



# UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	
CHEMISTRY		(	620/06
Paper 6 Alterna	tive to Practical	October/Novemb	er 2009
			1 hour
Candidates ans	wer on the Question Paper.		

### **READ THESE INSTRUCTIONS FIRST**

No additional materials are required.

Write your Centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use a pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, highlighters, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer all questions.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [ ] at the end of each question or part question.

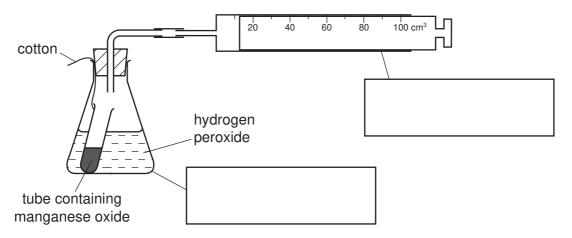
For Exam	For Examiner's Use		
1			
2			
3			
4			
5			
6			
7			
Total			

This document consists of 12 printed pages.



1 The apparatus below was used to make oxygen. The tube of manganese oxide was added to the hydrogen peroxide solution by releasing the cotton.

For Examiner's Use



- (a) Complete the boxes to identify the pieces of apparatus. [2]
- [1]
- (c) Give a test for oxygen.

(b) Why was the tube of manganese oxide suspended in the flask?

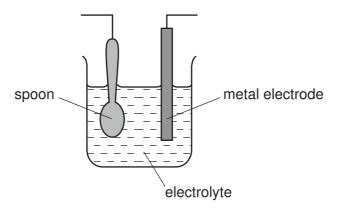
test

result [2]

[Total: 5]

**2** A steel spoon can be coated in silver using electrolysis. The spoon must be very clean and free of grease.

For Examiner's Use



(	a	)	Sı	Ja	a	e	s	t
١	•	,	$\sim$	-9	Э	•	_	۰

	(i)	one advantage of putting a thin layer of silver on the spoon,	
			[1]
	(ii)	one disadvantage if the spoon is used frequently,	
			[1]
	(iii)	why the spoon must be very clean and free of grease?	
			[1]
(b)	Wh	nich electrode should be the spoon?	
			[1]
(c)	lde	entify the metal from which the other electrode is made.	
			[1]
		ГТ	otal: 51

Thr	ree unlabelled bottles of chemicals each contained one of the following liquids:	
•	sodium nitrate dissolved in water; pure water;	
•	hexene.	
(a)	Give a test by which you could identify sodium nitrate solution.	
	test	
	result	[2]
(b)	Give a test by which you could identify pure water.	
	result	 [2]
(c)	Give a test by which you could identify hexene.  test	
	result	[2]
	[Tota	l: 6]

For Examiner's Use

© UCLES 2009 0620/06/O/N/09

3

**4** A student investigated the temperature change produced when equal lengths of magnesium ribbon reacted with excess dilute sulfuric acid of different concentrations (labelled solutions **A**, **B**, **C**, **D** and **E**).

For Examiner's Use

Five experiments were carried out.

# Experiment 1

Using a measuring cylinder, 20 cm<sup>3</sup> of sulfuric acid solution **A** was poured into a beaker. The initial temperature of the solution was measured. A length of magnesium ribbon was added to the solution and stirred. The highest temperature reached was measured.

#### Experiment 2

Experiment 1 was repeated using solution **B** instead of solution **A**. The initial and highest temperatures were measured as before.

## Experiment 3

Experiment 1 was repeated using solution **C**. The initial and highest temperatures were measured.

# Experiment 4

Experiment 1 was repeated using solution **D**. The initial and highest temperatures were measured.

## Experiment 5

Experiment 1 was repeated using solution **E**. The initial and highest temperatures were measured.

Use the thermometer diagrams in the table on page 6, to record the initial and highest temperatures in each experiment.

For Examiner's Use

solution of sulfuric acid	thermometer diagram	initial temperature /°C	thermometer diagram	highest temperature /°C	change in temperature /°C
Α	-30   -25   -20		35		
В	-30   -25   -20		40     35   30		
С	30 -25 -20		35		
D	30 -25 -20		35		
E	30 -25 -20		30   -25   -20		

[4]

(a) Work out the temperature change for each experiment and record the values in the table. [1]

