

Specimen Paper

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	



AQA Level 1/2 Certificate in Science: Double Award
Specimen Paper

Double Award

Chemistry Paper 2F

For this paper you must have:

- a ruler
- the Periodic Table (enclosed).

You may use a calculator.

Time allowed

- 60 minutes

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the space provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

Advice

- In all calculations, show clearly how you work out your answer.

Answer **all** questions in the spaces provided.

1 (a) Atoms contain electrons, neutrons and protons.

1 (a) (i) Which of these particles has no electrical charge?

.....

(1 mark)

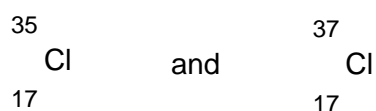
1 (a) (ii) Which statement in the table describes the mass of an electron?

Tick (✓) **one** box.

Statement	Tick (✓)
Electrons have a very small mass compared with protons.	
Electrons have about the same mass as protons.	
Electrons have a much greater mass than protons.	
Electrons have about the same mass as neutrons.	

(1 mark)

1 (b) Chlorine has different atoms, which can be represented as shown below.



1 (b) (i) Complete the sentence.

These atoms have the same number but different

..... numbers, and are called

(3 marks)

1 (b) (ii) Complete the sentences using the numbers in the box.

You may use each number once, more than once or not at all.

17	18	20	35	37
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All atoms of chlorine contain protons and electrons.

Some atoms of chlorine contain neutrons, while others
contain neutrons.

(4 marks)

9

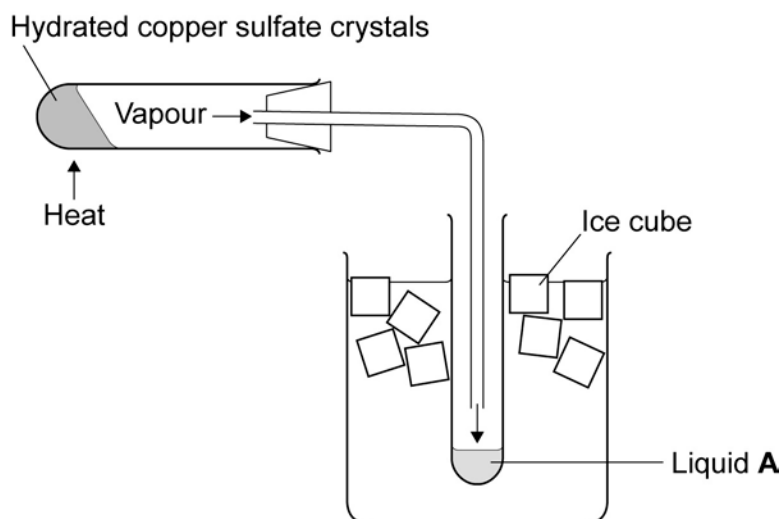
Turn over for the next question

Turn over ►

2 A student heated some hydrated copper sulfate crystals.

The crystals changed colour and gave off a vapour.

2 (a) The diagram shows the apparatus the student used.



2 (a) (i) Name liquid A

(1 mark)

2 (a) (ii) What helped the vapour to condense into liquid A?

.....

.....

(1 mark)

2 (b) (i) Hydrated copper sulfate crystals change colour when heated.

Use words from the box to complete the sentence.

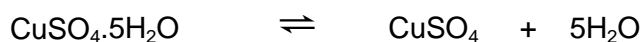
blue	green	red	white
------	-------	-----	-------

Hydrated copper sulfate crystals are and when heated change

to

(2 marks)

2 (b) (ii) The equation for the reaction is shown below.



What does the \rightleftharpoons symbol mean?

.....
(1 mark)

2 (c) The student wanted to find the mass lost when the copper sulfate was heated. He did the experiment twice. Each time, he weighed the copper sulfate before and after it was heated.

His results are shown in the table.

Mass of copper sulfate before heating in grams	Mass of copper sulfate after heating in grams	Mass lost in grams
2.50	1.72	0.78
2.50	1.61	0.89

2 (c) (i) The student used the same mass of hydrated copper sulfate each time but the mass lost was different.

