



Chemistry

7. Organic Chemistry

Triple Chemistry

Revisiting Booklet

Name:

Crude oil, hydrocarbons and alkanes

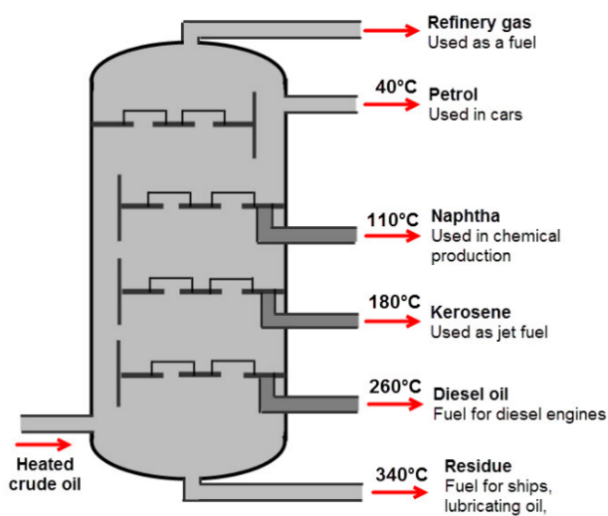
What is crude oil and where do we find it?

How is crude oil made?

What is the general formula for alkanes?

Complete this table

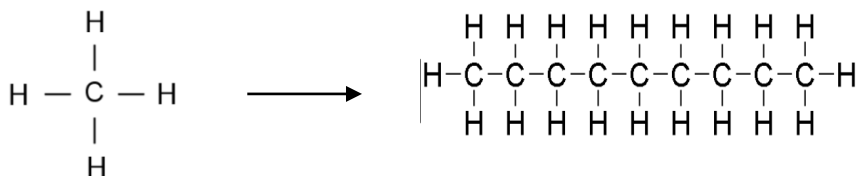
Name	Formula	Drawing of structure
Methane		
Ethane		$\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array}$
Propane		
Butane		



What method can we use to separate out the hydrocarbons in crude oil ?

Describe how this method works to separate out different hydrocarbons in terms of evaporation and condensation.

How does the **boiling point** change as you increase the molecular size?

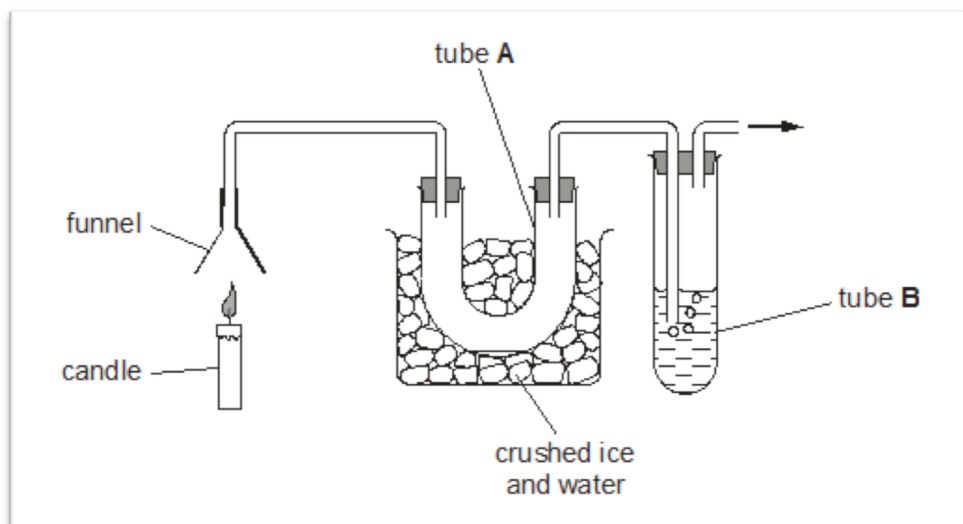


HT: Explain why..

How does **viscosity** change as you increase the molecular size?

How does the **flammability** change as you increase the molecular size?

Burning Hydrocarbon Fuels



What forms in tube A?

.....

What happens to the limewater in tube B?

.....

.....

.....

.....

Complete the equation for the complete combustion of ethane

Ethane + Oxygen \rightarrow _____ + _____

Write the word equations for the complete combustion of...

1. Methane

2. Propane

3. Butane

HT : Balance the symbol equation for the combustion of ethane



HT: Now write the balanced symbol equation for the complete combustion of Methane

When there is not enough oxygen available during combustion another product is formed.

What is this product? _____

Write a word equation for the incomplete combustion of ethane

Why is this product harmful?

Cracking hydrocarbons

What is cracking?

What are the 2 conditions for catalytic cracking?

1. _____

2. _____

What are the 2 conditions for steam cracking?

1. _____

2. _____

What are the products of cracking?

What are alkenes?

What is the test for alkenes?

I would add.....

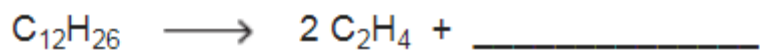
If an alkene was present it would turn.....

