GCSE Chemistry **Glossary**

Combined Science

acid	A substance that produces hydrogen ions (H^+) in aqueous solutions and has a pH of less than 7.
acid rain	Precipitation that is acidic due to dissolved sulfur dioxide and oxides of nitrogen.
acidity	The concentration of hydrogen ions (H^+) in a substance.
activation energy	The minimum amount of energy that particles must have to react.
agriculture	Relating to farming, including cultivating soil, growing crops and rearing livestock.
algae (singular: alga)	A group of mostly aquatic, eukaryotic organisms that take in carbon dioxide and produce oxygen by photosynthesis.
alkali	A soluble base. A substance that produces hydroxide ions (OH^-) in aqueous solutions and has a pH of more than 7.
alkali metal	A metal in Group 1 of the periodic table.
alkalinity	The capacity of a substance to neutralise an acid.
alkanes	A homologous series of hydrocarbons with the general formula C_nH_{2n+2}, e.g. methane, ethane, propane and butane.
alkenes	A homologous series of hydrocarbons that are more reactive than alkanes and react with bromine water.
alloy	A mixture of two or more elements, at least one of which is a metal.
alpha particle scattering experiment	The experiment that suggested that the mass of an atom was concentrated in the centre (nucleus) and that the nucleus was charged. The experiment led to the nuclear model of the atom, which replaced the plum pudding model.
anion	A negatively charged ion, formed when one or more electrons are gained. This ion is attracted to the anode in electrolysis.
anode	A positive electrode. Negatively charged ions (anions) move towards this electrode.
aqueous	A substance dissolved in water. Shown as (aq) in chemical equations.
aqueous solution	The mixture made by adding a soluble substance to water.
atmosphere	The layer of gases that surrounds the Earth.

atom	The smallest part of an element that can exist.
atomic model	A model to represent the structure of the atom. This model has been revised over time as new evidence has become available.
atomic number	The number of protons in an atom of an element.
Avogadro constant **(HT only)**	The number of atoms, molecules or ions in a mole of a given substance. It has a value of 6.02×10^{23}.
balanced equation	A representation of a chemical reaction using the formulae of the reactants and products. It shows the number of atoms of each element involved in the reaction.
ball and stick model	A model of a molecule that uses spheres to represent atoms and sticks to represent bonds.
base	A substance that reacts with an acid to neutralise it, e.g. metal oxides, metal hydroxides and metal carbonates.
bioleaching **(HT only)**	A process that uses bacteria to produce leachate solutions that contain metal compounds. The metal compounds can be processed to obtain a metal.
biomass	The mass of living material of an organism. This will include all of the proteins, carbohydrates and lipids that make up that organism. It does not include the water content.
blast furnace	A tower into which a blast of hot compressed air can be introduced from below. It is used to extract industrial metals, particularly iron.
boiling	The process that happens at the boiling point of a substance when the rate of evaporation is at its maximum.
boiling point	The temperature at which a substance changes from liquid to gas (evaporates). It is also the temperature at which a substance changes from gas to liquid (condenses).
bond	An attraction between atoms, ions or molecules that enables the formation of chemical compounds. Such attractions could be ionic, covalent or metallic.
bond energy	The amount of energy needed to break a bond, or the amount of energy released when a bond is made.
brittle	A material that breaks when stressed, rather than deforming.
bromine water	An orange solution of bromine that turns colourless when it reacts with an alkene.
Buckminsterfullerene	The first fullerene to be discovered. It has the chemical formula C_{60} and a spherical shape.
carbon footprint	The total amount of carbon dioxide and other greenhouse gases emitted over the full life cycle of a product, service or event.
carbon nanotube	A cylindrical fullerene with a very high length to diameter ratio.