© UCLES 2009 0620/06/O/N/09

Change in temperature /°C  Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  [1]  [1]	Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  Suggest why this Experiment produced the largest temperature change.	below.	par chart of the results for Experiments 1, 2, 3, 4 and 5 on the grid	[4]
Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  [1]  Suggest why this Experiment produced the largest temperature change.	Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  Suggest why this Experiment produced the largest temperature change.			
Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  [1]  Suggest why this Experiment produced the largest temperature change.	Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  Suggest why this Experiment produced the largest temperature change.			
Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  [1]  Suggest why this Experiment produced the largest temperature change.	Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  Suggest why this Experiment produced the largest temperature change.			
Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  Suggest why this Experiment produced the largest temperature change.	Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  Suggest why this Experiment produced the largest temperature change.			
Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  [1]  Suggest why this Experiment produced the largest temperature change.	Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  Suggest why this Experiment produced the largest temperature change.			
Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  [1]  Suggest why this Experiment produced the largest temperature change.	Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  Suggest why this Experiment produced the largest temperature change.			
Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  [1]  Suggest why this Experiment produced the largest temperature change.	Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  Suggest why this Experiment produced the largest temperature change.			
Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  [1]  Suggest why this Experiment produced the largest temperature change.	Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  Suggest why this Experiment produced the largest temperature change.			
Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  [1]  Suggest why this Experiment produced the largest temperature change.	Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  Suggest why this Experiment produced the largest temperature change.			
Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  [1]  Suggest why this Experiment produced the largest temperature change.	Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  Suggest why this Experiment produced the largest temperature change.			
Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  [1]  Suggest why this Experiment produced the largest temperature change.	Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  Suggest why this Experiment produced the largest temperature change.			
Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  [1]  Suggest why this Experiment produced the largest temperature change.	Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  Suggest why this Experiment produced the largest temperature change.			
Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  [1]  Suggest why this Experiment produced the largest temperature change.	Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  Suggest why this Experiment produced the largest temperature change.	change in		
Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  (ii) Suggest why this Experiment produced the largest temperature change.	Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  Suggest why this Experiment produced the largest temperature change.			
Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  (ii) Suggest why this Experiment produced the largest temperature change.	Use the results and observations to answer the following questions.  What type of chemical reaction occurs when magnesium reacts with dilute sulfuric roid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  i) Suggest why this Experiment produced the largest temperature change.			
What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  (ii) Suggest why this Experiment produced the largest temperature change.	What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  i) Suggest why this Experiment produced the largest temperature change.	/ · U		
What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  (ii) Suggest why this Experiment produced the largest temperature change.	What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  i) Suggest why this Experiment produced the largest temperature change.			
What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  (ii) Suggest why this Experiment produced the largest temperature change.	What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  i) Suggest why this Experiment produced the largest temperature change.			
What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  (ii) Suggest why this Experiment produced the largest temperature change.	What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  i) Suggest why this Experiment produced the largest temperature change.			
What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  (ii) Suggest why this Experiment produced the largest temperature change.	What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  i) Suggest why this Experiment produced the largest temperature change.			
What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  (ii) Suggest why this Experiment produced the largest temperature change.	What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  i) Suggest why this Experiment produced the largest temperature change.			
What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  (ii) Suggest why this Experiment produced the largest temperature change.	What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  i) Suggest why this Experiment produced the largest temperature change.			
What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  (ii) Suggest why this Experiment produced the largest temperature change.	What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  i) Suggest why this Experiment produced the largest temperature change.			
What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  (ii) Suggest why this Experiment produced the largest temperature change.	What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  i) Suggest why this Experiment produced the largest temperature change.			
What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  (ii) Suggest why this Experiment produced the largest temperature change.	What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  i) Suggest why this Experiment produced the largest temperature change.			
What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  (ii) Suggest why this Experiment produced the largest temperature change.	What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  i) Suggest why this Experiment produced the largest temperature change.			
What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  (ii) Suggest why this Experiment produced the largest temperature change.	What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  i) Suggest why this Experiment produced the largest temperature change.			
What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  (ii) Suggest why this Experiment produced the largest temperature change.	What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  i) Suggest why this Experiment produced the largest temperature change.			
What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  Suggest why this Experiment produced the largest temperature change.	What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  i) Suggest why this Experiment produced the largest temperature change.			
What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  (i) Which Experiment produced the largest temperature change?  [1]  (ii) Suggest why this Experiment produced the largest temperature change.	What type of chemical reaction occurs when magnesium reacts with dilute sulfuric acid?  [1]  i) Which Experiment produced the largest temperature change?  [1]  i) Suggest why this Experiment produced the largest temperature change.	Use the resi	ults and observations to answer the following questions.	
(i) Which Experiment produced the largest temperature change?  [1]  (ii) Suggest why this Experiment produced the largest temperature change.	i) Which Experiment produced the largest temperature change?  [1]  i) Suggest why this Experiment produced the largest temperature change.		5 1	
(i) Which Experiment produced the largest temperature change?  [1]  (ii) Suggest why this Experiment produced the largest temperature change.	i) Which Experiment produced the largest temperature change?  [1]  i) Suggest why this Experiment produced the largest temperature change.		emical reaction occurs when magnesium reacts with dilute sulfuric	
(i) Which Experiment produced the largest temperature change?  [1]  Suggest why this Experiment produced the largest temperature change.	i) Which Experiment produced the largest temperature change?  [1]  i) Suggest why this Experiment produced the largest temperature change.	acia?		
(ii) Suggest why this Experiment produced the largest temperature change.	i) Suggest why this Experiment produced the largest temperature change.			[1]
(ii) Suggest why this Experiment produced the largest temperature change.	i) Suggest why this Experiment produced the largest temperature change.			
(ii) Suggest why this Experiment produced the largest temperature change.	i) Suggest why this Experiment produced the largest temperature change.	(i) Which Expo	riment produced the largest temperature change?	
(ii) Suggest why this Experiment produced the largest temperature change.	i) Suggest why this Experiment produced the largest temperature change.	(i) William Expe	illient produced the largest temperature change:	
(ii) Suggest why this Experiment produced the largest temperature change.	i) Suggest why this Experiment produced the largest temperature change.			[1]
[41]	[41]			r · J
[41]	[41]	ii) Suggest wh	v this Experiment produced the largest temperature change	
[41]	[41]	ii, caggoot wii	y this Exponiment produced the largest temperature ondrige.	
[41]	[41]			
[1]	[1]			••••
				[1]

