

AS Level Chemistry Vocabularies

Topic 1 Atomic structure	
atomic orbitals	regions of space outside the nucleus that can be occupied by one or, at most, two electrons. Orbitals are named s, p, d and f. They have different shapes.
electron	tiny subatomic particles found in orbitals around the nucleus. They have a negative charge but have negligible mass.
electronic configuration	a way of representing the arrangement of the electrons in atoms showing the principal quantum shells, the subshells and the number of electrons present, e.g. $1s^2 2s^2 2p^3$. The electrons may also be shown in boxes.
energy levels (of electrons)	the regions at various distances from the nucleus in which electrons have a particular amount of energy. Electrons further from the nucleus have more energy. See principal quantum shells.
fragmentation	the breaking up of a molecule into smaller parts by the breaking of covalent bonds in a mass spectrometer.
free radical	very reactive atom or molecule that has a single unpaired electron.
ionisation energy, ΔH_i (1.4.1)	the energy needed to remove 1 mole of electrons from 1 mole of atoms of an element in the gaseous state to form 1 mole of gaseous ions.
isotopes (1.2.1)	atoms of an element with the same number of protons but different numbers of neutrons.
mass number / nucleon number	the total number of protons and neutrons in the nucleus of an atom.
nanotechnology	the design and production of machines that are so small we measure them in nanometres (nm), where $1 \text{ nm} = 1 \cdot 10^{-9} \text{ m}$.
neutron	a subatomic particle found in the nucleus of an atom. It has no charge and has the same mass as a proton.
nucleus	the small dense core at the centre of every atom, containing protons (positively charged) and neutrons (no charge). Nuclei are therefore always positively charged.
principal quantum shells, n	regions at various distances from the nucleus that may contain up to a certain number of electrons. The first quantum shell contains up to 2 electrons, the second up to 8 and the third up to 18.
proton	a positively charged subatomic particle in the nucleus.
spin-pair repulsion	electrons repel each other as they have the same charge. Electrons arrange themselves so that they first singly occupy different orbitals in the same sublevel. After that they pair up with their spins opposed to each other.
subshells	regions within the principal quantum shells where electrons have more or less energy depending on their distance from the nucleus. Subshells are given the letters s, p, d and f.

successive ionisation energy ΔH_{i1} , ΔH_{i2} , etc.	the energy required to remove the first, then the second, then the third electrons and so on from a gaseous atom or ion, producing an ion with one more positive charge each time. Measured in kJ per mole of ions produced.
Topic 2 Atoms, molecules and stoichiometry	
Avogadro constant (2.2.1)	the number of atoms (or ions, molecules or electrons) in a mole of atoms (or ions, molecules or electrons): its numerical value is $6.02 \cdot 10^{23}$.
compound	a substance made up of two or more elements bonded (chemically joined) together.
element	a substance made of only one type of atom.
empirical formula (2.3.3a)	the formula that tells us the simplest ratio of the different atoms present in a molecule.
mass spectrometer	an instrument for finding the relevant isotopic abundance of elements and to help identify unknown organic compounds.
molar mass	the mass of a mole of substance in grams.
mole (2.2.1)	the unit of amount of substance. It is the amount of substance that has the same number of particles (atoms, ions, molecules or electrons) as there are atoms in exactly 12 g of the carbon-12 isotope.
molecular formula (2.3.3b)	the formula that tells us the actual numbers of each type of atom in a molecule.
molecular ion	the ion that is formed by the loss of an electron from the original complete molecule during mass spectrometry and that gives us the relative molecular mass of an unknown compound.
relative atomic mass (2.1.2a)	the weighted average mass of the atoms of an element, taking into account the proportions of naturally occurring isotopes, measured on a scale on which an atom of the carbon-12 isotope has a mass of exactly 12 units.
relative formula mass (2.1.2d)	the mass of one formula unit of a compound measured on a scale on which an atom of the carbon-12 isotope has a mass of exactly 12 units.
relative isotopic mass (2.1.2b)	the mass of a particular isotope of an element on a scale in which an atom of the carbon-12 isotope has a mass of exactly 12 units.
relative molecular mass (2.1.2c)	the mass of a molecule measured on a scale in which an atom of the carbon-12 isotope has a mass of exactly 12 units.
spectator ions	ions present in a reaction mixture that do not take part in the reaction.
state symbol	a symbol used in a chemical equation that describes the state of each reactant and product: (s) for solid, (l) for liquid, (g) for gas and (aq) for substances in aqueous solution.
stoichiometry	the mole ratio of the reactants and products in the balanced equation for a reaction.

