

Name:

Date:

C7 - Test 4  
ORGANIC CHEMISTRY  
Intermediate

**GCSE**

CHEMISTRY

AQA - Triple Science

Mark

Grade

---

### Materials

For this paper you must have:

- Ruler
- Pencil and Rubber
- Scientific calculator, which you are expected to use when appropriate

### Instructions

- Answer all questions
- Answer questions in the space provided
- All working must be shown

### Information

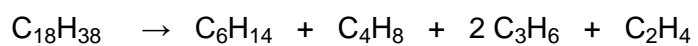
- The marks for the questions are shown in brackets

1.

This question is about organic compounds.

Hydrocarbons can be cracked to produce smaller molecules.

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



(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.

	<b>Boiling point</b>	<b>Flammability</b>	<b>Viscosity</b>
<b>A</b>	highest	lowest	highest
<b>B</b>	highest	lowest	lowest
<b>C</b>	lowest	highest	highest
<b>D</b>	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**

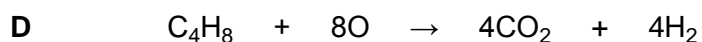
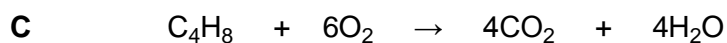
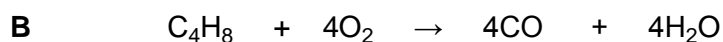
**D**

(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?



Tick **one** box.

**A**

**B**

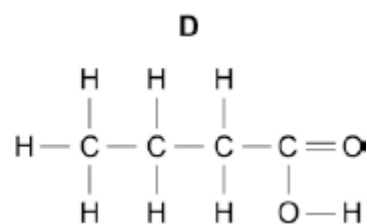
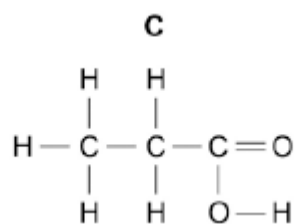
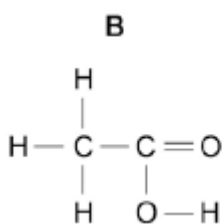
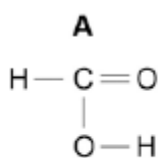
**C**

**D**

(1)

(d) Propanoic acid is a carboxylic acid.

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



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)

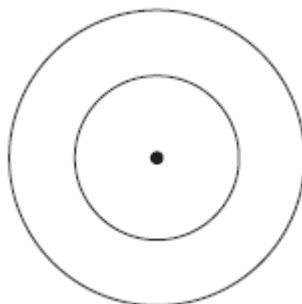
(Total 5 marks)

2.

Fossil fuels contain carbon and hydrogen.

(a) (i) Use the Chemistry Data Sheet to help you to answer this question.

Complete the figure below to show the electronic structure of a carbon atom.



(1)

(ii) Complete the word equation for the oxidation of hydrogen.

hydrogen + oxygen  $\longrightarrow$  \_\_\_\_\_

(1)

(b) Coal is a fossil fuel.

Coal contains the elements hydrogen, sulfur, oxygen and carbon.

Name **two** products of burning coal that have an impact on the environment.

What impact does each of the products you named have on the environment?

---

---

---

---

---

---

---

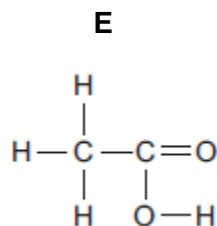
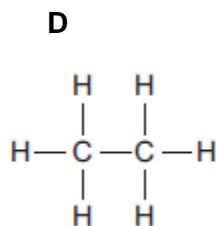
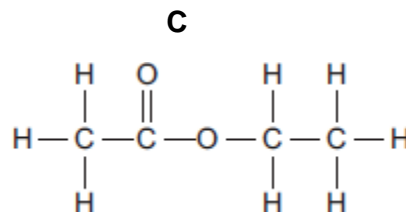
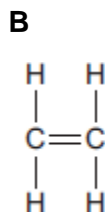
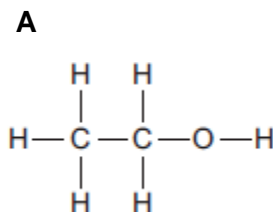
---

(4)

(Total 6 marks)

3.