carbonate ion	An ion with the formula CO_3^{2-}. Compounds containing this ion are called carbonates.
catalyst	A substance that increases the rate of a chemical reaction by lowering the activation energy without being used up in the reaction. In biological systems, enzymes act in this way.
catalytic cracking	A method of cracking that involves passing vaporised hydrocarbon molecules over a hot catalyst.
cathode	A negative electrode. Positively charged ions (cations) move towards this electrode.
cation	A positively charged ion, formed when one or more electrons are lost. This ion is attracted to the cathode in electrolysis.
cellulose	The main structural component in the cell walls of plant cells.
change of state	A physical change from one state of matter to another.
charge	A property of a particle that causes it to experience a force in an electric field.
chemical change	A change in which one or more new substances are produced.
chemical formula	A series of chemical symbols showing the number of atoms of each element in a compound.
chemical reaction	A process that involves rearrangement of atoms to produce new substances.
chemical symbol	A letter or series of letters used to represent an element, e.g. C for carbon, Na for sodium.
chromatography	A technique used to separate substances based on their solubility in a particular solvent.
climate change	A change in the average temperature and cycles of weather over a long period of time.
closed system	A system in which no reactants or products can enter or leave during a reaction.
collision theory	The theory that explains how various factors affect rates of reaction. Chemical reactions can occur only when reacting particles collide with each other and with sufficient energy.
combustion	A reaction between a substance and oxygen in the air. The scientific word for burning.
compound	A substance made up of two or more different elements chemically bonded together, e.g. water is a compound of hydrogen and oxygen.
concentrated	A solution with a large number of molecules of a substance in a given volume.

concentration	The mass of solute per given volume of solution, measured in grams per dm^3 (g/dm^3). **(HT only)** The number of moles of solute per given volume of solution, measured in moles per dm^3 (mol/dm^3).
condensation	A change of state from gas to liquid.
conduction	The transfer of heat or electricity through a material.
conservation of energy	Energy cannot be created or destroyed.
conservation of mass	No atoms are lost or made during a chemical reaction so the mass of the products equals the mass of the reactants.
covalent bond	The attraction between two atoms that share one or more pairs of electrons.
cracking	A process used to convert long-chain hydrocarbons into shorter, more useful molecules.
crude oil	A fossil fuel formed from the remains of an ancient biomass consisting mainly of plankton that was buried in mud.
crystallisation	A separation technique used to obtain a sample of pure salt from a salt solution.
delocalised electron	A bonding electron that is no longer associated with any particular atom and therefore free to move through the structure.
density	The mass per unit volume of a substance, measured in kilograms per metre cubed (kg/m^3). It is calculated by dividing the mass of an object by its volume.
desalination	A process that removes salt from salty water or sea water. It can be done by distillation or by processes that use membranes such as reverse osmosis.
diamond	A giant covalent structure in which each carbon atom forms covalent bonds with four other carbon atoms.
dilute	A solution with a small number of molecules of a substance in a given volume.
discharge (electrolysis)	The process of ions losing or gaining electrons to become atoms or molecules.
displacement reaction	A reaction in which a more reactive substance displaces a less reactive substance.
dissolve	To mix a solute with a solvent to form a solution.
distillation	A technique to separate and collect a solvent from a solution.
dot and cross diagram	A diagram showing the arrangement of the outer shell electrons of the atoms or ions in a substance.
double bond	A type of bond where two pairs of electrons are shared between atoms.

dynamic equilibrium	A condition reached when a reversible reaction is carried out in apparatus which prevents the escape of reactants and products, when the forward and reverse reactions occur at exactly the same rate.
effluent	The fluid that remains on the top of the sludge after sedimentation of sewage. It is treated with aerobic bacteria.
electric current	The flow of electrical charge.
electrochemical	A process or reaction in which a potential difference is produced by a chemical reaction.
electrode	An electrical conductor that is used to make contact with a non-metallic part of a circuit, e.g. an electrolyte.
electrolysis	The process of breaking down a substance by passing an electric current through it.
electrolyte	A liquid or solution that can conduct electricity.
electron	A particle with a relative charge of -1 and a very small relative mass. It orbits the nucleus of an atom or ion in energy levels (shells).
electronic structure	The number of electrons in each energy level (shell) of an atom, e.g. a sodium atom has an electronic structure of 2, 8, 1.
electrostatic force	The attractive or repulsive force between two charged objects.
element	A substance made of only one type of atom.
emit	To release or give out.
empirical formula	A formula that shows the proportions of the elements present in a compound but not the actual numbers.
endothermic	A reaction that takes in energy from the surroundings.
energy level	The distance from the nucleus of an atom where electrons orbit. Also called a shell.
energy level diagram	See reaction profile.
environmental impact	A negative or positive change to the environment as a result of activities, products or services.
enzyme	A biological catalyst that speeds up the rate of reactions.
equilibrium	A stable situation reached when the forward and reverse reactions in a reversible reaction occur at exactly the same rate in a closed system.
evaporation	A change of state from liquid to gas.