titre in a titration	the final burette reading minus the initial burette reading.
unified atomic mass unit (2.1.1)	one twelfth of the mass of a carbon-12 atom.
Topic 3 Chemical bonding	
anion	a negatively charged ion.
(average) bond energy/bond enthalpy (3.4.3a)	the energy needed to break 1 mole of a particular bond in 1 mole of gaseous molecules. (The value is averaged over similar bonds in different molecules.)
bond length (3.4.3b)	the internuclear distance of two covalently bonded atoms.
cation	a positively charged ion.
co-ordinate bond / dative covalent bond	a covalent bond in which both electrons in the bond come from the same atom.
covalent bond (3.4.1)	a bond formed by the sharing of pairs of electrons between two atoms.
delocalised electrons	electrons that are not associated with a particular atom – they can move between three or more adjacent atoms.
dipole	a separation of charge in a molecule. One end of the molecule is permanently positively charged and the other is negatively charged.
displayed formula	a drawing of a molecule that shows all the atoms and bonds within the molecule.
dot-and-cross diagram	a diagram showing the arrangement of the outer-shell electrons in an ionic or covalent element or compound. The electrons are shown as dots or crosses to show their origin.
double covalent bond	two shared pairs of electrons bonding two atoms together.
electronegativity (3.1.1)	the ability of an atom to attract the bonding electrons in a covalent bond.
electrovalent bond	another name for an ionic bond.
hybridisation of atomic orbitals	the process of mixing atomic orbitals so that each has some character of each of the orbitals mixed.
hydrogen bond	the strongest type of intermolecular force – it is formed between molecules having a hydrogen atom bonded to one of the most electronegative elements (F, O or N).
intermolecular forces	the weak forces between molecules.
ion polarisation	the distortion of the electron cloud on an anion by a neighbouring cation. The distortion is greatest when the cation is small and highly charged.
ionic bond (3.2.1)	the electrostatic attraction between oppositely charged ions.
lone pairs (of electrons)	pairs of electrons in the outer shell of an atom that are not bonded.
metallic bonding (3.3.1)	the electrostatic attraction between positive metal ions and delocalized electrons.

non-polar (molecule)	a molecule with no separation of charge; it will not be attracted to a positive or negative charge.
permanent dipole–dipole forces	a type of intermolecular force between molecules that have permanent dipoles.
pi (π) bonds	multiple covalent bonds involving the sideways overlap of p atomic orbitals.
polar (covalent bond)	a covalent bond in which the two bonding electrons are not shared equally by the atoms in the bond. The atom with the greater share of the electrons has a partial negative charge, δ^- , and the other has a partial positive charge, δ^+ .
polarising power (of a cation)	the ability of a cation to attract electrons and distort an anion.
shielding	the ability of inner shells of electrons to reduce the effective nuclear charge on electrons in the outer shell.
sigma (σ) bonds	single covalent bonds, formed by the 'end-on' overlap of atomic orbitals.
single covalent bond	a shared pair of electrons bonding two atoms together.
triple covalent bond	three shared pairs of electrons bonding two atoms together.
van der Waals' forces	the weak forces of attraction between molecules caused by the formation of temporary dipoles.
vaporisation	the change in state when a liquid changes to vapour.
Topic 4 States of matter	
allotrope	different crystalline or molecular forms of the same element. Graphite and diamond are allotropes of carbon.
alloy	a mixture of two or more metals or a metal with a non-metal.
boiling point	the temperature at which the vapour pressure is equal to the atmospheric pressure.
condensation	the change in state when a vapour changes to a liquid.
general gas equation	an equation relating the volume of a gas to the temperature, pressure and number of moles of gas. Also called the ideal gas equation. $pV = nRT$
giant molecular structure/giant covalent structure	structures having a three-dimensional network of covalent bonds throughout the whole structure.
ideal gas	a gas whose volume varies in proportion to the temperature and in inverse proportion to the pressure. Noble gases such as helium and neon approach ideal behaviour because of their low intermolecular forces.
kinetic theory	the theory that particles in gases and liquids are in constant movement. The kinetic theory can be used to explain the effect of temperature and pressure on the volume of a gas as well as rates of chemical reactions.