The figure below shows the displayed structures of five organic compounds, **A**, **B**, **C**, **D** and **E**.



(a) Choose which organic compound, **A**, **B**, **C**, **D** or **E**, matches the descriptions.

You may choose each compound once, more than once or not at all.

Write the letter of the compound that:

(i) is a saturated hydrocarbon

(1)

(ii) comes from a homologous series with the general formula  $C_nH_{2n}$

(1)

(iii) has the empirical formula  $C_2H_6O$

(1)

(iv) reacts with calcium carbonate to produce carbon dioxide

(1)

(v) reacts with compound **A** to produce compound **C**.

(1)

(b) Compound **B** ( $C_2H_4$ ) and  $C_8H_{18}$  are produced by cracking  $C_{14}H_{30}$



(i) Give **two** conditions for cracking.

---

---

(2)

(ii) Explain why  $C_8H_{18}$  has a lower boiling point than  $C_{14}H_{30}$

---

---

---

---

(2)

(c) Compound **B** is a colourless gas.

Give a chemical test and its result to show that compound **B** is unsaturated.

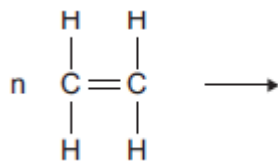
Test \_\_\_\_\_  
\_\_\_\_\_

Result \_\_\_\_\_  
\_\_\_\_\_

(2)

(d) Compound **B** is ethene.

Complete the equation to show the formation of poly(ethene) from ethene.



(3)

(Total 14 marks)

4.

Crude oil is a mixture of many different chemical compounds.

(a) Fuels, such as petrol (gasoline), can be produced from crude oil.

(i) Fuels react with oxygen to release energy.

Name the type of reaction that releases energy from a fuel.

\_\_\_\_\_

(1)

(ii) Fuels react with oxygen to produce carbon dioxide.

The reaction of a fuel with oxygen can produce a different oxide of carbon.

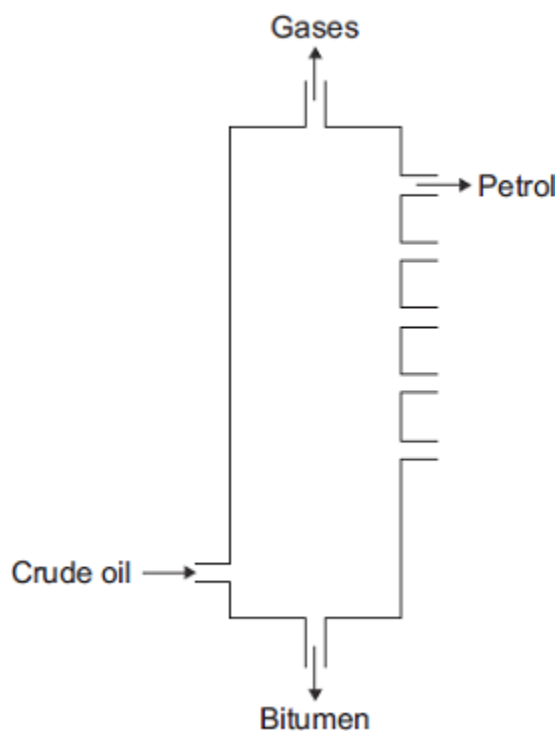
Name this different oxide of carbon and explain why it is produced.

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

(2)



- (b) Most of the compounds in crude oil are hydrocarbons.  
Hydrocarbons with the smallest molecules are very volatile.



*In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Describe and explain how **petrol** is separated from the mixture of hydrocarbons in crude oil.



