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TOPIC 11.1: FUELS & CRUDE OIL

THE ABOUT

CHAPTER ANALYSIS

MASTERY

- Straight forward topic
- Some memorising to be done

EXAM

- Tested in MCQ mainly
- Linked to ‘fractional distillation’ from Chapter 1.2 ‘Separation Techniques’

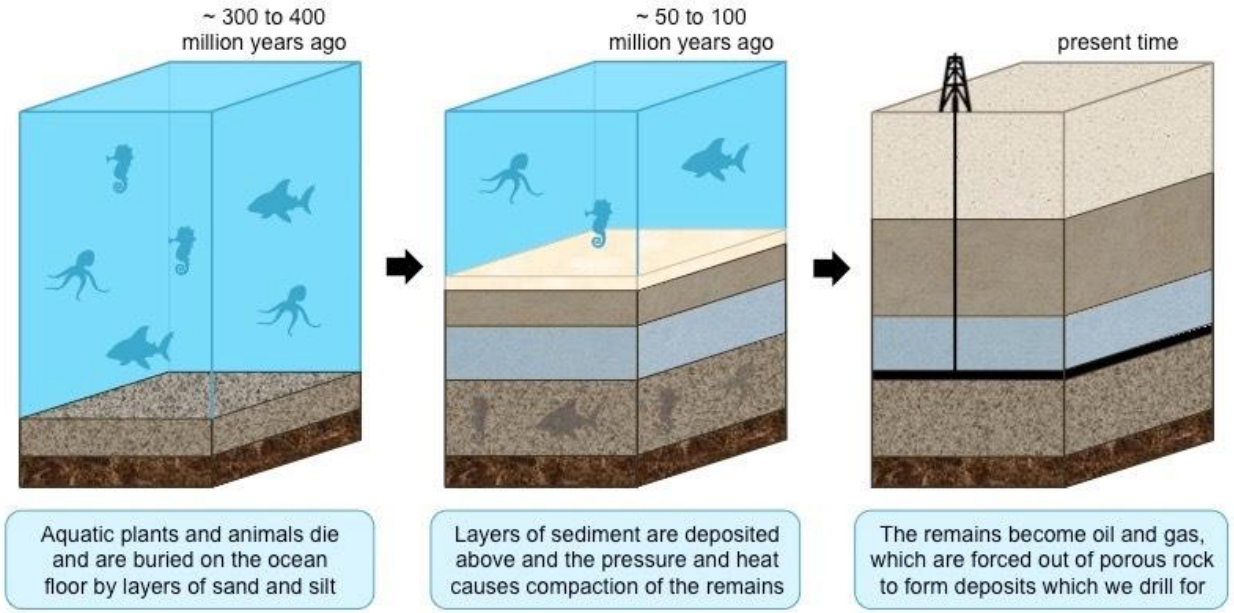
WEIGHTAGE

- Light overall weightage
- Constitute to around **1.5%** of marks for past 5 year papers

KEY CONCEPT

FUELS & CRUDE OIL
METHANE & PETROLEUM
FRACTIONAL DISTILLATION OF PETROLEUM

Fuels & Crude Oil



Fossil Fuels and Crude Oil

Fossil fuels are created due to compaction and heat from the remains of aquatic plants and animals.

Upon extraction, it is known as **crude oil or petroleum**, which is a thick black liquid. In order to be used as fuel for planes, cars and cooking, it has to undergo **fractional distillation** first.

Natural gas is a colourless gas found near fossil fuels in the earth's crust.

Hydrocarbons are compounds that contain **only hydrogen and carbon atoms**. Petroleum and natural gas are examples of the hydrocarbons.

Petroleum is a mixture of hydrocarbons that has differing numbers of carbon atoms while **natural gas** comprises mainly **methane CH_4** (up to 90%).

COMPETING USE

Petroleum, however, is a **non-renewable and limited resource**.

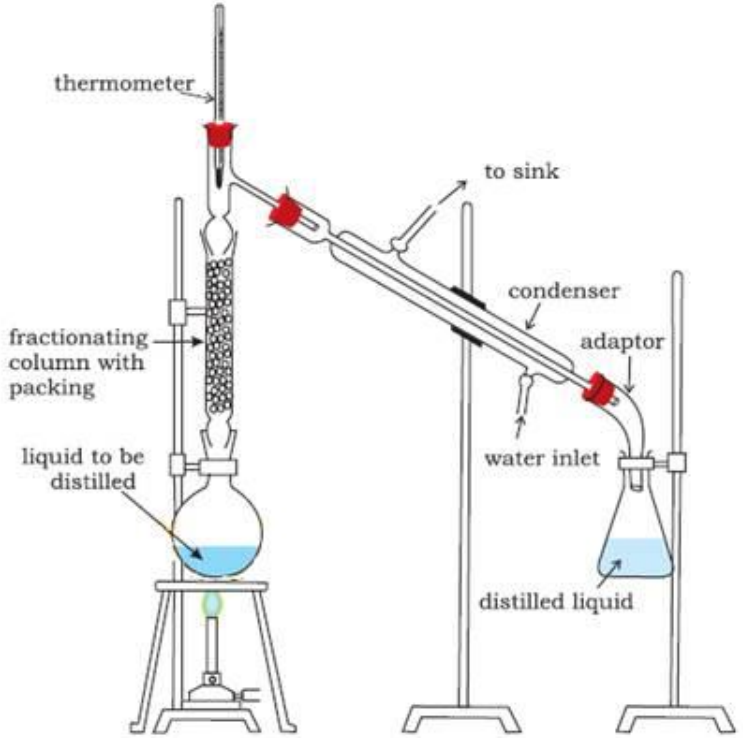
There is a **large demand from the petrochemical industry** as naphtha is used as a **chemical feedstock.**