Tick (✓) **two** reasons why the mass lost was different.

Reason	(✓)
The student used different test tubes for the two experiments.	
The student made errors in weighing during the experiments.	
The student used more ice in one of the experiments.	
The student did not heat the copper sulfate for long enough in one of the experiments.	

(2 marks)

Question 2 continues on the next page

Turn over ►

2 (c) (ii) What should the student do to improve his results?

Explain your answer.

.....

.....

.....

.....

.....

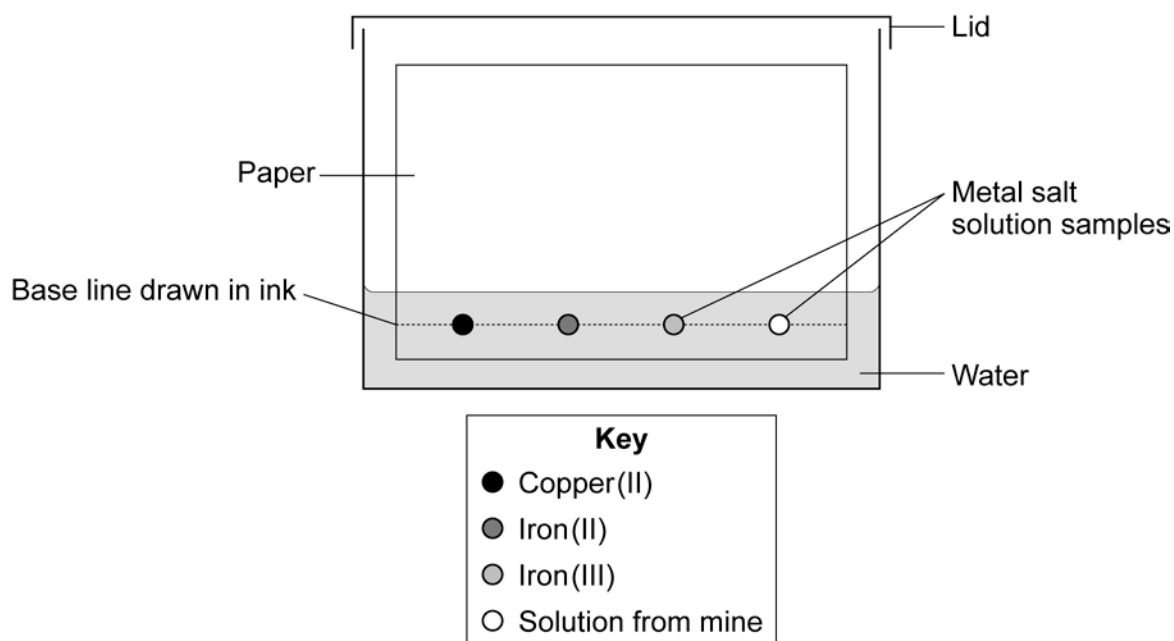
(3 marks)

<hr/> 10

- 3 A student analysed a sample of water from a disused mine to find out which metal ions were in the water.

He set the apparatus up as shown in the diagram.

He used a sample of water from the mine and samples of solutions containing known metal ions.



- 3 (a) Give **one** error the student made in the way he set up his apparatus. Explain the problem this error he made would have caused.

.....

.....

.....

.....

(2 marks)

