be used to accurately measure (via voltage) the pH of an aqueous solution.

pH scale
The pH scale runs from 0 to 14 and is used to describe the acidity or alkalinity of an aqueous solution.

Pi bond
A bond formed by the sideways overlap of two p-orbitals. In a pi bond the electron density is concentrated on either side of the line between the nuclei of the two joined by the bond.

Placebo effect
An improvement in the condition of an ill person that occurs in response to treatment but that cannot be considered due to the specific treatment used.

Planck('s) constant
The constant relating the change in energy for a system to the frequency of the electromagnetic radiation absorbed or emitted.

Plane polarised light
Electromagnetic radiation in which both components of the wave oscillate in a single plane. It is used for the detection of optical activity.

Plastic
Materials that can be shaped by applying heat or pressure.

Plasticizer
A substance added to a synthetic (man-made) plastic to make it flexible.

Polar covalent bond
A bond formed when electrons are shared unequally between two atoms due to a difference in electronegativity. One atom has a partial positive charge, and the other atom has an equal but opposite partial negative charge.

Polarimeter
A device used to study optically active substances.

Polarisability or polarising power
The extent to which the electron distribution in a molecule, ion or an atom can be distorted by an externally applied electric field.

Polarity
The dipole possessed by a bond as a consequence of a difference in electronegativity values between the bonded atoms.

Polar molecule
A polar molecule is an unsymmetrical molecule whose individual dipoles do not sum to zero or cancel.

Polar solvents
Solvents composed of polar molecules.

Polyamide
A polymer in which the monomer molecules are linked by amide bonds.

Polyester
A synthetic polymer formed by reacting alcohols with acids, so that the monomers are linked by the group, -O-CO-.

Polymer
A compound containing very large molecules composed of repeating units called monomers.

Polymerisation
A chemical reaction in which small molecules called monomers are joined together covalently to form a polymer.

Polypeptide
A long linear chain of between 10 and 100 amino acids linked via peptide bonds.

Polyprotic acid
An acid with more than one acidic proton or replaceable hydrogen. It dissociates in a stepwise manner , one proton or hydrogen ion at a time.

Polysaccharides
Carbohydrates whose molecules contain chains of monosaccharide molecules.

p orbital
A dumb bell-shaped atomic orbital; there are three per shell, beginning with the second.

Potential difference ('voltage')
A measure of the force pushing electrons around a circuit. If the potential difference between two points is 1 volt, then the passage of 1 coulomb of charge between these points involves 1 joule of energy.

Power (of a galvanic cell)
The power of a cell (measured in watts (W)) is given by the product of the voltage and the current.

Precipitate
A precipitate is an insoluble substance formed by a chemical reaction in solution. It occurs when two soluble salts react to give one soluble and one insoluble salt.

Pressure
A measure of the force pressing onto an object's surface. The pressure that a gas exerts upon its container is caused by the particles colliding with the walls of the container. Pressure is defined as force per unit area.
Pressure = $\frac{\text{force}}{\text{area}}$

Pressure law
The gas law stating that the pressure of a fixed mass (at constant volume) of an ideal gas is directly proportional to absolute temperature.

Primary alcohol
An alcohol containing the $-CH_2OH$ group.

Primary amine
An amine of the form RNH_2, where R is an alkyl or aryl group.

Primary air pollution
Primary pollutants enter the atmosphere directly from various sources.

Primary cell
A device which produces a flow of electric current. A primary cell cannot be recharged.

Primary Standard
A chemical which can be weighed out accurately to prepare a standard solution for volumetric analysis.

Primary structure (of a protein)
The order or sequence of the amino acids in a polypeptide chain.

Product
A substance produced during a chemical reaction.

Promotion
The movement of an electron from a low energy level to a higher energy level further away from the nucleus.

Propagation
An elementary reaction involving one radical causing the formation of another radical.

Prostaglandins
A group of organic compounds derived from essential fatty acids and causing a range of actions, including inflammation.

Protein
A molecule composed of one or more polypeptide chains, each with a characteristic sequence of amino acids linked via peptide bonds.

