UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

CHEMISTRY **0620/06**

Paper 6 Alternative to Practical **May/June 2009**

1 hour

Candidates answer on the Question Paper.

No additional materials are required.

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.

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	
3	
4	
5	
6	
Total	

This document consists of **12** printed pages and **4** blank pages.

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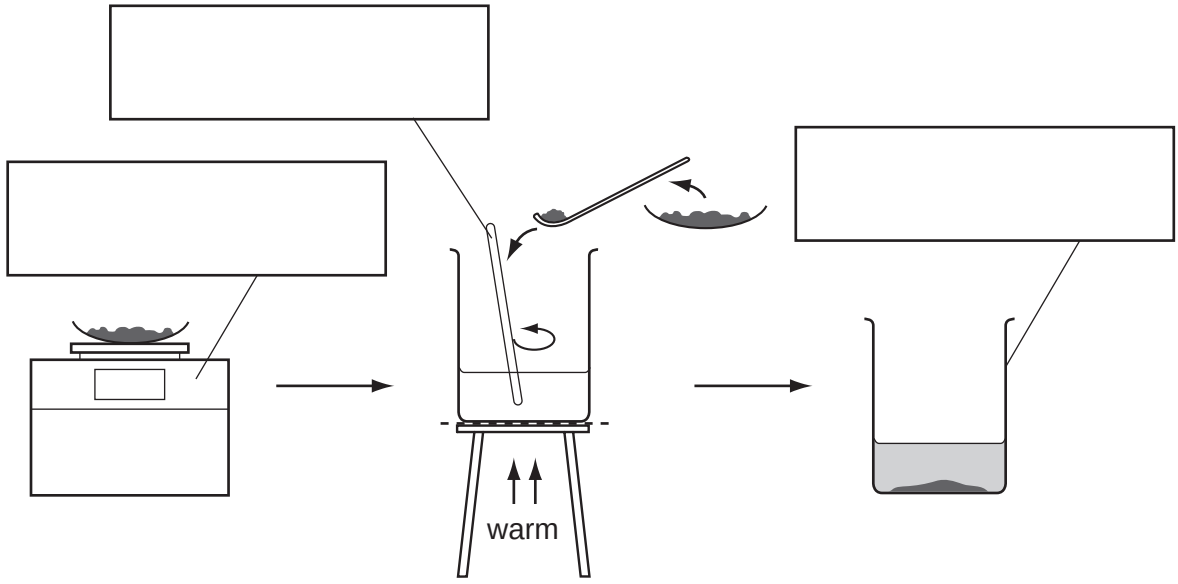
1 A student reacted nitric acid with magnesium oxide to prepare magnesium nitrate. The diagram shows the procedure followed in three stages.



1
magnesium oxide weighed

2
magnesium oxide added until all the nitric acid reacted

3
mixture allowed to cool

(a) Complete the boxes to identify the pieces of apparatus labelled. [3]

(b) **(i)** What term is used to describe the unreacted magnesium oxide?

..... [1]

(ii) What method is used to remove the unreacted magnesium oxide after stage 3?

..... [1]

(c) Describe how crystals of magnesium nitrate could be quickly obtained from the solution.

.....

..... [2]

[Total: 7]

For Examiner's Use

2 An experiment was carried out to measure the temperature changes during the neutralisation of sodium hydroxide solution with dilute hydrochloric acid. Both solutions were allowed to stand in the laboratory for about 30 minutes.

25 cm^3 of sodium hydroxide solution was added to a polystyrene beaker and the temperature was measured. 10 cm^3 of hydrochloric acid was added to the beaker and the highest temperature reached measured.

The experiment was repeated using different volumes of acid.

(a) Why were the solutions left to stand for about 30 minutes before the experiments?

.....