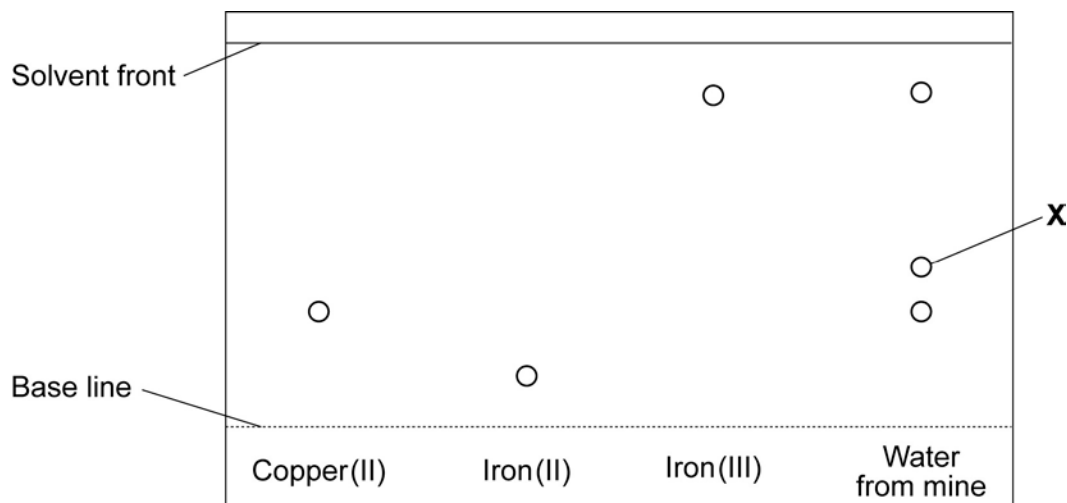
Question 3 continues on the next page

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3 (b) Another student repeated the experiment, but without making any errors.

After the water had soaked up the paper he sprayed it with a dilute solution of sodium hydroxide. Coloured spots appeared on the paper.

The results he obtained are shown in the diagram.



Identify **two** of the metal ions in the sample of water from the mine.

.....
(1 mark)

3 (c) Spots obtained by this method can be compared or identified by their R_f values.

$$R_f \text{ value} = \frac{\text{distance travelled by substance}}{\text{distance travelled by solvent}}$$

Use the diagram to calculate the R_f value of spot **X**.

Show clearly how you work out your answer.

.....
.....
.....
.....

R_f value =
(2 marks)

3 (d) Complete the sentence.

This method of analysis is called

(1 mark)

6

Turn over for the next question

Turn over ►

4 The table shows information about the halogens in Group 7 of the periodic table.

Name of halogen	Melting point in °C	Boiling point in °C	Electronic structure
Fluorine	-220	-188
Chlorine	-101	-35	2,8,7
Bromine	-7	+58	2,8,18,7
Iodine	+114	+183	2,8,18,18,7

4 (a) Use information from the table to help you to answer the questions.

4 (a) (i) Name **one** halogen that is a solid at 25°C.

.....
(1 mark)

4 (a) (ii) Name **one** halogen that is a gas at 25°C.

.....
(1 mark)

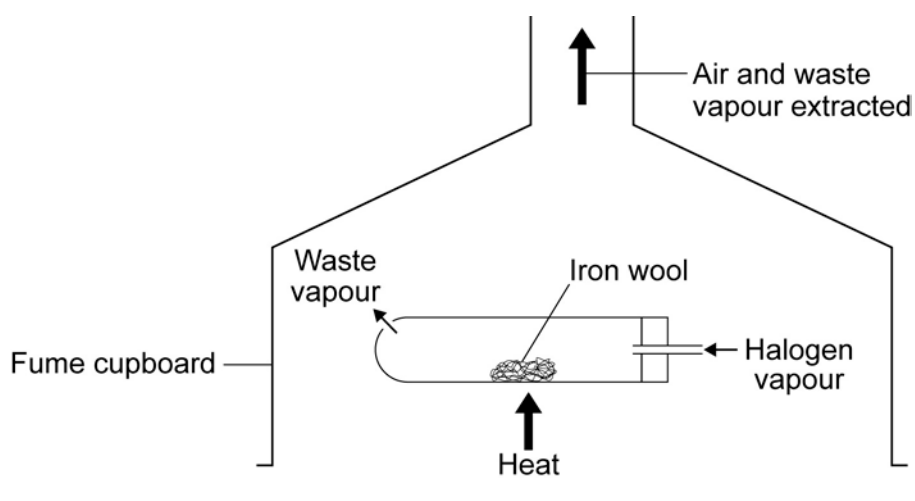
4 (a) (iii) Use the periodic table to help you to work out the correct electronic structure for fluorine. Write your answer in the table above.