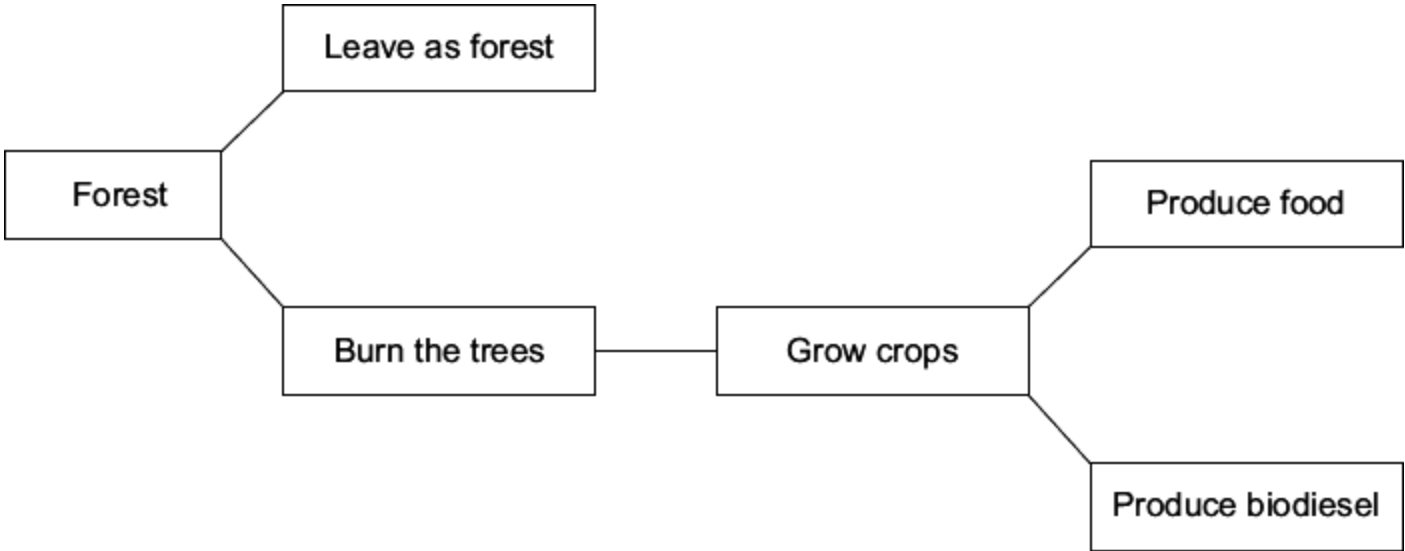
5.

Petroleum diesel is a fuel made from crude oil.

Biodiesel is a fuel made from vegetable oils.

To make biodiesel, large areas of land are needed to grow crops from which the vegetable oils are extracted.

Large areas of forest are cleared by burning the trees to provide more land for growing these crops.



(a) Use this information and your knowledge and understanding to answer these questions.

(i) Carbon neutral means that there is no increase in the amount of carbon dioxide in the atmosphere.

Suggest why adverts claim that using biodiesel is carbon neutral.

---

---

---

---

---

---

---

(2)

- (ii) Explain why clearing large areas of forest has an environmental impact on the atmosphere.

---

---

---

---

---

---

(2)

- (b) Why is there an increasing demand for biodiesel?

---

---

(1)

- (c) Suggest why producing biodiesel from crops:

- (i) causes ethical concerns

---

---

(1)

- (ii) causes economic concerns.

---

---

(1)

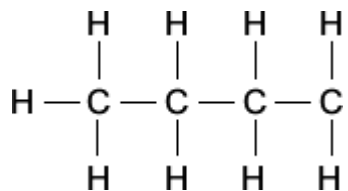
(Total 7 marks)

6.

Crude oil is a mixture of hydrocarbons. Most of these hydrocarbons are alkanes.