Proton
Positively charged particle found in the nuclei of all atoms. It has approximately the same mass as the neutron.

Pseudo order
An order of a chemical reaction that appears to be less than the true order because of the experimental conditions used. Pseudo orders occur when one reactant is present in large excess.

Pseudo order constant
If the rate equation takes the form, rate = k [A] [B] then k [A] is the pseudo first-order rate constant with respect to B. Similarly, k [B] is the pseudo first-order with respect to A.

Psychedelic drugs
(or psychotomimetics or hallucinogens) mind-altering drugs produce a qualitative change in thought, perception or mood and can cause vivid illusions and fantasies

p-type semiconductor
A p-type semiconductor is formed when the impurities added to silicon withdraw electrons from the occupied energy level leaving positive 'holes' which allow conduction to occur.

Purine
A nitrogen containing base found in nucleotides and nucleic acids. It contains one six membered ring fused with a five-membered ring

Pryimidine
A nitrogen containing base found in nucleotides and nucleic acids. It contains one six membered ring.

Q

Qualitative analysis
Analysis used to determine the nature of the constituents of a material or substance.

Quantitative analysis
Analysis used to determine the amount of each component in a material or substance.

Quantisation
The concept that energy can only be obtained in the form of small 'packets' called quanta.

Quantum (plural quanta)
A packet of energy.

Quaternary structure
The overall three-dimensional structure of a protein composed of two or more polypeptide chains.

R

Racemic mixture
An equimolar mixture of two enantiomers of the same compound. As their rotation of plane-polarised light is equal but opposite, the mixture is not optically active.

Radiation
The transmission of energy by means of an electromagnetic wave; or the emission of particles from the nucleus of a decaying atom.

Radical
(See free radical).

Radioactive decay
The decay of a radioactive nucleus to form the nucleus of another element by alpha decay or bet decay. Gamma rays may also be emitted.

Radioactive series
A series of isotopes produced one from the other in a sequence of spontaneous radioactive disintegrations.

Random coil
An irregular arrangement of a polypeptide chain in space.

Rate constant
The constant in a rate expression. The rate constant is unaffected by changes in the concentrations of the reactants, but is only affected by changes in temperature.

Rate determining step
The slowest elementary step in a reaction mechanism that controls the rate of the overall reaction.

Rate expression
A rate expression is the experimentally determined relationship between the rate of a reaction and the concentrations of the chemical species that occur in the overall chemical reaction.

Rate of decay
The change in the number of radioactive nuclides in a sample per unit time.

Rate of reaction
The rate of reaction indicates how fast reactants are being converted to products during a chemical reaction. It is the rate of formation of a product, or the rate of consumption of a reactant, divided by the corresponding coefficient in the stoichiometric equation. The rate has units of mol dm^{-3} s^{-1}.

Reactant
A substance that is consumed during a chemical reaction.

Reacting masses
The masses of elements and compounds which take part in a chemical reaction.

Reaction mechanism
A description of the changes in electronic structure that occur during a reaction. The movement of electron pairs is shown by means of curly arrows.

Reaction quotient
A quotient obtained by applying the equilibrium law to initial concentrations, rather than to equilibrium concentrations.

Reactivity series
An order of metal reactivity based on the relative rates of reactions of metals with oxygen, water, dilute aqueous acid and solutions of metal ions or salts.

Reactor core
The part of a nuclear reactor where the fission reaction takes place.

Real gas
A real gas does not obey the gas laws and exhibits non-ideal behaviour. Its molecules have a finite size and there are intermolecular or inter-atomic forces of attraction operating between the molecules or atoms.

Recrystallisation
A technique for the purification of solid crystalline substances. The procedure is based on the fact that solutes are much more soluble in a hot solvent and much less soluble when the solvent is cold.

Redox equation
An equation constructed by combining two half equations so the numbers of electrons on both sides of the equation and cancel.

Redox reaction
A reaction involving reduction and oxidation and which results in one or more electrons being transferred.

