



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

CANDIDATE  
NAME

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CENTRE  
NUMBER

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CANDIDATE  
NUMBER

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**CHEMISTRY**

**0620/51**

Paper 5 Practical Test

**October/November 2012**

**1 hour 15 minutes**

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

**READ THESE INSTRUCTIONS FIRST**

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.

Practical notes are provided on page 8.

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.

<b>For Examiner's Use</b>	
<b>Total</b>	

This document consists of **7** printed pages and **1** blank page.



- 1 You are going to investigate the speed of reaction when iodine is produced by the reaction of solution **L** with potassium iodide at different temperatures.

**Read all the instructions below carefully before starting the experiments.**

**Instructions**

You are going to carry out five experiments.

**(a) Experiment 1**

Fill the burette with the aqueous solution **L** provided to the 0.0 cm<sup>3</sup> mark.  
Add 10 cm<sup>3</sup> of solution **L** from the burette into a boiling tube. Record the initial temperature of the solution in the table.

Use a measuring cylinder to pour 5 cm<sup>3</sup> of the aqueous potassium iodide and 3 cm<sup>3</sup> of aqueous sodium thiosulfate provided into a second boiling tube. Add 2 cm<sup>3</sup> of the starch solution provided to this boiling tube and shake the mixture.

Add the mixture in the second boiling tube to the solution **L** in the first boiling tube, shake the mixture and start the clock. These chemicals react to form iodine which reacts with starch. When a blue colour first appears stop the clock and record the time in the table. Measure and record the final temperature of the mixture in the table.

**(b) Experiment 2**

Discard the contents of the boiling tube and rinse both boiling tubes with distilled water.

Use a measuring cylinder to pour 5 cm<sup>3</sup> of aqueous potassium iodide and 3 cm<sup>3</sup> of aqueous sodium thiosulfate into the first boiling tube. Add 2 cm<sup>3</sup> of the starch solution and shake the mixture.

Add 10 cm<sup>3</sup> of solution **L** from the burette into the second boiling tube. Heat solution **L** to about 40 °C stirring with a thermometer. Record the temperature of solution **L** in the table.

Add the mixture in the first boiling tube to the solution **L**, shake the mixture and start the clock. When a blue colour first appears, stop the clock and record the time in the table. Measure and record the final temperature of the mixture in the table.

**(c) Experiment 3**

Repeat Experiment 2, heating solution **L** to about 50 °C.

**(d) Experiment 4**

Repeat Experiment 2, heating solution **L** to about 60 °C.

