SWGS KS5 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.

Module 2 Foundations in chemistry

Module 2.1

Acid	Proton donor
Alkali	A type of base that dissolves in water to produce OH- (hydroxide) ions
Anhydrous	A crystalline compound containing NO water molecules
Anion	A negatively charged ion
Atomic (proton) number	The number of protons in the nucleus of an atom
Avogadro constant	The number of atoms per mole of the carbon-12 isotope
Base	Proton acceptor
Cation	A positively charged ion
Concentration	The amount of solute, in moles (or grams), dissolved in 1 dm^3 of solution
Empirical formula	The formula that shows the simplest whole-number ratio of atoms of each element present in a compound
Hydrated	A crystalline compound containing water molecules
Ion	A positively or negatively charged atom or group of atoms, where the number of electrons is different from the number of protons
Isotopes	Atoms of the same element with different numbers of neutrons and different masses
Mass (nucleon) number	The sum of the protons and neutrons in the nucleus (also known as nucleon number)
Molar gas volume	The volume per mole of gas molecules at a stated temperature and pressure
Molar mass	The mass per mole of a substance, in units of g mol^{-1}
Mole	The amount of any substance containing as many elementary particles as there are carbon atoms in exactly 12g of carbon-12
Molecular formula	A formula which shows the number and type of atoms of each element present in a molecule

Molecule	The smallest part of a covalent compound that can exist whilst still retaining its chemical identity
Oxidation	Loss of electrons
Oxidation number	A measure of the number of electrons that an atom uses to bond with atoms of another element.
Oxidising agent	A reagent that oxidises another species
Reducing agent	A reagent that reduces another species
Reduction	Gain of electrons
Relative atomic mass	The weighted mean mass of an atom of an element compared with one-twelfth of the mass of an atom of carbon-12
Relative isotopic mass	The mass of an atom compared with one-twelfth of the mass of an atom of carbon-12
Salt	The product of a reaction where the H+ ions in an acid are replaced by metal or ammonium ions
Standard solution	A solution of known concentration
Stoichiometry	The ratio of the amount, in moles, of each substance in a chemical equation (essentially the big balancing numbers)
Water of crystallisation	Water molecules that are bonded into a crystalline structure of a compound

Module 2.2

Term	Definition
Anion	A negatively charged ion with more electrons than protons.
Atomic orbital	A region around a nucleus that can hold up to two electrons, with opposite spin.
Bond angle	The angle between two bonds at an atom.
Bonded Pair	A pair of electrons shared between two atoms to make a covalent bond.
Cation	A positively charged ion with fewer electrons than protons.
Coordinate bond	A shared pair of electrons in which the bonded pair has been provided by one of the bonded atoms only. Also called a dative covalent bond.
Covalent Bonding	The strong electrostatic attraction between a shared pair of electrons and the nuclei of the bonded atoms.

Dative bond	A shared pair of electrons in which the bonded pair has been provided by one of the bonded atoms only. Also called a coordinate covalent bond.
Delocalised electrons	Electrons that are shared between more than two atoms.
Dipole	A separation in electrical charge so that one atom of a polar covalent bond, or one end of a polar molecule, has a small positive charge δ+ and the other has a small negative charge δ-.
Dipole-dipole force	An attractive force between permanent dipoles in neighbouring polar molecules.
Electron configuration.	A shorthand method for showing how electrons occupy sub-shells in an atom.
Electronegativity	A measure of the attraction of a bonded atom for the pair of electrons in a covalent bond.
Giant covalent lattice.	A three-dimensional structure of atoms, bonded together by strong covalent bonds.
Giant ionic lattice	A three-dimensional structure of oppositely charged ions, bonded together by strong ionic bonds.
Giant metallic lattice.	A three-dimensional structure of positive ions and delocalised electrons, bonded together by strong metallic bonds.
Hydrogen bond	A strong dipole-dipole attraction between an electron-deficient hydrogen atom of -NH, -OH or -HF on one molecule and a lone pair of electrons on a highly electronegative atom containing N, O or F on a different molecule.
Induced dipole-dipole interaction	Attractive forces between induced dipoles in different molecules; also called London forces.
Intermolecular forces	An attractive force between molecules. Intermolecular forces can be London Forces, permanent dipole-dipole interactions or hydrogen bonding.
Ion	A positively or negatively charge atom or a (covalently bonded) group of atoms (a polyatomic ion) where the number of electrons is different from the number of protons.
Ionic Bonding	The electrostatic attraction between positive and negative ions.
London Forces	Attractive forces between induced dipoles in different molecules; also called induce dipole-dipole interactions.
Lone pair	An outer shell pair of electrons that is not involved in chemical bonding.