Redox titration
A titration used to determine the concentration of a solution of an oxidising agent or of a reducing agent.

Reductant
(See reducing agent).

Reduction
Reduction involves a decrease in oxidation number or gain of electrons.

Reducing agent
A chemical or substance that brings about reduction; it donates electrons to the reactant or one of the reactants. In the reaction the reducing agent itself is oxidised.

Reducing smog
A smog containing soot particles and aqueous sulfur dioxide from the combustion of coal in power stations.

Refining
The processes which separate, convert and purify chemicals in crude oil in oil refinery, or the removal of impurities from metals.

Refluxing
The process of boiling a liquid in a flask fitted with a condenser so that the condensed liquid runs back into the flask.

Reforming
Processes occurring where molecules obtained from crude oil or petroleum are converted into more useful products. The reactions involved are rearrangements and do not involve a change in the molar mass of the molecule.

Relative abundance
The relative abundance is the percentage of a particular isotope of an element relative to other isotopes of the same element in a naturally occurring sample.

Relative atomic mass
The weighted average (according to relative abundances) of the isotopic masses of the atoms in a naturally occurring sample of that element.

Relative isotopic mass
The mass of a particular isotope of an element compared to the mass of one twelfth of a carbon-12 atom. They are measured using a mass spectrometer.

Repeating unit
The unit of a polymer chain that originates from a single monomer, in the case of addition polymers, or from the pair of molecules usually used to make condensation polymers.

Residue (amino acid)
A single amino acid within a polypeptide chain.

Resistance
A measure of an electrical component's opposition to the flow of an electric current. It is measured in ohms (Ω).

Resolution
The separation of a racemic mixture into its two enantiomers (optical isomers).

Restricted rotation
The phenomenon where bonded atoms cannot rotate relative to one another because either the bond between them prevents it, or because the two atoms are part of a ring that restricts rotation.

Restriction enzymes
Enzymes that cause cleavage of both strands of double-stranded DNA at or near specific base sequences.

Retention factor (Rf value)
The retention factor, or Rf, is defined as the distance travelled by the compound divided by the distance travelled by the eluent.

Retrovirus
An RNA virus containing reverse transcriptase.

Reverse osmosis
A method for removing dissolved salts from water, for example, in the desalination of sea water, by the use of a semi-permeable membrane and high pressure.

Reversible reaction
A reversible reaction is a physical or chemical reaction that can go either backwards or forwards depending on the conditions. When a reversible reaction has equal forward and reverse rates the reaction is at equilibrium.

Ribose
A monosaccharide and a component of RNA.

Rusting
The corrosion of iron or steel.

S

Salt
A ionic compound formed by the reaction of an acid with a base, in which the hydrogen of the acid has been replaced by a metal ion. They are usually prepared via neutralisation, precipitation or direct synthesis.

Salt bridge
An ionic connection made between two half cells that contains an electrolyte with ions that do not cause precipitation of the ions in the two half cells. It allows ions to flow while preventing the two solutions from mixing. It prevents a build up of charge which would stop the flow of current.

Saturated
A term used to describe an organic molecule that contains no carbon-carbon multiple bonds and contains only carbon-carbon single bonds.

Saturated fat
A fatty acid containing only fully saturated alkyl chains.

Saturated solution
A solution which contains as much of the dissolved solute as possible at a particular temperature.

Saturated vapour
A vapour that is in equilibrium with a liquid. A saturated vapour is at the maximum pressure (the saturated vapour pressure) at a particular temperature. If the saturated vapour pressure of a liquid is equal to atmospheric pressure, then the temperature is the boiling point of that liquid.

s-block elements
Elements where the valence electrons are in an s-orbital. The s-block comprises groups 1 and 2.

Secondary air pollution
Secondary pollutants, are formed when primary pollutants react with each other or with other compounds present in the atmosphere.

Secondary alcohol
An alcohol where the carbon bearing the –OH group is attached to two other carbon atoms in alkyl or aryl groups.

