Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education (9–1)

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

9567793711

CHEMISTRY **0971/61**

Paper 6 Alternative to Practical **May/June 2018**

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 an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

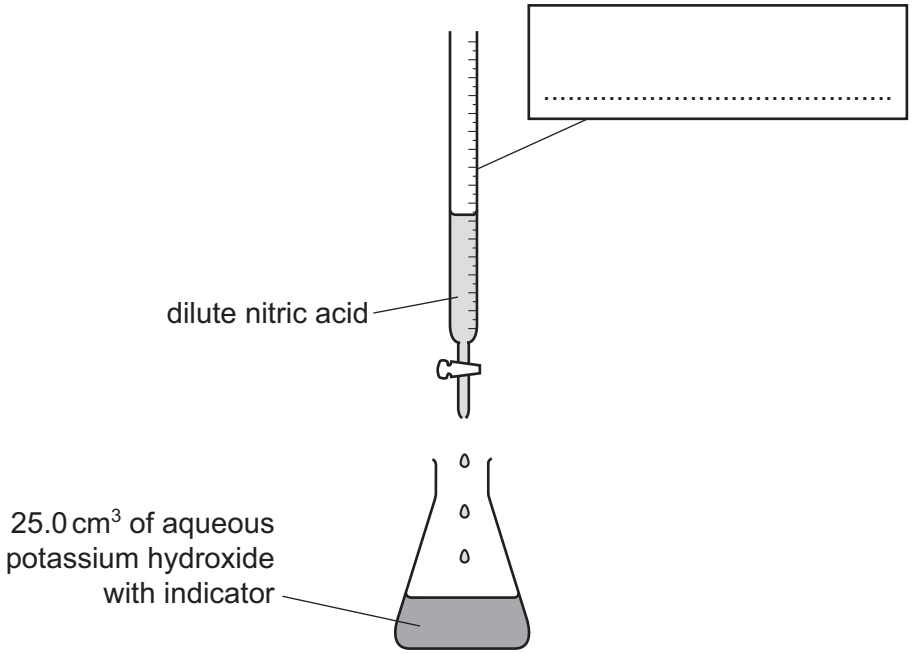
Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

This document consists of **11** printed pages and **1** blank page.

CAMBRIDGE International Examinations

1 The volume of dilute nitric acid that reacts with 25.0 cm^3 of aqueous potassium hydroxide can be found by titration using the apparatus shown.



(a) Complete the box to name the apparatus. [1]

(b) Name a suitable indicator that could be used.

..... [1]

A student did the titration four times and recorded the following results.

titration number	volume of dilute nitric acid / cm^3
1	18.1
2	18.9
3	18.3
4	18.2

(c) (i) Which **one** of the results is anomalous?

..... [1]

(ii) Suggest what might have caused this result to be anomalous.

..... [1]

(iii) Use the **other** results to calculate the average volume of dilute nitric acid that reacted with the aqueous potassium hydroxide.

..... [2]

(d) The equation for the reaction taking place in the titration is shown.

$$HNO_3 + KOH \rightarrow KNO_3 + H_2O$$

The student concluded that the aqueous potassium hydroxide was more concentrated than the dilute nitric acid.

Explain whether or not the student's conclusion was correct.

.....

.....