evidence	The available information or facts that either support or counter a scientific theory or hypothesis.
excess	An amount that is more than is necessary.
exothermic	A reaction that transfers energy to the surroundings.
extraction (of metals)	The process of obtaining a metal from an ore, usually by reduction or electrolysis.
fertiliser	A formulation that contains minerals to promote plant growth.
filter bed	A layer of sand used to filter insoluble solids from ground water.
filtration	A technique used to separate substances that are insoluble in a particular solvent from those that are soluble in the solvent.
finite resource	A limited resource that isn't replenished or replaced quickly enough to be considered renewable.
flammability	A measure of how easily a substance ignites.
formulation	A mixture that has been designed as a useful product.
fossil fuel	A fuel formed over millions of years from the remains of dead plants and animals. Examples are coal, oil and natural gas.
fractional distillation	A separation technique used to separate miscible liquids with different boiling points.
fraction	A group of hydrocarbons that condense together when crude oil is separated by fractional distillation.
freezing	A change of state from liquid to solid.
fullerene	A molecule of carbon atoms with a hollow shape. It has a cage-like structure based on hexagonal rings of carbon atoms.
gas	The state of matter in which a substance can flow and completely fill a container. It has no fixed shape or volume and can be compressed. The particles are far apart and move quickly in all directions. Shown as (g) in chemical equations.
general formula	A chemical formula that applies to a particular homologous series.
giant covalent structure	A huge 3D structure made up of many atoms held together by covalent bonds.
giant ionic lattice	A huge 3D structure in which there are strong electrostatic forces of attraction in all directions between oppositely charged ions.
global dimming	A decrease in the amount of solar radiation reaching the surface of the Earth, caused by particulates in the atmosphere.

global warming	The gradual increase in the temperature of the Earth's atmosphere.
gradient	The steepness of a line (on a graph).
graphene	A single layer of graphite.
graphite	A giant covalent structure in which each carbon atom forms covalent bonds with three other carbon atoms, forming layers of hexagonal rings with no covalent bonds between the layers. One electron from each carbon atom is delocalised.
greenhouse effect	The retention of heat in the atmosphere due to greenhouse gases. The gases absorb energy transferred as long wavelength radiation from the Earth's surface and release it in all directions, including back towards Earth, helping to keep the Earth warm.
greenhouse gas	A gas that can absorb long wavelength radiation, e.g. water vapour, carbon dioxide and methane.
ground water	Fresh water found underground in soil spaces and porous rocks.
groups	A column of the periodic table that contains elements with similar chemical properties.
half equation **(HT only)**	A symbol equation that shows how individual atoms or ions gain or lose electrons.
halide ion	An ion with a charge of -1, formed when a halogen gains an electron.
halogen	An element in Group 7 of the periodic table.
homologous series	A series of compounds which have the same general formula and functional group, and react in a similar way, e.g. alkanes.
hydrocarbon	A molecule made of hydrogen and carbon atoms only.
hydrogen ion	A positively charged ion with the chemical formula H^+, found in acidic solutions.
hydroxide ion	A negatively charged ion with the chemical formula OH^-, found in alkaline solutions.
impure substance	A substance which is a mixture of elements, compounds, or elements and compounds.
indicator	A substance that changes colour when added to acidic or alkaline solutions.
inert	A substance that does not take part in chemical reactions.
insoluble	A substance that does not dissolve in a given solvent.

