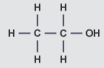
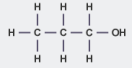
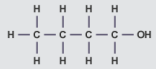
Chemistry Knowledge Organiser
C10 - Organic reactions – triple students only

Key Terms	Definitions
Alcohol	A family of chemicals containing a C-OH functional group
Carboxylic acid	A family of chemicals containing a  unctional group.
Fermentation	When bacteria or yeast is used to break down a chemical.

Alcohols

Another family of chemicals are alcohols. They are similar in structure to alkanes except that one of the C-H bonds is replaced with a C-OH. To name an alcohol, you user the same system as naming an alkane except the –**ane section is replaced by –ol** for example methanol.

Name	Molecular formula	Full structural formula
Methanol	CH_3OH	
Ethanol	C_2H_5OH	
Propan-1-ol	C_3H_7OH	
Butan-1-ol	C_4H_9OH	

Reactions and uses of Alcohols

The first four alcohols are flammable and this means that they will undergo **complete combustion** in air making carbon dioxide and water. This means they make very good fuels.
Unlike carboxylic acids alcohols **will not form** acids when dissolved in water.
Alcohols with react with metal producing **hydrogen gas.**
Alcohols are also **excellent solvents**, which means they are useful in the chemical industry.
Alcohols can be **oxidised** to carboxylic acids
They can react with carboxylic acids to form **esters.**

Making ethanol

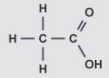
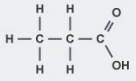
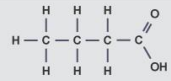
There are two techniques for making ethanol:

1. Fermentation
2. Hydration of ethane (see page on alkenes)

Process	Description	Advantages	Disadvantages
Fermentation	Sugar and yeast (anaerobic respiration) produces ethanol	Uses plants so is renewable, carbon neutral. Needs low temp 37˚C	Slow, relies on crops
Hydration of ethene	Ethene reacted with steam at a high temp and pressure	Fast, produces ethanol in large quantities	Ethene from crude oil is non renewable. Lots of energy required

Carboxylic Acids

Another family of chemicals are carboxylic acids. They contain a COOH functional group. To name carboxylic acids you **add –oic acid** to the end of the name. For example ethanoic acid. Carboxylic acids can be made from the oxidation of an alcohol.

Name	Molecular formula	Full structural formula
Methanoic acid	HCOOH	
Ethanoic acid	CH_3COOH	
Propanoic acid	C_2H_5COOH	
Butanoic acid	C_3H_7COOH	

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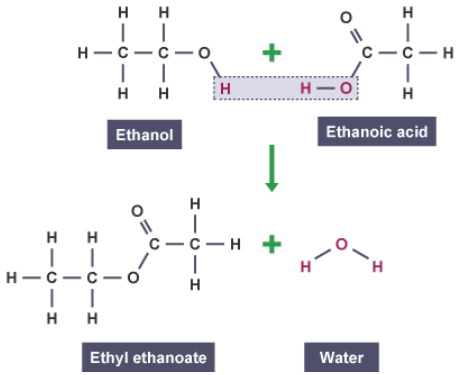
Reactions and properties of carboxylic acids

When dissolved in water carboxylic acids will **form a weak acid**. This means they will partially dissociate. This means that they will undergo similar reactions to other acid, for example, they will react with a metal to form hydrogen gas, they will also react with a **metal carbonate to form carbon dioxide.**

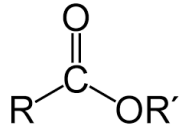
An alcohol and a carboxylic acid will react together to form **an ester.** This reaction needs to be done with **a strong acid catalyst** present, for example concentrated sulphuric acid.



This is known as a **condensation** reaction as two molecules have reacted to make a larger molecule and a small molecule. This small molecule is usually water but can be other small molecules.

Esters

Esters are chemicals with the following functional group:



Esters have a pleasant smell this means they are used in many artificial scents and flavours.

Key Terms	Definitions
Esters	A family of chemicals containing the functional group 
Condensation Reaction	A reaction when two molecules make a larger molecule and a smaller molecule, usually water.
Diol	An alcohol which contains 2 C-OH groups
Condensation Polymer	A polymer that has been formed through a condensation reaction

Condensation Polymers

There is a second type of polymer which is known as a condensation polymer. These are formed from a condensation reaction. For condensation polymerisation to occur, you need to have reagents that have the correct functional groups at **both ends of the molecule.** For example to make a polyester, you will need, a diol and a diacid.

The R in the diagram above just represents the rest of the molecule, to make different sorts of polyester, you simply change the R group. Below is an example showing the formation of one type of polyester.