lattice	a regularly repeating arrangement of ions, atoms or molecules in three dimensions.
partial pressure	the pressure that an individual gas contributes to the overall pressure in a mixture of gases.
real gases	gases that do not obey the ideal gas law, especially at low temperatures and high pressures.
vapour pressure	the pressure exerted by a vapour in equilibrium with a liquid.
Topic 5 Chemical energetics	
enthalpy change of reaction, $\Delta H_{\text{r}}^{\ominus}$ (5.1.3bi)	the enthalpy change which occurs when equation quantities of materials react under standard conditions, and with everything in its standard state.
enthalpy change of formation, $\Delta H_{\text{f}}^{\ominus}$ (5.1.3bii)	the enthalpy change which occurs when one mole of the compound is formed from its elements under standard conditions, and with everything in its standard state.
enthalpy change of combustion, $\Delta H_{\text{c}}^{\ominus}$ (5.1.3biii)	the enthalpy change which occurs when one mole of the compound is burned completely in oxygen under standard conditions, and with everything in its standard state.
endothermic	term used to describe a reaction in which energy is absorbed from the surroundings: the enthalpy change is positive.
enthalpy change	the energy transferred in a chemical reaction (symbol ΔH).
enthalpy cycle	a diagram showing alternative routes between reactants and products that allows the determination of one enthalpy change from other known enthalpy changes by using Hess's law.
enthalpy profile diagram	a diagram showing the enthalpy change from reactants to products along the reaction pathway.
exothermic	the term used to describe a reaction in which energy is released to the surroundings: the enthalpy change is negative.
Hess's law	the total enthalpy change for a chemical reaction is independent of the route by which the reaction takes place.
standard conditions (5.1.3a)	conditions of temperature and pressure that must be the same in order to compare moles of gases or enthalpy changes accurately. Standard conditions are a pressure of 10^5 pascals (100 kPa) and a temperature of 298 K (25 °C).
standard enthalpy change	an enthalpy change that takes place under the standard conditions of pressure (10^5 Pa) and temperature (298 K).
surroundings	in enthalpy changes, anything other than the chemical reactants and products, for example the solvent, the test tube in which the reaction takes place, the air around the test tube.
Topic 6 Electrochemistry	
disproportionation	the simultaneous reduction and oxidation of the same species in a chemical reaction.

half-equation	in a redox reaction, an equation showing either an oxidation or a reduction.
oxidation	the addition of oxygen, removal of electrons or increase in oxidation number of a substance; in organic chemistry refers to a reaction in which oxygen atoms are added to a molecule and/or hydrogen atoms are removed from a molecule.
oxidation number (oxidation state)	a number given to an atom in a compound that describes how oxidised or reduced it is.
oxidizing agent	a reactant that increases the oxidation number of (or removes electrons from) another reactant.
redox reaction	a reaction in which oxidation and reduction take place at the same time.
reducing agent	a reactant that decreases the oxidation number of (or adds electrons to) another reactant.
reduction	the removal of oxygen, addition of electrons or decrease in oxidation number of a substance; in organic chemistry it is the removal of oxygen atoms from a molecule and/or the addition of hydrogen atoms to a molecule.
Topic 7 Equilibria	
acid	a proton (hydrogen ion) donor.
alkali	a base that is soluble in water.
amphoteric	able to behave as both an acid and a base. Aluminium oxide is amphoteric.
base	a proton (hydrogen ion) acceptor.
Bronsted–Lowry theory of acids	acids are proton donors and bases are proton acceptors.
closed system	a system in which matter or energy is not lost or gained, e.g. gases in a closed vessel.
dissociation	the break-up of a molecule into ions, for example, when HCl molecules dissolve in aqueous solution, they dissociate completely into H ⁺ and Cl ⁻ ions.
dynamic (equilibrium)	in an equilibrium mixture, molecules of reactants are being converted to products at the same rate as products are being converted to reactants.
equilibrium constant	a constant calculated from the equilibrium expression for a reaction.
equilibrium expression	a simple relationship that links K_c to the equilibrium concentrations of reactants and products and the stoichiometric equation.
equilibrium reaction	a reaction that does not go to completion and in which reactants and products are present in fixed concentration ratios.
Le Chatelier's principle (7.1.2)	when any of the conditions affecting the position of equilibrium are changed, the position of that equilibrium shifts to minimize the change.

