

LC Chemistry – Key Definitions



Atomic Number

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The number of protons in the nucleus in one atom of an element.

Aufbau Principle

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Electrons always occupy the lowest available energy level first.

Acid (Arrhenius)

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A substance which dissociates in water to produce H^+ ions.

Allotropes

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Allotropes are different physical forms of the same element, due to a different arrangement of the atoms of an element.



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Absorption spectrum

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A spectrum of electromagnetic radiation transmitted through a substance, showing dark lines or bands due to absorption at specific wavelengths.

Aldehyde

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An organic compound containing a functional group with the structure ' =O ', at the end of a chain of carbon atoms.

Alcohol

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An alcohol is an organic compound in which the -OH (hydroxyl group) is bonded to a saturated carbon atom.

Activation energy

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The minimum amount of energy which colliding molecules must have before they can react together.



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Alkanes

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Hydrocarbons in which there are only single bonds between carbon atoms.

Aliphatic hydrocarbon

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Compound whose molecules contain only chains of carbon atoms (no ring structures).

Alkenes

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Hydrocarbons in which there is a double bond between two carbon atoms.

Allotropes

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Allotropes are different physical forms of the same element (and are due to different arrangements of the atoms of the element).



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**Amphoteric
substance**

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A substance which shows both acidic and basic properties.

**Aromatic
compound**

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Compounds whose molecules contain a benzene ring structure.

Atomic number

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The number of protons in the nucleus of one atom of an element.

Atomic radius

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Half the distance between the nuclei of atoms of that element when bonded together by a single covalent bond.



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Aufbau principle

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Electrons occupy the lowest available energy level.

Auto-ignition

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The explosion of the petrol-air mixture in an engine before the spark is produced.

Avogadro's law

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states that equal volumes of gases under the same conditions of temperature and pressure contain equal numbers of molecules.

Base (according to Arrhenius theory)

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A substance which dissociates in water to produce OH⁻ ions.



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Base (according to
Bronsted-Lowry
theory)

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A proton acceptor.

Biochemical
Oxygen Demand
(B.O.D.)

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A measure of the amount of organic pollution in water. It is defined as the amount of dissolved oxygen consumed by biochemical action, when a sample of water is kept in the dark at 20° C for 5 days.

Boyle's law

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For a fixed mass of gas is kept at constant temperature, the volume is inversely proportional to the pressure.

Catalyst

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A substance that alters the rate of a chemical reaction but which is not used up during the reaction, and which is chemically unchanged at the end of it.

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Catalytic converter (function)

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Change poisonous molecules like carbon monoxide and nitrogen oxide in car exhausts into less harmful molecules, such as CO₂ and Nitrogen.

Catalytic cracking

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is the breaking down of long-chain hydrocarbon molecules into short-chain molecules for which there is a greater demand.

Charles's law

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For a fixed mass of gas kept at constant pressure, the volume is directly proportional to its' temperature, measured on the Kelvin scale.

Chemical equilibrium

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A system is in chemical equilibrium when the rate of forward reaction is equal to the rate of reverse reaction.



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Conjugate acid-base pair

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Two substances that differ from each other by a proton.

Dehydrocyclisation

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involves the use of catalysts to convert straight-chained alkanes into cyclic compounds, which have a higher octane number.

Dipole-dipole force

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The positive end of a polarised molecule attracts the negative end of another polarised molecule (e.g. Na^+ and Cl^- of two different molecules of salt).

Electronegativity

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A measure of the attraction of an atom of an element for the shared pair of electrons in a covalent bond.



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Emission spectrum

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When this light is passed through a prism, the resulting spectrum of colours is called an emission spectrum.

Endothermic reaction

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A reaction in which heat is taken in, or there is a decrease in surrounding temperature after the reaction occurs.

Energy level

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A fixed amount of energy an electron in an atom may have.

Eutrophication

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The enrichment of natural waters by nutrients (nitrates and phosphates), causing the very rapid growth of algae which, when they die and decay, consume large amounts of oxygen. The water is then depleted of oxygen, and aquatic life dies.