instrumental method	An accurate, sensitive and rapid method used to identify elements and compounds.
intermolecular forces	The attraction between individual molecules in a covalently bonded substance.
ion	A charged particle formed when an atom or molecule loses or gains one or more electrons.
ionic bond	The electrostatic force of attraction between positively and negatively charged ions.
ionic equation **(HT only)**	An equation that shows the ions involved in a chemical reaction.
ionisation	The process by which atoms or molecules become charged due to the loss or gain of one or more electrons.
isotopes	Atoms of the same element with different numbers of neutrons.
James Chadwick	The scientist who provided experimental evidence to show the existence of neutrons within the nucleus of an atom.
lattice	A closely-packed regular arrangement of atoms, ions or molecules.
Le Chatelier's Principle **(HT only)**	The principle that if a system is at equilibrium and a change is made to any of the conditions, the position of equilibrium moves to counteract the change.
leachate solution **(HT only)**	The acidic solution containing copper (II) ions produced by bioleaching.
life cycle assessment (LCA)	A process that assesses the environmental impact of a product over the course of its life.
limestone	A sedimentary rock composed mainly of calcium carbonate.
limewater	An aqueous solution of calcium hydroxide. It turns milky (cloudy) in the presence of carbon dioxide.
limiting reactant **(HT only)**	The reactant in a chemical reaction that is completely used up and therefore limits the amount of products.
litmus paper	Indicator paper used to test pH. Red paper turns blue in alkaline solutions and blue paper turns red in acidic solutions. It is bleached white in the presence of chlorine.
liquefy	To make or become liquid.
liquid	The state of matter in which a substance can flow and take the shape of a container. It has a fixed volume and cannot be compressed. The particles can move around each other. Shown as (l) in chemical equations.

lubricant	A substance that reduces the effects of friction by helping two surfaces move past each other more easily.
mass number	The total number of protons and neutrons in the nucleus of an atom.
melting	A change of state from solid to liquid.
melting point	The temperature at which a substance changes from solid to liquid (melts). It is also the temperature at which a substance changes from liquid to solid (freezes).
Mendeleev	The scientist who developed the periodic table. He left gaps for elements he predicted had not yet been discovered.
metal	An element that forms positive ions.
metal carbonate	A type of base characterised by the presence of a carbonate ion (CO_3^{2-}). It produces a salt, water and carbon dioxide when it reacts with an acid.
metal hydroxide	A type of base characterised by the presence of a hydroxide ion (OH^-). It produces a salt and water when it reacts with an acid.
metal ore	Naturally occurring rocks that contain metals or metal compounds in sufficient amounts to make it worthwhile extracting them.
metal oxide	A chemical compound formed when a metal reacts with oxygen. It produces a salt and water when it reacts with an acid.
metallic bond	The attraction between a metal ion and delocalised electrons.
microbe	An organism that can only be seen using a microscope.
mining	The process of obtaining minerals from the Earth.
miscible	Liquids that dissolve in each other.
mixture	A substance consisting of two or more substances not chemically combined together, e.g. air is a mixture of nitrogen, oxygen, carbon dioxide and small amounts of other gases.
mobile phase	In chromatography, the solvent that moves, carrying different substances with it.
mole (mol) **(HT only)**	An amount of a substance that has a mass in grams that is numerically equal to its relative formula mass. The number of atoms, molecules or ions in this amount of a substance is the Avogadro constant (6.02×10^{23}).
molecular formula	A formula that shows the actual numbers of atoms of each element in a molecule.
molecule	A substance made of more than one atom held together by covalent bonds.
molten	A substance that is made liquid by heating.