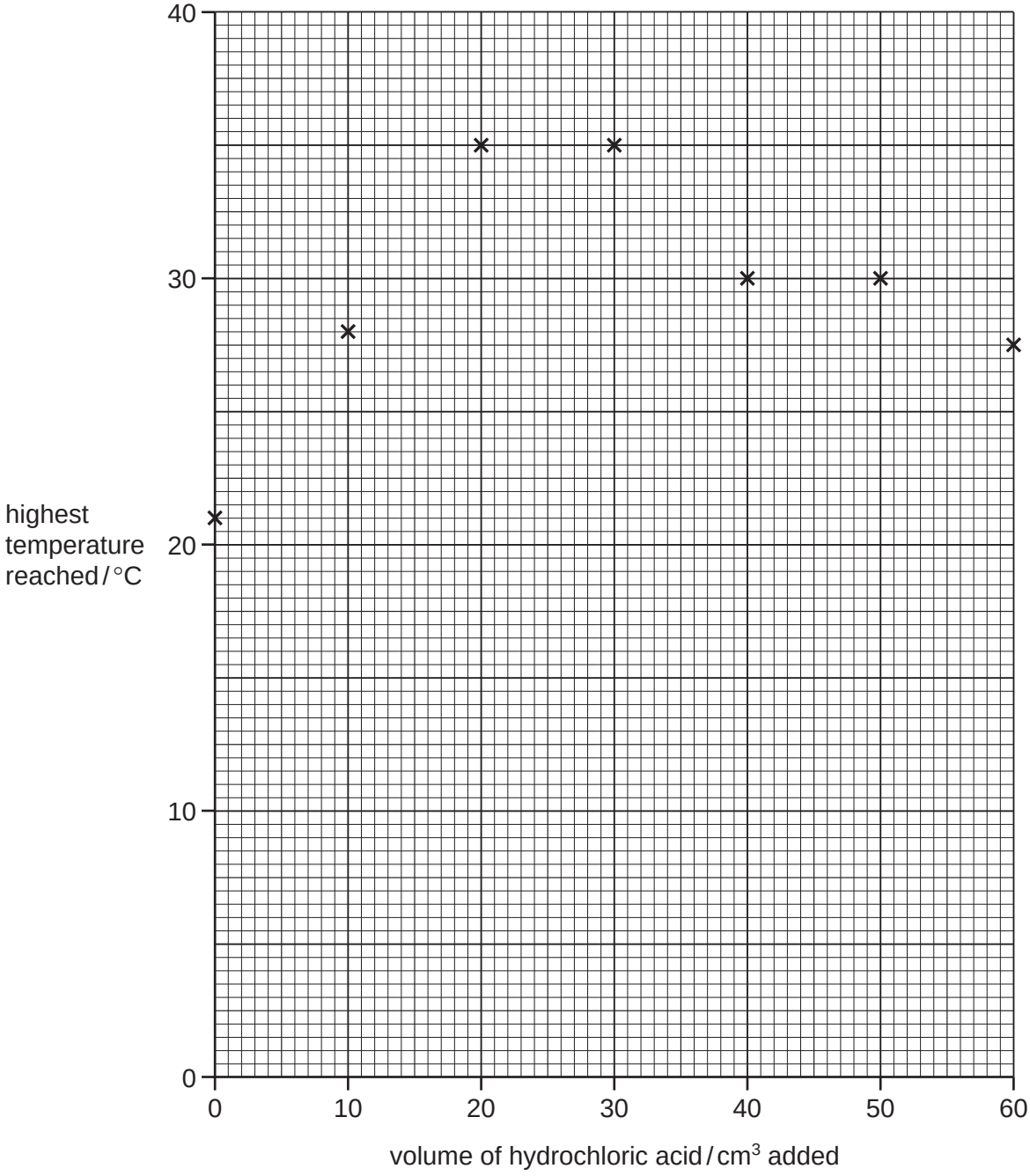
[1]

(b) Why was a polystyrene beaker used instead of a glass beaker?

.....

[1]

The results of the experiments are shown plotted on the grid below.



For Examiner's Use

(c) What type of chemical reaction occurs when sodium hydroxide is neutralised by hydrochloric acid?

.....

[1]

(d) **(i)** Which point appears to be inaccurate?

.....

[1]

(ii) Draw **two** straight lines through the points and extend them until they cross. [2]

(iii) What volume of hydrochloric acid was needed to neutralise 25 cm^3 of the sodium hydroxide solution?

.....

[2]

[Total: 8]

For Examiner's Use

3 Describe a chemical test to distinguish between each of the following pairs of substances. An example is given.

Example: hydrogen and carbon dioxide

test lighted splint

result with hydrogen gives a pop

result with carbon dioxide splint is extinguished

(a) zinc carbonate and zinc chloride

test .....

result with zinc carbonate .....

result with zinc chloride ..... [2]

(b) ammonia and chlorine

test .....

result with ammonia .....

result with chlorine ..... [3]

(c) aqueous iron(II) sulfate and aqueous iron(III) sulfate

test .....

