SWGS KS4 vocabulary List: Chemistry

This list consolidates key vocabulary in the subject, making it easier for you to know, understand and use it accurately. This may be provided as a pre-filled glossary or a word list to complete. Your teachers will use this vocabulary frequently, and you will encounter it in reading. You will be expected to learn meanings and spellings.

C1

Atom	The smallest particle that can exist on its own.
Element	Substance made up of only one type of atom
Molecule	Two or more atoms that are chemically joined together.
Compound	Substance made up of two or more different elements that are chemically joined together
Mixture	Two or more substances that are mixed but not chemically joined together
Symbol	One or two letters that represent an element
Formula	The symbols and numbers which represent the atoms in a substance
Periodic table	Table in which all known elements are arranged based on their properties
Electron	A negatively charged sub-atomic particle located in shells around nucleus with negligible mass.
Proton	A positively charged sub-atomic particle in the nucleus of an atom with a relative mass of 1
Neutron	A sub-atomic particle with no electrical charge in the nucleus with a relative mass of 1.
Atomic number	The number of protons in a nucleus of an atom
Mass number	The number of protons plus neutrons in the nucleus of an atom
Isotope	Atoms of the same element with different numbers of neutrons.
Ion	An atom or group of atoms that has become charged by losing or gaining electrons.

Ionic bond	Occurs between a metal and a non-metal. Strong electrostatic force of attraction between oppositely charged ions.
Covalent bond	Occurs between non-metals. A strong force of attraction between nuclei of two atoms that are sharing one or more pairs of electrons.

C2.1

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C2.2 and C2.3

Anion	A negatively charged ion.
Cation	A positively charged ion.
Covalent bond	A shared pair of electrons between 2 non-metal atoms.
Diamond	A giant covalent structure made from carbon atoms, each of which forms 4 covalent bonds with its neighbouring atoms to form a lattice structure.
Electron shell	Different energy levels in atoms, occupied by electrons. Maximum numbers of electrons in each shell are as follows: 1st shell – 2 electrons, 2nd shell – 8 electrons, 3rd shell – 8 electrons.
Electrostatic forces	The forces of attraction between oppositely charged ions.
Empirical formula	Simplest whole number ratio of atoms of each element in a compound.
Fullerenes	Molecules of carbon atoms with hollow shapes. The carbon atoms in the structures each have 3 bonds to neighbouring atoms. E.g. Buckminster fullerene = C_{60}.
Giant covalent structure	A lattice structure containing many atoms covalently bonded together, the strong covalent bonds mean that giant covalent structures have high melting points.
Graphene	A single layer of graphite with properties that make it useful in electronics and composite materials.
Graphite	A giant covalent structure made of carbon atoms, each of which is bonded to 3 other atoms, forming layers of hexagonal rings which have intermolecular forces between them, there is one delocalised electron per carbon atoms which is free to love to carry charge.
Intermolecular forces	A weak electrostatic forces between molecules. Variations in these forces lead to different boiling/melting points.
Ion	A charged particle formed when atoms lose/gain electrons.
Ionic bond	The strong electrostatic force in an ionic compound holding the cations and anions together.

Lattice	Contains repeating patterns of atoms/molecules within a structure.
Nanoparticles	Particles with diameters between 1-100nm in size. Theyn can exhibit properties different to those for the same material in bulk.
Polymer	Large long chain molecules made up of lots of small monomers joined together by covalent bonds. The vary widely in their properties.
Relative atomic mass (Ar)	The mass of mole of atoms of an element. The big number next to each element in the periodic table.
Relative formula mass (Mr)	The mass of one mole of a compound or elemental molecule. The combined relative atomic masses of the atoms in a formula.

C3.1

Law of conservation of mass	The principle that states that the total mass stays the same during a chemical reaction, because atoms are neither created nor destroyed in the reaction.
State symbols	Letters used to represent the physical state of a substance (e.g. g, gas; l, liquid; s, solid; aq, aqueous)
Half equation	A type of chemical equation that models the change that happen to one reactant in a reaction (and whether it loses or gains electrons, e^-)
Ionic equation	A type of chemical equation that models how oppositely charge ions for in ionic compound
Spectator ions	A charged particle present in a reaction mixture, but that doesn't take part in the reaction
Precipitate	An insoluble product in the solid state, formed during a reaction involving solutions
Mole	Amount of substance that contains 6. 02 x 10^{23} particles (know as Avogadro's constant). 1 mole has a mass equal to the Mr of the substance.
Avogadro constant	The number of elementary entities in one mole
Molar mass	The mass in grams in one mole of substance
Excess	A reactant present in an amount more than that needed to react completely with the other reactant in a chemical reaction
Limiting	A reactant present in an amount less that that needed to react completely with the other reactant in a chemical reaction
Stoichiometry	The relative amounts of each substance in a chemical reaction (essentially the big balancing numbers in an equation)