(1 mark)

4 (a) (iv) Use the periodic table to name **one** Group 7 element that is **not** shown in the table above.

.....
(1 mark)

4 (b) A teacher demonstrated the reactivity of the halogens to some students. Halogen vapour was passed over heated iron wool in a fume cupboard.



The teacher's observations are shown in the table below.

	Observations	
	During the reaction	After the reaction
Bromine	The iron wool glowed	A red–brown solid had been produced
Chlorine	The iron wool glowed brightly	A dark brown solid had been produced
Iodine	The iron wool did not glow	A black solid had been produced

4 (b) (i) What is the order of reactivity of these three halogens?

Order of reactivity: most reactive halogen 1

2

least reactive halogen 3

(1 mark)

4 (b) (ii) Explain how you used the teacher's observations to decide your order of reactivity.

.....

.....

.....

.....

(2 marks)

7

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ANSWER IN THE SPACES PROVIDED**

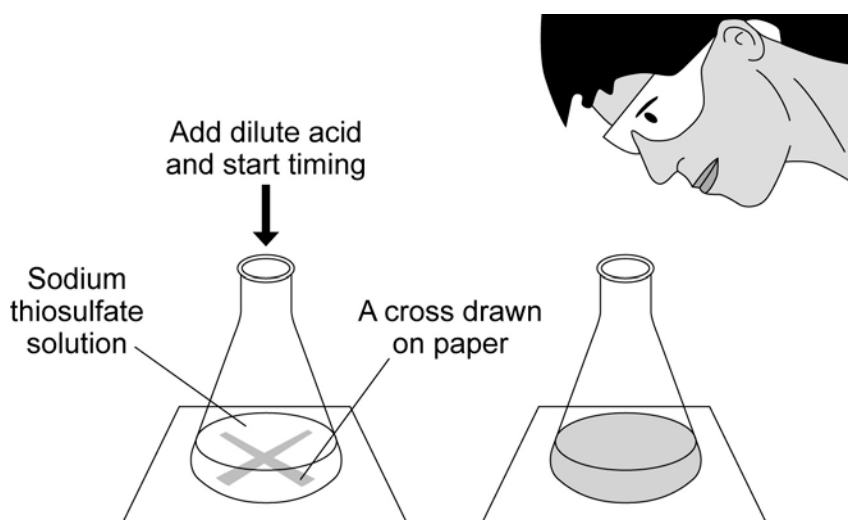
5 Sodium thiosulfate solution reacts slowly with dilute hydrochloric acid.



During the reaction a solid is formed. This makes the reaction mixture cloudy. The speed of the reaction can be followed by timing how long it takes for the reaction mixture to become too cloudy to be able to see through.

A student is investigating how temperature affects the speed of the reaction.

- The student used a measuring cylinder to measure out 10cm^3 of sodium thiosulfate solution and 30cm^3 of water. She mixed them together in a conical flask.
- She stood the conical flask on a cross drawn on a sheet of paper.
- She then added 5cm^3 of dilute hydrochloric acid to the mixture and started her stopwatch.
- Once the mixture became so cloudy she could no longer see the cross, she recorded the time taken.
- She repeated the experiment at different temperatures by warming or cooling the reagents before she mixed them.



