

Q1. The table below gives information about four alcohols.

Alcohol	Formula	Melting point in °C	Boiling point in °C
Methanol	CH <sub>3</sub> OH	-94	65
Ethanol	CH <sub>3</sub> CH <sub>2</sub> OH	-118	78
Propanol	CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> OH	-129	97
Butanol	CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> OH	-89	118

(a) Which alcohol in the table is liquid over the greatest temperature range?

\_\_\_\_\_

(1)

(b) Which statement is correct?

Tick **one** box.

A molecule of ethanol has 5 hydrogen atoms

Butanol has the highest boiling point

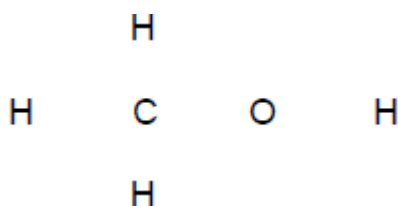
Methanol has the largest molecules

Propanol has the highest melting point

(1)

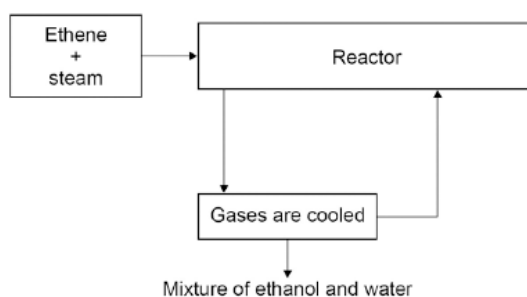
(c) A molecule of methanol has five single covalent bonds. Draw the missing bonds in **Figure 1** to complete the displayed formula for methanol.

Figure 1



(1)

(d) **Figure 2** shows a flow diagram of the process to produce ethanol. **Figure 2**



Complete the word equation for the reaction to produce ethanol.



(1)

(e) What happens to the unreacted ethene?

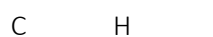
\_\_\_\_\_  
\_\_\_\_\_

(1)

(Total 5 marks)

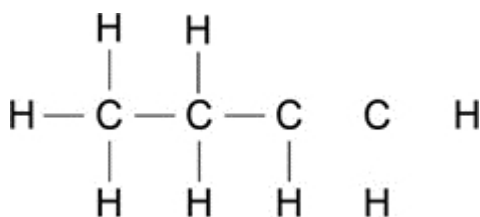
**Q2.** This question is about alkenes and crude oil.

(a) Pentene is an alkene molecule containing five carbon atoms. Complete the formula for pentene.



(1)

(b) Butene is an alkene molecule containing four carbon atoms. The diagram shows all of the atoms and some of the bonds in the displayed formula for butene. Complete the displayed formula by adding the remaining bonds.

