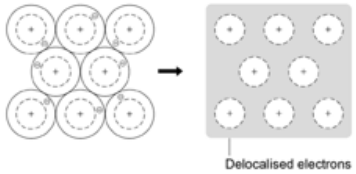
Exmouth Community College
Academy Trust

Metallic bonding

Metals LOSE ELECTRONS to form POSITIVE IONS



GIANT structures of atoms in a REGULAR pattern

Delocalised electrons are free to move.

What is a metallic bond?

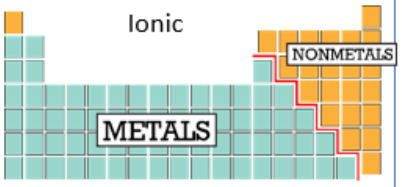
Sharing delocalised electrons – STRONG metallic bonds.

Which type of bonding is it?

M:M
Metallic

M:NM
Ionic

NM:NM
Covalent



Ionic bonding

Metals LOSE ELECTRONS to form POSITIVE IONS
Non-metals GAIN ELECTRONS to form NEGATIVE IONS

Electrons transferred from metal to non-metal

Ions have electronic structure of a noble gas

What is an ionic bond?
STRONG electrostatic force of attraction between **oppositely charged ions**

How do we quickly work out the charges on ions?

Group	Electrons in outer shell	Charge on ion
1	1	1+
2	2	2+
6	6	2-
7	7	1-

C3 Structure and Bonding

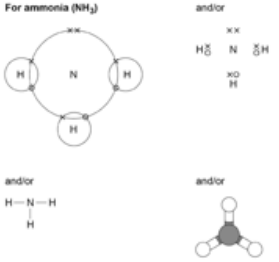
Covalent Bonding

Two **non-metals** will **SHARE** pairs of electrons

STRONG bond formed.

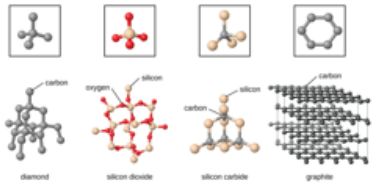
Small molecules

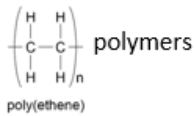
A small group of atoms sharing electrons



Giant Structures

Many atoms sharing electrons





Limitations of these models

Model	Limitations
Dot and cross	Looks like electrons aren't identical Electrons look like they are in fixed positions
Displayed formula	Doesn't show true shape of the molecule
Ball and stick	Can attempt to show 3D shape but doesn't show electrons

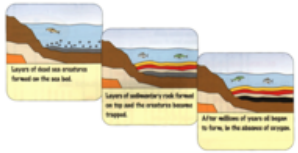
Year 9 – Chemistry / Bonding – HT3

Crude Oil / Fuels

K O

Hydrocarbons

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

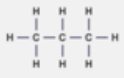
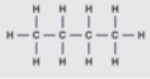


It is a **FINITE** resource

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 -

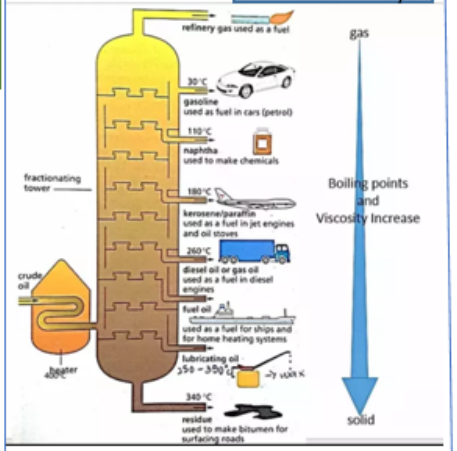
C_nH_{2n+2}

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

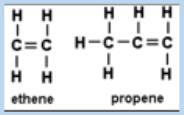
$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

Cracking

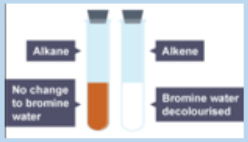
The larger molecules from fractional distillation are less useful. We can break them down into smaller, more useful molecules.

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

Alkenes have **some double bonds.**

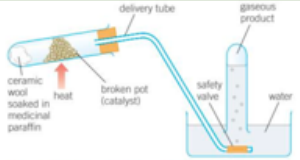


They turn **bromine water colourless.**



They are used to make **polymers.**

The apparatus for cracking



Catalytic cracking – catalyst and 500°C

Steam cracking – steam and 850°C

Year 9 – Chemistry / Carbon Chemistry – HT3