

Definitions and Concepts for CAIE Chemistry IGCSE

Topic 14 - Organic Chemistry

Definitions in **bold** are for extended supplement only

Definitions have been taken, or modified from the [CAIE Specification for GCSE Chemistry, 0971, Version 1 September 2020](#)

Addition polymerisation: The reaction in which many small molecule monomers bond together to form a long chain polymer.

Addition reaction: A reaction in which at least two molecules combine together to form a larger molecule.

Alcohols: Organic compounds containing the functional group -OH . The first four members of a homologous series of alcohols are methanol, ethanol, propanol and butanol. **Alcohols can be oxidised to carboxylic acids.**

Alkanes: The most common hydrocarbon found in crude oil. The first four alkanes are methane, ethane, propane and butane. They have the general formula $\text{C}_n\text{H}_{2n+2}$ and can undergo substitution reactions with chlorine.

Alkenes: Hydrocarbons with a double bond between two of the carbon atoms in their chain, causing them to be unsaturated. They have the general formula C_nH_{2n} and react to produce polymers in addition polymerisation reactions. The first three alkenes are ethene, propene and butene.

Biodegradable: Able to be broken down by living organisms.

Carboxylic acids: Organic compounds containing the functional group -COOH . The first four members of a homologous series of carboxylic acids are methanoic acid, ethanoic acid, propanoic acid and butanoic acid. **Carboxylic acids are weak acids and can be formed by the oxidation of alcohols.**

Chromatography: A process used to separate substances in a mixture. Separation of the substance depends on distribution between a mobile phase and a stationary phase.

Chromatography is used to identify the products of hydrolysis of carbohydrates and proteins.

Complex carbohydrates: A large number of sugar units joined together in long chains by condensation polymerisation.

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Condensation polymerisation: Reactions in which monomers join together and lose small molecules, such as water. These reactions involve monomers with two functional groups.

Cracking: A process that involves breaking down larger hydrocarbons to produce smaller more useful molecules. Cracking can be done by catalytic cracking or steam cracking.

Crude oil (petroleum): A finite resource found in rocks. It is the remains of an ancient biomass consisting mainly of plankton that was buried in mud. Most of the compounds in crude oil are hydrocarbons which can be separated by fractional distillation.

Ester: The product of a condensation reaction between a carboxylic acid and an alcohol in the presence of an acid catalyst. For example: ethanol + ethanoic acid → ethyl ethanoate.

Fermentation: A chemical process by which molecules such as glucose are broken down anaerobically. Ethanol is produced when sugar solutions are fermented using yeast.

Fractional distillation: A process used to separate a mixture of liquids, in particular to separate crude oil. The liquids have different boiling points so can be separated into different fractions within a fractionating column.

Functional group: The group of atoms responsible for how a particular compound reacts. All compounds in the same homologous series have the same functional group.

General formula: A chemical formula which applies to a class of compounds, representing the composition of the atoms present in the compound. E.g. Alkanes have the general formula C_nH_{2n+2} where n is the number of carbon atoms in the molecule.

Homologous series: A series of compounds with the same functional group and similar chemical properties.

Hydrocarbons: Molecules that are made up of hydrogen and carbon atoms only.

Hydrolysis: The breakdown of a compound by the reaction with water. Proteins can be hydrolysed to amino acids and carbohydrates can be hydrolysed to simple sugars.

Molecular formula: The actual ratio of atoms of each element present in a compound.

Monomer: Small short chain molecules which can join together to form a long chain polymer.

Polyamide: A category of polymers which contain the amide functional group in their main chain. Formed by a condensation reaction between a diamine and a dicarboxylic acid.



Polyester: A category of polymers which contain the ester functional group in their main chain. Formed by a condensation reaction between a diol and a dicarboxylic acid.

Polymer: Large long-chain molecule made up of lots of small monomers joined together by covalent bonds.

Proteins: Constituents of food. **Polymers made up of amino acid molecules with amide linkages. Proteins can be hydrolysed to amino acids.**

Saturated hydrocarbon: A hydrocarbon compound containing only single bonds between carbon atoms. Alkanes are saturated compounds.

Structural formula: A formula which shows the arrangement of atoms in the molecule of a compound but does not show all the bonds between them. E.g. $\text{CH}_3\text{CH}_2\text{COCH}_3$.

Structural isomerism: A type of isomerism which occurs when compounds have the same molecular formula but a different structural formula.

Unsaturated hydrocarbon: A compound that contains double or triple carbon bonds so that it does not contain the maximum number of hydrogen atoms. Alkenes are unsaturated compounds.

Weak acid: A weak acid is only partially ionised in an aqueous solution. This means only a small number of the H^+ ions are released. Carboxylic acids are examples of weak acids.