Tick the correct box to show if the compound is an alkene or an alkane

	Alkane	Alkene
$ \begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \end{array} $		
$ \begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{H} \\ \\ \text{H} \end{array} $		
$ \begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{C}=\text{C} \\ \quad \\ \text{H} \quad \text{H} \end{array} $		
$ \begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}=\text{C}-\text{H} \\ \\ \text{H} \end{array} $		

Why does cracking need to be carried out? What are alkenes used for?

Complete the cracking equations



Reactions of alkenes

What is a homologous series?

What are the two products when alkenes are burnt?

1. _____

2. _____

Addition reactions

The carbon-carbon double bond is very reactive and molecules can react with the alkene and be 'added' across the double bond.

With halogens....

Ethene + _____ → dibromoethane

With hydrogen...

Pentene + hydrogen → _____

- Requires a catalyst

With water (steam)....

_____ + steam ↔ ethanol

- Requires a catalyst

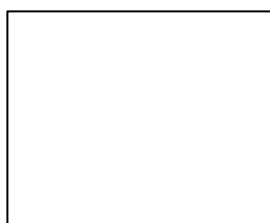
Structures of alcohols, carboxylic acids and esters

Alcohols

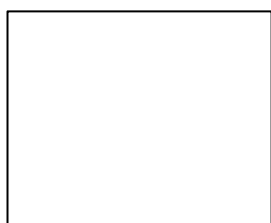
What is the functional group of an alcohol? _____

Draw:

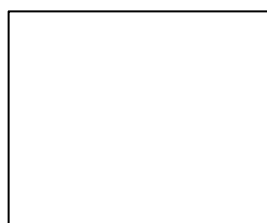
Methanol



Ethanol



Propanol



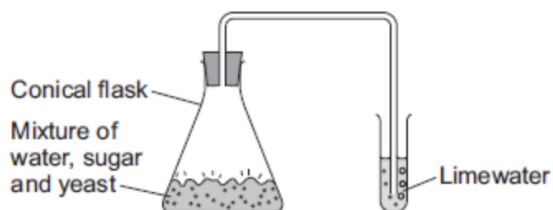
Butanol



Formula: _____

Uses of alcohols

1. _____
2. _____
3. _____



A student set up this apparatus to make ethanol from sugar.

What is this process called? _____

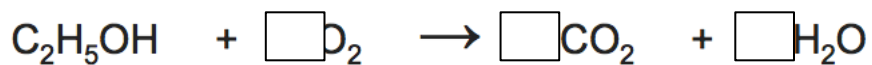
What will happen to the limewater? Explain why.

The student wanted to separate the solid yeast from the solution at the end. How might they do this?

Reactions of alcohols

Combustion produces _____ and _____

Balance this combustion equation



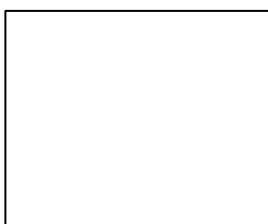
Alcohols also react with **Sodium** to give a strongly **alkaline** solution and with **oxidising** agents to give **carboxylic acids**.

Carboxylic Acids

What is the functional group of a carboxylic acid? _____

Draw:

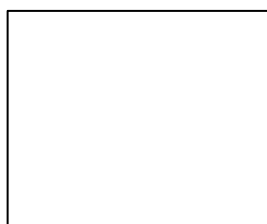
Methanoic Acid



Ethanoic Acid



Propanoic Acid



Butanoic Acid



Formula: _____

Reactions of carboxylic acids

Carboxylic acids react like a typical acid.

Carboxylic Acid + Metal \rightarrow Salt + _____

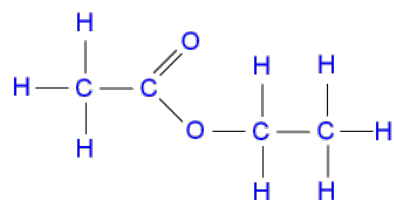
Carboxylic Acid + Metal Carbonate \rightarrow Salt + _____ + _____

HT: Why are carboxylic acids called 'weak acids'?

Esters

What is the functional group of an Ester? _____

_____ + _____ \rightarrow (with acid catalyst) ester + water



Name the carboxylic acid and alcohol used to make this compound

Acid: _____

Alcohol: _____

Name this compound _____

The compound shown above is volatile. What does this mean?

Give a se of the homologous series of compounds to which the compound above belongs

Polymers

Define...

Monomer:

.....

Polymer:.....

.....

Addition Polymerisation

Polymers are formed from alkenes by _____ polymerisation. The _____ bond 'opens up' and the _____ are joined end to end to form a long chain _____ with a carbon '_____'.