Production of substances such as plastics and drugs will be affected when petroleum eventually runs out.

FRACTIONAL DISTILLATION DEPENDS ON DIFFERENT BOILING POINTS

Recall from 'Chapter 1.2 – Separation Techniques', **fractional distillation** is used to separation solutions with different boiling points.

A similar concept is used to separate the hydrocarbons into the different components!



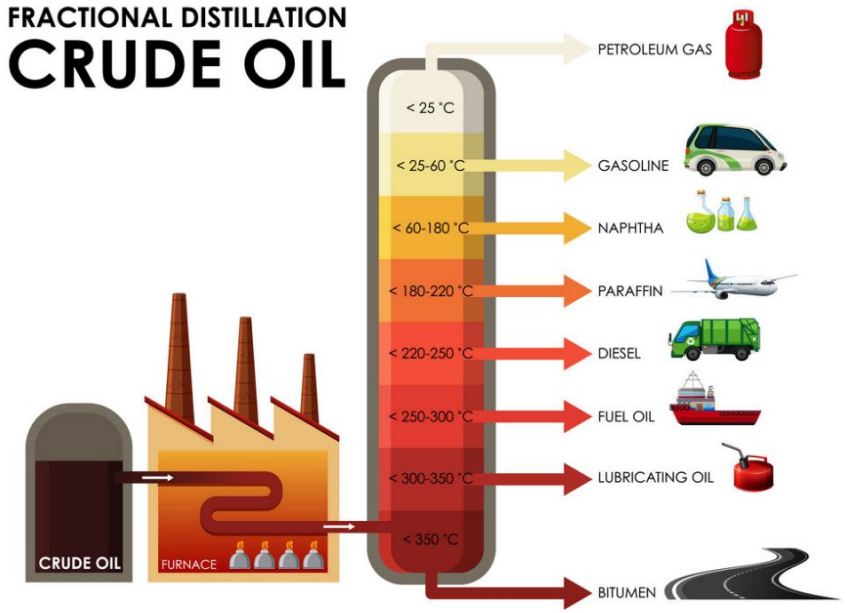
Fractional Distillation

Fraction	Boiling Point	Carbon atoms	Uses
Petroleum Gas	< 25°C	1- 4	Fuel for cooking
Petrol / Gasoline	25°C - 60°C	5 - 10	Fuel for car vehicles
Naphtha	60°C - 180°C	8 – 12	chemical feedstock
Paraffin	180°C - 220°C	10 – 16	Aircraft fuel, heating & cooking
Diesel	220°C - 250°C	15 – 25	Fuel for diesel engines like buses & lorries
Lubricating Oil	300°C - 350°C	19 - 35	Machine lubricants; polishes & waxes
Bitumen	>580°C	>70	Surfacing roads

FRACTIONAL DISTILLATION OF PETROLEUM

Petroleum is a **mixture of hydrocarbons** that has different number of carbon atoms. The **different no. of carbon atoms** result in them having d**ifferent boiling points**.

Petroleum needs to undergo **fractional distillation** to be separated into useful fractions.



CLASSIFICATION OF ORGANIC COMPOUNDS

HOMOLOGOUS SERIES

A **homologous series** is defined as a family of organic compounds that has
:

- Same general formula
- Same functional group
- Similar chemical properties (undergo similar chemical reactions)
- Gradual change in physical properties
- Each member differs from the next by -CH_2

FUNCTIONAL GROUP

A **functional group** is an atom or a group of atoms that is responsible for the chemical properties of the molecule:

- C=C bond in alkenes
- -OH group in alcohols
- -COOH group in carboxylic acids
- -COO- group in esters

NAMING OF ORGANIC COMPOUNDS

Prefix	Number
Meth-	1
Eth-	2
Prop-	3
But-	4
Pent-	5
Hex-	6
Hep-	7
Oct-	8
Non-	9
Dec-	10

Suffix	Homologous series	Example
-ane	Alkanes	Propane C_3H_8
-ene	Alkenes	Butene C_4H_8
-ol	Alcohol	Ethanol C_2H_5OH
-oic acid	Carboxylic Acid	Pentanoic acid C_4H_9COOH

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