Metallic bonding	The electrostatic attraction between positive metal ions and delocalised electrons.
Molecular formula	A formula that shows the number and type of atoms of each element present in a molecule.
molecule	The smallest part of a covalent compound that can exist while retaining its chemical identity, consisting of two or more atoms covalently bonded together.
Permanent dipole	A small charge difference that does not change across a bond, with positive and negative partial charges on the bonded atoms: the result of the bonded atoms having different electronegativities.
Permanent dipole-dipole interactions.	Attractive forces between the permanent dipoles in different molecules.
Polar covalent bond	A bond with a permanent dipole, having positive and negative partial charges on the bonded atoms.
Polar molecule	A molecule with an overall dipole, having taken into account any dipoles across bonds and the shape of the molecule.
Principal quantum number n	A number representing the relative overall energy of each orbital, which increases with distance from the nucleus. The sets of orbitals with the same n-value are referred to as electron shells or energy levels.
Shell (electron shell)	A group of atomic orbitals with the same principal quantum number n. Also known as main energy level.
Sub-shell	A group of orbitals of the same type within a shell.
Π bond (Pi bond)	A bond formed by the sideways overlap of two p orbitals, containing 2 electrons and with the electron density concentrated above and below the line joining the nuclei of the bonding atoms.
σ bond (sigma bond)	A bond formed by the overlap of one orbital from each bonding atom, consisting of two electrons and with the electron density centred around a line directly between the nuclei of the two atoms.

<u>Module 3 Periodic table and energy</u>

Term	Definition

Activation energy	Minimum energy required to start a reaction by the breaking of bonds.
Average Bond enthalpy	The energy required to break 1 mol of a specified bond by homolytic fission in molecules in a gaseous state.
Catalyst	A species than lowers the activation energy of a reaction by providing an alternate route but is not used up itself.
Disproportionation	A redox reaction in which the same elements is both oxidised and reduced
Dynamic equilibrium	An equilibrium in a closed system where the rate of forward reaction equals that of the reverse reaction leaving constant concentrations of products and reactants.
Enthalpy, H	The heat energy stored in a chemical system
Hess' Law	If a reaction can take place by more than one route and the initial and final conditions are the same, the total enthalpy change is the same for each route.
Homogeneous equilibrium	An equilibrium in which all the species have the same physical state
Le Chatelier's principle	When a system in equilibrium is subjected to a change, the system readjusts to minimise the effect of the change
Standard conditions	Pressure of 100kpa and Temperature of 298K. In solution concentration of 1 mol dm^{-3}.
Standard enthalpy change of combustion	The enthalpy change when one mol of a substance reacts completely with oxygen under standard conditions and all reactants and products in their standard states
Standard enthalpy change of formation	The enthalpy change when 1 mol of a compound is formed from its constituent elements in standard states under standard conditions.
Standard enthalpy change of neutralisation	The enthalpy change that accompanies the reaction of an acid and a base to form one mole of water, under standards conditions and all reactants in their standard states
Standard enthalpy change of reaction	The enthalpy change that accompanies a reaction in the molar quantities expressed in a chemical reaction under standards conditions and all reactants in their standard states