C3.2

Exothermic	An exothermic reaction releases more energy than is used to make the reaction take place. There is an overall transfer of energy to the surroundings
Endothermic	An endothermic reaction takes in more energy than is released during the reaction. There is an overall transfer of energy from the surroundings
Reaction profile	A chart that shows the energy of reactants and products in a chemical reaction
Activation energy	The minimum amount of energy needed to start a reaction
Bond energy	The amount of energy needed to break a mole of a particular covalent bond

C3.3

Redox	A chemical reaction in which one substance is reduced while another is oxidised
Oxidised	Describes a substance that has gained oxygen, or lost electrons, in a chemical reaction
Reduced	Describes a substance that has lost oxygen, or gained electrons, in a chemical reaction
Acid	A substance that ionises in water, releasing hydrogen ions, H^+
Base	A substance that neutralises acids forming a salt and water
Alkali	A soluble base
pH	The relative acidity or alkalinity of an aqueous solution
pH scale	A scale that measures relative acidity or alkalinity, from 0 (strongly acidic) to 14 (strongly alkaline)
Neutralisation	A reaction between an acid and a base or alkali, producing a salt plus water
Carbonate	Ionic compounds which contain the carbonate ion, CO_3^{2-} (e.g., calcium carbonate, $CaCO_3$)
Dilute	A solution with a relatively low amount of solute (dissolved substance)
Concentrated	A solution with a relatively high amount of solute (dissolved substance)

Weak acid	Acid only partially ionises in aqueous solution
Strong acid	Acid fully ionises in aqueous solution

C3.4

Electrolysis	A process in which an electric current is passed through a compound, causing a chemical change
Electrolyte	A compound in its liquid state or in solution that contains ions and conducts electricity
Electrode	An electrical conductor used in electrolysis
Cathode	The negative electrode used in electrolysis
Anode	The positive electrode used in electrolysis
Cation	A positively charged ion
Anion	A negatively charged ion
Molten	In the liquid state
Aqueous	A solution in which the solvent is water (e.g. NaCl, table salt, dissolved in water can be described as aqueous NaCl)
Discharged	In electrolysis, the loss or gain of electrons by an ion to become an atom
Inert	Very unreactive and unable to form compounds
Electroplating	Coating an object with a metal by electrolysis
Cryolite	Compound in which aluminium oxide dissolves, allowing the electrolysis of aluminium oxide to be performed at lower temperatures

C4

Trend	A general pattern or direction of change

Density	The mass of a substance per unit volume. An object with a high density is dense and feels heavy for its size
Reactivity	The tendency of a substance to take part in chemical reactions
Alkali metal	An element in group 1
Halogen	An element in group 7 (IUPAC group 17)
Halide ions	A negative ion formed by a group 7 element
Displacement	A reaction in which a more reactive element displaces a less reactive element in a compound
Noble gases	An element in group 0 (IUPAC group 18)
Monatomic	Existing as single atoms, e.g., Group 0 elements
Diatomic	A molecule containing two atoms
Transition metal	An element in the block of the Periodic Table between groups 2 & 3 (IUPAC Group 13)
Catalyst	A substance that increases the rate of reaction, without being used up, by lowering the activation energy needed
Limewater	Alkaline calcium hydroxide solution. It turns cloudy white in the presence of carbon dioxide
Flame test	A test that helps to identify metal ions in compounds from the colour they produce in a flame
Retention time	The time taken for a substance to travel through a gas chromatography column
Mass spectrometer	A machine that can measure the mass of atoms and molecules
Molecular ion	A positive ion formed in a mass spectrometer when an electron is removed from an atom or molecule
Qualitative	Data that are descriptive or difficult to measure (e.g., colour)

Quantitative	Data that are obtained by making measurements (e.g., length, mass)
Litmus paper	Paper which changes colour in different pH conditions. Blue litmus paper changes red in an acidic solution and red litmus changes blue in an alkali solution

