

Knowledge check

Subject area: Organic chemistry

Level: 14–16 years (Higher)

Topic: Hydrocarbons

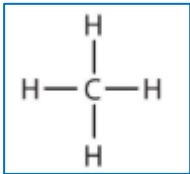
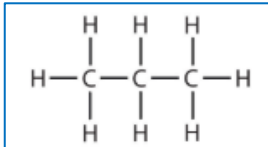
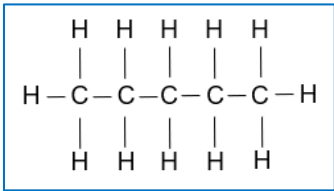
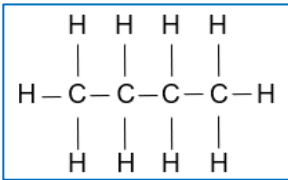
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1. Crude oil is a complex mixture of compounds called hydrocarbons.

Hydrocarbon molecules may be either straight chain or ring structures.

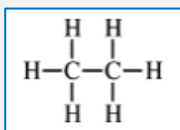
Carbon atoms have 4 covalent bonds.
Hydrogen atoms have 1 covalent bond.

a) Draw structures showing all bonds for the following hydrocarbons.

Methane, CH ₄	Propane, C ₃ H ₈
	
Pentane, C ₅ H ₁₂	Butane, C ₄ H ₁₀
	

b) Give the molecular formula and structure of the missing molecule in part a).

Answer: Missing formula is C₂H₆.



c) Place the four molecules in part a) in order of boiling point, lowest first.

Answer: Methane, propane, butane, pentane.

All of the hydrocarbons shown in part a) belong to a homologous series.
These hydrocarbons are also saturated.

d) What is the name of the homologous series?

Answer: The alkanes.

e) What is the meaning of the term 'saturated'?

Answer: Hydrocarbons containing carbon single bonds only.

f) What is the general formula of the alkanes?

Answer: C_nH_{2n+2} .

2. Use the names, formulae or structures to work out which of the molecules are hydrocarbons and which are alkanes.

Place a tick or cross in the box.

	Hydrocarbon	Alkane
H_2O	<i>Answer: x</i>	<i>Answer: x</i>
C_5H_{12}	<i>Answer: ✓</i>	<i>Answer: ✓</i>
C_4H_8	<i>Answer: ✓</i>	<i>Answer: x</i>
$\text{C}_2\text{H}_5\text{OH}$	<i>Answer: x</i>	<i>Answer: x</i>
Pentane	<i>Answer: ✓</i>	<i>Answer: ✓</i>
<pre> H H H-C - C-H H H </pre>	<i>Answer: ✓</i>	<i>Answer: ✓</i>
<pre> H H \ / C=C / \ H H </pre>	<i>Answer: ✓</i>	<i>Answer: x</i>
<pre> H H \ / N-C-H / H H </pre>	<i>Answer: x</i>	<i>Answer: x</i>

3. This is a hydrocarbon puzzle.

Write down the molecular formula of the alkane using the following clues.

a) It contains 5 carbon atoms.

Answer: C_5H_{12} .

b) It contains 18 hydrogen atoms.

Answer: C_8H_{18} .

c) It contains 6 carbon-carbon single bonds per molecule.

Answer: C_7H_{16} .

d) It has the highest boiling point of the first 10 alkanes.

Answer: $C_{10}H_{22}$.

e) A molecule known as centane.

Answer: $C_{100}H_{202}$.