

Exercise walk-through

4.1

Crude oil alkanes and alkenes

Pearson Edexcel · International GCSE · Chemistry

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The method

Method — Families and their formulae

alkanes C_nH_{2n+2} C-C single bonds only	alkenes C_nH_{2n} one C=C double bond	alcohols (C) $C_nH_{2n+1}OH$ -OH group
carboxylic acids (C) $C_nH_{2n+1}COOH$ -COOH group	esters (C) $RCOOR'$ -COO- link	

The homologous series with general formulae and functional groups.

Method — The column and the furnace

Cracking: long alkane $\rightarrow$ alkene + shorter alkane (silica/alumina, 600–700 °C), because long fractions are oversupplied and short ones and alkenes are wanted.

Exercises 2.1·2.3

2.1 State the general formulae of alkanes and alkenes. [2]

2.2 Name the fraction used for aircraft fuel and the one used for roads. [2]

2.3 Write the two products of complete combustion of propane. [2]

Exercises 2.1·2.3

2.1 State the general formulae of alkanes and alkenes. [2]

2.1 C_nH_{2n+2} ; C_nH_{2n} .

2.2 Name the fraction used for aircraft fuel and the one used for roads. [2]

2.2 Kerosene; bitumen.

2.3 Write the two products of complete combustion of propane. [2]

2.3 Carbon dioxide and water.

Exercises 2.4·3.1

2.4 Name the two conditions for catalytic cracking, and name the catalyst. [3]

2.5 Give the colour change when ethene is bubbled through bromine water, and the reaction type. [2]

3.1 Explain how fractional distillation separates crude oil into fractions, referring to boiling points and the column's temperature gradient. [4]

Exercises 2.4·3.1

2.4 Name the two conditions for catalytic cracking, and name the catalyst. [3]

2.4 Temperature 600–700 °C; catalyst silica or alumina; (the vapour is passed over the hot catalyst) – conditions: heat + catalyst.

2.5 Give the colour change when ethene is bubbled through bromine water, and the reaction type. [2]

2.5 Orange to colourless; addition.

3.1 Explain how fractional distillation separates crude oil into fractions, referring to boiling points and the column's temperature gradient. [4]

3.1 The furnace vaporises the crude oil; vapours rise up the fractionating column which is cooler towards the top; each fraction condenses where the temperature falls to its boiling point; small molecules with low boiling points condense at the top, large viscous molecules at the bottom.

Exercises 3.2·3.3

3.2 Explain why carbon monoxide forms in car engines and why it is dangerous. [3]

3.3 Dodecane ($\text{C}_{12}\text{H}_{26}$) cracks into ethene and one other product. Write the equation, and give one reason industry wants more ethene. [3]

Exercises 3.2·3.3

3.2 Explain why carbon monoxide forms in car engines and why it is dangerous. [3]

3.2 When oxygen is limited, incomplete combustion gives carbon monoxide instead of CO_2 ; CO binds to haemoglobin, reducing the blood's capacity to transport oxygen, causing poisoning.

3.3 Dodecane ($\text{C}_{12}\text{H}_{26}$) cracks into ethene and one other product. Write the equation, and give one reason industry wants more ethene. [3]

3.3 $\text{C}_{12}\text{H}_{26} \rightarrow \text{C}_{10}\text{H}_{22} + \text{C}_2\text{H}_4$; ethene is used to make polymers/plastics – ethanol – for which demand exceeds supply.