UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

CHEMISTRY **0620/05**

Paper 5 Practical Test **May/June 2009**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions
An Insert is provided with the Question Paper

READ THESE INSTRUCTIONS FIRST

Write your name, Centre number and candidate number 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.

Answer **all** questions.
Practical notes are provided on page 8.
You have been provided with a separate Insert to be used with Question 1.

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 Examiner's Use	
1	
2	
Total	

This document consists of **8** printed pages and **1** Insert.

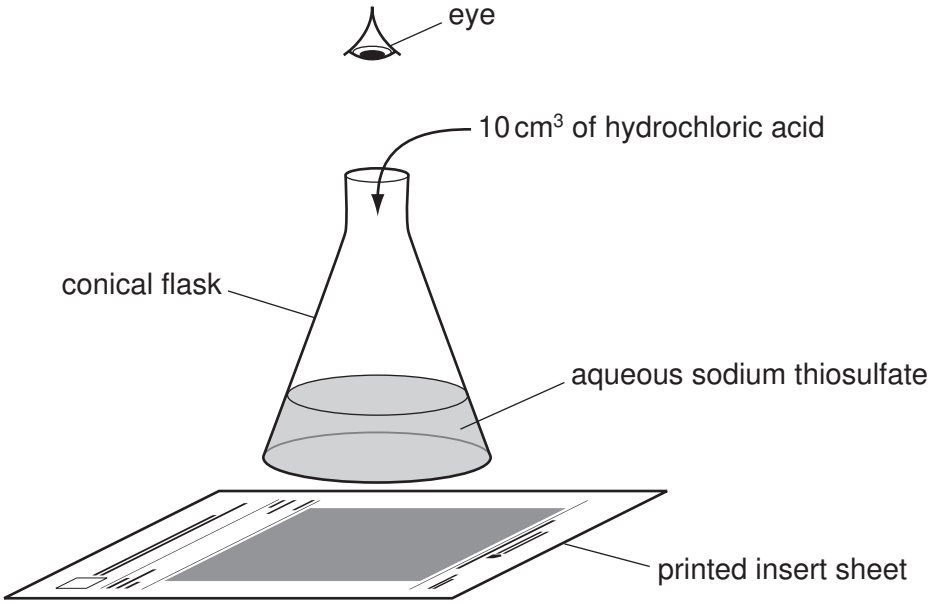
UNIVERSITY of CAMBRIDGE International Examinations

[Turn over

For Examiner's Use

1 You are going to investigate the effect of temperature on the speed of reaction between hydrochloric acid and aqueous sodium thiosulfate. When these chemicals react they form a precipitate, which makes the solution go cloudy. The formation of this precipitate can be used to show how fast the reaction proceeds.

Read all the instructions below carefully before starting the experiments.



You are going to carry out five experiments.

Experiment 1

Using the large measuring cylinder pour 50 cm^3 of aqueous sodium thiosulfate into the conical flask. Measure the temperature of the solution and record it in the table. Place the conical flask on the printed insert provided.
Place 10 cm^3 of the hydrochloric acid provided into the small measuring cylinder. Add the acid to the liquid in the flask and immediately start your timer and shake the flask. Record in the table of results the time taken for the printed words to disappear from view. Measure and record the final temperature of the liquid.
Wash out the flask **thoroughly** with water and rinse with distilled water.

Experiment 2

Pour 50 cm^3 of aqueous sodium thiosulfate into the conical flask. Heat the solution gently until the temperature is about 30 °C. Remove the flask from the heat, measure the temperature of the solution and record it in the table.
Place 10 cm^3 of hydrochloric acid into the small measuring cylinder and repeat Experiment 1.
Measure and record the final temperature of the liquid.
Wash out the flask **thoroughly** with water and rinse with distilled water.

Experiment 3

Repeat Experiment 2, this time heating the sodium thiosulfate solution to about 40 °C before adding the hydrochloric acid.
Measure the temperatures and record them in the table.

Experiment 4

Repeat Experiment 2, this time heating the sodium thiosulfate solution to about 50 °C before adding the hydrochloric acid.
Measure and record the temperatures in the table.

Experiment 5

Repeat Experiment 2, this time heating the sodium thiosulfate solution to about 60 °C before adding the hydrochloric acid.
Measure and record the temperatures in the table.

Complete the table of results.