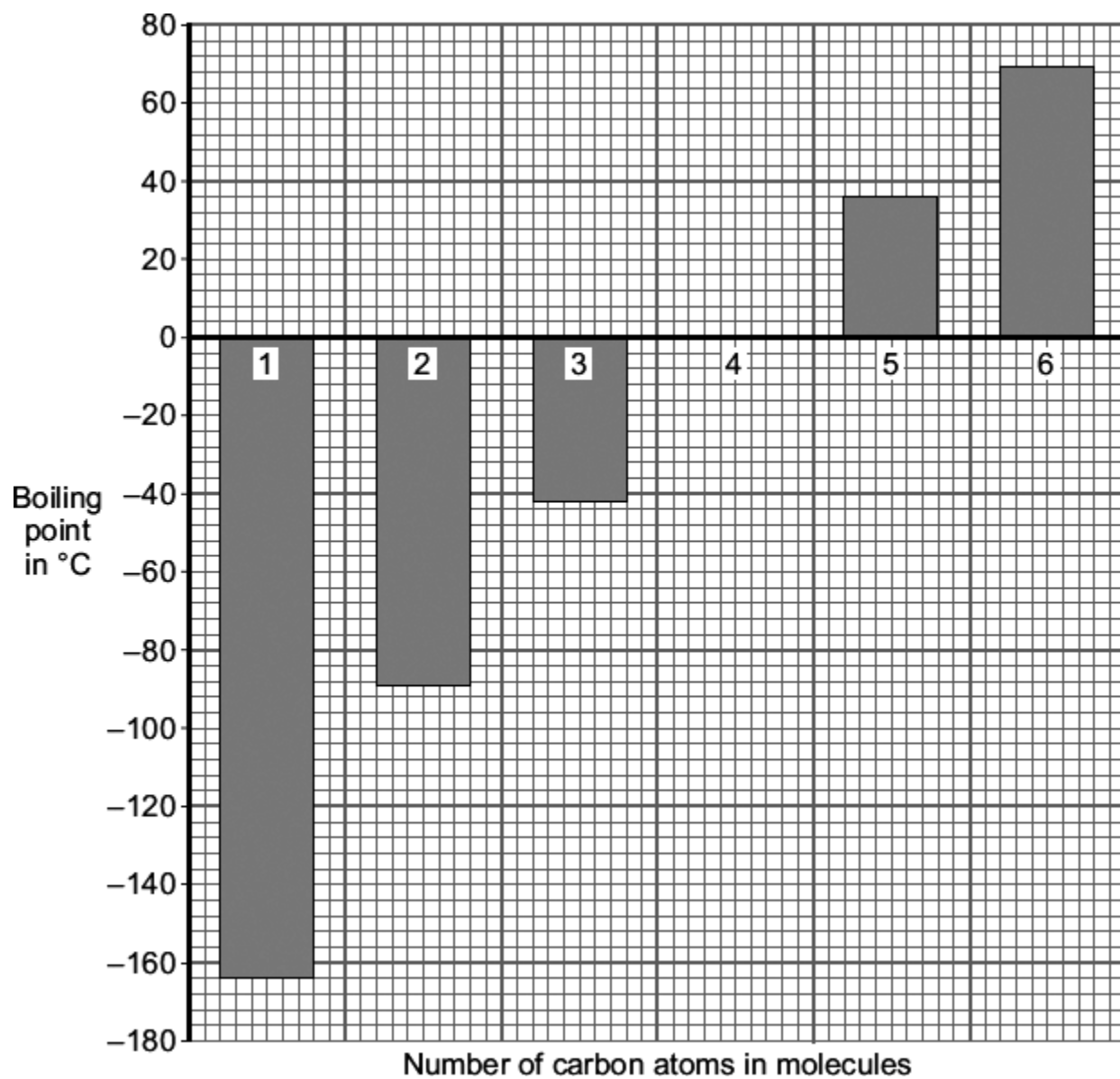
- (a) The general formula of an alkane is  $C_nH_{2n+2}$

Complete the structural formula for the alkane that has **six** carbon atoms in its molecules.



(1)

(b) The boiling points of alkanes are linked to the number of carbon atoms in their molecules.



(i) Describe the link between the number of carbon atoms in an alkane molecule and its boiling point.

---

---

(1)

- (ii) Suggest **two** reasons why all of the alkanes in the bar chart are better fuels than the alkane with the formula  $C_{30}H_{62}$

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

\_\_\_\_\_

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

\_\_\_\_\_

(2)

- (c) During the last 200 million years the carbon cycle has maintained the percentage of carbon dioxide in the atmosphere at about 0.03 %.