Secondary amine
An amine where the nitrogen atom bears two alkyl or aryl groups.

Secondary cell
A secondary cell can be recharged by passing an electric current through it in the opposite direction.

Secondary structure (of a protein)
The three-dimensional conformation of sections of polypeptide chains. Common protein secondary structures include the alpha-helix, the beta sheet and the random coil.

Second order
A reaction in which the rate of reaction is proportional to the product of the concentrations of two of the reactants or to the square of the concentration of one of the reactants.

Semiconductor
A crystalline material with a conductivity intermediate between that of a conductor and an insulator. Its conductivity rises with increasing temperature.

Sex hormones
Various hormones, such as oestrogen, progesterone and testosterone, affecting the growth or function of the reproductive organs, the development of secondary sex characteristics, and the behavioral patterns of animals.

Shells
The main energy levels of an atom where the electrons are located.

Shielding (of electrons)
Shielding electrons are the electrons in the energy levels between the nucleus and the outer or valence electrons. They are described as 'shielding' electrons because they 'shield' the valence electrons from the nuclear charge and reduce the pull on them by the protons in the nucleus.

Side effects
A secondary and usually adverse effect of a drug.

Side reactions
Unwanted reactions which reduce the yield of the product being formed by the main reaction.

Sigma bond
A bond formed by the head-on overlap between atomic orbitals along an imaginary line joining the two nuclei (the internuclear axis). The electron density is concentrated along the internuclear axis. Sigma bonds can be formed by the overlap of two s-orbitals, an s-orbital and a p-orbital or two p-orbitals.

Single bond
A covalent bond formed by the sharing of one pair of electrons.

Skeletal formula
A formula representing organic molecules where the carbon and hydrogen atoms are omitted and only the bonds between them are shown.

Slag
A mixture of molten non-metallic oxides produced during the extraction of iron in the blast furnace. It consists of oxide impurities that have reacted with the calcium oxide produced from the decomposition of limestone.

Smog
A form of air pollution consisting of a combination of smoke and fog.

Smoke
Tiny particles of unburnt carbon suspended in air.

S_N1 (halogenoalkanes)
A nucleophilic substitution in which a carbocation intermediate is formed in the rate determining step which then reacts with the nucleophile.

S_N2 (halogenoalkanes)
A nucleophilic substitution where a concerted reaction occurs in which the nucleophile begins to bond with the carbon bearing the halogen as the halogen begins to leave the molecule.

Soap
A sodium or potassium salt of a long-chain organic acid.

Solid
A state of matter whose particles are in fixed positions and are not able to move from one location to another. The particles are held in a lattice by chemical bonds or intermolecular forces.

Solid phase chemistry
Solid phase chemistry involves carrying a synthesis with one of the reactant molecules attached to an insoluble material known as a solid support.

Solubility
The amount of solute required to form a saturated solution in a given volume of solvent.

Solute
A solute is the solid, liquid or gas that has been dissolved to form a solution.

Solution
A solution is formed when a solid, liquid or gas is dissolved into a solvent.

Solvation
The process occurring when ions dissolve in a polar solvent and become surrounded by solvent molecules.

Solvent
A solvent is a liquid that dissolves solids, liquids or gases to form a solution.

s orbital
A spherically symmetrical atomic orbital; there is one per shell. s-orbitals have the lowest energy orbital in a given shell.

Specific heat capacity
The specific heat capacity is the amount of heat energy required to raise the temperature of one kilogram of a substance, by one degree kelvin (or Celsius).

Spectrochemical series
Arrangement of ligands in order of increasing ability to produce d-orbital splitting.

Spectroscopy
The production and analysis of spectra.

Spectator ions
Ions present in solution that do not participate directly in a reaction.

Spectral line
A particular wavelength of light emitted (or absorbed) by an atom, ion (or molecule).

Spectral series
A group of related lines in the emission (or absorption) spectrum of a substance. The lines in a spectral series occur when all the transitions all occur between one particular energy level and a set of different energy levels.

Spectroscope
An instrument for examining the different wavelengths present in electromagnetic radiation.