open system	a system in which matter is lost or gained, e.g. a mixture of solids and gases in an open beaker.
reversible reaction	a reaction in which products can be changed back to reactants by reversing the conditions.
strong acid/base	an acid or base that is (almost) completely ionised in water.
weak acid/base	an acid or base that is only slightly ionized in water.
Topic 8 Reaction kinetics	
activation energy (8.2.1)	the minimum energy that colliding particles must possess for a successful collision that results in a reaction to take place.
adsorption	(in catalysis) the first stage in heterogeneous catalysis – molecules of reactants (usually gases) form bonds with atoms on the surface of the catalyst.
Boltzmann distribution	a graph showing the distribution of energies of the particles in a sample at a given temperature.
catalyst	a substance that increases the rate of a reaction but remains chemically unchanged itself at the end of the reaction.
cofactor	a small molecule that is not a substrate but that is essential for an enzyme-catalysed reaction.
denaturation	the process by which the three dimensional structure of a protein or other biological macromolecule is changed, often irreversibly. Relatively high temperatures, extremes of pH and organic solvents often cause denaturation.
enzyme	a protein molecule that is a biological catalyst. Most act on a specific substrate.
enzyme activity	a measure of the rate at which substrate is converted to product in an enzyme-catalysed reaction.
heterogeneous catalysis	the type of catalysis in which the catalyst is in a different phase from the reactants. For example, iron in the Haber process.
homogeneous catalysis	the type of catalysis in which the catalyst and reactants are in the same phase. For example, sulfuric acid catalysing the formation of an ester from an alcohol and carboxylic acid.
metabolism	the series of linked chemical reactions taking place in living organisms.
rate of reaction	a measure of the rate at which reactants are used up or the rate at which products are formed. The units of rate are $\text{mol dm}^{-3} \text{s}^{-1}$.
solute	a substance that is dissolved in a solution.
substrate	a molecule that fits into the active site of an enzyme and reacts.
Topic 9 The Periodic Table	
metalloid	elements that have a low electrical conductivity at room temperature but whose conductivity increases with increasing temperature. Metalloids are found in a diagonal band running from the top left to nearly the bottom right of the p-block in the Periodic Table.

periodicity	the repeating patterns in the physical and chemical properties of the elements across the periods of the Periodic Table.
Topic 10 Group 2	
alkaline earth metals	the elements in Group 2 of the Periodic Table.
Topic 11 Group 17	
halogens	Group 17 elements.
Topic 12 Nitrogen and sulfur	
eutrophication	an environmental problem caused by fertilisers leached from fields into rivers and lakes. The fertiliser then promotes the growth of algae on the surface of water. When the algae die, bacteria thrive and use up the dissolved oxygen in the water, killing aquatic life.
Topic 13 An introduction to AS level organic chemistry	
addition reaction	an organic reaction in which two reactant molecules combine to give a single product molecule.
alkanes	saturated hydrocarbons with the general formula C_nH_{2n+2} .
alkenes	unsaturated hydrocarbons with a carbon-carbon double bond. Their general formula is C_nH_{2n} .
carbocation	an alkyl group carrying a single positive charge on one of its carbon atoms, e.g. $^+CH_2CH_3$
chiral centre	a carbon atom with four different groups attached, creating the possibility of optical isomers.
condensation reaction	a reaction in which two organic molecules join together and in the process eliminate a small molecule, such as water or hydrogen chloride.
dehydration	a reaction in which a water molecule is removed from a molecule, e.g. in the dehydration of an alcohol to give an alkene.
electrophile	a species that can act as an acceptor of a pair of electrons in an organic mechanism.
free-radical substitution	the reaction in which halogen atoms substitute for hydrogen atoms in alkanes. The mechanism involves steps in which reactive free radicals are produced (initiation), regenerated (propagation) and consumed (termination).
functional group	an atom or group of atoms in an organic molecule that determine the characteristic reactions of a homologous series.
gene	a length of DNA that carries a code for making a particular protein.
general formula	a formula that represents a homologous series of compounds using letters and numbers; e.g. the general formula for the alkanes is C_nH_{2n+2} . By substituting a number for n in the general formula you get the molecular formula of a particular compound in that homologous series.
hydrocarbon (13.1.1)	a compound made up of carbon and hydrogen only.