C5

Actual Yield	The actual mass of a product made in a chemical reaction.
Theoretical yield	The maximum possible mass of a product that can be made in a chemical reaction
Percentage yield	A measure of how much product is actually made, calculated from: (actual yield ÷ theoretical yield) x 100.
Limiting reactant	The reacting substance that is completely used up in a chemical reaction and which determines how much product is made.
Atom economy	A measure of how many reactant atoms form a desired product, calculated from: (RFM of desired product or products / RFM of all products) x 100.
Titre	Volume of one reactant needed to react completely with the other reactant in a titration.
Pipette	A piece of apparatus used to measure accurate and repeatable volumes of liquid. Also called a volumetric pipette.
Burette	A piece of apparatus used to add varying but measured volumes of solution during a titration. Usually allows measurements to 2 decimal places ending with 0 or 5.
Meniscus	The curved upper surface of a liquid/solution. Measurements should be read from the BOTTOM of this curve.
Concordant titres	Titres within 0.10 cm^3 of each other.
Rate of reaction	A measure of how quickly a reactant is used up or a product is formed. Example units for rate include g/s and cm^3/s.
Successful collision	A collision between reactant particles that has enough energy for a reaction to happen.
Reaction profile	Chart showing how the energy of reactants and products changes during a reaction.
Gradient	Another word for steepness. On a graph, the gradient is defined as being the change in the 'y' value divided by the change in the 'x' value. It defines how steep a line is.
Activation energy	The minimum amount of energy that colliding particles must have for them to react.

Concentration	The concentration of a solution tells us how much of a substance is dissolved in water. The higher the concentration, the more particles of the substance are present. Common units are mol/dm^3 and g/dm^3.
Reversible reaction	A chemical reaction which can go both ways i.e. the products can re-form the reactants.
Dynamic Equilibrium	In reversible chemical reactions, a situation where the forward and backward reactions happen at the same rate, and the concentrations of the reactants and products stay the same. This must take place in a closed system.
Equilibrium position	A measure of the relative concentrations of substances in an equilibrium, showing if there are more reactants or products at equilibrium.
Closed system	A reaction vessel where no reactants or products can escape or are lost to the surroundings.
Haber process	The industrial chemical process that makes ammonia by reacting nitrogen and hydrogen together.
Exothermic reaction	Reaction in which energy is given out to the surroundings. The surroundings then have more energy than they started with so the temperature increases. Associated with a loss of energy from the reaction (negative energy change).
Endothermic reaction	Reaction in which energy is taken in from the surroundings. The surroundings then have less energy than they started with so the temperature decreases. Associated with a gain in energy for the reaction (positive energy change).

C6

Electrolysis	The decomposition (breakdown) of a compound using an electric current. As an extraction process, it is usually only carried out to extract metals above carbon in the reactivity series.
Phytomining	Using plants to extract metals from their (usually very low grade) ores in soils.
Bioleaching	Using bacteria to extract metals from their (usually low grade) ores.
Displacement reaction	Where a more reactive element displaces a less reactive element from the compound it is originally in.
Haber Process	Industrial process used to produce ammonia (used in fertiliser production) from hydrogen and nitrogen via a reversible reaction.
Contact process	One of the stages involved in the manufacture of sulfuric acid (sued in the production of many other chemicals). Sulphur dioxide reacts with oxygen to make sulphur trioxide in a reversible reaction.
Fertiliser	A chemical containing mineral ions which are necessary for plant growth and used to boost crop yield.

Ammonium ion	Compound ion with the formula NH_4^+ (a soluble source of nitrogen)
Nitrate ion	Compound ion with the formula NO_3^- (a soluble source of nitrogen)
Phosphate ion	Compound ion with the formula PO_4^{3-} (a soluble source of phosphorus)
Life Cycle Assessment (LCA)	A life-cycle assessment or LCA is a 'cradle-to-grave' analysis of the impact of a manufactured product on the environment.
Alloy	A mixture of two or more elements, where at least one element is a metal.
Steel	An alloy of iron and at least one other element, commonly carbon, widely used in construction.
Brass	An alloy of copper and zinc. Used for coins and musical instruments.
Bronze	An alloy of copper and tin. Used for bells, sculptures and boat propellers.
Duralumin	An allow of aluminium and copper. Used for aircraft parts.
Solder	An alloy of tin and lead. Used for joining electrical components and some pipes.
Composite material	A composite material consists of two or more materials with contrasting properties. They are combined to produce a material with improved properties.
Corrosion	When a metal oxidises in air and weakens its structure.
Rusting	Rusting is a specific example of corrosion, which occurs when iron or steel reacts with oxygen and water.
Electroplating	Electroplating involves using electrolysis to put a thin layer of a metal on the object.
Galvanising	When iron is coated in zinc, the layer stops oxygen and water reaching the iron.
Hydrocarbon	A compound containing **ONLY** hydrogen and carbon.
Organic compound	Compounds that contain carbon atoms, joined by covalent bonds to other atoms (including other carbon atoms).
Fractional distillation	A process used to separate crude oil (a mixture of hydrocarbons) into simpler, more useful, mixtures/fractions.
Finite resource	Non-renewable resource that cannot be replenished once used.