Over the last 100 years the percentage of carbon dioxide in the atmosphere has increased to about 0.04 %.

Most of this increase is caused by burning fossil fuels to heat buildings, to generate electricity and to power our transport.

Fossil fuels contain carbon that has been locked up for millions of years.

- (i) Burning fossil fuels, such as petrol, releases this locked up carbon. Balance the chemical equation for the combustion of one of the alkanes in petrol.



(1)

- (ii) Where did the carbon that is locked up in fossil fuels come from?

\_\_\_\_\_

\_\_\_\_\_

(1)

- (iii) The burning of fossil fuels has caused the percentage of carbon dioxide in the atmosphere to increase to above 0.03 %.

Explain why.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(2)

(Total 8 marks)

7.

Water sold in plastic bottles has a high 'carbon cost'.

The 'carbon cost' depends on the amount of carbon dioxide emitted in making and transporting the product.

The more carbon dioxide emitted, the higher the 'carbon cost'.

(a) Plastic water bottles are made from a polymer.

The polymer is made from ethene.

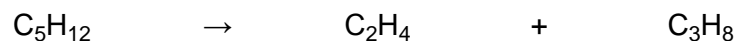
Ethene is made by cracking hydrocarbons.

(i) Name the polymer made from ethene.

---

(1)

(ii) Ethene can be made by cracking the hydrocarbon pentane,  $C_5H_{12}$ .



Explain why there is a 'carbon cost' for the process of cracking a hydrocarbon.

---

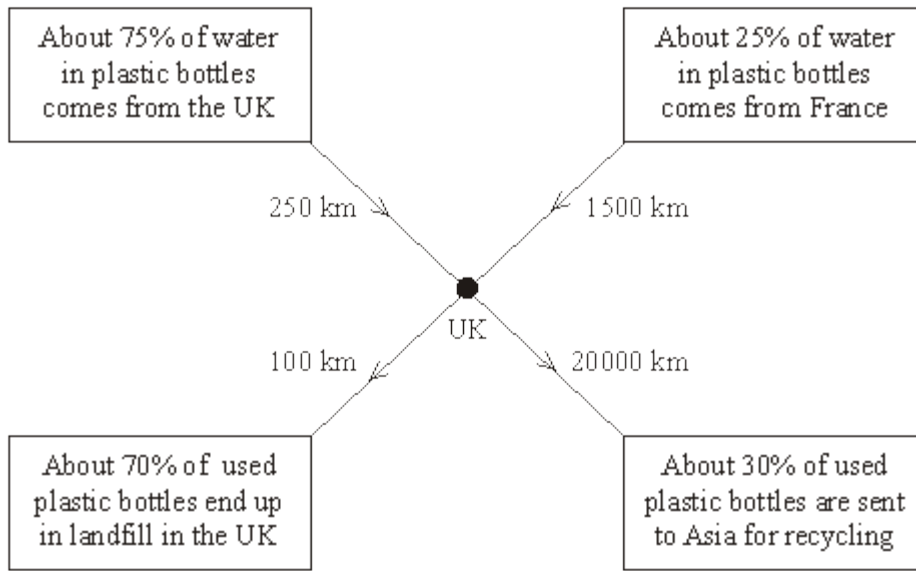
---

---

---

(2)

- (b) The diagram shows information about water sold in plastic bottles in the UK. The diagram also shows the average distances that water and plastic bottles are transported.



Suggest how the high 'carbon cost' of water sold in plastic bottles could be reduced.

---

---

---

---

---

---

---

(3)

(Total 6 marks)



8.

About 3000 million years ago, carbon dioxide was one of the main gases in the Earth's atmosphere.

About 400 million years ago, plants and trees grew on most of the land. When the plants and trees died they were covered by sand and slowly decayed to form coal.

(a) Describe and explain how the composition of the Earth's atmosphere was changed by the formation of coal.

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

(3)

(b) Today, coal is burned in power stations to release the energy needed by industry. Carbon dioxide, water and sulfur dioxide are produced when this coal is burned.

