Hydrocarbons

10SCIE - Fire & Fuels

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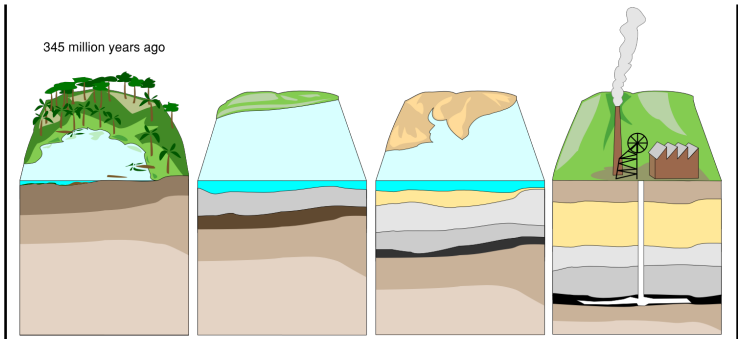
Learning Outcomes

- Recognise that a hydrocarbon contains only C and H atoms
- Name and write the formula for the first six hydrocarbons

Term	Description	Example
Atom/Molecule	The smallest unit of an element	One atom of H
Element	Many of the same atoms together	Hydrogen, Oxygen
Compound	Two or more elements chemically joined together	Water (H_2O)

Hydrocarbon Formation

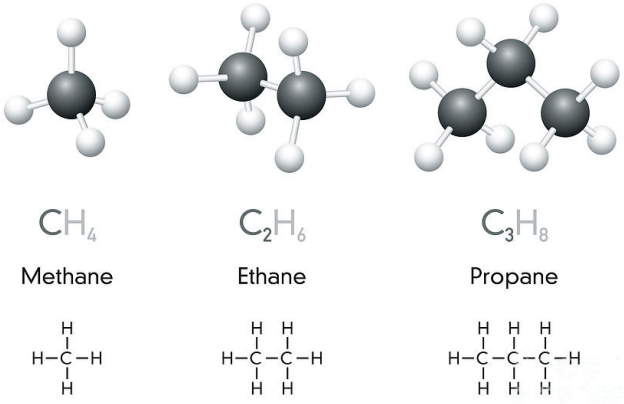
1. Layers of dead organic matter settle on the seabed.	2. Layers of sedimentary rock build up on top.	3. The heat and pressure from these rocks, along with the absence of oxygen mean that oil and gas (fossil fuels) are formed over millions of years.



Crude Oil

Crude oil is what we get directly out of the ground and is made of a mixture of lots of different hydrocarbons (molecules made of only hydrogen and carbon).

Hydrocarbons



- A hydrocarbon with 4 carbons is called **butane**
- A hydrocarbon with 5 carbons is called **pentane**
- A hydrocarbon with 6 carbons is called **hexane**
- Can you guess what 7, 8, 9 and 10 are called?

Hydrocarbon Formula

- Methane has 1 carbon and 4 hydrogens so it is called CH_4
- Ethane has 2 carbons and 6 hydrogens so it is called C_2H_6
- Propane has 3 carbons and 8 hydrogens so it is called C_3H_8
- What is the pattern? Try write a general formula using n to represent the number of carbons..

Answer

$$C_nH_{2n+2}$$

Calculating Hydrocarbons

$$C_nH_{2n+2}$$

Using this formula you can calculate the formula for any hydrocarbon!

1. Find the formula for the 17th hydrocarbon
2. Find the formula for the 56th hydrocarbon
3. Find the formula for the 117th hydrocarbon

Answers

1. $C_{17}H_{36}$
2. $C_{56}H_{114}$
3. $C_{117}H_{236}$

Hydrocarbon Properties

A longer chain of carbons means:

- Less ability to flow (higher viscosity)
- Less flammable
- Less volatile
- Higher boiling point

Making Alkanes

IN PAIRS OR GROUPS, WRITE FORMULA AND MAKE MODELS FOR THESE ALKANES:

1. An alkane with one carbon molecule
2. An alkane with three carbon molecules
3. An alkane with six carbon molecules

You may need to join groups to make the larger molecules.

Hands up for check each time!

Alkanes	Formula	Boiling point [°C]	Melting point [°C]	Density
Methane	CH4	-162	-182	gas
Ethane	C2H6	-89	-183	gas
Propane	C3H8	-42	-188	gas
Butane	C4H10	0	-138	gas
Pentane	C5H12	36	-130	0.626 (liquid)

Alkanes	Formula	Boiling point [°C]	Melting point [°C]	Density
Hexane	C6H14	69	-95	0.659 (liquid)
Octane	C8H18	126	-57	0.703 (liquid)
Icosane	C20H42	343	37	solid
Hexacontane	C60H122	625	100	solid

Combustion of Hydrocarbons

Try and conmplete these word and symbol equations (refer to your notes):

Complete Combustion

$$methane + oxygen \rightarrow \quad +$$

$$CH_4 + \frac{1}{2}O_2 \rightarrow \quad +$$

Incomplete Combustion

$$CH_4 + \frac{1}{2}O_2 \rightarrow \quad +$$