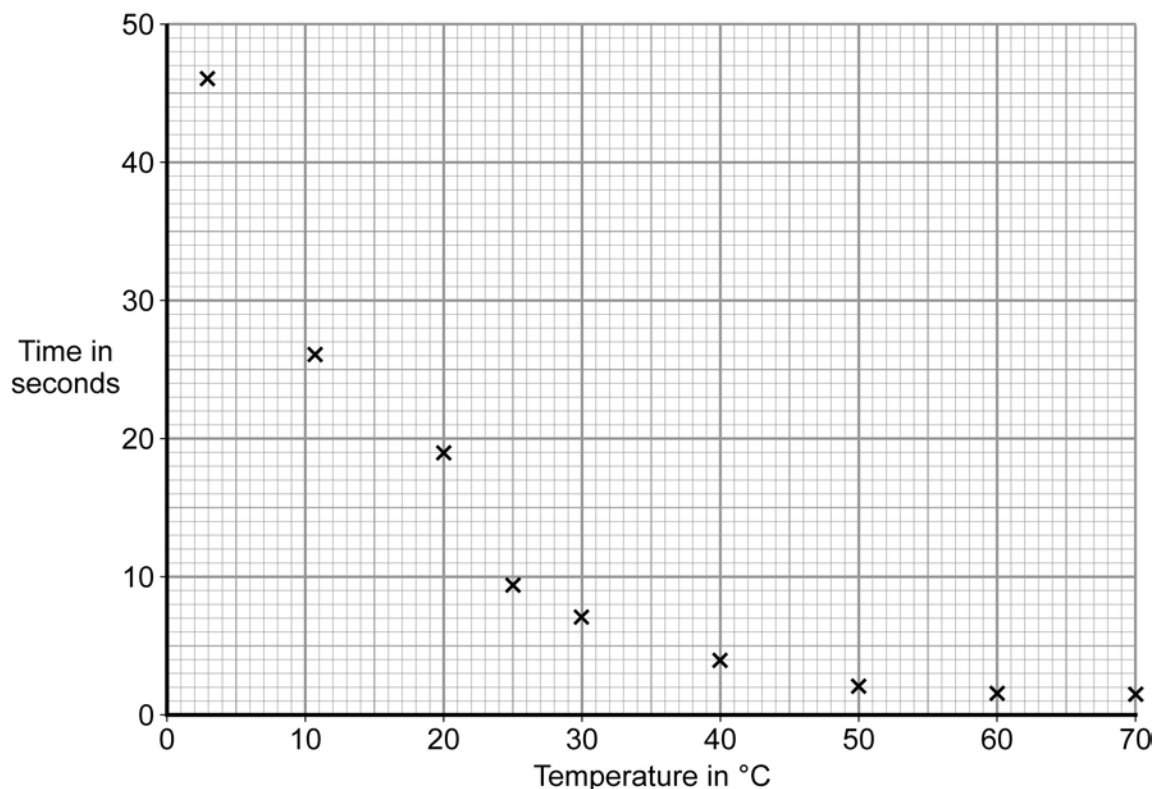
5 (a) Use the equation to help identify the insoluble product that makes the mixture cloudy.

.....
(1 mark)

Question 5 continues on the next page

Turn over ►

5 (b) The student's results are shown on the graph.



5 (b) (i) One of the points on the graph is anomalous. Draw a circle around this point.

(1 mark)

5 (b) (ii) The student thought that the anomalous result could have happened because she recorded the wrong temperature.

Suggest what the temperature should have been.

.....

.....

.....

(1 mark)

5 (b) (iii) What should the student have done to check this result?

.....

.....

(1 mark)

5 (b) (iv) What conclusion can you draw from the graph?

.....
.....
(1 mark)

5 (b) (v) Use the graph to estimate how long it would have taken for the cross on the paper to no longer be visible at 35°C.

..... seconds
(1 mark)

5 (c) The student was asked why an **increase** in temperature changes the rate of a chemical reaction.

Complete the sentences.

At higher temperatures the particles have more

and move

This means that the particles will more often.
(3 marks)

9

Turn over for the next question

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6 (a) Sodium hydrogencarbonate decomposes when it is heated strongly.

One of the products is carbon dioxide gas.

Describe the test for carbon dioxide and give the result if carbon dioxide is present.

.....
.....

(2 marks)

6 (b) A student heated 0.672 g of sodium hydrogencarbonate and collected the carbon dioxide produced. She measured the volume of carbon dioxide she had collected every minute until the sodium hydrogencarbonate had all decomposed. The student's results are shown in **Table 1**.

Table 1

Time in minutes	Volume of carbon dioxide collected in cm ³
0	0
1	46
2	70
3	85
4	94
5	96
6	96
7	96

6 (b) (i) What piece of apparatus is most suitable for collecting the gas produced and measuring its volume?

