

Hydrocarbons

10SCIE - Fire & Fuels

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2019

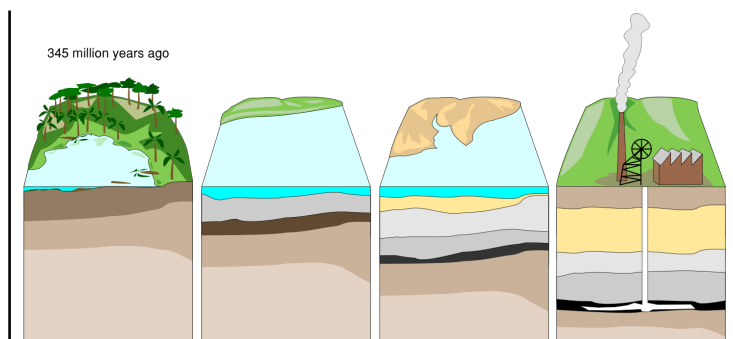
Learning Outcomes

- 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. |
|--|--|---|

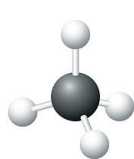


Crude Oil

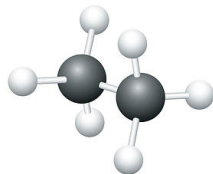
Crude oil is what we get directly out of the ground and is made of a mixture of lots of different hydrocarbons (molecules made of only hydrogen and carbon).



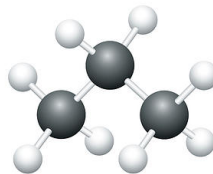
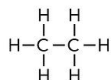
Hydrocarbons



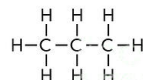
Methane



Ethane



Propane



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- 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
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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!

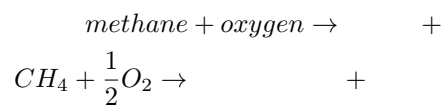
| Alkanes | Formula | Boiling point [°C] | Melting point [°C] | Density |
|---------|--------------------------------|--------------------|--------------------|----------------|
| Methane | CH ₄ | -162 | -182 | gas |
| Ethane | C ₂ H ₆ | -89 | -183 | gas |
| Propane | C ₃ H ₈ | -42 | -188 | gas |
| Butane | C ₄ H ₁₀ | 0 | -138 | gas |
| Pentane | C ₅ H ₁₂ | 36 | -130 | 0.626 (liquid) |

| Alkanes | Formula | Boiling point [°C] | Melting point [°C] | Density |
|-------------|----------------------------------|--------------------|--------------------|----------------|
| Hexane | C ₆ H ₁₄ | 69 | -95 | 0.659 (liquid) |
| Octane | C ₈ H ₁₈ | 126 | -57 | 0.703 (liquid) |
| Icosane | C ₂₀ H ₄₂ | 343 | 37 | solid |
| Hexacontane | C ₆₀ H ₁₂₂ | 625 | 100 | solid |

Combustion of Hydrocarbons

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

Complete Combustion



Incomplete Combustion