Module 4 Core Organic Chemistry

Term	Definition
Addition Polymerisation	Formation of a very long molecular chain (addition polymer), by repeated addition reactions of many unsaturated alkene molecules (monomers).
Addition reaction	A reaction in which a reactant is added to an unsaturated molecule to make one saturated molecule.
Alicyclic	Containing carbon atoms joined together in a ring that is not aromatic.
Aliphatic	Containing carbon atoms joined together in unbranched (straight) or branched chains.
Alkanes	The hydrocarbon homologous series with the general formula C_nH_{2n+2}.
Alkenes	The hydrocarbon homologous series with one double carbon to carbon bonds and the general formula C_nH_{2n}
Alkyl group	A side chain formed by removing a hydrogen atom from a alkane parent chain. Any Alkyl group is often shown as R.
alkynes	The hydrocarbon homologous series with one triple carbon to carbon bond and the general formula C_nH_{2n-2}
Aromatic	Containing one or more benzene ring.
Carbocation	An ion that contains a positively charged carbon atom.
Chain reaction	A reaction in which the propagation steps release new radicals that continue the reaction.
Cis-trans isomerism	A special type of E/Z isomerism in which there are two non-identical atoms/groups and two identical atoms/groups around the C=C double bond. – the cis isomer has the identical groups on each carbon on the same side, whereas the trans isomer has the identical atoms/groups on opposite sides.
Condensation reaction	A reaction in which two small molecules react together to form a larger molecule with elimination of a small molecule such as water.
Dehydration	An elimination reaction in which water is removed from a saturated molecule to make an unsaturated molecule.
E/Z isomerism	A type of stereoisomer in which different groups attached to each carbon of a C=C double bond may be arranged differently in space because of the restricted rotation of the C=C bond.
electrophile	An atom (or a group of atoms) which is attracted to an electron-rich centre or atom where it accepts a pair of electrons to form a new covalent bond.
Electrophilic addition	An addition reaction in which the first step is attack by an electrophile on a region of high electron density.
Electrophilic substitution	A type of substitution reaction in which an electrophile in which an electrophile is attracted to an electron rich centre or atom, where it accepts a pair of electrons to form a new covalent bond.
Elimination reaction	The removal of a molecule from a saturated molecule to make an unsaturated molecule.
Functional group	The part of the organic molecule responsible for its chemical reactions.
General formula	The simplest algebraic formula of a member of a homologous series.
Heterolytic fission	The breaking of a covalent bond with both the bonded electrons going to one atom, forming a cation and an anion.
Homologous series	A series of organic compounds with the same functional group but with each successive member differing by a CH_2

Homolytic fission	The breaking of a covalent bond with one of the bonded electrons going to each atom forming two radicals.
Hydrocarbon	A compound of hydrogen and carbon only
Hydrolysis	A reaction with water that breaks a chemical compound into two compounds, the H and OH in a water molecule becomes incorporated into the two compounds.
Initiation	The first step in a radical reaction in which radicals are produced when a covalent bond is broken by homolytic fission.
Intermediate	A species formed during a reaction that reacts further and is not present in the final products.
Nomenclature	A system of naming compounds.
nucleophile	An atom (or group of atoms) which is attracted to an electron deficient centre or atom, where it donates a pair of electrons to form a new covalent bond.
Nucleophilic substitution	A reaction in which a nucleophile is attracted to an electron-deficient carbon atom, and replaces an atom or group of atoms on the carbon atom.
Primary alcohol	An alcohol in which the OH group is attached to a carbon atom that is attached to two or three hydrogen atoms.
propagation	The steps that continue a free radical reaction, in which a radical reacts with a reactant molecule to form a new molecule and another radical, causing a chain reaction.
Radical	A species with an unpaired electron.
Reaction mechanism	The sequence of bond breaking and bond forming steps that shows the path taken by electrons during a reaction.
Secondary alcohol	An alcohol in which the OH group is attached to a carbon atom that is attached to two carbon chains and one hydrogen atoms.
Skeletal formula	A simplified organic formula, with hydrogen atoms removed from alkyl chains, leaving just the carbon skeleton and associated functional groups.
Stereoisomers	Compounds with the same structural formula but with a different arrangement of atoms in space.
Structural formula	A formula showing the minimal detail for the arrangement of atoms in a molecule.
Structural isomers	Molecules with the same molecular formula but with different structural formula.
termination	The step at the end of a radical substitution reaction when two radicals combine to form a molecule
Tertiary alcohol	An alcohol in which the OH group is attached to a carbon atom that is attached to three carbon atoms and no hydrogen atoms.