Draw a ring around your answer.

gas jar

gas syringe

test tube

(1 mark)

6 (b) (ii) How do the results show that the sodium hydrogencarbonate had fully decomposed?

.....
.....

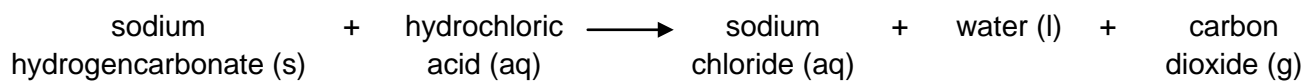
(1 mark)

Question 6 continues on the next page

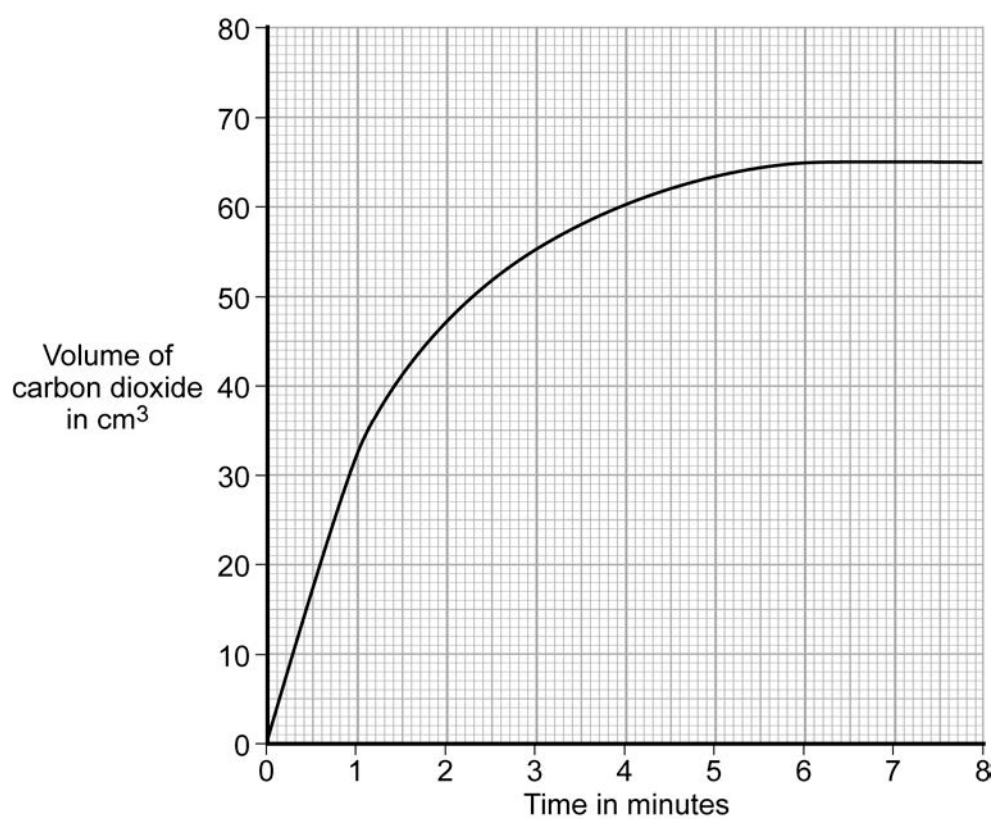
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6 (c) Carbon dioxide is also formed when sodium hydrogencarbonate is added to an acid.

A student studied the reaction between sodium hydrogencarbonate and an excess of dilute hydrochloric acid. The word equation for the reaction is:



The student measured the volume of carbon dioxide produced in the experiment. The results are shown in the graph.



6 (c) (i) What would the student **see** as the acid was added to the sodium hydrogencarbonate?

.....

(1 mark)

6 (c) (ii) After how many minutes had all the sodium hydrogencarbonate been used up?

.....

(1 mark)

6 (c) (iii) Describe, as fully as you can, how the volume of gas produced changes with time.

.....

.....

.....

.....

.....

.....

(3 marks)

9

Turn over for the next question

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7 Ethene is made by cracking long-chain saturated hydrocarbons from crude oil.

