# ( Alkanes (general formula, structures, combustion) )

Q1. ( 2019 )

Petrol contains mainly alkanes.

Which of the following compounds is an alkane?

**[1 mark]**

Tick (✓) **one** box.

$C_2H_4$ ☐

$C_4H_8$ ☐

$C_6H_{14}$ ☐

$C_8H_{16}$ ☐

Q2. ( 2019 )

Large hydrocarbon molecules in the diesel oil fraction are cracked to produce smaller hydrocarbon molecules.

Describe the conditions needed to crack hydrocarbon molecules from the diesel oil fraction.

**[2 marks]**

Q3. ( 2019 )

Explain why large hydrocarbon molecules in the diesel oil fraction are cracked to produce smaller hydrocarbon molecules.

**[2 marks]**

Q4. ( 2019 )

Complete the equation for the cracking of $C_{15}H_{32}$

**[1 mark]**

$$C_{15}H_{32} \rightarrow C_{12}H_{26} + _____$$

Q5. ( 2019 )

Natural gas is mainly methane.

When methane burns it can produce both carbon monoxide and carbon dioxide.

Explain the process by which carbon monoxide can be produced when methane is burned.

**[2 marks]**

Q6. ( 2019 )

Balance the equation for the combustion of methane to produce carbon monoxide.

**[1 mark]**

$$___\ CH_4(g) + ___\ O_2(g) \rightarrow ___\ CO(g) + ___\ H_2O(l)$$

Q7. ( 2019 )

Propane burns to form carbon dioxide and water.

The equation for the reaction is:

$$C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(l)$$

3.60 $dm^3$ carbon dioxide is produced when a sample of propane is burned in 7.25 $dm^3$ oxygen.

Calculate the volume of unreacted oxygen.

Give your answer in $cm^3$

**[4 marks]**

Volume of unreacted oxygen = _____ $cm^3$

Q8. a). ( 2020 )

This question is about hydrocarbons.

Hexane and hexene are hydrocarbons containing six carbon atoms in each molecule.

Hexane is an alkane and hexene is an alkene.

Draw **one** line from each hydrocarbon to the formula of that hydrocarbon.

**[2 marks]**

| **Hydrocarbon** | **Formula** |
|---|---|
| | $C_6H_8$ |
| Hexane | $C_6H_{10}$ |
| | $C_6H_{12}$ |
| Hexene | $C_6H_{14}$ |
| | $C_6H_{16}$ |

Q8. b). ( 2020 )

Bromine water is added to hexane and to hexene.

What would be observed when bromine water is added to hexane and to hexene?

**[2 marks]**

Hexane _____

_____

Hexene _____

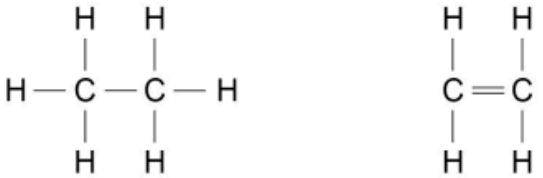
_____

Q9. ( 2020 )

Ethane is an alkane and ethene is an alkene.

**Figure 1** shows the displayed structural formulae of ethane and of ethene.

**Figure 1**



**Ethane** **Ethene**

Compare ethane with ethene.

You should refer to:

- their structure and bonding
- their reactions.

**[6 marks]**

Q10. a). ( 2021 )

This question is about alkanes.

**Table 1** shows information about some alkanes.

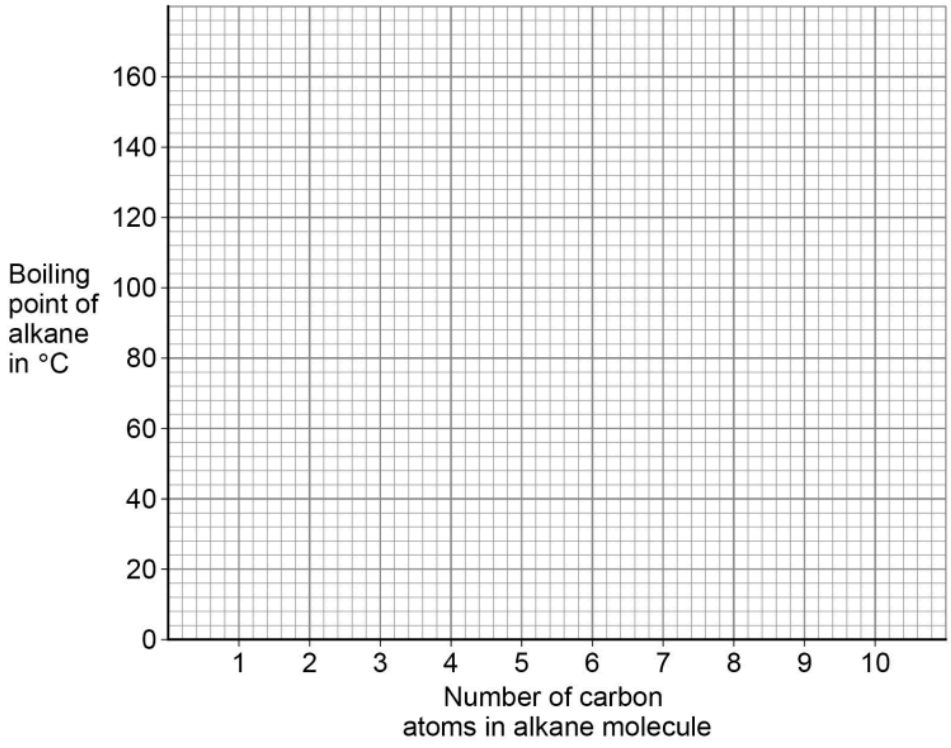
**Table 1**

| Number of carbon atoms in alkane molecule | Boiling point of alkane in °C |
|---|---|
| 4 | 0 |
| 5 | 36 |
| 6 | 69 |
| 7 | **X** |
| 8 | 126 |
| 9 | 151 |

Plot the data from **Table 1** on **Figure 2**.

**[2 marks]**

**Figure 2**




Q10. b). ( 2021 )

Predict the boiling point **X** of the alkane with seven carbon atoms in a molecule.

Use **Table 1** and **Figure 2**.

**[1 mark]**

**X** = _____ °C

Q10. c). ( 2021 )

**Figure 2** is **not** suitable to show the boiling point of the alkane with three carbon atoms in a molecule.

Suggest **one** reason why.

**[1 mark]**

_____

_____

Q10. d). ( 2021 )

What is the state at 20 °C of the alkane with four carbon atoms in a molecule?

Use **Table 1**.

**[1 mark]**

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Q10. e). ( 2021 )

**Table 1** is repeated below.

**Table 1**

| Number of carbon atoms in alkane molecule | Boiling point of alkane in °C |
|---|---|
| 4 | 0 |
| 5 | 36 |
| 6 | 69 |
| 7 | **X** |
| 8 | 126 |
| 9 | 151 |

The alkane with nine carbon atoms in a molecule is called nonane.

Complete the formula of nonane.

**[1 mark]**

$C_9H$___

Q10. f). ( 2021 )

Nonane will condense lower in a fractionating column during fractional distillation than the other alkanes in **Table 1**.

Explain why.

You should refer to the temperature gradient in the fractionating column.

**[2 marks]**