hydrolysis	the breakdown of a compound by water, which is often speeded up by reacting with acid or alkali.
hydrophobic	the non-polar part of a molecule that has no attraction for water molecules ('water hating').
initiation step	the first step in the mechanism of free radical substitution of alkanes by halogens. It involves the breaking of the halogen-halogen bond by UV light from the Sun.
nucleophile	species that can act as a donor of a pair of electrons.
nucleophilic addition	the mechanism of the reaction in which a nucleophile attacks the carbon atom in a carbonyl group and adds across the C=O bond, e.g. aldehydes or ketones reacting with hydrogen cyanide.
optical isomers	stereoisomers that exist as two nonsuperimposable mirror images.
propagation step	a step in a free-radical mechanism in which the radicals formed can then attack reactant molecules generating more free-radicals, and so on.
skeletal formula	a simplified version of the displayed formula that has all the symbols for carbon and hydrogen atoms removed, as well as the carbon to hydrogen bonds. The carbon to carbon bonds are left in place as are the bonds to other atoms.
stereoisomers	compounds whose molecules have the same atoms bonded to each other but with different arrangements of the atoms in space.
structural formula	the formula that tells us about the atoms bonded to each carbon atom in an organic molecule, e.g. $\text{CH}_3\text{CH}=\text{CH}_2$.
structural isomers	compounds with the same molecular formula but different structural formulae.
substitution	a reaction that involves the replacement of one atom, or group of atoms, by another.
termination step	the final step in a free-radical mechanism in which two free radicals react together to form a molecule.
14 Hydrocarbons	
addition polymerisation	the reaction in which monomers containing carbon-to-carbon double bonds react together to form long-chain molecules called polymers.
cracking	the process in which large, less useful hydrocarbon molecules are broken down into smaller, more useful molecules.
enhanced global warming	the increase in average temperatures around the world as a consequence of the huge increase in the amounts of CO_2 and other greenhouse gases produced by human activity.
haemoglobin	the iron-containing protein found in red blood cells that transports oxygen around the body.
monomer	a small, reactive molecule that reacts to make long-chain molecules called polymers.
polymer	a long-chain molecule made up of many repeating units.

saturated hydrocarbons	compounds of hydrogen and carbon only in which the carbon-carbon bonds are all single covalent bonds, resulting in the maximum number of hydrogen atoms in their molecules.
unsaturated hydrocarbons	compounds of hydrogen and carbon only whose molecules contain carbon-to-carbon double bonds (or triple bonds).
15 Halogen compounds	
elimination	a reaction in which a small molecule, such as H ₂ O or HCl, is removed from an organic molecule.
S_N1 mechanism	the steps in a nucleophilic substitution reaction in which the rate of the reaction (which is determined by the slow step in the mechanism) involves only the organic reactant, e.g. in the hydrolysis of a tertiary halogenoalkane.
S_N2 mechanism	the steps in a nucleophilic substitution reaction in which the rate of the reaction (which is determined by the slow step in the mechanism) involves two reacting species, e.g. in the hydrolysis of a primary halogenoalkane.
16 Hydroxy compounds	
biofuels	renewable fuels, sourced from plant or animal materials.
primary alcohol	an alcohol in which the carbon atom bonded to the -OH group is attached to one other carbon atom (or alkyl group).
secondary alcohol	an alcohol in which the carbon atom bonded to the -OH group is attached to two other carbon atoms (or alkyl groups).
tertiary alcohol	an alcohol in which the carbon atom bonded to the -OH group is attached to three other carbon atoms (or alkyl groups).
17 Carbonyl compounds	
Fehling's solution	an alkaline solution containing copper(II) ions used to distinguish between aldehydes and ketones. A positive test is one in which the clear blue solution gives a red/orange precipitate when warmed with aldehydes, but no change is observed with ketones.
hydroxynitrile	an organic compound containing both an -OH and a -CN group, e.g. 2-hydroxypropanenitrile, CH ₃ CH(OH)CN.
Tollens' reagent	an aqueous solution of silver nitrate in excess ammonia solution, sometimes called ammoniacal silver nitrate solution. It is used to distinguish between aldehydes and ketones. It gives a positive 'silver mirror' test when warmed with aldehydes, but no change is observed with ketones.
18 Carboxylic acids and derivatives	
esterification	the reaction between an alcohol and a carboxylic acid (or acyl chloride) to produce an ester and water.
19 Nitrogen compounds	
20 Polymerisation	

amino acid residue	an amino acid unit within a polypeptide chain.
21 Organic synthesis	
22 Analytical chemistry	
infra-red spectroscopy	a technique for identifying compounds based on the change in vibrations of particular atoms when infra-red radiation of specific frequencies is absorbed