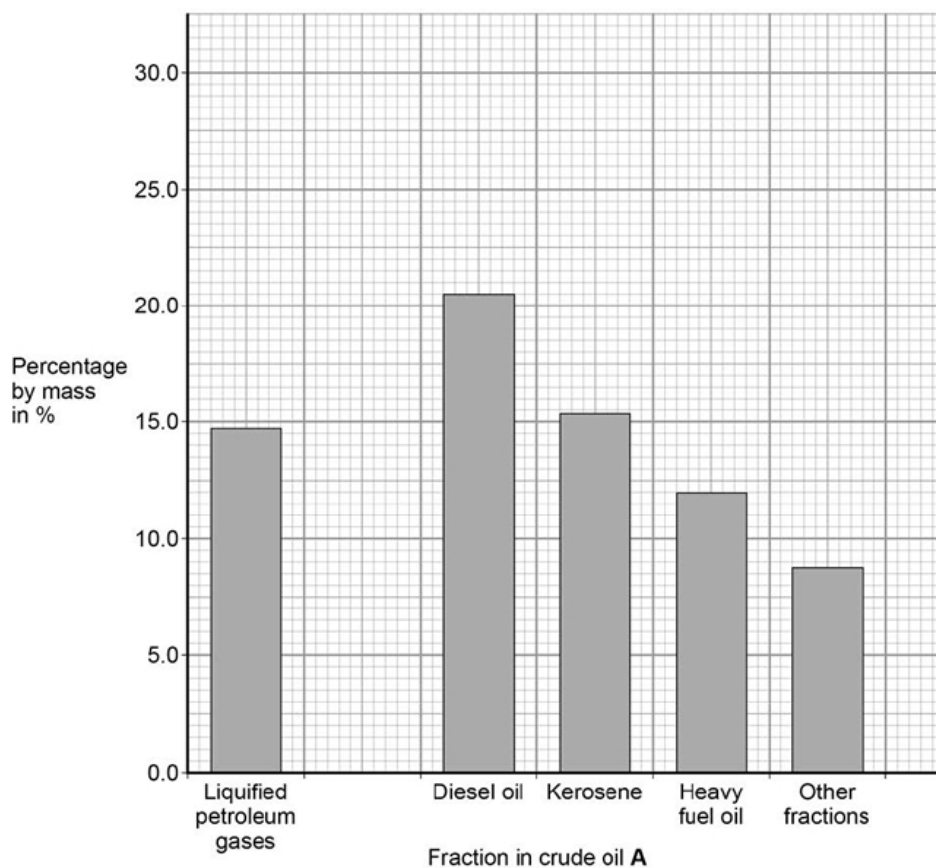


(1)

Pentene and butene are produced from crude oil. The table shows the percentages of different fractions in two samples of crude oil.

Fraction	Percentages by mass in %	
	Crude oil A	Crude oil B
Liquefied petroleum gases	14.7	7.1
Petrol	28.6	11.1
Diesel oil	20.5	17.2
Kerosene	15.4	38.5
Heavy fuel oil	12.0	16.0
Other fractions	8.8	10.1

The graph shows the percentages of different fractions in crude oil **A**.



(c) Plot the data for petrol in the table above on the graph.

(1)

(d) What mass of crude oil **A** is needed to obtain 12 tonnes of heavy fuel oil?. Use the table above.

10 tonnes

100 tonnes

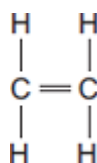
1000 tonnes

10 000 tonnes

(1)

(Total 4 marks)

**Q3.** A molecule of ethene ( $C_2H_4$ ) is represented as:



(a) A sample of ethene is shaken with bromine water.

Complete the sentence.

The bromine water turns from orange to \_\_\_\_\_.

(1)

(b) Most ethene is produced by the process of cracking.

(i) Complete the sentence.

Cracking is a type of thermal \_\_\_\_\_.

(1)

(ii) Decane ( $C_{10}H_{22}$ ) can be cracked to produce ethene ( $C_2H_4$ ) and **one** other product.

Complete the equation to show the formula of the other product.



(1)

(Total 3 marks)

**Q4.** This question is about compounds produced from crude oil. The table below shows four of these compounds.

Compound	Melting point in °C	Boiling point in °C
methane ( $CH_4$ )	-183	-164
ethene ( $C_2H_4$ )	-169	-104
decane ( $C_{10}H_{22}$ )	-30	+174
icosane ( $C_{20}H_{42}$ )	+37	+343

(a) Tick (✓) **two** correct statements about the four compounds.

Statement	Tick (✓)
Methane has the lowest melting point and icosane has the highest boiling point.	
Ethene and methane are alkanes.	
Methane and decane are gases at room temperature (20°C).	
Decane and icosane are liquid at 100°C.	

(2)

(b) Petrol contains a mixture of compounds, including octane ( $C_8H_{18}$ ).