Spontaneous reaction
A reaction which will occur when the reactants are mixed together under standard conditions. It does not require an input of heat energy and is accompanied by a decrease in free energy.

Stability
A compound is described as being stable if it does not tend to decompose into its elements or into other compounds.

Standard electrode potential
The potential difference generated by a half-cell under standard conditions when connected by a salt bridge and an external circuit to a standard hydrogen electrode .

Standard hydrogen electrode
The standard hydrogen electrode is a half cell used to measure standard electrode potentials. It consists of hydrogen gas (at a pressure of one atmosphere) bubbled over a platinum electrode in a one molar solution of hydrochloric acid at 298 K. It is assigned a voltage of zero.

Standard enthalpy change of reaction
The enthalpy change when molar amounts of substances in a balanced equation react under standard thermodynamic conditions.

Standard solution
A solution with an accurately known concentration. They are made by dissolving a known amount of a primary standard in water.

Standard temperature and pressure (stp)
Standard conditions of 0 °C and 1 atmosphere pressure.

States of matter
Solid, liquid and gas are the three states of matter in which all substances can exist, depending on the conditions of temperature and pressure.

State symbols
Symbols used in equation to describe the physical state of the substances that are participating in the reaction.

Stationary phase
One of the two phases forming a chromatographic system. It may be a solid, a gel or a liquid. If a liquid, it may be distributed on a solid. The liquid may also be chemically bonded to the solid (bonded phase) or immobilised onto it (immobilised phase).

Steam cracking
Cracking out in the presence of steam at very high temperatures.

Steam reforming
The reaction of naphtha with steam over a platinum/alumina catalyst to give a variety of branched-chain alkanes, cycloalkanes and aromatic compounds, used in the blending of fuels.

Stereo-isomerism
Isomerism arising from differences in the shapes of molecules. Includes geometric and optical isomerism.

Steric factor
An effect in which the rate of a chemical reaction depends on the size or shape of groups of atoms within a molecule.

Steric hindrance
The prevention or slowing down of a reaction by atoms or functional groups blocking the access of an attacking molecule or ion.

Steroid
A group of lipids with a characteristic fused carbon-ring structure that includes cholesterol and the sex hormones.

Sticky ends
Two DNA molecules with short overhanging single-stranded sequences that are complementary to one another, facilitating the sealing of the ends.

Stimulants
A drug that temporarily arouses or accelerates physiological activity and prevents sleep.

Stoichiometry
The ratio in which the elements combine in a compound, or the ratio in which compounds react in a reaction.

Standard solution
A solution whose concentration is accurately known and does not change with time.

Standard state
A reference state for a specific element (in a particular allotropic form, where appropriate) according to standard thermodynamic conditions.

State symbols
State symbols indicate whether a substance shown in an equation is a solid (s), liquid (l), gas (g) or in aqueous solution (aq), that is, dissolved in water.

Stereo-isomerism
A type of isomerism in which the connectivity of atoms in the isomers is the same, but the arrangements in space are different.

Stereospecific reactions
Reactions with one of the optical isomers or enantiomers of a compound, but not the other.

Stoichiometric quantities
A reaction where amounts of reactants are reacted together so that all are consumed at exactly the same time.

Storage cell
An electrochemical cell that stores, in the form of chemical energy, useful quantities of electrical energy, for example, lead-acid battery.

Strain
Strain is present in a molecule or transition structure if the energy is enhanced because of unfavourable bond lengths or bond angles, relative to a standard. It is quantitatively defined as the standard enthalpy of a structure relative to a strainless structure (real or hypothetical) made up from the same atoms with the same types of bonding.

Stratosphere
The layer of the atmosphere between 15 and 30 km, above the troposphere.

Strong acid/base
A strong acid or strong base is completely dissociated or ionised when dissolved in water

Structural formula
A structural formula shows the connectivity of the atoms in the molecule.

Structural isomers
A type of isomerism in which the connectivity of atoms in the isomeric compounds differs.