Backbone, polymer, addition, double, monomer

Name of monomer	Name of polymer
Ethene	Poly(ethene)
	Poly(propene)
Chloroethene	

Draw the missing monomers and polymers

Monomer	Polymer
	$\left[\begin{array}{cc} \text{H} & \text{Cl} \\ & \\ -\text{C} & - & \text{C}- \\ & \\ \text{H} & \text{H} \end{array} \right]_n$
$\begin{array}{c} \text{H} & & \text{H} \\ & \diagdown & / \\ & \text{C} = \text{C} \\ & / & \diagdown \\ \text{H} & & \text{H} \end{array}$	
	$\left(\begin{array}{cc} \text{H} & \text{H} \\ & \\ -\text{C} & - & \text{C}- \\ & \\ \text{H} & \text{CH}_3 \end{array} \right)_n$

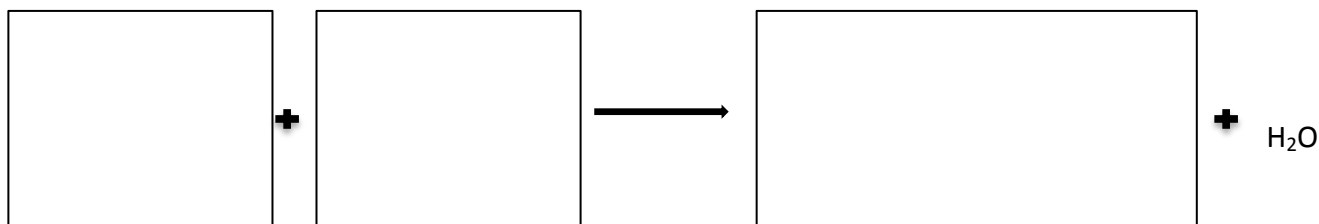
HT: Condensation Polymerisation

Condensation polymerisation produces the desired polymer as well as a small molecule e.g. water or HCl.

To make a polyester you need a _____ and a _____.

They then join up end to end making multiple ester bonds in a long chain.

Draw the displayed formula of the polyester formed by ethanediol and hexanedioic acid.



Comparing Condensation and Addition Polymerisation

	Addition Polymerisation	Condensation Polymerisation
Number of Monomer reactants		
Type of monomers		
Number of products		
Type of polymer made		

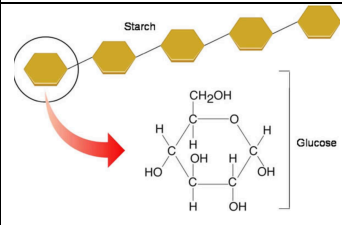
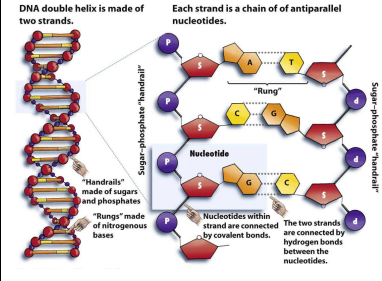
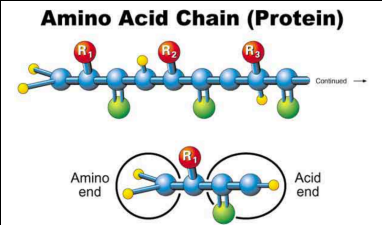
Disposal of polymer plastics

Give 3 problems cause by the disposal of plastics in landfill sites

1. _____
2. _____
3. _____

Plastics made from plants would be more environmentally friendly than plastics made from crude oil.
Explain why.

Natural Polymers

	Monomers	Small Product lost	Type of polymerisation	Picture	Uses
Starch				 <p>The diagram shows a chain of four glucose units linked together. A red arrow points from one unit to a detailed chemical structure of a glucose molecule. The structure is a six-membered ring with a CH₂OH group at the top, and various hydroxyl (OH) and hydrogen (H) groups attached to the carbons in the ring.</p>	
DNA				 <p>The diagram illustrates a DNA double helix. Labels include: <ul style="list-style-type: none"> "DNA double helix is made of two strands." "Each strand is a chain of of antiparallel nucleotides." "Super-phosphate 'handrail'" (referring to the phosphate groups on the outside of the strands). "Rungs" made of nitrogenous bases (referring to the base pairs connecting the strands). "Nucleotide" (a unit consisting of a phosphate, a sugar, and a base). "Nucleotides within strand are connected by covalent bonds." "The two strands are connected by hydrogen bonds between the nucleotides." </p>	
Proteins				 <p>The diagram shows a chain of amino acids. The backbone consists of a repeating sequence of alpha-carbon (blue), nitrogen (red), and carbonyl carbon (green). Side chains (R₁, R₂, R₃) are attached to the alpha-carbons. Labels include: <ul style="list-style-type: none"> "Amino end" (at the left end of the chain). "Acid end" (at the right end of the chain). "Continued" (with an arrow pointing to the right). </p>	

HT: Making Polypeptides and proteins from amino acids

Amino acids contain 2 functional groups

1. _____
2. _____

These groups react together in a **condensation** reaction to make a protein.