

AQA Chemistry GCSE

Topic 7: Organic Chemistry

Flashcards



What is crude oil?



What is crude oil?

Crude oil is a mixture of compounds; a fossil fuel consisting of the remains of ancient biomass.

Finite resource - cannot be replaced as it is used up.



What is a hydrocarbon?



What is a hydrocarbon?

A compound made up exclusively of hydrogen and carbon atoms



What are alkanes?



What are alkanes?

Saturated hydrocarbons of a general formula C_nH_{2n+2}



What is a homologous series?



What is a homologous series??

Series of compounds with same general formula, same functional groups and similar chemical properties.



Describe the combustion of hydrocarbons



Describe the combustion of hydrocarbons

- Exothermic reaction occurring when hydrocarbons are reacted with oxygen.
- Complete combustion produces carbon dioxide and water (carbon and hydrogen atoms are completely oxidised).
- Incomplete combustion produces carbon or carbon monoxide and water.



Describe the physical properties of alkanes



Describe the physical properties of alkanes

- First few in series are gases, then change to liquids, then to solids.
- In general, boiling points and viscosity increase as molecules get bigger.
- Volatility and flammability decrease as molecules get bigger.
- Poor reactivity.



Explain how fractional
distillation of crude oil takes
place



Explain how fractional distillation of crude oil takes place

- Crude oil is heated and vaporised.
- Vapor rises up the fractionating column (tower).
- The column is hotter at the bottom and cooler at the top.
- Hydrocarbons cool as they go up the column and condense at different heights, as they have different boiling points.
- Large molecules, high boiling points - collected at the bottom.
- Small molecules, low boiling points - collected at the top.
- This gives fractions, which can be used in various ways.



What is cracking?



What is cracking?

When large hydrocarbons are thermally broken down into smaller and useful molecules



What type of reaction is cracking?



What type of reaction is cracking?

Thermal decomposition



What are the conditions for cracking?



What are the conditions for cracking?

Reactant heated to vapor, passed over a hot catalyst (catalytic cracking) or heated to vapor, mixed with steam and heated to high temperatures (steam cracking)



How are the products of cracking used?



How are the products of cracking used?

The products are alkanes and alkenes – used as polymers and starting materials for synthesis.



What is an alkene?



What is an alkene?

Unsaturated hydrocarbon. Contains a C=C bond.

General formula for alkenes is: C_nH_{2n} .



What is the test for alkenes?



What is the test for alkenes?

Add bromine water. Colour change occurs from orange to colourless.



Describe the combustion of alkenes



Describe the combustion of alkenes

They burn with smoky flames due to incomplete combustion



Describe addition reactions of alkenes



Describe addition reactions of alkenes

Addition atoms across the carbon-carbon double bond so that the double bond becomes a single carbon-carbon bond.

- With hydrogen - hydrogenation; requires a higher temperature and a nickel catalyst
- With steam - hydration; requires high temperature, pressure, and concentrated phosphoric acid (H_3PO_4) as a catalyst
- With $\text{Br}_2/\text{Cl}_2/\text{I}_2$ - addition of halogens



What is an alcohol?



What is an alcohol?

An organic compound that contains an -OH functional group



State characteristics of methanol, ethanol, propanol and butanol



State characteristics of methanol, ethanol, propanol and butanol

- Dissolve in water to form a neutral solution.
- React with sodium to form hydrogen.
- Burn in oxygen.
- React with carboxylic acids in presence of acid catalyst to form esters.



Oxidation of the alcohols leads to...?



Oxidation of the alcohols leads to...?

Carboxylic acids



What are some uses of alcohols?



What are some uses of alcohols?

- Fuels
- Solvents
- Drinks

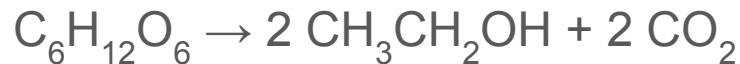


State the conditions required for fermentation of glucose and state the equation of the reaction



State the conditions required for fermentation of glucose and state the equation of the reaction

30 degrees Celsius, aqueous solution of the glucose, absence of air, yeast added;



What are carboxylic acids?