A Level Chemistry Vocabularies

23 Chemical energetics	
bond energy/bond enthalpy	the energy needed to break 1 mole of a particular bond in 1 mole of gaseous molecules.
electron affinity (first electron affinity) ΔH_{ea1}^{\ominus} (23.1.2a)	the enthalpy change when 1 mole of electrons is added to 1 mole of gaseous atoms to form 1 mole of gaseous ions under standard conditions.
electron affinity (second electron affinity) ΔH_{ea2}^{\ominus}	the enthalpy change when 1 mole of electrons is added to 1 mole of gaseous 1 ⁻ ions to form 1 mole of gaseous 2 ⁻ ions under standard conditions.
enthalpy change of atomisation ΔH_{at}^{\ominus} (23.1.1a)	the enthalpy change when 1 mole of gaseous atoms is formed from its element under standard conditions.
enthalpy change of hydration ΔH_{hyd}^{\ominus} (23.2.1a)	the enthalpy change when 1 mole of a specified gaseous ion dissolves in sufficient water to form a very dilute solution.
enthalpy change of solution ΔH_{sol}^{\ominus} (23.2.1b)	the energy absorbed or released when 1 mole of an ionic solid dissolves in sufficient water to form a very dilute solution.
entropy (23.3.1)	a measure of the dispersal of energy or disorder of a system. The system becomes energetically more stable when disordered.
Gibbs free energy	the energy change that takes into account both the entropy change of a reaction and enthalpy change. Reactions are likely to be feasible if the value of the Gibbs free energy change of reaction is negative. The Gibbs free energy change of reaction is given by the relationship $\Delta G^{\ominus} = \Delta H^{\ominus} - T\Delta S^{\ominus}$
lattice energy (23.1.1b)	the enthalpy change when 1 mole of an ionic compound is formed from its gaseous ions under standard conditions.
24 Electrochemistry	
anode	the positive electrode in electrolysis and the negative electrode in voltaic cell.
cathode	the negative electrode in electrolysis and the positive electrode in voltaic cell.
discharge	the conversion of ions to atoms or molecules at electrodes during electrolysis, for example, during the electrolysis of concentrated sodium chloride solution, chlorine is discharged at the anode by the

	conversion of Cl^- ions to Cl atoms, which then combine to form Cl_2 molecules.
electrochemical cell	two half-cells in separate compartments joined by a salt bridge. When the poles of the half-cells are joined by a wire, electrons travel in the external circuit from the half-cell with the more negative E^\ominus value to the half-cell with the more positive E^\ominus value.
electrode	a rod of metal or carbon (graphite) which conducts electricity to or from an electrolyte.
electrode potential	the voltage measured for a half-cell compared with another half-cell.
electrolysis	the decomposition of a compound into its elements by an electric current.
electrolyte	a molten ionic compound or an aqueous solution of ions that is decomposed during electrolysis.
Faraday constant	the charge carried by 1 mole of electrons (or 1 mole of singly charged ions). It has a value of 96 500 coulombs per mol (C mol^{-1}).
Faraday's laws	First law: the mass of a substance produced at an electrode during electrolysis is proportional to the quantity of electricity passed in coulombs. Second law: the number of Faradays needed to discharge 1 mole of an ion at an electrode equals the number of charges on the ion.
feasibility (of reaction)	the likelihood or not of a reaction occurring when reactants are mixed. We can use E^\ominus values to assess the feasibility of a reaction.
fuel cell	a source of electrical energy that comes directly from the energy stored in the chemicals in the cell, one of which is oxygen (which may come from the air).
half-cell	half of an electrochemical cell. The half-cell with the more negative E^\ominus value supplies electrons. The half-cell with the more positive E^\ominus value receives electrons.
Nernst equation	an equation used to predict quantitatively how the value of an electrode potential varies with the concentration of the aqueous ion.
salt bridge	a piece of filter paper soaked in potassium nitrate solution used to make electrical contact between the half-cells in an electrochemical cell.
standard cell potential (24.2.1b)	the difference in standard electrode potential between two half-cells.
standard electrode potential (24.2.1a)	the electrode potential of a half-cell when measured with a standard hydrogen electrode as the other half-cell.
standard hydrogen electrode	a half-cell in which hydrogen gas at a pressure of 1 atmosphere (101 kPa) bubbles into a solution of $1.00 \text{ mol dm}^{-3} \text{ H}^+$ ions. This electrode is given a standard electrode potential of 0.00 V. All other standard electrode potentials are measured relative to this value.
25 Equilibria	

