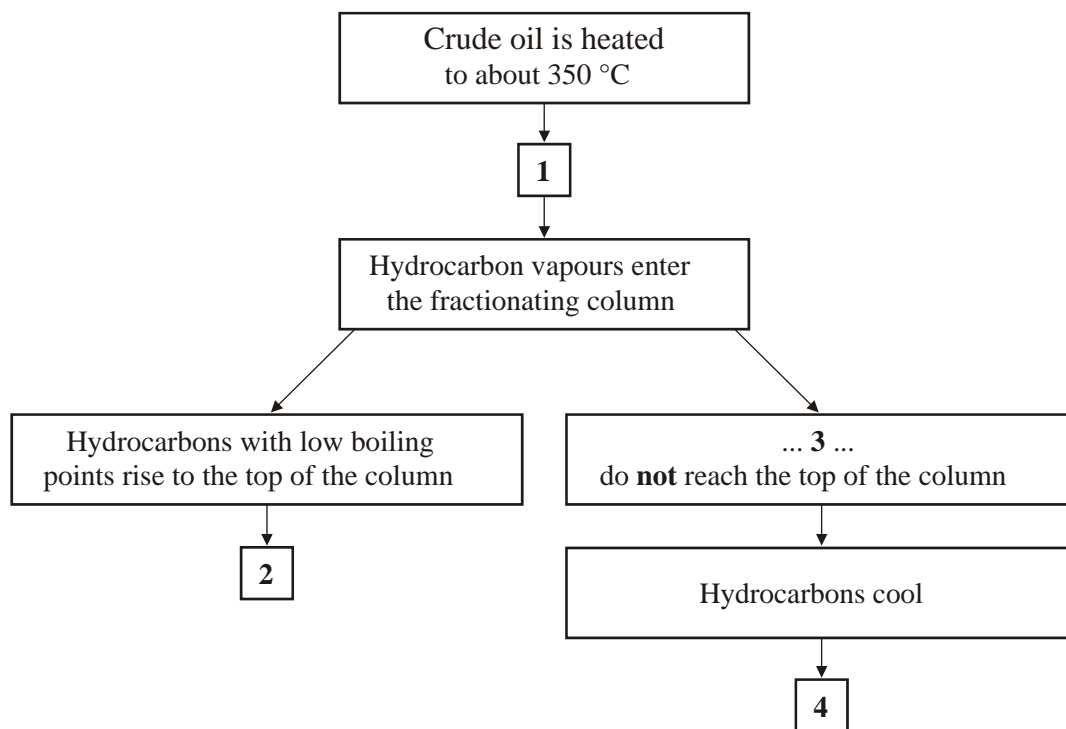


Crude oil and hydrocarbons

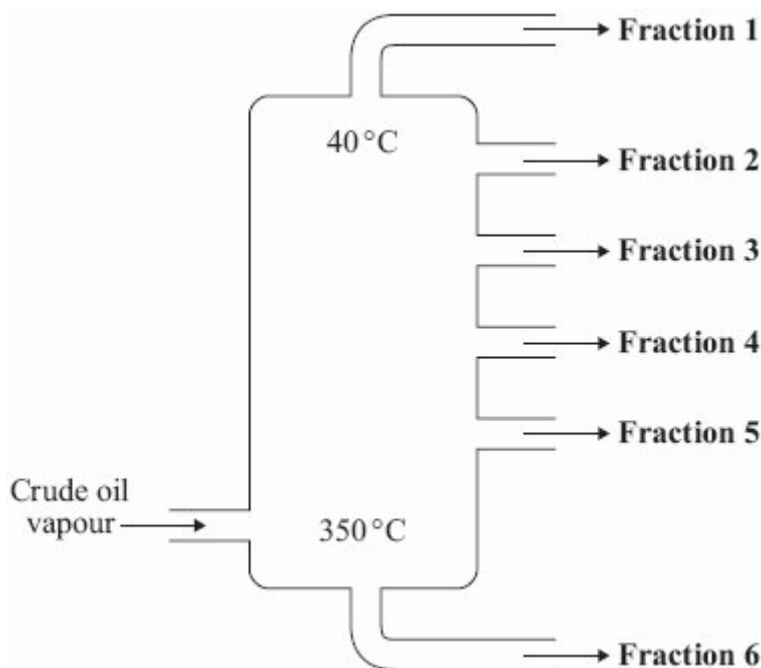
1. The flow chart shows stages in the fractional distillation of crude oil.