Sub-atomic particles
The particles, electrons, protons and neutrons, from which all atoms are made.

Sublimation
The direct change of state from solid to gas (or from gas to solid) without melting or freezing occurring.

Sub-critical reaction (nuclear)
A nuclear reaction in which less than one neutron causes another fission event and the process dies out.

Sub-shell
A sub-division of an electron shell.

Substituent
An atom, radical, or group substituted for another in a chemical compound.

Substitution
A reaction in which one atom or group of atoms is replaced by another atom or functional group.

Substrate
The compound acted upon by an enzyme.

Sugar
A sweet, crystalline and water-soluble mono- or disaccharide.

Sunscreen
A chemical that protects the skin from harmful ultraviolet radiation from the sun.

Synergistic effect
The condition in which the result of the combined action of two or more drugs is greater than the sum of their separate, individual effects.

Synthesis
A series of reactions resulting in the production of a particular chemical

Synthesis gas
A mixture of carbon monoxide and hydrogen gas produced by the steam reforming of natural gas using nickel oxide catalyst.

System
A term used to describe the material or mixture of chemicals being studied. Everything outside the system is the surroundings.

T

Temperature
The measure of the average kinetic energy of the particles in a substance.

Termination
An elementary step in a reaction involving the combination of two radicals to form a molecule.

Tertiary alcohol
An alcohol in which the carbon atom bearing the –OH group is attached to three other carbon atoms, that is, to three alkyl or aryl groups.

Tertiary structure (of a protein)
The overall three-dimensional folded shape of a protein composed of a single polypeptide chain.

Tetramethylsilane
A reference standard for proton nuclear magnetic resonance.

Theoretical yield
The maximum amount or mass of a particular product that can be formed when the limiting reactant is completely consumed and there are no losses or side reactions.

Thermal cracking
Cracking carried out a high temperature in the absence of a catalyst.

Thermal decomposition
The decomposition of a substance by heating.

Thermal dissociation
The process whereby a substance decomposes on heating but is regenerated on cooling. This is provided it has been heated in a closed system and the products have not escaped.

Thermal inversion
A thermal inversion occurs when cold dense air is near the ground, and there is a layer of warmer and therefore lighter air above it. They often occur in valleys and trap pollutants formed during the day in towns and cities located there.

Thermal pollution
Industrial discharge of heated water into a river, lake, or other body of water, causing a rise in temperature that endangers aquatic life by decreasing the solubility of dissolved oxygen.

Thermochemical equation
A chemical equation that describes the reaction occurring and gives the associated enthalpy change.

Thermochemistry
The study of heat changes occurring during chemical reactions.

Thermodynamics
The laws which govern energy transfers and the direction of chemical and physical changes.

Thermoplastics
Plastics which soften when heated and can then be re-moulded. Most addition polymers are thermoplastics.

Thermosetting plastics
Plastics which do not soften on heating but only char and decompose – they cannot be re-moulded.

Thin-layer chromatography
A form of chromatography in which compounds are separated by a suitable solvent or solvent mixture on a thin layer of adsorbent material coated onto a flat support.

Tidal power
Tidal power utilises the twice daily variation in sea level caused primarily by the gravitational effect of the Moon to generate electricity.

Titration
A Chemical technique in which one solution is used to analyse another solution and find its concentration or amount.

Titration curve
A plot of the pH of the reaction mixture against the amount of titrant added.

Tolerance
The capacity of the body to endure or become less responsive to a substance (such as a drug) with repeated use or exposure.

trans-
A prefix typically used to describe the geometric isomer of a 1,2-disubstituted alkene with atoms or functional groups on opposite sides of a double bond or ring. It is also used in complex ions to designate two groups located directly across a central metal or ion from each other.

Transition (electronic)
A movement of electrons between energy levels. This can be from to a higher energy level, involving a shell further away from the nucleus, or to a lower energy level closer to the nucleus.

Transition state
(See activated complex).

Transition element/metal
A set of metals in the Periodic Table, located between groups 2 and 3/13, in which filling of electrons in an inner d-shell occurs.