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Exothermic reaction

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A reaction in which heat is liberated, or the amount of heat in the surrounding environment increases after the reaction takes place.

First ionisation energy

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The first ionisation energy is the energy required to remove the most loosely bound electron from a neutral gaseous atom.

Flocculation

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The process in which small particles in water are made to coagulate and form a precipitate. It is done by adding a Flocculating Agent such as aluminium sulphate.

Fractional distillation

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The process in which crude oil is separated into fractions according to different boiling points ranges.



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Free chlorine

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Free chlorine refers to both hypochlorous acid and the hypochlorite ion, and is commonly added to water systems for disinfection.

Free radical

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A free radical is any atom or molecule that has a single unpaired electron in an outer shell.

Functional group

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A group of atoms on which the characteristic properties of a particular compound depend.

Gay Lussacs' law of combining volumes

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In a reaction between gases, the volumes of the reacting gases and the volumes of the products, if gaseous, are in the ratio of small whole numbers (at the same temperature and pressure).



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Ground state

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The state of an atom when all of its electrons are in their lowest available energy levels.

Half-life

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The time taken for half of the nuclei in a radioactive sample to decay.

Hard water

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Hard water is water which will not readily form lather with soap due to the presence of dissolved calcium or magnesium salts in the water.

Heat of reaction

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The heat change which occurs when a reaction takes place according to a given chemical equation.



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Heat of formation

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The heat change which occurs when one mole of a compound is formed from its elements in their default states.

Heat of combustion

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The heat change which occurs when one mole of a substance is burnt in excess oxygen.

Heat of neutralisation

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The heat change that occurs when one mole of H^+ ions from an acid reacts with one mole of OH^- ions from a base.

Heisenberg's uncertainty principle

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It is not possible to determine both the position and the momentum of an electron in an atom simultaneously.



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Hess' law

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The heat change for a given reaction depends only on the initial and the final states of the system and is independent of the path followed.

Heterolytic Fission

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The breaking of a covalent bond so that one atom retains the two shared electrons and the other atom retains none, causing ions to form.

Homogenous catalysis

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A system by which both the catalyst and the reactants are in the same phase or state.

Homolytic Fission

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The breaking of a covalent bond so that each atom retains one of the shared electrons, forming two free radicals.



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Homologous series

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A series of compounds, all members of which contain the same functional group, and successive members differ by a CH_2 unit.

Hund's rule

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When two or more orbitals of equal energy are available to electrons, the electrons occupy them single before filling them in pairs.

Hydrocarbon

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An organic compound consisting of hydrogen and carbon only.

Hydrogen bond

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The electrical attraction between the slightly positive hydrogen atoms of one molecule and slightly negative atoms in another molecule (of Oxygen, Nitrogen or Fluorine).



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Ideal gas

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One that obeys the ideal gas laws at all temperatures and pressures.

Indicator

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A substance, which by means of a colour change, indicates the presence of another substance.

Intermolecular force

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The force of attraction between a molecule and another adjacent molecule.

Intramolecular force

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The forces of attraction which hold an individual molecule together, e.g. ionic bonding.

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Instantaneous rate
of reaction

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The rate of change in concentration of a reactant or product at a particular time.

Ionic bond

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The electrical attraction between the oppositely charged ions which are produced when electrons are transferred from one atom to another.

Isomerisation

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The conversion of long chain and unbranched hydrocarbons into their shorter, more branched (and more useful) isomers.

Isotope

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Atoms of the same element but which differ in the numbers of neutrons in their nucleus (or have different mass numbers).

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Le Chatelier's principle

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If a system in equilibrium is subjected to a stress, then the system will adjust itself to relieve the stress.

Limiting reagent

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The reactant not present in excess.

Lone pair

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Pair of electrons in the outer shell of an atom not involved in bonding.

Mass number

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The number of proton and neutrons in an atom of an element.