monomer	A small molecule that reacts with other small molecules to form a larger molecule (polymer).
neutralisation reaction	A reaction between an acid and a base or an acid and an alkali, forming a salt and water.
neutral	A substance with a pH of 7.
neutron	A particle with no charge found in the nucleus of the atom. It has the same mass as a proton.
Niels Bohr	The scientist who adapted the nuclear model by suggesting that electrons orbit the nucleus at specific distances.
noble gas	An unreactive gas found in Group 0 of the periodic table.
non-enclosed system	A system in which reactants or products can enter or leave during a reaction.
non-metal	An element that forms negative ions.
nuclear model	The model of the atom suggested by Rutherford. In this model, the mass of the atom is concentrated at the nucleus, which is positively charged.
nucleus (plural: nuclei)	The centre of the atom, consisting of protons and neutrons. It is positively charged.
odourless	Having no smell.
organic compound	A chemical compound that contains carbon atoms.
outer shell	The energy level of an atom furthest from the nucleus.
oxidation	The loss of electrons from a substance or the gain of oxygen by a substance.
particle model	A model that describes the arrangement and movement of particles in a substance.
particulates	Microscopic particles suspended in the air.
peer review	The evaluation of scientific research by other scientists working in the same field.
percentage by mass	The relative atomic mass of an element in a compound as a percentage of the relative formula mass of the compound.
periodic table	A table of all the known elements arranged in order of atomic number so that elements with similar properties are in columns, known as groups.
petrochemical	A substance obtained from the processing of petrol.

pH	A measure of the acidity or alkalinity of a substance on a scale of 0 to 14.
pH scale	A scale from 0 to 14 that is used to measure the acidity or alkalinity of a substance.
photosynthesis	An endothermic reaction in which energy is transferred from the environment to chloroplasts by light. It is represented by the equation: $\text{carbon dioxide + water} \xrightarrow{\text{light}} \text{glucose + oxygen}$
phytomining **(HT only)**	A process that uses plants to absorb metal compounds. The plants are then harvested and burned to produce ash that contains metal compounds.
plankton	Small organisms that live in large bodies of water.
plum pudding model	Thomson's model of the atom that suggested that the atom is a ball of positive charge with negative electrons embedded in it.
pollutant	A substance with undesirable effects that is introduced to the environment.
pollution	The introduction of harmful materials into the environment.
polymer	A large molecule that consists of many repeating units (monomers).
potable water	Water that is safe to drink. It is not the same as pure water because it contains dissolved substances.
potential difference	A measure of the work done or the energy transferred to a component by each coulomb of charge that passes through it, measured in volts (V).
precipitate	An insoluble solid that is formed in a solution during a chemical reaction.
pressure	The force per unit cross-sectional area for a force acting at right angles to a surface.
product	A substance that is formed in a chemical reaction.
protein	A molecule made up of long chains of amino acids, used for building the cells and tissues of the body.
proton	A particle with a charge of +1 found in the nucleus of the atom. It has the same mass as a neutron.
pure metal	A metal consisting of a single element.
pure substance	A single element or compound, not mixed with any other substance.
pure water	Water consisting only of molecules of H_2O.

quarrying	The process of blasting rock out of the ground in huge pits to obtain materials.
radius	The distance from the centre to the circumference of a circle or sphere.
rate of reaction	A measure of how quickly a reactant is used up or a product is formed in a chemical reaction.
raw materials	Materials from the Earth's crust, atmosphere or oceans, or from living organisms, from which products are made.
reactant	A substance that takes part in a chemical reaction.
reaction profile	A graph showing the relative energies of reactants and products, the activation energy and the overall energy change of a reaction. Also known as an energy level diagram.
reactivity	A measure of how reactive a substance is.
reactivity series	A list of elements arranged in order of reactivity, with the most reactive elements at the top and the least reactive elements at the bottom.
recast	To melt a metal object down and reshape it.
recycling	The collection and processing of used materials to make new products.
redox reaction	A reaction in which one substance is reduced and another is oxidised.
reduction	The gain of electrons by a substance or the loss of oxygen from a substance.
reform	To melt a metal object down and reshape it.
relative atomic mass (A_r)	The average mass of an atom of an element that takes into account the abundance of the isotopes of the element.
relative formula mass (M_r)	The sum of the relative atomic masses of the atoms in a compound in the numbers shown in the formula.
renewable resource	An energy resource which can be replenished and will not run out.
reverse osmosis	The desalination process in which seawater is forced through a membrane at high pressure. The membrane allows water molecules to pass through but prevents dissolved chemicals from doing so.
reversible reaction	A reaction in which the products can react to produce the original reactants. Represented by: $A + B \rightleftharpoons C + D$
R_f value	In chromatography, the ratio of the distance moved by a compound to the distance moved by the solvent.
salt	A compound formed by the neutralisation of an acid by a base.

