Q1. This question is about organic compounds.

Hydrocarbons can be cracked to produce smaller molecules.

The equation shows the reaction for a hydrocarbon, $C_{18}H_{38}$

$C_{18}H_{38} \rightarrow C_6H_{14} + C_4H_8 + 2\,C_3H_6 + C_2H_4$

(a) Which product of the reaction shown is an alkane?

Tick **one** box.

C_2H_4 ☐

C_3H_6 ☐

C_4H_8 ☐

C_6H_{14} ☐

(1)

(b) The table below shows the boiling point, flammability and viscosity of $C_{18}H_{38}$ compared with the other hydrocarbons shown in the equation.

	Boiling point	**Flammability**	**Viscosity**
A	highest	lowest	highest
B	highest	lowest	lowest
C	lowest	highest	highest
D	lowest	highest	lowest

Which letter, **A**, **B**, **C** or **D**, shows how the properties of $C_{18}H_{38}$ compare with the properties of C_2H_4, C_3H_6, C_4H_8 and C_6H_{14}?

Tick **one** box.

A ☐

B ☐

C ☐

D ☐

(1)

(c) The hydrocarbon C_4H_8 was burnt in air.

Incomplete combustion occurred.

Which equation, **A**, **B**, **C** or **D**, correctly represents the incomplete combustion reaction?

A $C_4H_8 + 4O \rightarrow 4CO + 4H_2$

B $C_4H_8 + 4O_2 \rightarrow 4CO + 4H_2O$

C $C_4H_8 + 6O_2 \rightarrow 4CO_2 + 4H_2O$

D $C_4H_8 + 8O \rightarrow 4CO_2 + 4H_2$

Tick **one** box.

A ☐

B ☐

C ☐

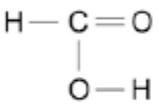
D ☐

(1)

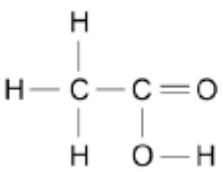
(d) Propanoic acid is a carboxylic acid.

Which structure, **A**, **B**, **C** or **D**, shows propanoic acid?

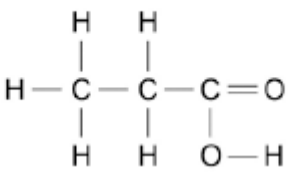
A



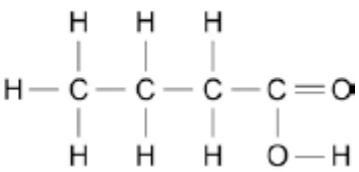
B



C



D



Tick **one** box.

A ☐

B ☐

C ☐

D ☐

(1)

(e) Propanoic acid is formed by the oxidation of which organic compound?

Tick **one** box.

Propane ☐

Propene ☐

Propanol ☐

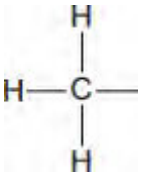
Polyester ☐

(1)
(Total 5 marks)

Q2. This question is about organic compounds.

(a) Wine contains ethanol (CH_3CH_2OH).

(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 ..... .

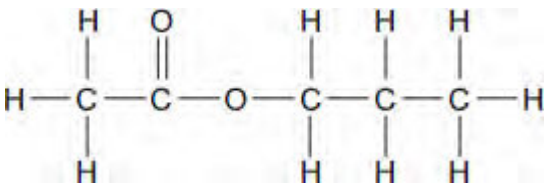
This type of reaction is ..... .

(2)

(b) Propyl ethanoate, a fragrance, can be produced by reacting ethanoic acid with an alcohol.

Propyl ethanoate is a member of a series of organic compounds. The members of the series all have the same functional group.

The displayed structure of propyl ethanoate is:



(i) Draw a ring around the functional group for this series on the displayed structure of propyl ethanoate.

(1)

(ii) Name the series of organic compounds with this functional group.

.....

(1)

(iii) The alcohol used to make propyl ethanoate has the formula $CH_3CH_2CH_2OH$

Name this alcohol.

.....

(1)

(Total 6 marks)

Q3. Chlorine and bromine are important Group 7 elements.

(a) Explain why chlorine is added to drinking water.

.....

.....

(1)

(b) Describe what you would **see** when bromine water is added to an unsaturated organic compound.

.....

.....

(1)

(c) Bromine can be extracted from seawater. The dissolved bromide ions are reacted with chlorine. Bromine and chloride ions are formed.

(i) Complete and balance the equation below, which represents the reaction between chlorine and bromide ions.

$Cl_2 + 2Br^- \rightarrow$ ..... + ...

(1)

(ii) Describe what you **see** when chlorine is added to a solution containing bromide ions.

.....

.....

(1)

(d) In terms of electronic structure:

(i) state why bromine and chlorine are both in Group 7

.....