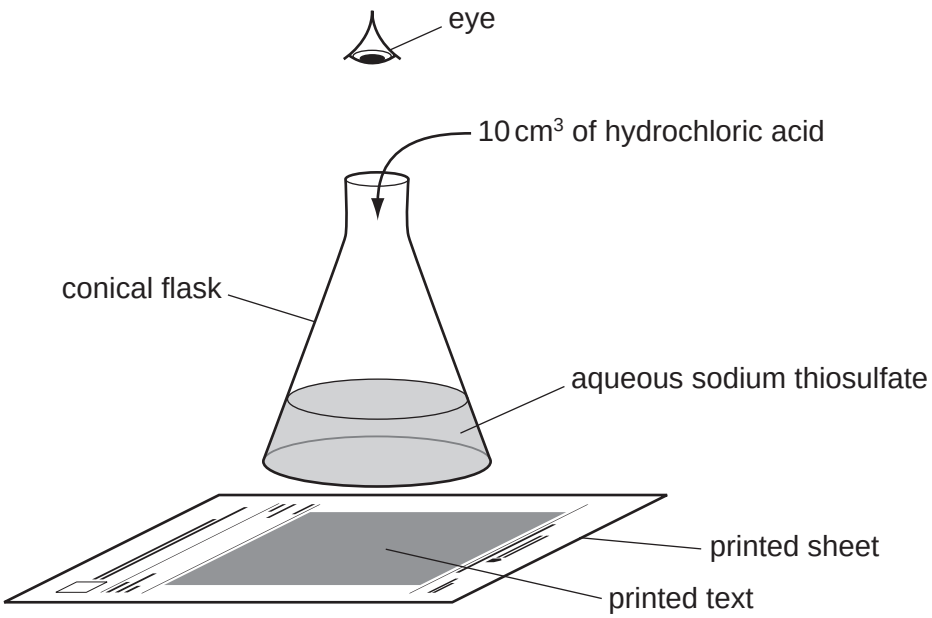
result with aqueous iron(II) sulfate .....

result with aqueous iron(III) sulfate ..... [3]

[Total: 8]

For Examiner's Use

4 A student investigated 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, using the set up shown below.



Five experiments were carried out.

Experiment 1

By using a measuring cylinder 50 cm^3 of aqueous sodium thiosulfate was poured into a flask. The temperature of the solution was measured. The conical flask was placed on the printed text.
10 cm^3 of hydrochloric acid was added to the flask and the timer started. The time taken for the printed text to disappear from view was recorded in the table. The final temperature of the mixture was measured.

Experiment 2

50 cm^3 of aqueous sodium thiosulfate was poured into a conical flask. The solution was heated until the temperature was about 30 ºC. The temperature of the solution was measured.
10 cm^3 of hydrochloric acid was added to the flask and *Experiment 1* was repeated.
The final temperature of the liquid was measured.

Experiment 3

Experiment 2 was repeated but the sodium thiosulfate solution was heated to about 40 ºC before adding the hydrochloric acid.
The initial and final temperatures were measured.

Experiment 4

Experiment 2 was repeated but the sodium thiosulfate solution was heated to about 50 ºC before adding the hydrochloric acid.
The initial and final temperatures were measured.

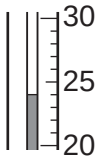
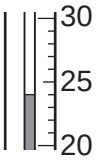
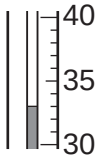
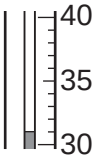
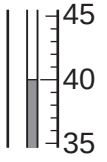
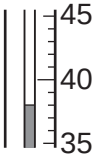
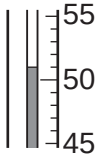
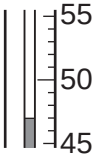
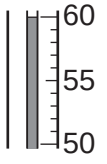
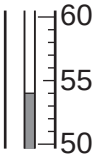
Experiment 5

Experiment 2 was repeated but the sodium thiosulfate solution was heated to about 60 ºC before adding the hydrochloric acid.
The initial and final temperatures were measured.

Use the thermometer diagrams to record all of the initial and final temperatures in the table.

(a) Complete the table of results to show the average temperatures.