<u>Module 5 Physical chemistry and transition elements</u>

Keyword	Definition
Ligand	A molecule or ion that can donate a pair of electrons to the central transition metal ion
BrØnsted-Lowry acid	Proton donor
BrØnsted-Lowry base	Proton acceptor
Buffer solution	A system which minimises pH changes on addition of small amounts of an acid or a base
Complex ion	A transition metal ion bonded to ligands by coordinate bonds

Conjugate acid-base pair	Two species that can be interconverted by transfer of a proton
Coordination number	The total number of coordinate bonds formed between a central metal ion and ligands
D block element	Elements with their highest energy electron in a d-sub-shell
Dibasic acid	Contains two hydrogen ions per molecule which can be replaced by a metal or ammonium ion in an acid-base reaction
End point	The point in a titration where the indicator changes colour
Enthalpy change of atomisation	The enthalpy change when one mole of gaseous atoms forms from the element in its standard state
enthalpy change of hydration	The enthalpy change which takes place when one mole of isolated gaseous ions is dissolved in water to form one mole of aqueous ions under standard conditions
enthalpy change of solution	The enthalpy change that takes place when one mole of a compound is completely dissolved in water under standard conditions
entropy	Degree of disorder in a chemical system
Equivalence point	The point in a titration at which the volume of one solution has exactly reacted with the volume of the second solution
First electron affinity	The enthalpy change which takes place when one electron is added to each atom in one mole of gaseous atoms to form one mole of gaseous 1- ions
First ionisation energy	The energy required to remove one electron from each atom in one mole of gaseous atoms of an element to form one mole of gaseous 1+ ions
Half-life	The time taken for the concentration of a reactant to decrease by half
lattice enthalpy	The enthalpy change that accompanies the formation of one mole of an ionic compound from its gaseous ions under standard conditions
Ligand substitution	A reaction in which one or more ligands in a complex ion are replaced by different ligands
Monobasic acid	Contains one hydrogen ion per molecule which can be replaced by a metal or ammonium ion in an acid-base reaction
Optical isomers	Stereoisomers which are non-superimposable mirror images
Order	The power to which a reactant is raised in the rate equation
Overall order	The sum of the individual orders of reactants in the rate equation
Partial pressure	The contribution the pressure of a gas makes towards the total pressure in a gaseous mixture
Rate constant	The constant that links the rate of reaction with the concentrations of the reactants raised to the power of their orders in the rate equation
Rate determining-step	The slowest step in the reaction mechanism of a multi-step reaction

Rate of reaction	The change in concentration of a reactant or a product over time
Second electron affinity	The enthalpy change which takes place when one electron is added to each ion in one mole of gaseous 1- ions to form one mole of gaseous 2- ions
Second ionisation energy	The energy required to remove one electron from each ion in one mole of gaseous 1+ ions of an element to form one mole of gaseous 2+ ions
standard electrode potential	The e.m.f of a half-cell compared with a standard hydrogen half-cell, measured at 298K & 100kPa and using 1 mol dm^{-3} solutions
Stereoisomers	Compounds with the same structural formulae but different arrangement of atoms in space
Transition element	A d-block element which forms and ion with an incomplete d-sub-shell

Module 6 Organic chemistry and analysis

Keyword	Definition
Aromatic	Any organic molecule containing at least one benzene ring
Delocalised electrons	Electrons shared between more than 2 atoms
Electrophilic substitution	A type of substitution reaction in which an electrophile is attracted to an electron-rich centre or atom, where it accepts a pair of electrons to form a new covalent bond
Hydrolysis	A reaction with water that breaks a chemical compound into two compounds, the H and OH in a water molecule becomes incorporated into the two compounds.
Nucleophilic addition	A reaction in which a nucleophile attacks the slightly positive carbon atom resulting in addition across the C=O bond