

# Definitions and Concepts for Edexcel Chemistry IGCSE

## Topic 4 - Organic Chemistry

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*Definitions marked by "\*" are for separate sciences only*

*Definitions have been taken, or modified from the [Edexcel Specification for IGCSE Chemistry, 4CH1, Issue 2, April 2018](#)*

**Acid rain:** Rain that is acidic due to gases, such as sulfur dioxide, reacting with water vapour in the clouds.

**\*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  $\text{-OH}$ . The first four members of a homologous series of alcohols are methanol, ethanol, propanol and butanol. Alcohols can be oxidised to carboxylic acids by microbial oxidation or by the reaction with potassium dichromate(VI). Alcohols can be formed from alkenes by the reaction with steam and a phosphoric acid catalyst.

**Alkanes:** The most common hydrocarbon found in crude oil. Alkanes have the general formula  $\text{C}_n\text{H}_{2n+2}$ .

**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  $\text{C}_n\text{H}_{2n}$ .

**Biodegradable:** Able to be broken down by living organisms. Some polyesters are biodegradable.

**\*Carboxylic acids:** Organic compounds with the functional group  $\text{-COOH}$ . The first four members of a homologous series of carboxylic acids are methanoic acid, ethanoic acid, propanoic acid and butanoic acid. Carboxylic acids have typical acidic properties.

**Catalytic cracking:** Long-chain hydrocarbons are heated at  $600\text{-}700^\circ\text{C}$  to turn them into a gas. The vapour is then passed over a silica or alumina catalyst. The long chain molecules split apart on the surface of the catalyst.

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**Combustion:** The burning of a substance. Combustion of hydrocarbon fuels releases energy. During combustion, the carbon and hydrogen in the fuels are oxidised.

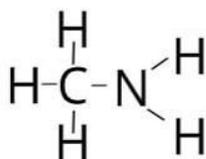
**Complete combustion:** Combustion carried out in sufficient oxygen. Water and carbon dioxide are the only products of the complete combustion of a hydrocarbon.

**\*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:** 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.

**Displayed formula:** A type of structural formula that shows all the bonds between every atom in the compound. E.g.



**Empirical formula:** The smallest whole number ratio of atoms of each element in a compound. E.g.  $\text{CH}_2$  is the empirical formula of  $\text{C}_2\text{H}_4$ .

**\*Ester:** The product of a condensation reaction between a carboxylic acid and alcohol. They contain the functional group  $-\text{COO}-$  and are volatile compounds with distinct smells. They are commonly used in perfumes and flavourings.

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

**Finite resource:** A resource which will one day run out, e.g. crude oil.

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

**Fuel:** A substance which releases energy when burned.

**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. For example, 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.

**Impurities:** Chemical substances within a compound which are different to the chemical composition of the compound. Combustion of hydrocarbons containing sulfur impurities leads to the formation of sulfur dioxide.

**Incomplete combustion:** Combustion which is carried out with insufficient oxygen. It can lead to the production of toxic carbon monoxide and carbon particulates.

**Isomerism:** The existence of molecules with exactly the same molecular formula but a different arrangement of atoms in space.

**\*Microbial oxidation:** The oxidation of a substance by microorganisms. Ethanol undergoes microbial oxidation to produce ethanoic acid.

**Molecular formula:** The actual number of atoms of each element in the compound.

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

**Particulates:** Polluting particles which cause global dimming and health problems for humans. Carbon particulates (soot) are a product of incomplete combustion.

**\*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 molecules made up of lots of small monomers joined together by covalent bonds.

**Repeat unit:** The part of a polymer whose repetition would produce the complete polymer chain.

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

**Steam cracking:** Long-chain hydrocarbons are heated to turn them into a gas. The hydrocarbon vapour is then mixed with steam and heated to a very high temperature which caused them to split into smaller molecules.

**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.  $CH_3CH_2COCH_3$ .



**Substitution reaction:** A reaction in which a functional group of a compound is replaced by another functional group.

**Unsaturated hydrocarbons:** 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.