**(e) Experiment 5**

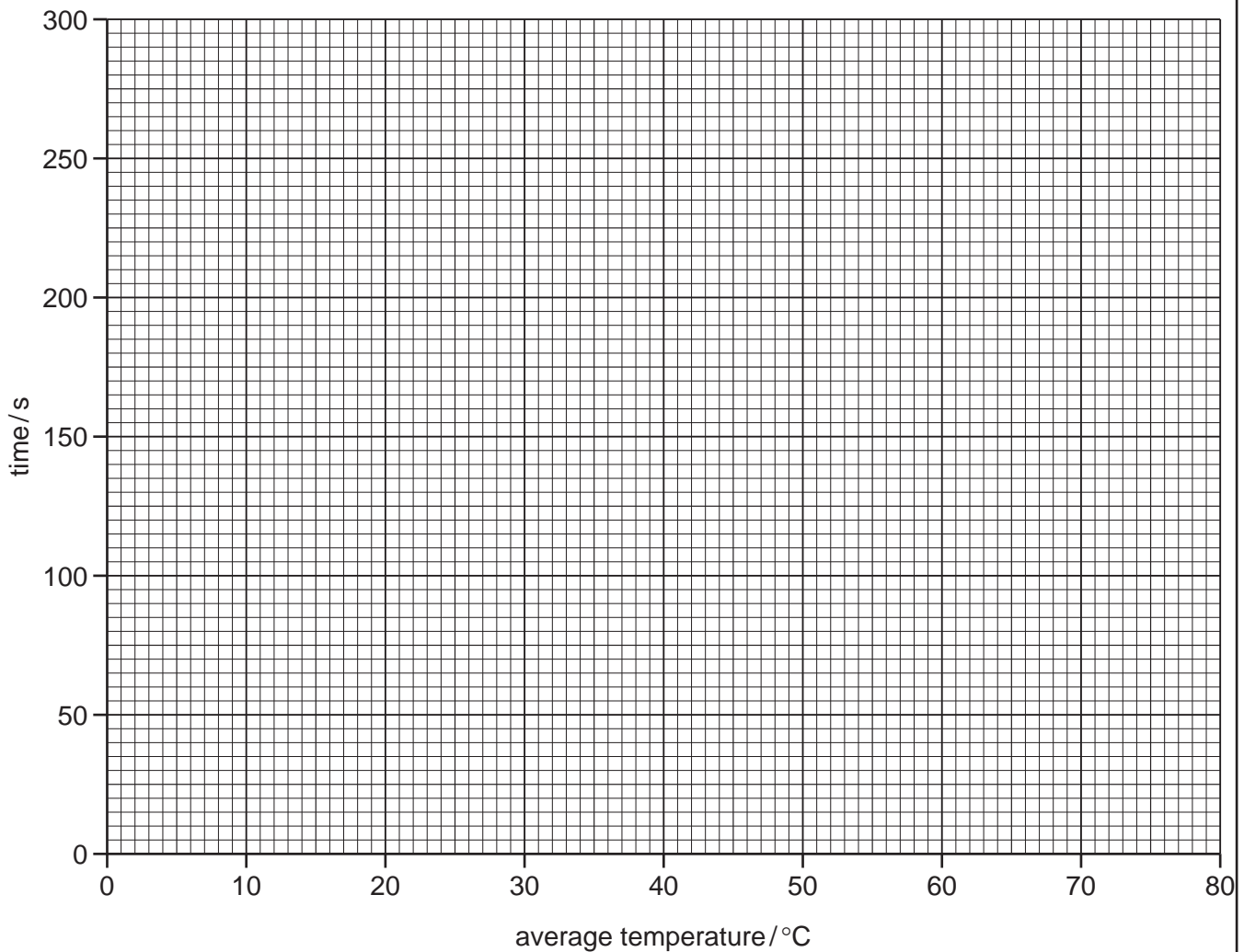
Repeat Experiment 2, heating solution **L** to about 70 °C.

(f) Complete the table of results.

experiment	temperature of solution L/ $^{\circ}$ C	final temperature of mixture/ $^{\circ}$ C	average temperature/ $^{\circ}$ C	time for blue colour to appear /s
1				
2				
3				
4				
5				

[5]

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



[5]

**(h)** From your graph, work out the time taken for the blue colour to first appear if solution **L** was heated to 80 °C. The final temperature of the reaction mixture was 64 °C. Show **on the grid** how you obtained your answer.

..... [3]

**(i)** Suggest the purpose of the starch solution in the experiments.

..... [1]

**(j) (i)** In which experiment was the reaction speed fastest?

..... [1]

**(ii)** Explain, using ideas about particles, why this experiment was the fastest.

.....  
..... [2]

**(k)** Predict the effect on the time and speed of the reaction in Experiment 5 if it was repeated using a less concentrated solution of **L**.

time .....

speed ..... [2]

**(l)** Why was a burette used to measure solution **L** instead of a measuring cylinder?

.....  
..... [1]

[Total: 20]

- 2 You are provided with a mixture of two solids, **M** and **N**.  
Solid **M** is water-soluble and solid **N** is insoluble.  
Carry out the following tests on the mixture, recording all of your observations in the table.  
Conclusions must **not** be written in the table.