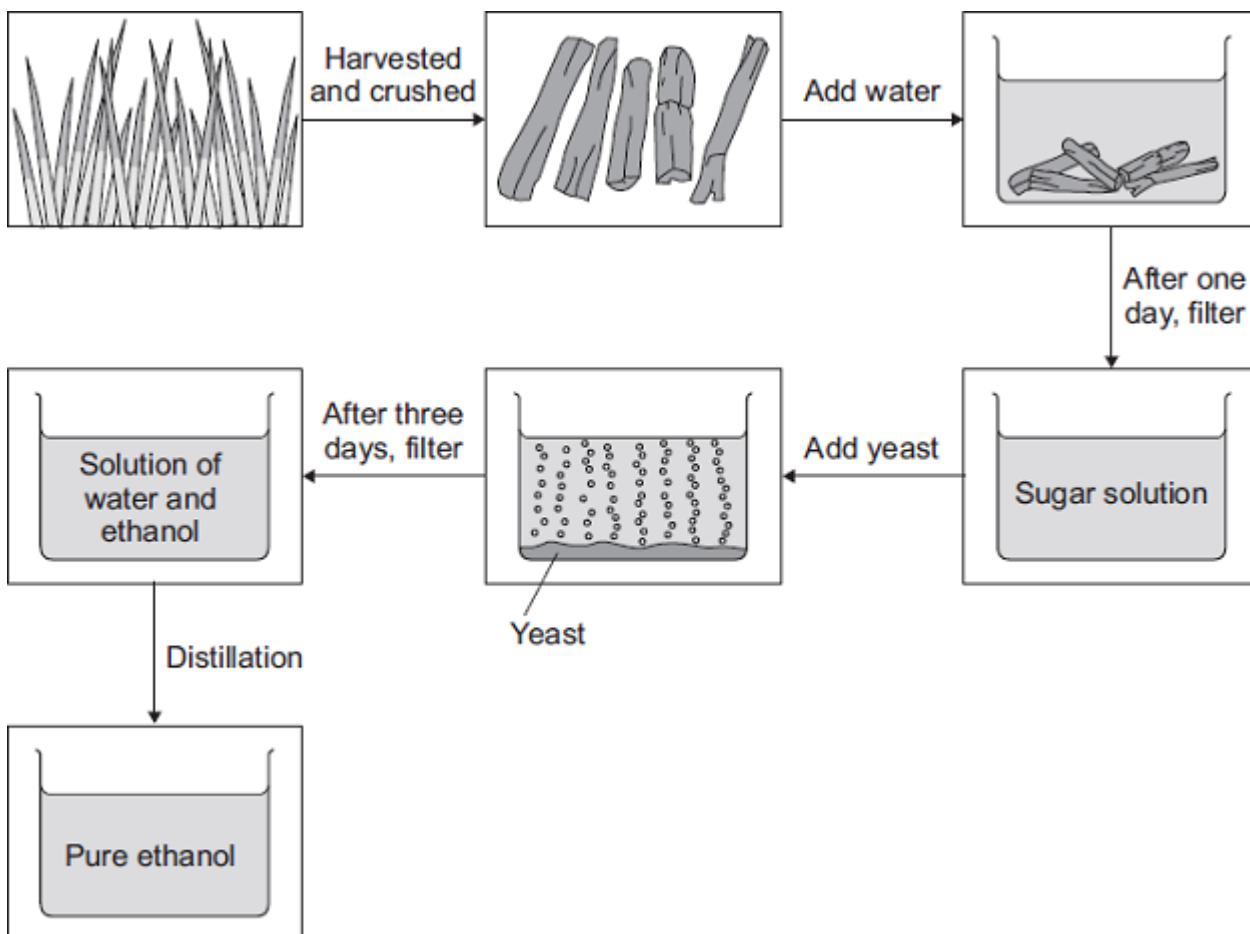
Complete the word equation for the complete combustion of octane.



(2)

(c) Most petrol used in cars contains about 5% ethanol ( $C_2H_5OH$ ).

Ethanol can be produced from sugar cane.