.....

(1)

(ii) explain why bromine is less reactive than chlorine.

.....

.....

.....

.....

.....

.....

.....

(3)

(e) What is the result of adding acidified silver nitrate solution to a solution containing:

(i) chloride ions

.....

(1)

(ii) bromide ions?

.....

(1)
(Total 10 marks)

##

Modem window frames are often made from uPVC which contains the plastic poly(chloroethene).



(a) State why plastic window frames need no painting or maintenance.

.....

.....

(1)

(b) Poly(chloroethene) is a polymer formed by the *addition polymerisation* of chloroethene.

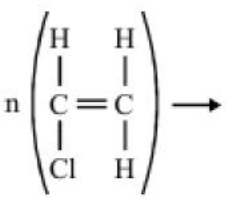
(i) Chloroethene is an unsaturated molecule. Why is this molecule said to be unsaturated?

.....

.....

(1)

(ii) Complete the diagram to represent how poly(chloroethene) is formed from chloroethene.



(3)

(iii) Explain what is meant by the term *polymerisation*.

.....

.....

.....

.....

(2)

(iv) Why is this an *addition polymerisation*?

.....

.....

(1)
(Total 8 marks)

Q5. (a) Alkenes can be made by cracking large alkane molecules.

(i) Explain how the cracking process is carried out.

.....

.....

.....

.....

(2)

(ii) Give a chemical test which would show the difference between an alkene and an alkane.

Test .....

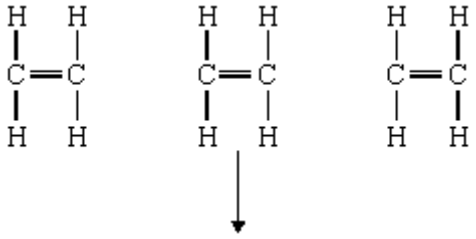
Result of test .....

.....

(2)

(b) Alkenes, such as ethene, can be made into polymers.

(i) Complete the following to show how the ethene molecules bond to form part of a polymer.



(1)

(ii) Name the polymer formed from ethene.

.....

(1)

(iii) Explain **one** important problem caused by the everyday use of this polymer.

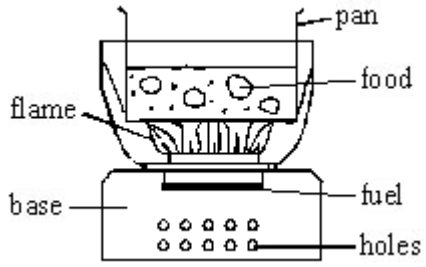
.....

.....

.....

(2)
(Total 8 marks)

Q6. The diagram below shows a camping stove used by some students.



A student wrote the report below to explain how the stove works. The report has had some words removed. Complete the report using words from the list.

air	chemical change	liquids	physical change
argon	gases	nitrogen	solid
carbon dioxide	heat energy	oxygen	water vapour

To use the stove a fuel called methylated spirits is poured into the burner and lit with a match.

The holes in the base let ..... into the stove. This contains the gas called

..... which is needed for the fuel to burn.

When the fuel burns, new substances are formed. This shows that a .....

takes place.

When all of the methylated spirits has burned nothing is left in the burner. This shows that

the new substances must all be ..... .

Methylated spirits contains carbon and hydrogen. When the fuel burns the carbon is changed

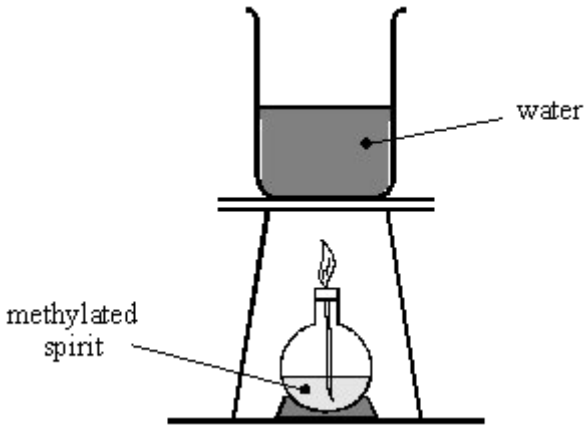
into ..... .

The hydrogen is changed into ..... .

When the fuel burns it gives out ..... which cooks the food in the pan.

(Total 7 marks)

Q7. A student is using a spirit burner to heat some water.



(a) Complete these sentences.

Substances like methylated spirit which we burn to give out energy, are called

..... . The energy is given out as ..... energy.

(2)

(b) Choose a word from this list to complete the sentence below.

gases **liquids** **solids**

The methylated spirit seems to disappear as it burns.

The new substances produced during burning are mainly .....

(1)

(Total 3 marks)