Functional group	An atom, or group of atoms, that determines the main chemical properties of an organic compound.
Homologous series	A series of compounds which have the same general formula but differ by CH_2 in the molecular formula of neighbouring compounds.
General formula	An algebraic formula that sets out a rule or trend which is followed by all members of a homologous series E.g. The general formula for the alkanes is C_nH_{2n+2}, with n standing for the number of carbon atoms.
Cracking	A reaction in which larger saturated hydrocarbon molecules are broken down into smaller, more useful hydrocarbon molecules, some of which are unsaturated.
Displayed formula	This shows the structure of a molecule, including **ALL** the covalent bonds.
Molecular formula	Chemical formula showing the actual number of atoms of each element in a molecule.
Saturated hydrocarbon	A hydrocarbon containing only single bonds
Unsaturated hydrocarbon	Contain at least one double carbon-carbon bond (C=C)
Alkane	Saturated hydrocarbon. A compound of hydrogen and carbon only, with no C=C bonds.
Alkene	Unsaturated hydrocarbon with a double bond between the carbon atoms.
Alcohol	An organic compound containing a hydroxyl group, -OH. The 'alcohol' in alcoholic drinks is ethanol, produced by the fermentation of sugars and found in wines, spirits and beers.
Carboxylic acid	A homologous series of compounds that contain the carboxyl functional group, -COOH
Complete combustion	Burning in a plentiful supply of oxygen or air. Complete combustion of a hydrocarbon produces water vapour and carbon dioxide
Oxidise	Chemical substances are oxidised by the addition of oxygen, removal of hydrogen or the removal of electrons.
Addition reaction	Type of reaction in which two substances react together to form one new substance.
Addition polymer	Large molecule formed in addition reactions between unsaturated monomer molecules.
Monomer	Small molecule that can join end to end with other monomers to form a polymer molecule.
Polymer	A large molecule formed from many identical smaller molecules known as monomers.
Repeat unit	A part of a polymer that would make a complete polymer molecule if many of them were joined end to end. Commonly shown with brackets around.

Condensation polymerisation	Chemical reaction in which monomers (containing the functional groups of a carboxylic acid with either an alcohol or an amine) join together to produce a polymer and a small molecule such as water.
Condensation polymer	Long molecules (such as nylon, Kevlar or polyester) produced during condensation polymerisation. They contain either an ester or an amide functional group.
Polyamide	Condensation polymer, such as nylon, made by reacting a dicarboxylic acid with a diamine.
Polyester	Condensation polymer made from two types of monomer, one with two –OH groups and one with two –COOH groups.
Relative formula mass	The sum of the relative atomic masses of the atoms in a chemical formula.
Intermolecular forces (IMF)	Weak attractive forces between molecules. When a simple molecular substance melts or boils, it is the intermolecular forces that are broken (not the covalent bonds in each molecule)
Starch	A type of carbohydrate which is a polymer formed from glucose monomers.
Protein	Organic compound made up of amino acid molecules. One of the three main food groups, proteins are needed by the body for cell growth and repair
Nucleotide	The monomers which form the polymer DNA. There are 4 of these: adenine, thymine, cytosine and guanine.
Chemical cell	A store of chemical energy that can be transferred as an electric current in a circuit until its reactants are used up.
Fuel cell	Device that produces a voltage continuously when supplied with a fuel and oxygen.
Atmosphere	The layers of gases that surround the Earth. The important gases in the atmosphere are nitrogen, oxygen and carbon dioxide.
Incomplete combustion	Burning when there is a limited supply of air or oxygen.
Climate change	Long term alteration of weather patterns
Greenhouse gas	The gases responsible for global warming - carbon dioxide, methane, water, nitrous oxides and CFCs (chlorofluorocarbons).
Greenhouse effect	The retention of heat (infrared radiation) in the atmosphere caused by the build-up of greenhouse gases.
Enhanced greenhouse effect	The extra carbon dioxide, greater than would happen naturally, caused solely by human activity, through combustion/agriculture/industry and leading to increased warming of the atmosphere.
Smog	A type of air pollution that appears as a visible smoky fog which is very harmful to health.

Soot	The fine black particles, chiefly composed of carbon, produced by incomplete combustion of coal, oil, wood, or other fuels.
Acid rain	Rain that contains dissolved acidic gases such as nitrogen oxides and sulphur dioxide.
Potable water	Water that is safe to drink.
Precipitate	A solid insoluble compound.
Sedimentation	When chemicals are added to water to form insoluble compounds that can be filtered out of water during treatment.
Chlorination	Adding chlorine to domestic water supplies to kill micro-organisms. Also known as sterilisation.