Table of results

experiment number	initial temperature of solution / °C	final temperature of solution / °C	average temperature / °C	time for printed words to disappear / s
1				
2				
3				
4				
5				

[5]

[Turn over

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

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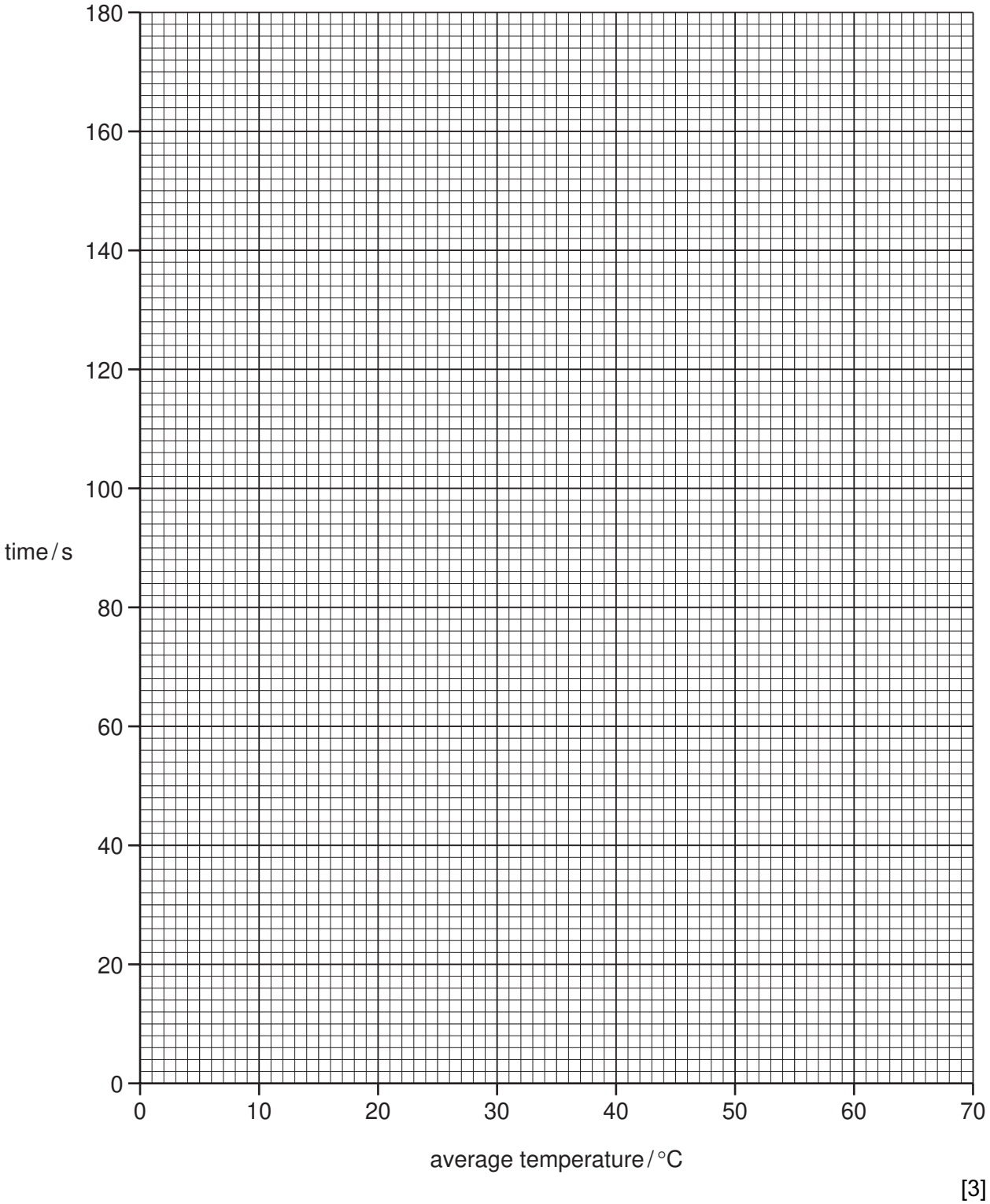

[3]

For Examiner's Use

(b) Describe the appearance of the solution in the conical flask at the end of each experiment.

.....

[1]

(c) (i) In which experiment was the speed of reaction greatest?

.....

[1]

(ii) Explain why the speed was greatest in this experiment.

.....

.....

.....

