



# Definitions and Concepts for Edexcel Chemistry A-level

## Topic 6: Organic Chemistry 1

**Hydrocarbon:** A compound exclusively consisting of hydrogen and carbon atoms.

**Homologous series:** Series of organic compounds with the same functional group and general formula. Consecutive members of a series differ by  $-\text{CH}_2$ .

**Functional group:** a group of atoms responsible for the characteristic reactions of a particular compound.

**Addition:** Joining two or more molecules together to form a larger molecule. *Hydration* is the addition of a  $\text{H}_2\text{O}$  molecule. *Halogenation* involves the addition of a halogen. *Hydrogenation* is the addition of  $\text{H}_2$ . *Electrophilic addition* describes all the above examples.

**Polymerisation:** Joining together lots of simple molecules (monomers) to form a giant molecule (a polymer).

**Repeating unit:** A simplest pattern (group of elements bonded together) of the polymer that, upon translation, reproduces the whole structure.

**Elimination:** When a small group of atoms breaks away from a larger molecule to form a  $\text{C}=\text{C}$  bond.

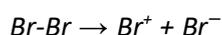
**Substitution:** When one species is replaced by another.

**Hydrolysis:** Breaking bonds in a molecule by reaction with  $\text{H}_2\text{O}$ .

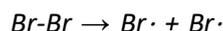
**Dehydration:** Reaction in which water is eliminated from a starting material.

**Saturated:** Refers to a compound with all the C-C bonds being single bonds.

**Heterolytic fission:** The process of breaking a covalent within a molecule leading to the formation of ions. Upon bond breaking, one atom receives the electron pair and becomes a negatively charged ion. Other atom becomes a cation, e.g.



**Homolytic fission:** The process of breaking a covalent within a molecule leading to the formation of radicals. Upon bond breaking, each atom receives one electron from the bonding pair and both atoms become radicals, e.g.



**Radicals:** A species with an unpaired electron. Represented in mechanisms by a single dot.

**Free radical substitution:** Photochemical reaction (requires UV light) between halogens and alkanes to form halogenoalkanes. *Initiation* is the process of forming the radicals from a molecule by homolytic fission. *Propagation* is the formation of a new radical and a new molecule from some radical and other molecule. *Termination* concludes the mechanism and is the process of two radicals joining together to form a molecule. Polysubstitution (multiple substitution) is often a problem.

**Stereoisomerism:** Occurs when two double bonded carbon atoms each have two different atoms or groups attached to them. Includes *E/Z* isomerism and *cis/trans* isomerism. This is a consequence of a restricted rotation around the  $\text{C}=\text{C}$  double bond.



**Structural isomerism:** Occurs when species have the same molecular formula, but a different structural formula, e.g.  $C_6H_{12}$  can be ascribed to hex-1-ene, but also to 2-methylpent-1-ene.

**Saturated hydrocarbons:** Hydrocarbons which contain only single (sigma) bonds between carbon atoms.

**Unsaturated hydrocarbons:** Hydrocarbons which contain at least one carbon-carbon double bond.

**Cracking:** Breaking long chain alkanes into smaller, more useful hydrocarbons. Helps to convert low demand hydrocarbons into more highly demanded ones.

**Reforming:** Processing of straight chain hydrocarbons into branched chain alkanes and cyclic hydrocarbons for efficient combustion. Done so there's no knocking.

**Knocking:** Alkanes explode of their own accord when the fuel/air mixture in an engine is compressed.

**Complete combustion:** Produces fully oxidised products (e.g.  $CO_2$ ) as opposed to *incomplete combustion* (produces CO).

**Catalytic Converters:** Get rid of pollutants in cars by using platinum catalyst to convert them to harmless gases, e.g.  $2NO + CO \rightarrow N_2 + CO_2$ .

**Biofuels:** Fuels made from living matter over a short period of time. e.g. biodiesel made by refining renewable fats and oils such as vegetable oil.

**Recycling:** Conversion of a waste from polymer into other useful materials.

**Incinerator:** A device for converting polymer waste into energy.

**Feedstock:** For conversion of polymer waste into compounds that can be used to synthesise new polymers.

**Biodegradable:** Refers to a polymer that can be decomposed by microbes. Usually has polar groups (e.g. ester, amide).

**Electrophile:** Electron pair acceptor in an organic mechanism. Attracted to areas with lot of electrons/high negative charge.

**Nucleophile:** Electron pair donors in an organic mechanism. Attracted to electron-deficient areas.

**Electron releasing group:** A group that releases the electrons towards the atom it is joined to.

**Carbocation:** A carbon atom bearing a positive charge.

**Markovnikoff's rule:** *Weak statement* - when adding a hydrogen halide to an unsymmetrical alkene, the major product is formed from hydrogen adding to the carbon with more hydrogens, and halide adding to the carbon with fewer hydrogens.

*Strong statement* - The major product of an electrophilic addition to the unsymmetrical alkene results from a reaction proceeding *via* the most stable carbocationic intermediate (stability increases in the order: primary<secondary<tertiary).

**Distillation with addition:** Performing the reaction under distillation conditions whilst adding one of the reagents. The product distills off as it forms in case of oxidation of an alcohol to an aldehyde.



**Solvent extraction:** A method for separating a compound from a mixture by causing it to move to another solvent.

**Fractional distillation:** A distillation that utilises a fractionating column (packed glass beads that provide a surface for the vapour to condense and evaporate again). Used to separate liquids of similar boiling points.