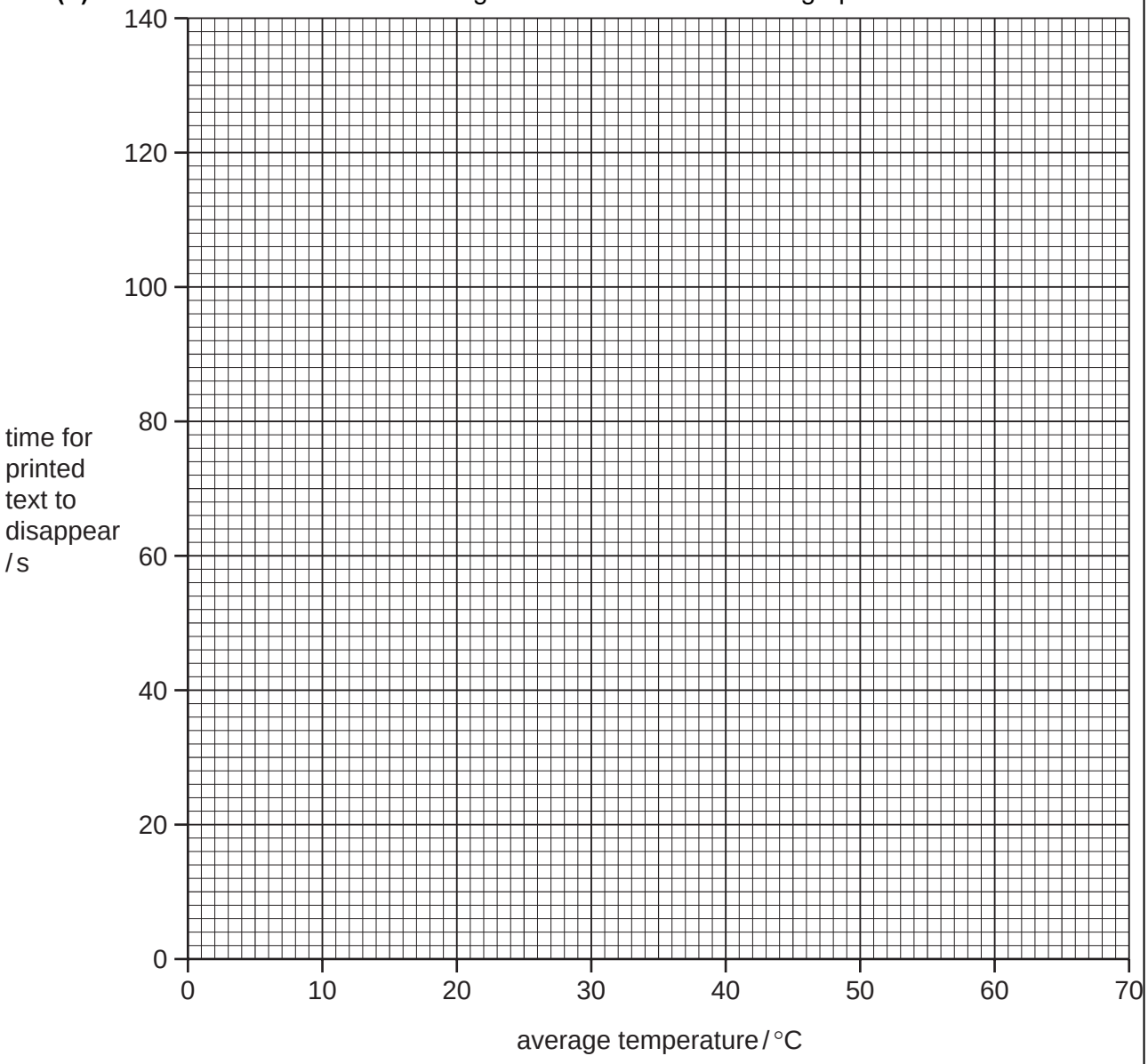
Table of results

experiment	thermometer diagram	initial temperature /°C	thermometer diagram	final temperature /°C	average temperature /°C	time for printed text to disappear /s
1						130
2						79
3						55
4						33
5						26

[5]

For Examiner's Use

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



[4]

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

.....

[1]

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

.....

.....

.....

[3]

For Examiner's Use

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

.....

..... [1]

(e) (i) From your graph, deduce the time for the printed text to disappear if *Experiment* 2 was to be repeated at 70 ºC.

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]

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Question 5 starts on page 12

For Examiner's Use

5 Two solids, **S** and **V**, were analysed. **S** was copper(II) oxide.
The tests on the solids, and some of the observations are in the following table.
Complete the observations in the table. Do not write any conclusions in the table.

test	observation
<u>tests on solid **S**</u> **(a)** Appearance of solid **S**	black solid
(b) Hydrogen peroxide was added to solid **S** in a test-tube.	slow effervescence
A glowing splint was inserted into the tube.	splint relit
(c) Dilute sulfuric acid was added to solid **S** in a test-tube. The mixture was heated to boiling point.	blue solution formed
The solution was divided into three equal portions into test-tubes.	
(i) To the first portion of the solution, excess sodium hydroxide was added.	..... [1]
(ii) To the second portion of the solution, about 1 cm^3 of aqueous ammonia solution was added.	..... [2]
Excess ammonia solution was then added.	..... [2]
(iii) To the third portion of the solution, dilute hydrochloric acid was added followed by barium chloride solution.	..... [2]

test	observation
<u>tests on solid **V**</u> **(d)** Appearance of solid **V**	black solid
(e) Hydrogen peroxide was added to solid **V** in a test-tube.	rapid effervescence
A glowing splint was inserted into the tube.	splint relit

For Examiner's Use

(f) **(i)** Compare the reactivity 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 **V**?

.....

.....

..... [2]

[Total: 11]

For Examiner's Use

6 Acid base indicators

Indicators are used to identify acids and bases.
Indicators can be obtained from berries and other fruits.

(a) Plan an experiment to obtain an aqueous solution of an indicator from some berries.

.....

.....

.....

.....

.....

.....

..... [3]

(b) Plan an experiment to use the indicator solution to show that it is an effective indicator.

.....

.....

.....

.....

.....

.....

..... [3]

[Total: 6]

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