What are carboxylic acids?

Organic compounds that contain a COOH functional group



State characteristics of carboxylic acids



State characteristics of carboxylic acids

- Dissolve in water to form an acidic solution (contains H^+ ions)
- React with metal carbonates to form carbon dioxide
- React with alcohols with an acid catalyst to produce esters
- React with metals to give off hydrogen gas



What type of acid is
carboxylic acid?



What type of acid is carboxylic acid?

It is a weak acid.



Explain why carboxylic acids are weak acids?

Higher tier only



Explain why carboxylic acids are weak acids?

They are partially dissociated in water, thus the pH of a carboxylic acid in solution is not as low as a solution of a strong acid of the same concentration.

Higher tier only



What is an ester and how is it formed? What is characteristic about this class of compounds?



What is an ester and how is it formed?

An organic compound containing a -COO- functional group, formed from carboxylic acid and alcohol in the presence of a sulfuric acid catalyst.

They have a fruity smell.



What is a polymer? How do molecules containing C=C bond form polymers?



What is a polymer? How do molecules containing C=C bond form polymers?

A polymer is a long chain molecule which is made by lots of smaller molecules joining together.

C=C bonds open up and many smaller molecules (monomers) join together to form a chain (a polymer). No other products are made.

It is called an “addition polymerisation” reaction.



Give 3 examples of addition polymers and their uses.



Give 3 examples of addition polymers and their uses.

Polyethene - plastic bags

(Poly)tetrafluoroethene (PTFE) - teflon surfaces, for use in non-stick kitchenware

(Poly)chloroethene (polyvinylchloride, PVC) - water pipes



What is a repeating unit of a polymer?



What is a repeating unit of a polymer?

It is a smallest structure which, upon numerous translations, yields the structure of the polymer.

In addition polymers: to draw it, take a monomer, change $C=C$ to $C-C$ and show additional single bonds extending away from these carbons.



What is a condensation polymer? How is it made?
There are 2 main groups - name them and give industrially relevant examples.

Higher tier only



What is a condensation polymer?

It is a polymer made in condensation polymerisation.

In this reaction, many molecules join together; the polymer is formed, but also a small molecule is released, e.g. H_2O , HCl .

Polyesters, e.g. terylene.

Polyamides, e.g. Nylon.

Higher tier only



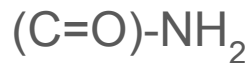
What is an amide bond?

Higher tier only



What is an amide bond?

An amide bond is similar to the ester bond, with O replaced by N, e.g.



Just like an ester, it contains the C=O group.



What is an amino acid?

Higher tier only



What is an amino acid?

It is an organic compound that contains both a carboxylic acid functionality (COOH) and an amine functional group (-NH_2).

Higher tier only



How do amino acids make proteins? What are polypeptides?

Higher tier only



How do amino acids make proteins? What are polypeptides?

By numerous condensation polymerisation reactions; proteins are polymers made of amino acids (monomers).

*Polypeptides are also made by condensation polymerisation of amino acids, but are shorter than proteins. One could think about proteins as a product of many polypeptide chains bonded together.

Higher tier only



What are carbohydrates?



What are carbohydrates?

They are organic molecules made of C, H, and O. They are biologically relevant, e.g. starch and cellulose.

Both of these are polymers made of glucose (other carbohydrate) monomers. Their structures differ in the way the glucose molecules are joined together.



What is DNA? Describe its role and structure.



What is DNA? Describe its role and structure.

DNA (deoxyribonucleic acid) is a material that makes up chromosomes - cell structures that store genetic information.

DNA is made of two polymer chains that are held together in a double helix.

Each polymer chain can be made from 4 different monomers - nucleotides.