Match statements, **A**, **B**, **C** and **D**, with the numbers **1 – 4** in the flow chart.

- A** Hydrocarbons in the crude oil turn to vapour
- B** Hydrocarbons collected as gases
- C** Hydrocarbons with high boiling points
- D** Hydrocarbons condense to form liquids

2. Crude oil vapour can be separated into a number of fractions.



- (a) Crude oil vapour enters the fractionating column.

What happens as the vapour cools?

- 1 The fractions separate because they have different densities.
 - 2 The fractions condense at 40 °C.
 - 3 The fractions condense at different temperatures.
 - 4 The fractions condense at 350 °C.
- (b) **Fraction 6** will contain . . .
- 1 alkanes with high boiling points.
 - 2 alkanes with a small number of carbon atoms in each molecule.
 - 3 only hydrocarbons that are unsaturated.
 - 4 only hydrocarbons with low boiling points.
- (c) **Fraction 1** contains the alkanes called methane, ethane, propane and butane.

By what process could pure methane be obtained from this fraction?

- 1 evaporation
- 2 electrolysis
- 3 thermal decomposition
- 4 fractional distillation

Unit C1, C1.4.1 and C1.4.2

- (d) Which of these statements is correct for the alkanes?
- 1 They are a series of compounds with the general formula C_nH_{2n+1}
 - 2 They are saturated compounds.
 - 3 Most are gases at room temperature ($20\text{ }^\circ\text{C}$), some are liquids, none are solids.
 - 4 Their molecules have a carbon : hydrogen ratio of 1 : 4

3. This question is about four alkanes, **A**, **B**, **C** and **D**.

Alkane	Formula	Boiling point in $^\circ\text{C}$
A	C_2H_6	-89
B	C_3H_8	-42
C	C_4H_{10}	0
D	C_5H_{12}	+36

Match alkanes, **A**, **B**, **C** and **D**, with the numbers **1** – **4** in the sentences.

The alkane with the structural formula $\begin{array}{ccccccc} & & \text{H} & & \text{H} & & \text{H} \\ & & | & & | & & | \\ \text{H} & - & \text{C} & - & \text{C} & - & \text{C} & - & \text{H} \\ & & | & & | & & | \\ & & \text{H} & & \text{H} & & \text{H} \end{array}$ is ... **1** ...

The alkane with the highest boiling point is ... **2** ...

The alkane that boils at the same temperature as ice melts is ... **3** ...

The alkane that is a gas at $-50\text{ }^\circ\text{C}$ is ... **4** ...

Unit C1, C1.4.1 and C1.4.2

4. Crude oil contains a large number of alkanes, which have the general formula C_nH_{2n+2}
Crude oil can be separated into a number of fractions by fractional distillation.

- (a) Crude oil can be separated into fractions in this way because . . .
- 1 the alkanes it contains have different boiling points.
 - 2 the alkanes it contains have different densities.
 - 3 alkanes are compounds which are made up of more than one element.
 - 4 all alkanes vaporise easily when they are heated.
- (b) Each fraction from the crude oil will contain . . .
- 1 a single alkane.
 - 2 a mixture of several alkanes.
 - 3 alkanes that have the same boiling point.
 - 4 alkanes that have the same density.

The alkanes are a series of compounds.

The first ten alkanes in the series range from methane, CH_4 to decane, $C_{10}H_{22}$

- (c) The difference between the formulae of successive alkanes is . . .
- 1 C
 - 2 H_2
 - 3 CH
 - 4 CH_2
- (d) Which of the following changes in the alkane series, from methane to decane?
- 1 the general formula
 - 2 the number of bonds on each carbon atom
 - 3 the ratio of carbon atoms to hydrogen atoms
 - 4 the number of elements present