

## Alkanes - Questions by Topic

Q1.

Heptane, C<sub>7</sub>H<sub>16</sub>, is one of the compounds present in crude oil.

(a) When heptane is reformed, the products include 2,2,3-trimethylbutane and cycloheptane.

(i) Give a reason why petrol should **not** contain a high proportion of heptane.

(1)

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(ii) Draw the **skeletal** formula of 2,2,3-trimethylbutane.

(1)

(iii) Write the equation for reforming heptane into cycloheptane.

Use **molecular** formulae.

State symbols are not required.

(1)

(iv) When petrol is burned in a car engine, oxides of nitrogen are formed.

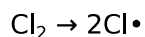
Explain how these compounds result in damage to trees.

(2)

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(b) Heptane reacts with chlorine in sunlight.

(i) Chlorine radicals are formed in the first step in the mechanism.



Name this step in the mechanism.

(1)

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(ii) Give the **two** propagation steps for the formation of chloroheptane.

Use molecular formulae. Curly arrows are **not** required.

(2)

(iii) Give the termination step which forms a hydrocarbon.

(1)

(iv) Explain how some dichloroheptane,  $C_7H_{14}Cl_2$ , also forms during this reaction.

You may include equation(s) in your answer.

(2)

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**(Total for question = 11 marks)**

Q2.

Which of these is not a chemical reaction?

(1)

- A cracking
- B fractional distillation
- C polymerisation
- D reforming

**(Total for question = 1 mark)**

Q3.

Members of the homologous series of alkanes have the same

- A boiling temperature
- B density
- C empirical formula
- D general formula

**(Total for question = 1 mark)**

Q4.

Which of these fuels is obtained from fermented sugar cane?

(1)

- A ethanol
- B hydrogen
- C petrol
- D propane

**(Total for question = 1 mark)**

Q5.

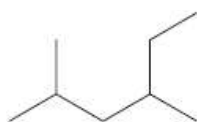
The alkanes are a homologous series of saturated hydrocarbons.

(a) Draw the displayed formulae of the three alkanes with molecular formula  $C_5H_{12}$ .

(3)

(b) Give the systematic name of compound **P**.

(1)



Compound **P**

Systematic name

.....

(c) The table shows the boiling temperatures of the first four straight-chain alkanes.

Molecular formula of alkane	Boiling temperature / °C
$CH_4$	-164
$C_2H_6$	-89
$C_3H_8$	-42
$C_4H_{10}$	-0.5

Predict the molecular formula and boiling temperature of the straight-chain alkane that has five carbon atoms in its molecules.

(2)

Molecular formula .....

Boiling temperature .....

(d) Alkanes undergo incomplete combustion when they burn in a limited supply of air.

(i) Write the equation for the incomplete combustion of propane,  $C_3H_8$ , to form carbon, carbon monoxide, carbon dioxide and water.

State symbols are not required.

(1)

(ii) Explain the toxicity of carbon monoxide.

(2)

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(e) Propane reacts with chlorine in the presence of ultraviolet radiation. The reaction starts when some chlorine molecules are split into free radicals. A mixture of products is formed.

(i) Write the two propagating steps to show how C<sub>3</sub>H<sub>7</sub>Cl is formed.

Curly arrows are not required.

(2)

(ii) Identify the different C<sub>3</sub>H<sub>7</sub>Cl molecules that are produced in this reaction.

(1)

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(iii) Give a reason why a mixture of C<sub>3</sub>H<sub>7</sub>Cl molecules is formed.

(1)

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(iv) Give a reason why some hexane is formed in this reaction.

(1)

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(v) A small amount of a product with molar mass 113 g mol<sup>-1</sup> is formed.

Deduce the structure and name of a possible product with this molar mass.

(2)

Structure

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Name

.....

**(Total for question = 16 marks)**

Q6.

What is the total number of structural isomers with the molecular formula  $C_6H_{14}$ ?

**A** 4

**B** 5

**C** 6

**D** 7

**(Total for question = 1 mark)**