7 (a) Use words from the box to complete the sentences.

alkane

alkene

catalyst

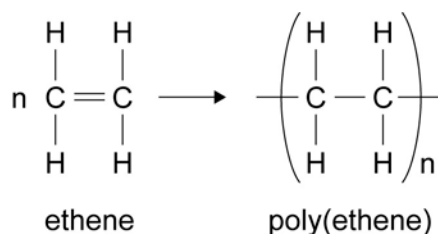
fuel

Cracking involves heating the to make a vapour.

The vapour is either passed over a hot or mixed with steam and heated to a very high temperature.

(2 marks)

7 (b) Poly(ethene) is made from ethene by a polymerisation reaction. The reaction can be represented by:



Use this equation to help you answer the following questions.

7 (b) (i) Describe what is meant by a polymerisation reaction.

.....

.....

.....

.....

(2 marks)

- 7 (b) (ii) Ethene and poly(ethene) behave in different ways when shaken with bromine water. Complete the table to show the colour changes that are seen when ethene and poly(ethene) are shaken with bromine water.

	Colour at start	Colour at end
Ethene		
Poly(ethene)		

(3 marks)

- 7 (b) (iii) Explain why ethene and poly(ethene) behave differently with bromine water.

.....

.....

.....

.....

(2 marks)

- 7 (c) Disposal of waste poly(ethene) can result in environmental problems. Suggest why.

.....

.....

(1 mark)

10

END OF QUESTIONS

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ANSWER IN THE SPACES PROVIDED**

The Periodic Table

				3	4	5	6	7	0	
1	2								4	
7	9								19	20
Li lithium 3	Be beryllium 4								F fluorine 9	Ne neon 10
23	24								35.5	40
Na sodium 11	Mg magnesium 12								Cl chlorine 17	Ar argon 18
39	40								79	84
K potassium 19	Ca calcium 20								Se selenium 34	Kr krypton 36
85	88								122	131
Rb rubidium 37	Sr strontium 38								Sb antimony 51	Xe xenon 54
133	137								207	[222]
Cs caesium 55	Ba barium 56								Pb lead 82	Rn radon 86
[223]	[226]								[209]	[210]
Fr francium 87	Ra radium 88								Po polonium 84	At astatine 85
[227]	[227]								204	209
La* lanthanum 57	Ac* actinium 89								Tl thallium 81	Bi bismuth 83
									201	204
									Hg mercury 80	Po polonium 84
									197	[209]
									Au gold 79	Po polonium 84
									195	[210]
									Pt platinum 78	At astatine 85
									192	[210]
									Ir iridium 77	At astatine 85
									190	[210]
									Os osmium 76	At astatine 85
									186	[210]
									Re rhenium 75	At astatine 85
									184	[210]
									W tungsten 74	At astatine 85
									183	[210]
									Ta tantalum 73	At astatine 85
									181	[210]
									Hf hafnium 72	At astatine 85
									178	[210]
									Ti titanium 22	At astatine 85
									178	[210]
									Zr zirconium 40	At astatine 85
									178	[210]
									Hf hafnium 72	At astatine 85
									178	[210]
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									Ta tantalum 73	At astatine 85
									186	[210]
									Re rhenium 75	At astatine 85
									184	[210]
									W tungsten 74	At astatine 85
									184	[210]
									W tungsten 74	At astatine 85
									186	[210]
									Re rhenium 75	At astatine 85
									190	[210]
									Os osmium 76	At astatine 85
									192	[210]
									Ir iridium 77	At astatine 85
									195	[210]
									Pt platinum 78	At astatine 85
									197	[210]
									Au gold 79	At astatine 85
									201	[210]
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									Tl thallium 81	At astatine 85
									209	[210]
									Pb lead 82	At astatine 85
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									Pb lead 82	At astatine 85
									210	[210]
									Bi bismuth 83	At astatine 85
									214	[210]
									Po polonium 84	At astatine 85
									218	[210]
									At astatine 85	At astatine 85
									222	[210]
									Rn radon 86	At astatine 85
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									230	[210]
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