Transmittance
A measure of the extent to which a sample in a spectrometer or colorimeter absorbs electromagnetic radiation of a particular wavelength.

Trend
A term used to describe the way in which a chemical or physical property increases or decreases along a series of elements or organic compounds (homologous series).

Triple bond
A covalent bond formed by the sharing of three pairs of electrons between two atoms.

Troposphere
The layer of the atmosphere closest to the ground and extending upwards (15 – 30 km) to the stratosphere.

U

Ultraviolet/Visible spectroscopy
Ultraviolet/visible spectroscopy involves the absorption of ultraviolet/visible light by a molecule causing the promotion of an electron from a ground electronic state to an excited electronic state.

Unimolecular
An elementary step involving one particle dissociating into two or more particles.

Universal indicator
A mixture of indicators which changes colour several times as the pH of an aqueous solution changes.

Unit cell
The smallest repeating part of a lattice or crystalline structure.

Unsaturated fatty acid
A fatty acid containing one or more carbon-carbon double bonds.

Unsaturation
A term used to describe a molecule, such as an alkene or fat, containing one or more carbon-carbon double or triple (multiple) bonds.

V

Valence electrons
The electrons in the outermost shell of an atom or ion. They are typically involved in bond formation.

Valence shell electron pair repulsion theory (VSEPR)
A model which states that the shape of bonds around the central atom of a molecule is determined by minimising the repulsion between the regions of high electron density.

Van der Waals' forces
Intermolecular forces, that operate between noble gas atoms and non-polar molecules in the solid and liquid states. They occur when the electrons within an atom or molecule induce a temporary dipole in an adjacent atom or molecule. They occur with increasing molecular or atomic size.

Vapour
A gas in contact with its liquid at a temperature below its boiling point.

Vapour pressure
The pressure of the vapour (gas) over a liquid where the gas and vapour are in equilibrium.

Virus
A simple organism that consists essentially of a core of RNA or DNA surrounded by a protein coat. They are only able to replicate inside a host cell.

Vitamin
Various unrelated fat-soluble or water-soluble organic substances essential in minute amounts for normal growth and activity of the body and obtained naturally from plant and animal foods.

Volatile organic compound (VOC)
Volatile organic compound, present in the atmosphere from evaporation of solvents or hydrocarbon fuels (man-made) or emitted by plants (Biological), and important precursors for photochemical formation of ozone.

Volatility
A qualitative measure of the how readily a liquid or solid is vaporised upon heating or evaporation.

Voltaic cell
Voltaic or galvanic cells contain two half cells, each of which is composed of an electrode in contact with an electrolyte. They are connected with a salt bridge and an external circuit.

W

Water of crystallisation
Water molecules that are incorporated into the crystal lattice of many inorganic salts when they crystallise from aqueous solution.

Wavelength
The distance between the peaks (or troughs) of one complete wave.

Wave number
The reciprocal of the wavelength of a wave. It is the number of complete waves in a particular unit of distance, for example, 1 cm. It is commonly used in infrared spectroscopy.

Weak acid/base
A weak acid is only partially dissociated or ionised when dissolved in water.

Word equation
A summary of a chemical reaction using the chemical names of the reactant and products.

Z

Zeolite
A naturally occurring series of aluminosilicate rocks that contain cations in the cavities of the aluminosilicate framework. They are widely used in ion-exchange columns.

Zero order
A chemical reaction in which the rate of reaction is independent of the concentration of a reactant.

Ziegler-Natta process
A method for the manufacture of high-density polyethene using a catalyst of titanium(IV) chloride and triethylaluminium under slight pressure.

Zone of nuclear stability
The area encompassing the stable nuclides on a plot of their positions as a function of the number of protons and the number of neutrons in the nucleus.

Zone refining
A technique used to reduce the level of impurities in semiconductors. It is based on the fact that the solubility of an impurity may be different in the solid and liquid phases.

Zwitterion
(See dipolar ion).

Zymase
A mixture of enzymes found in yeast involved in fermentation.