acid–base indicator	a substance that changes colour over a narrow range of pH values.
acid dissociation constant, K_a (25.1.3b)	the equilibrium constant for a weak acid: $K_a = \frac{[H^+][A^-]}{[HA]}$
buffer solution (25.1.5a)	a solution that minimises changes in pH when moderate amounts of acid or base are added. Common forms of buffer consist of either a weak acid and its conjugate base or a weak base and its conjugate acid.
common ion effect	the reduction in the solubility of a dissolved salt by adding a compound that has an ion in common with the dissolved salt. This often results in precipitation of the salt.
conjugate pair (acid/base) (25.1.2)	an acid and base on each side of an equilibrium equation that are related to each other by the difference of a proton; e.g. the acid in the forward reaction and the base in the reverse reaction or the base in the forward reaction and the acid in the reverse reaction.
ionic product of water, K_w (25.1.3d)	the equilibrium constant for the ionization of water. $K_w = [H^+][OH^-]$
pH (25.1.3a)	the hydrogen ion concentration expressed as a logarithm to base 10. $pH = -\log_{10}[H^+]$
pK_a (25.1.3c)	values of K_a expressed as a logarithm to base 10. $pK_a = -\log_{10}K_a$
solubility product, K_{sp}	the equilibrium expression showing the product of the concentrations of each ion in a saturated solution of a sparingly soluble salt at 298 K, raised to the power of the relative concentrations: $K_{sp} = [C^{y+}(aq)]^a[A^{x-}(aq)]^b$ where a is the number of C^{y+} ions in one formula unit of the compound and b is the number of A^{x-} ions in one formula unit of the compound.
solute	a substance that is dissolved in a solution.
26 Reaction kinetics	
desorption	the last stage in heterogeneous catalysis. The bonds holding the molecule(s) of product(s) to the surface of the catalyst are broken and the product molecules diffuse away from the surface of the catalyst.
half-life	the time taken for the amount (or concentration) of the limiting reactant in a reaction to decrease to half its value.
order of reaction	the power to which the concentration of a reactant is raised in the rate equation. If the concentration does not affect the rate, the reaction is zero order. If the rate is directly proportional to the reactant concentration, the reaction is first order. If the rate is directly proportional to the square of the reactant concentration, the reaction is second order.
rate constant	the proportionality constant in the rate equation (see rate equation).

rate equation	<p>an equation showing the relationship between the rate constant and the concentrations of those reactants that affect the rate of reaction. The general form of the rate equation is:</p> $\text{rate} = k[\text{A}]^m[\text{B}]^n$ <p>where k is the rate constant, $[\text{A}]$ and $[\text{B}]$ are the concentrations of those reactants that affect the rate of reaction, m is the order of the reaction with respect to A and n is the order of reaction with respect to B.</p>
rate-determining step	the slowest step in a reaction mechanism.
27 Group 2	
28 Chemistry of transition elements	
bidentate	ligands that can form two co-ordinate bonds from each ion or molecule to the central transition metal ion.
complex (28.2.4)	a central transition metal ion surrounded by ligands.
co-ordination number	the number of co-ordinate (dative) bonds formed by ligands to the central transition metal ion in a complex.
degenerate orbitals (28.3.1a)	atomic orbitals at the same energy level.
ligand (28.2.2)	a molecule or ion with one or more lone pairs of electrons available to donate to a transition metal ion.
monodentate	ligands, such as water and ammonia, that can form only one co-ordinate bond from each ion or molecule to the central transition metal ion.
non-degenerate orbitals (28.3.1b)	atomic orbitals that have been split to occupy slightly different energy levels.
stability constant, K_{stab} (28.5.1)	the equilibrium constant for the formation of the complex ion in a solvent from its constituent ions or molecules.
transition element (28.1.1)	a d-block element which forms one or more stable ions with incomplete d-orbitals.
29 An introduction to A Level organic chemistry	
30 Hydrocarbons	
arenes	hydrocarbons containing one or more benzene rings.
Friedel–Crafts reaction	the electrophilic substitution of an alkyl or acyl group into a benzene ring.
31 Halogen compounds	
32 Hydroxy compounds	