salty water	Water that contains a high concentration of dissolved salts.
saturated solution	A solution in which no more solute can dissolve in the solvent at a given temperature.
sediment	A collection of small fragments of matter, such as soil and rocks, that is deposited in layers.
sedimentary rock	Rock that is formed when layers of sediment are deposited, e.g. limestone and sandstone.
sedimentation	The process of settling or being deposited as sediment.
sewage	The waste material carried by sewer drains and pipes.
shell	The distance from the nucleus of an atom where electrons orbit. Also called an energy level.
simple distillation	A technique used to separate a solvent from a solution.
sludge	Solid particles that settle from sewage during treatment, which are then treated by anaerobic bacteria.
small molecule	A molecule with no overall charge consisting of only a few atoms held together by covalent bonds.
solid	The state of matter in which a substance has a fixed shape and cannot flow or be compressed. The particles are close together in a regular arrangement. Shown as (s) in chemical equations.
solubility	A measure of the amount of substance that will dissolve in a certain volume of solvent.
soluble	A substance that will dissolve in a given solvent.
solute	The substance that dissolves in a solvent to make a solution. In salt water, this substance is the salt.
solution	A homogenous mixture of two or more substances, formed when a solute dissolves in a solvent. Salt water is an example.
solvent	The substance in which a solute dissolves. In salt water, this substance is the water.
starch	An insoluble carbohydrate that is a polymer made of glucose monomers. In most plants this is the storage molecule for glucose. Iodine is used to test for this molecule.
state symbol	An abbreviation used in a symbol equation to show if a reactant or product is a solid (s), liquid (l), gas (g) or dissolved in water (aq).
state of matter	The classification of a substance as solid, liquid or gas.
stationary phase	The component in chromatography that does not move, e.g. the paper in paper chromatography.

steam cracking	A method of cracking that involves mixing vaporised hydrocarbon molecules with steam and heating to a very high temperature.
sterilise	To remove microorganisms from an object or substance.
sterilising agent	Something which removes microorganisms from an object or substance, e.g. chlorine, ozone or ultraviolet light.
sulfate ion	An ion with the formula SO_4^{2-}.
surface area	The total area of the surface of an object.
sustainable	Able to be maintained at a certain level or rate, or continue over time.
symbol equation	An equation that uses the chemical formulae of the reactants and products to model a chemical reaction.
synthesise	To make something by combining parts.
synthetic	A substance made by chemical synthesis.
tangent	A straight line that touches a curve (on a graph) at a given point.
temperature	The average kinetic energy of the particles in a substance, measured in degrees Celsius (°C).
theory	A general explanation that applies to a wide range of situations and examples.
thermal decomposition	A reaction in which a single reactant breaks down when heated, forming two or more products.
toxic	A chemical that can cause illness or death if taken into the body. Another word for poisonous.
turbidity	The cloudiness of a fluid causes by suspended particles.
uncertainty	The interval within which the true value is expected to lie. For an instrument, this is plus or minus half of the smallest scale division. For a set of repeat measurements, this is plus or minus half of the range.
universal indicator	A mixture of dyes that changes colour gradually over a range of pH, used to test for acids and alkalis.
unreactive	A substance which does not react chemically.
viscosity	A measure of how difficult it is for a substance to flow. The more viscous a substance, the more difficult it is for it to flow.
volcanic activity	Emission of gases or lava from a volcano.

voltage	See potential difference.
volume	The amount of space that a substance or object occupies.
word equation	An equation that uses only the names of the reactants and products to model a chemical reaction.
yield	The amount of a product obtained.