[3]

(d) Why is the same volume of sodium thiosulfate and the same volume of hydrochloric acid used in each experiment?

.....

.....

[1]

(e) (i) From your graph deduce the time for the printed words to disappear if Experiment 2 was repeated at 70 °C.
Show clearly on the grid how you worked out your answer.

.....

[3]

(ii) Sketch on the grid the curve you would expect if all the experiments were repeated using 50 cm^3 of more concentrated sodium thiosulfate solution. [1]

(f) Explain one change that could be made to the experimental **method** to obtain more accurate results.

change .....

explanation .....

[2]

[Total:20]

[Turn over

2 You are provided with two solids, solid **S** and solid **V**.
Carry out the following tests on **S** and **V**.
Record all your observations in the table.
Do not write any conclusions in the table.

For Examiner's Use

tests	observations
<u>tests on solid **S**</u> **(a)** Describe the appearance of solid **S**.	.....
(b) Place half of solid **S** in a test-tube. Add about 2 cm^3 of hydrogen peroxide and shake the tube. After 1 minute insert a glowing splint into the tube.	....[2]
(c) Add the rest of solid **S** to about 5cm^3 of dilute sulfuric acid in a **boiling tube**. Heat the solution **carefully** to boiling point. Place the tube and contents in a test-tube rack. Leave to stand for 1 minute. Decant off the liquid into another test-tube and add an equal volume of distilled water to the tube. Using clean test-tubes, divide the solution into 3 equal portions.	colour of solution .....[1]
(i) Add several drops of aqueous sodium hydroxide to the first portion of the solution and shake the tube. Now add excess sodium hydroxide to the tube. Heat the contents of the tube gently.	....[2] .....[1]
(ii) To the second portion of the solution add 1 cm^3 of aqueous ammonia solution. Now add excess ammonia solution to the tube.	.....[2] ....[2]
(iii) To the third portion of solution add about 1 cm^3 of dilute hydrochloric acid followed by about 1 cm^3 of barium chloride solution.	.....[2]

tests	observations
<u>tests on solid **V**</u> **(d)** Describe the appearance of solid **V**.	.....[1]
(e) Place half of solid **V** in a test-tube. Add about $2cm^3$ of hydrogen peroxide to the test-tube. Test the gas with a glowing splint.	....[2]

For Examiner's Use

(f) **(i)** Compare the reaction of solid **S** and solid **V** with hydrogen peroxide.

..... [1]

(ii) Identify the gas given off in test **(e)**.

..... [1]

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

.....

.....

..... [2]

(h) What conclusions can you draw about solid **V**?

.....

..... [1]

[Total: 20]

NOTES FOR USE IN QUALITATIVE ANALYSIS

Test for anions

anion	*test*	*test result*
carbonate (CO_3^{2-})	add dilute acid	effervescence, carbon dioxide produced
chloride (Cl^-) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
iodide (I^-) [in solution]	acidify with dilute nitric acid, then add aqueous lead(II) nitrate	yellow ppt.
nitrate (NO_3^-) [in solution]	add aqueous sodium hydroxide then aluminium foil; warm carefully	ammonia produced
sulfate (SO_4^{2-}) [in solution]	acidify with dilute nitric acid, then aqueous barium nitrate	white ppt.

Test for aqueous cations

cation	*effect of aqueous sodium hydroxide*	*effect of aqueous ammonia*
aluminium (Al^{3+})	white ppt., soluble in excess giving a colourless solution	white ppt., insoluble in excess
ammonium (NH_4^+)	ammonia produced on warming	-
calcium (Ca^{2+})	white ppt., insoluble in excess	no ppt., or very slight white ppt.
copper(Cu^{2+})	light blue ppt., insoluble in excess	light blue ppt., soluble in excess giving a dark blue solution
iron(II) (Fe^{2+})	green ppt., insoluble in excess	green ppt., insoluble in excess
iron(III) (Fe^{3+})	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess
zinc (Zn^{2+})	white ppt., soluble in excess giving a colourless solution	white ppt., soluble in excess giving a colourless solution

Test for gases

gas	*test and test results*
ammonia (NH_3)	turns damp red litmus paper blue
carbon dioxide (CO_2)	turns limewater milky
chlorine (Cl_2)	bleaches damp litmus paper
hydrogen (H_2)	“pops” with a lighted splint
oxygen (O_2)	relights a glowing splint