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Metal Ore

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A mineral that contains a compound of the metal and from which the metal is extracted.

Monobasic acid

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A molecule that dissociates in solution to produce one H^+ ion, e.g. HCl

Neutralisation

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The reaction between an acid and a base to form a salt and water.

Octane number

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A measure of a fuels' efficiency or it's tendency to resist knocking.



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Octet rule

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This states that when atoms bond together, they attain the stable structure of having eight electrons in the outer shell of their atoms.

Orbital

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The region in space around the nucleus of an atom in which there is a very high probability of finding an electron.

Oxidation (two definitions)

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Loss of electrons, increase in oxidation number.

Oxidation number

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The charge which an atom of the element has, or appears to have, in a compound.



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Oxidising agent

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A substance that causes oxidation. The oxidising agent takes the electrons and is therefore reduced in the process.

Oxygenate

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A fuel that has a high octane number because of the presence of oxygen in it. It is added to fuels (like butane) to increase their octane number and decrease the amount of pollution they produce.

Pauli exclusion principle

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No more than two electrons can occupy an orbital, and this they can only do if they have opposite spin.

Permanent hardness

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The type of hardness which cannot be removed by boiling the water.

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pH

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$\text{pH} = -\log_{10} [\text{H}^+]$. pH is a measure of a solution's acidity or alkalinity, on a scale from 0 (very acidic) to 14 (very basic).

Pi bond (π)

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A covalent bond made by the sideways overlapping of two p orbitals.

Plastic

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A material which can be softened and molded by heat and pressure.

Polar covalent bond

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A covalent bond in which the shared pair of electrons is attracted more to one of the joined atoms than the other.

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Non-polar covalent bond

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When both atoms involved in bonding have equal share of the electron bond pair.

Primary standard

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A substance that is available in a stable and pure enough state to be made up directly into a standard solution.

Radioactivity

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The spontaneous decay of the unstable nuclei of a radioactive substance.

Rate of reaction

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The change in the concentration of any reactant or product per unit time.



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Reducing agent

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A substance that causes reduction. The reducing agent supplies the electrons and is therefore oxidised in the process.

Reduction (two definitions)

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Gain of electrons. Decrease in oxidation number.

Relative molecular mass (M_r)

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The mass of a molecule of that substance compared with one twelfth of the mass of the carbon-12 isotope.

Saturated compound

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Compounds which contain only single bonds between atoms, e.g. alkanes.



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Sigma bond (σ)

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A covalent bond made by the head-on overlapping of two p-orbitals. A single covalent bond is a sigma bond.

Standard solution

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A solution whose concentration is accurately known.

Weak Base (Two definitions)

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A base that only slightly dissociates in water. A base that is not very likely to accept H^+ ions.

Steam reforming

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A reaction used for the manufacture of hydrogen, by reacting steam with natural gas at high temperature.



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Strong acid (Two definitions)

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An acid that fully dissociates in water. An acid that is very likely to donate H^+ ions.

Strong base (Two definitions)

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A base that fully dissociates in water. A base that is very likely to accept H^+ ions.

Structural formula

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The formula of a compound showing the way in which the atoms are arranged in the molecule.

Isomers

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Compounds with the same molecular formula but different structural formulas.



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Reflux

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The process of boiling a liquid so that any vapour liquefied is returned to the reaction mixture.

Temporary hardness

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The type of hardness which can be removed by boiling the water.

Transition element

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One whose atoms have an incomplete d orbital.

Unsaturated compound

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Compounds which contain one or more double or triple bond between carbon atoms. The alkenes and alkynes are unsaturated.

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Valency

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The number of electrons which an atom of an element must either gain or lose to attain a noble gas structure.

Van der Waals' force

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Temporary dipoles caused by the random movement of electrons within a molecule.

Volatile liquid

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Liquid with low boiling point.

Weak Acid (Two definitions)

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An acid that only slightly dissociates in water. An acid that is not very likely to donate H^+ ions.



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