(i) Draw a ring around the correct answer to complete the sentence.

The reaction to produce ethanol from sugar solution is

- combustion.
- displacement.
- fermentation.

(1)

(ii) Some people say that increasing the production of ethanol from sugar cane will be **good** for the environment. Suggest **two** reasons why.

1. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(2)

(iii) Other people say that increasing the production of ethanol from sugar cane will be **bad** for the environment.

Suggest **two** reasons why.

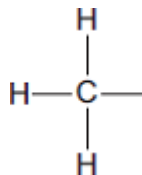
1. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(2)  
(Total 9 marks)

**Q5.** This question is about organic compounds.

(a) Wine contains ethanol ( $\text{CH}_3\text{CH}_2\text{OH}$ ).

(i) Complete the displayed structure of ethanol.



(1)

(ii) Wine left in a glass for several days turns sour.  
The sour taste is caused by ethanoic acid.



Complete the sentences.

The ethanoic acid is produced from a reaction between ethanol  
and \_\_\_\_\_ .

This type of reaction is \_\_\_\_\_ .

(2)  
(Total 3 marks)

## Mark schemes

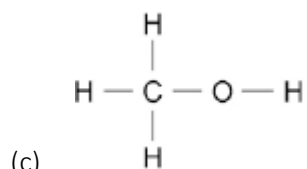
### Q1.

(a) Propanol

1

(b) Butanol has the highest boiling point

1



1

(d) ethene + water ( $\rightarrow$  ethanol)

*allow answers in either order*

*allow steam for water*

1

(e) goes back to reactor

*allow is recycled*

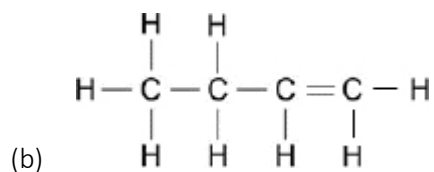
1

[5]

### Q2.

(a)  $\text{C}_5\text{H}_{10}$

1



1

(c) bar labelled petrol to 28.6 (%)

*allow a tolerance of  $\pm \frac{1}{2}$  a square*

1

(d) 100 tonnes

1

[4]

### Q3.

(a) colourless

*ignore clear*

1

(b) (i) decomposition

1

(ii) C<sub>8</sub>H<sub>18</sub>

1

[3]

Q4.

(a) Methane has the lowest melting point and icosane has the highest boiling point

1

Decane and icosane are liquid at 100°C

1

(b) water / H<sub>2</sub>O

*either order*

1

carbon dioxide / CO<sub>2</sub>

*allow hydrogen oxide*

1

(c) (i) fermentation

1

(ii) any **two** from:

- sugar cane / plants absorb carbon dioxide  
*ignore oxygen released*
- growing sugar cane / plants reduces global warming  
*allow ethanol from plants is carbon neutral*
- renewable resource / sustainable  
*accept conserves fossil fuels / petrol*

2

(iii) any **two** from:

- destruction of habitats / forests (to grow sugar cane/crops)
- fermentation releases carbon dioxide
- production plants cause visual pollution
- pollution from the transportation of sugar cane / Ethanol
- growing sugar cane / plants uses a lot of land

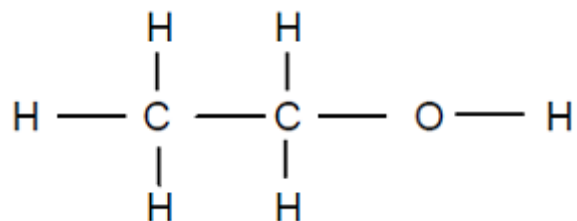
2

[9]

Q5.

(a) (i)





*allow other arrangements provided connectivity is correct*

*allow — OH*

1

(ii) oxygen

*accept O<sub>2</sub>*

*allow O*

1

oxidation

*allow oxidisation / oxidising / oxidised*

*allow redox*

1

[3]