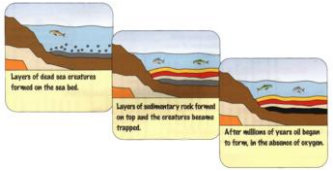
CF2 – Knowledge organiser

Hydrocarbons

Crude Oil is made from the remains of living **sea creatures** decayed in mud millions of years ago

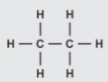
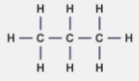
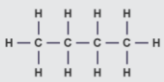


It is a **FINITE** resource

It is made of a mixture of Hydrocarbons.

Hydrocarbons are made of **Hydrogen and Carbon only.**

The main hydrocarbons in Crude Oil are **alkanes**

Alkane	Molecular formula	Structural formula
Methane	CH_4	
Ethane	C_2H_6	
Propane	C_3H_8	
Butane	C_4H_{10}	

The general formula for an alkane is -

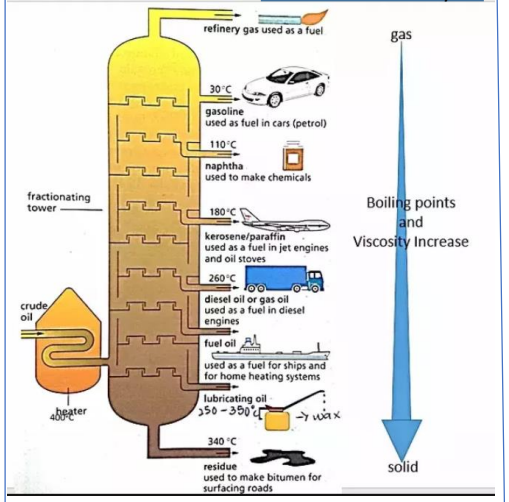
C_nH_{2n+2}

Fractional Distillation

How do we separate the mixture of hydrocarbons to use them?

Works by **evaporation** and then **condensation.**

Smaller molecules burn most easily



1. **Heat** the crude oil to **evaporate** it.
2. The gases **rise** up the column.
3. The different fractions **condense** at **different temperatures**.

Combustion

Combustion (burning) is a reaction with **oxygen**

A reaction with oxygen is called 'oxidation'

When hydrocarbons burn a lot of **energy** is released.

Complete combustion of hydrocarbons the only products are **carbon dioxide and water**

Complete combustion only happens if there is plenty of oxygen

General equation

hydrocarbon + oxygen → carbon dioxide + water

Complete combustion of propane

propane + oxygen → carbon dioxide + water

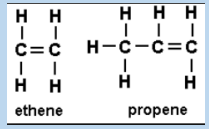
$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

Cracking

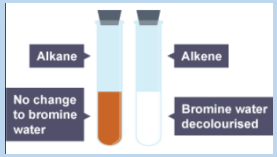
The larger molecules from fractional distillation are less useful. We can break them down into smaller, more useful molecules.

Cracking produces a mixture of **alkanes and alkenes**.

Alkenes have **some double bonds**.

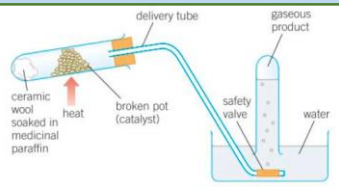


They turn **bromine water colourless**.



They are used to make **polymers.**

The apparatus for cracking



Catalytic cracking – catalyst and 500°C

Steam cracking – steam and 850°C

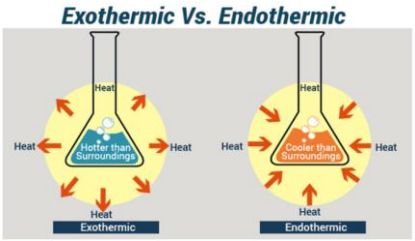
Exothermic vs Exothermic

Exothermic

In some reactions more energy comes OUT than goes in

The reactants have more energy than the products.

e.g. combustion, oxidation, neutralisation.



Endothermic

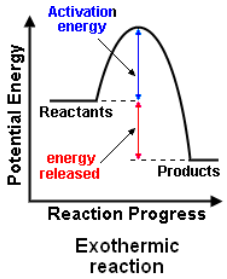
In some reactions more energy goes IN than comes out.

The products have more energy than the reactants.

e.g. thermal decomposition

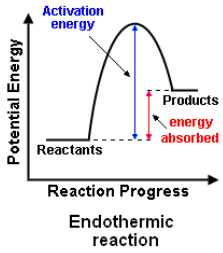
Reaction Profiles

Exothermic



Products at LOWER energy than reactants

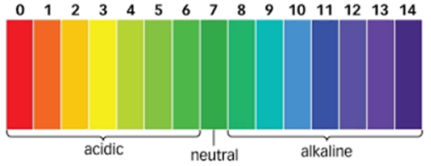
Endothermic



Products at HIGHER energy than reactants

Activation Energy is the energy needed to start a reaction.

Reactions of acids



Acid+metal → salt + hydrogen
Acid + alkali → salt + water
Acid + insoluble base → salt + water
Acid + carbonate → salt + water + carbon dioxide

Acids produce H^+ ions
Alkalis produce OH^- ions

HT: OILRIG
e.g. $2HCl + Mg \rightarrow MgCl_2 + H_2$
Magnesium is oxidised
$Mg \rightarrow Mg^{2+} + 2e^-$

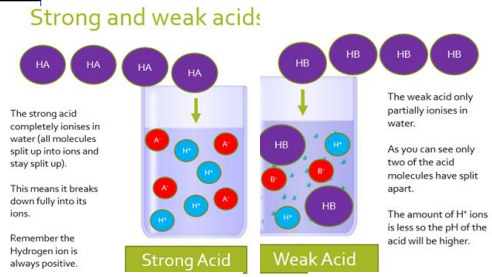
$H^+_{(aq)} + OH^-_{(aq)} \rightarrow H_2O_{(l)}$

Hydrochloric Acid → Chlorides
HCl
Nitric Acid → Nitrates
HNO_3
Sulphuric Acid → Sulphates
H_2SO_4

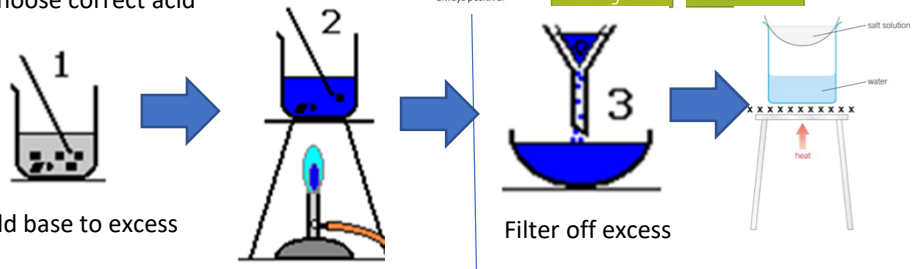
HT: Strong and Weak acids

Concentration of hydrogen ions in mol/dm³	pH
0.10	1.0
0.010	2.0
0.0010	3.0
0.00010	4.0

RP: Preparation of a dry sample of a soluble salt



Choose correct acid



Add base to excess

Filter off excess