Name three elements that are in this coal.

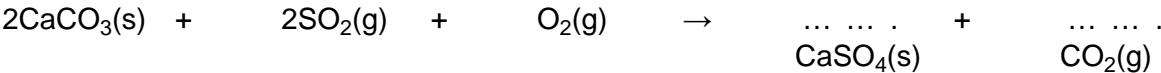
\_\_\_\_\_
\_\_\_\_\_
\_\_\_\_\_

(2)

(c) In some power stations coal is mixed with calcium carbonate (limestone). The mixture is crushed before it is burned.

(i) Many chemical reactions happen when this mixture is burned. The chemical equation represents one of these reactions.

Balance the chemical equation.



(1)

(ii) Explain how the use of calcium carbonate in the mixture:

increases atmospheric pollution

---

---

---

---

decreases atmospheric pollution.

---

---

---

---

(4)

(Total 10 marks)


9.

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

**WONDERFUL WINDOWS**

Replace your old wooden windows  
with our super high quality uPVC  
windows!

**NO PAINTING - MAINTENANCE FREE**



(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.

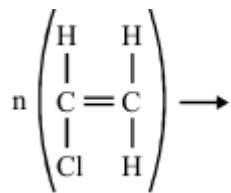
(i) Chloroethene is an unsaturated molecule. Why is this molecule said to be unsaturated?

---

---

(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*?

---

---

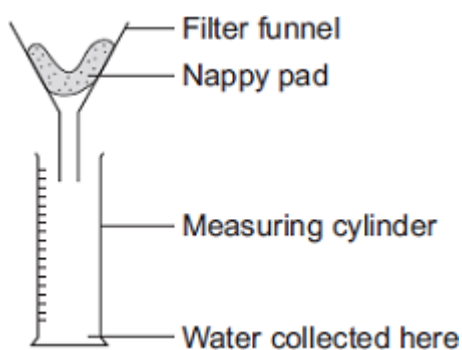
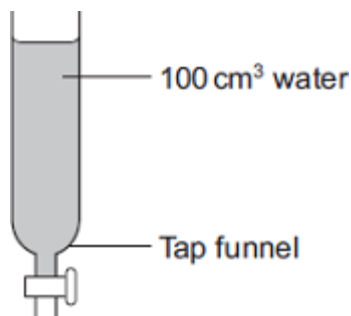
(1)

(Total 8 marks)

10.

Disposable nappies for babies need to absorb as much water as possible. Disposable nappies have a pad containing a special polymer called a hydrogel. Hydrogels absorb water.

A company called Aqanaps compared the water absorption of its nappy pads with nappy pads made by other companies.



- A scientist from Aqanaps poured 100 cm<sup>3</sup> of water onto the pad of one of their nappies.
- He measured the volume of water that passed through.
- He did the test three times using a new nappy pad for each test.
- The scientist then repeated the procedure using the nappy pads from three other companies, **A**, **B** and **C**.

The results are shown in the table.

Company	Volume of water collected in cm <sup>3</sup>		
	Pad 1	Pad 2	Pad 3
Aqanaps	55	57	55
A	47	46	39
B	65	63	64
C	38	39	38

(a) (i) Choose **one** result in the table that should be tested again.

Result: Company \_\_\_\_\_ Pad \_\_\_\_\_

Explain why you chose this result.

---

---

---

(2)

(ii) Suggest **one** variable that should be controlled in this investigation.

---

---

(1)

(iii) Suggest **one** possible cause of error in this investigation.

---

---

(1)

- (b) (i) The Aqanaps company studied the results. The company concluded that it should increase the amount of hydrogel used in its nappy pads.

Give **two** reasons why the company decided to increase the amount of hydrogel used in its nappy pads.

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

\_\_\_\_\_

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

\_\_\_\_\_

**(2)**

- (ii) Suggest **one** disadvantage for the company if it increases the amount of hydrogel used in its nappy pads.

\_\_\_\_\_

\_\_\_\_\_

**(1)**

**(Total 7 marks)**