33 Carboxylic acids and derivatives	
acyl chloride	a reactive organic compound related to a carboxylic acid, with the -OH group in the acid replaced by a -Cl atom, for example ethanoyl chloride, CH ₃ COCl.
34 Nitrogen compounds	
azo dyes	coloured compounds formed on the addition of phenol (or another aryl compound) to a solution containing a diazonium ion. They contain the -N=N- group.
complementary base pairing	In nucleic acids, bases are said to be complementary to each other if they form specific hydrogen-bonded pairs. In DNA adenine (A) always pairs with thymine (T) and cytosine (C) always pairs with guanine (G).
coupling reaction	when a diazonium ion reacts with an alkaline solution of phenol (or similar compound) to make an azo dye.
diazotisation	the reaction between phenylamine and nitrous acid (nitric(III) acid), HNO ₂ , to give a diazonium salt in the first step in making an azo dye.
dipeptide	the product formed when two amino acids react together.
electropherogram	the physical results of electrophoresis.
electrophoresis	the separation of charged particles by their different rates of movement in an electric field.
peptide bond	the link between the amino acid residues in a polypeptide or protein chain. The link is formed by a condensation reaction between the -NH ₂ group of one amino acid and the -COOH group of another amino acid.
35 Polymerisation	
disulfide bridge	an S-S bond formed when the -SH groups on the side-chain of two cysteine residues in a protein combine. Disulfide bridges help maintain the tertiary structure of some proteins.
DNA (deoxyribonucleic acid)	a polymer with a double helical structure containing two sugar-phosphate chains with nitrogenous bases attached to them. The sequence of bases forms a code, which is used to form more DNA by replication or to encode mRNA (transcription).
genetic code	a code made up of sets of three consecutive nitrogenous bases that provides the information to make specific proteins.
genetic engineering	the deliberate alteration of one or more bases in the DNA of an organism, leading to an altered protein with improved properties. Scientists hope to be able to use genetic engineering to eliminate genetic diseases which are caused by mutations in DNA.
genetic fingerprinting	a technique based on matching the minisatellite regions of a person's DNA to a database of reference samples.
nitrogenous bases	nitrogen-containing bases found in DNA and RNA. In DNA they are adenine (A), guanine (G), thymine (T) and cytosine (C). In RNA uracil (U) replaces thymine.

nucleotide	a compound consisting of a nitrogenous base, a sugar (ribose or deoxyribose) and a phosphate group. Nucleotides form the basic structural units of DNA and RNA.
polyamides	polymers whose monomers are bonded to each other via the amide link, -CONH-.
polyesters	polymers whose monomers are bonded to each other via the ester link, -COO-.
polypeptides	natural polymers whose monomers are bonded to each other via the amide link, -CONH-, and whose monomers are amino acids.
primary structure (of proteins)	the sequence of amino acids in a polypeptide chain.
protein	condensation polymer formed from amino acids and joined together by peptide bonds. Proteins can be structural (e.g. cartilage), catalysts (enzymes), hormones (e.g. insulin) or antibodies.
secondary structure (of proteins)	the second level of protein structure. The folding of a polypeptide chain into specific structures (e.g. α -helix and β -pleated sheet), which are stabilised by hydrogen bonds formed between -CO and -NH groups in peptide bonds.
tertiary structure (of proteins)	the third level of protein structure. It involves further folding of the polypeptide chain, which is stabilised by interactions between the amino acid side-chains (ionic interactions, hydrogen bonding, van der Waals' forces and disulfide bonds).
36 Organic synthesis	
active site (of an enzyme)	the 'pocket' on an enzyme surface where the substrate binds and undergoes catalytic reaction.
competitive inhibition	enzyme inhibition by molecules that bind to the active site, preventing the normal substrate from reacting. They have a structure similar to the substrate molecule. The inhibition is reversible.
lock-and-key mechanism	a model used to explain why enzymes are so specific in their activity. It is suggested that the active site of the enzyme has a shape into which the substrate fits exactly – rather like a particular key fits a particular lock.
37 Analytical techniques	
GLC	gas-liquid chromatography.
GLC/MS	a technique in which a mass spectrometer is connected directly to a gas-liquid chromatograph to identify the components in a mixture.
HPLC	high-performance liquid chromatography.
mobile phase	the solvent in the chromatography process, which moves through the column or over the paper or thin layer.
NMR	nuclear magnetic resonance spectroscopy.
optical resolution	the separation of optically active isomers (enantiomers) from a mixture.

partition coefficient	the ratio of the concentrations of a solute in two different immiscible solvents when an equilibrium has been established.
retention time	the time taken for a component in a mixture to travel through the column in GLC or HPLC.
<i>R_f</i> value	the ratio of the distance a component has travelled compared with the distance travelled by the solvent front during paper chromatography or TLC.
splitting pattern	the pattern of peaks that main signals are divided into in high-resolution NMR.
stationary phase	the immobile phase in chromatography that the mobile phase passes over or through. Examples are the surface of the thin-layer particles in TLC or the involatile liquid adsorbed onto the column in GLC or HPLC.
TLC	thin-layer chromatography.
TMS	tetramethylsilane. An inert, volatile liquid used as a reference in NMR, given a chemical shift of zero.
two-way chromatography	a technique used in paper or thin-layer chromatography in which one spot of a mixture is placed at the corner of a square sheet and is developed in the first solvent as usual. The sheet is then turned through 90° and developed in the second solvent, giving a better separation of components having similar <i>R_f</i> values.
X-ray crystallography	an analytical technique that uses the diffraction pattern of X-rays passed through a solid sample to elucidate its structure.