tests	observations
Add about 15 cm <sup>3</sup> of distilled water to the mixture in a boiling tube. Stopper and shake the boiling tube for one minute. Filter the contents of the boiling tube, keeping the filtrate and residue for the following tests.	
<u>tests on the filtrate</u>  Divide the filtrate into five portions in five test-tubes.  <b>(a)</b> Use pH indicator paper to test the pH of the filtrate.	..... [1]
<b>(b) (i)</b> To the second portion of the filtrate, add drops of aqueous sodium hydroxide and shake the mixture.  Now add excess aqueous sodium hydroxide to the test-tube.  <b>(ii)</b> To the third portion of the filtrate, add drops of aqueous ammonia and shake the mixture.  Now add excess aqueous ammonia to the test-tube.	..... ..... [3] ..... ..... [3]
<b>(c)</b> To the fourth portion of the filtrate, add about 1 cm <sup>3</sup> of dilute nitric acid followed by silver nitrate solution.	..... [1]
<b>(d)</b> To the fifth portion of the filtrate, add about 1 cm <sup>3</sup> of dilute nitric acid followed by barium nitrate solution.	..... [2]

tests	observations
<p><u>tests on the residue</u></p> <p>Use a spatula to transfer some of the residue into two test-tubes.</p> <p><b>(e)</b> To the first sample of the residue, add about 3 cm<sup>3</sup> of dilute hydrochloric acid. Boil the mixture for about two minutes and test the gas given off with damp blue litmus paper.</p>	<p>.....</p> <p>..... [2]</p>
<p><b>(f)</b> To the second sample of the residue, add about 3 cm<sup>3</sup> of aqueous hydrogen peroxide.</p> <p>Test the gas given off.</p>	<p>.....</p> <p>..... [3]</p>

**(g)** What conclusions can you draw about solid **M**?

.....

..... [2]

**(h)** Identify the gas given off in test **(f)**.

..... [1]

**(i)** What conclusions can you draw about solid **N**?

.....

.....

..... [2]

[Total: 20]



## NOTES FOR USE IN QUALITATIVE ANALYSIS

## Test for anions

<i>anion</i>	<i>test</i>	<i>test result</i>
carbonate ( $\text{CO}_3^{2-}$ )	add dilute acid	effervescence, carbon dioxide produced
chloride ( $\text{Cl}^-$ ) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
iodide ( $\text{I}^-$ ) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	yellow ppt.
nitrate ( $\text{NO}_3^-$ ) [in solution]	add aqueous sodium hydroxide then aluminium foil; warm carefully	ammonia produced
sulfate ( $\text{SO}_4^{2-}$ ) [in solution]	acidify with dilute nitric acid, then aqueous barium nitrate	white ppt.

## Test for aqueous cations

<i>cation</i>	<i>effect of aqueous sodium hydroxide</i>	<i>effect of aqueous ammonia</i>
aluminium ( $\text{Al}^{3+}$ )	white ppt., soluble in excess giving a colourless solution	white ppt., insoluble in excess
ammonium ( $\text{NH}_4^+$ )	ammonia produced on warming	–
calcium ( $\text{Ca}^{2+}$ )	white ppt., insoluble in excess	no ppt., or very slight white ppt.
copper ( $\text{Cu}^{2+}$ )	light blue ppt., insoluble in excess	light blue ppt., soluble in excess giving a dark blue solution
iron(II) ( $\text{Fe}^{2+}$ )	green ppt., insoluble in excess	green ppt., insoluble in excess
iron(III) ( $\text{Fe}^{3+}$ )	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess
zinc ( $\text{Zn}^{2+}$ )	white ppt., soluble in excess giving a colourless solution	white ppt., soluble in excess giving a colourless solution

## Test for gases

<i>gas</i>	<i>test and test results</i>
ammonia ( $\text{NH}_3$ )	turns damp red litmus paper blue
carbon dioxide ( $\text{CO}_2$ )	turns limewater milky
chlorine ( $\text{Cl}_2$ )	bleaches damp litmus paper
hydrogen ( $\text{H}_2$ )	'pops' with a lighted splint
oxygen ( $\text{O}_2$ )	relights a glowing splint

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