<b>(e)</b>	Pre	edict the effect on the temperature changes that would happen if		
	(i)	equal masses of magnesium powder were used in the Experiments.		-
			[1]	
	(ii)	40 cm <sup>3</sup> of dilute sulfuric acid was used in Experiment 1.		
			[1]	
	(iii)	Explain your answer to (e)(ii).		
			[1]	
(f)	Giv	ve <b>one</b> possible source of experimental error in this investigation.		
			[1]	

For Examiner's Use

[Total: 16]

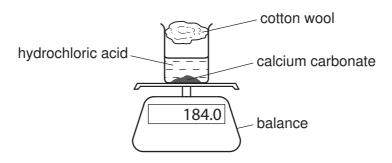
Three aqueous solutions **K**, **L** and **M**, were analysed. **L** was a solution of sodium hydroxide. The tests on the solutions and some of the observations are in the table. Complete the observations in the table. Do not write any conclusions in the table.

For Examiner's Use

	tests	observations
(a)	Appearance of the solutions.	
	solution <b>K</b>	colourless liquid
	solution <b>L</b>	colourless liquid
	solution <b>M</b>	colourless liquid
(b)	Universal Indicator paper was used to test the pH of each solution.	
	solution <b>K</b>	pH 10
	solution <b>L</b>	pH[1]
	solution <b>M</b>	pH 2
(c)	tests on solution <b>K</b>	
	<ul> <li>(i) Drops of solution K were added to copper sulfate solution in a test-tube. Excess of solution K was then added to the test-tube.</li> <li>(ii) Experiment (c)(i) was repeated using aqueous aluminium sulfate instead of</li> </ul>	pale blue precipitate formed deep blue solution formed
	aqueous copper sulfate.	white precipitate formed insoluble in excess
	(iii) A few drops of nitric acid and silver nitrate solution were added to solution <b>K</b> .	no visible reaction
(d)	tests on solution L	
	(i) Experiment (c)(i) was repeated using solution <b>L</b> .	[1]
	(ii) Experiment (c)(ii) was repeated using solution L.	
		[3]
(e)	test on solution <b>M</b> Experiment (c)(iii) was repeated using solution <b>M</b> .	white precipitate formed

(f)	What conclusions can you make about solution <b>K</b> ?	For Examiner's Use
	[2]	
(g)	What conclusions can you make about solution <b>M</b> ?	
	[2]	
	[Total: 9]	

6 Dilute hydrochloric acid was added to excess calcium carbonate in a beaker as shown.



The beaker was placed on a balance and the mass of the beaker and contents recorded every minute.

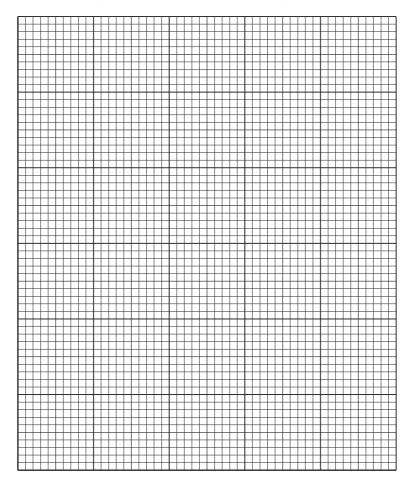
The results are shown in the table.

mass of beaker and contents/g	184.11	178.0	175.6	174.6	174.0	174.0
time/min	0	1	2	3	4	5

© UCLES 2009 0620/06/O/N/09

(a) Plot the results on the grid and draw a smooth line graph.

For Examiner's Use



[5]

(b)	Use your graph to determine the mass of the beaker and contents after 30 seconds. Show clearly on your graph how you worked out your answer.	
		[2]
(c)	Why does the mass of the beaker and contents decrease?	
		[1]
(d)	Suggest the purpose of the cotton wool.	
		[1]
(e)	After how long did the reaction finish?	
		[1]
(f)	A second experiment was carried out using hydrochloric acid at a lower temperature.	

[2]

[Total: 12]

On the grid sketch a curve to show the expected results for this experiment.

Label this curve C.

Leaves from trees contain a mixture of coloured pigments which are not soluble in water. A student was given these two instructions to investigate the pigments in the leaves.	For Examiner's Use
<ol> <li>Crush some leaves to extract the coloured pigments.</li> <li>Use the liquid extract to find the number of coloured pigments in the leaves.</li> </ol>	
(a) What would the student need in order to effectively carry out instruction 1?	
[3]	
(b) Describe an experiment to carry out instruction 2.  A space has been left below if you want to draw a diagram to help answer the question.	
[4]	
[Total: 7]	

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

University of Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.