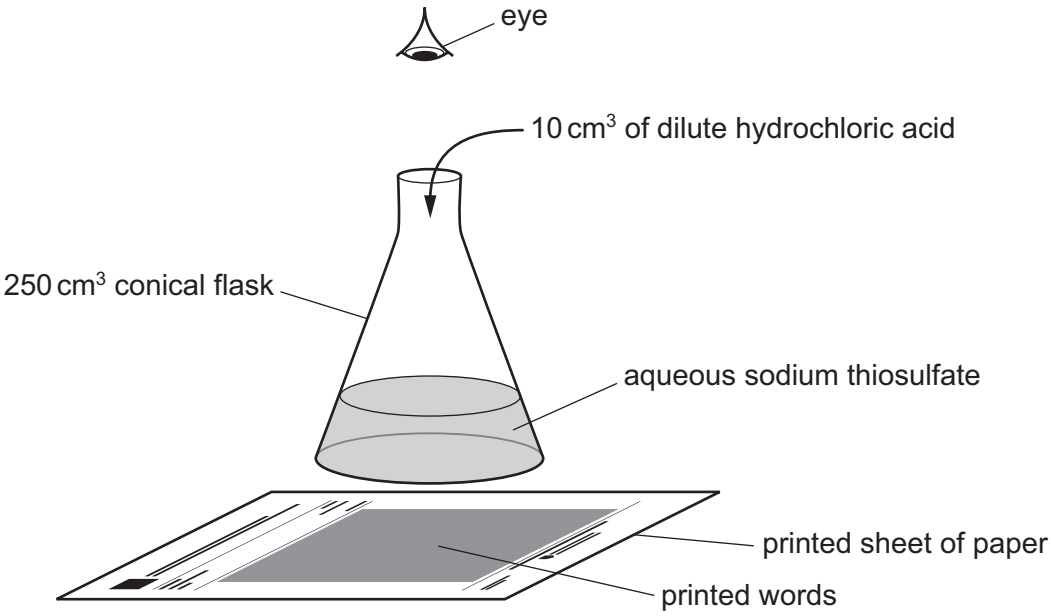
..... [2]

[Total: 8]

[Turn over

2 A student investigated the rate of reaction between dilute 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.

Five experiments were done using the apparatus shown.



Experiment 1

- A large measuring cylinder was used to pour 50 cm^3 of aqueous sodium thiosulfate into a 250 cm^3 conical flask. The conical flask was placed on a printed sheet of paper.
- 10 cm^3 of dilute hydrochloric acid was added to the solution in the conical flask. A timer was started immediately and the mixture was swirled.
- The time taken for the printed words to disappear from view was measured.

Experiment 2

- The large measuring cylinder was used to pour 40 cm^3 of aqueous sodium thiosulfate into a conical flask, followed by 10 cm^3 of distilled water. The conical flask was placed on the printed sheet of paper.
- 10 cm^3 of dilute hydrochloric acid was added to the solution in the conical flask. The timer was started immediately and the mixture was swirled.
- The time taken for the printed words to disappear from view was measured.

Experiment 3

- Experiment 2 was repeated but using 35 cm^3 of aqueous sodium thiosulfate and 15 cm^3 of distilled water.

Experiment 4

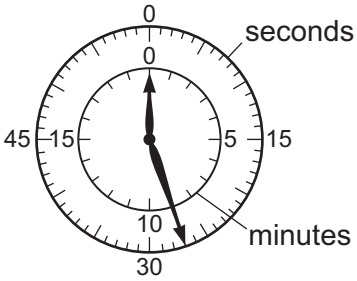
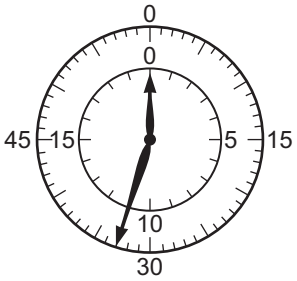
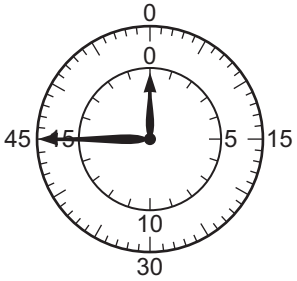
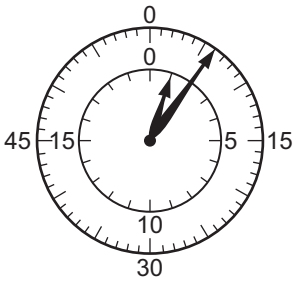
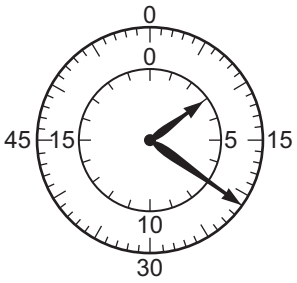
- Experiment 2 was repeated but using 30 cm^3 of aqueous sodium thiosulfate and 20 cm^3 of distilled water.

Experiment 5

- Experiment 2 was repeated but using 10 cm^3 of aqueous sodium thiosulfate and 40 cm^3 of distilled water.

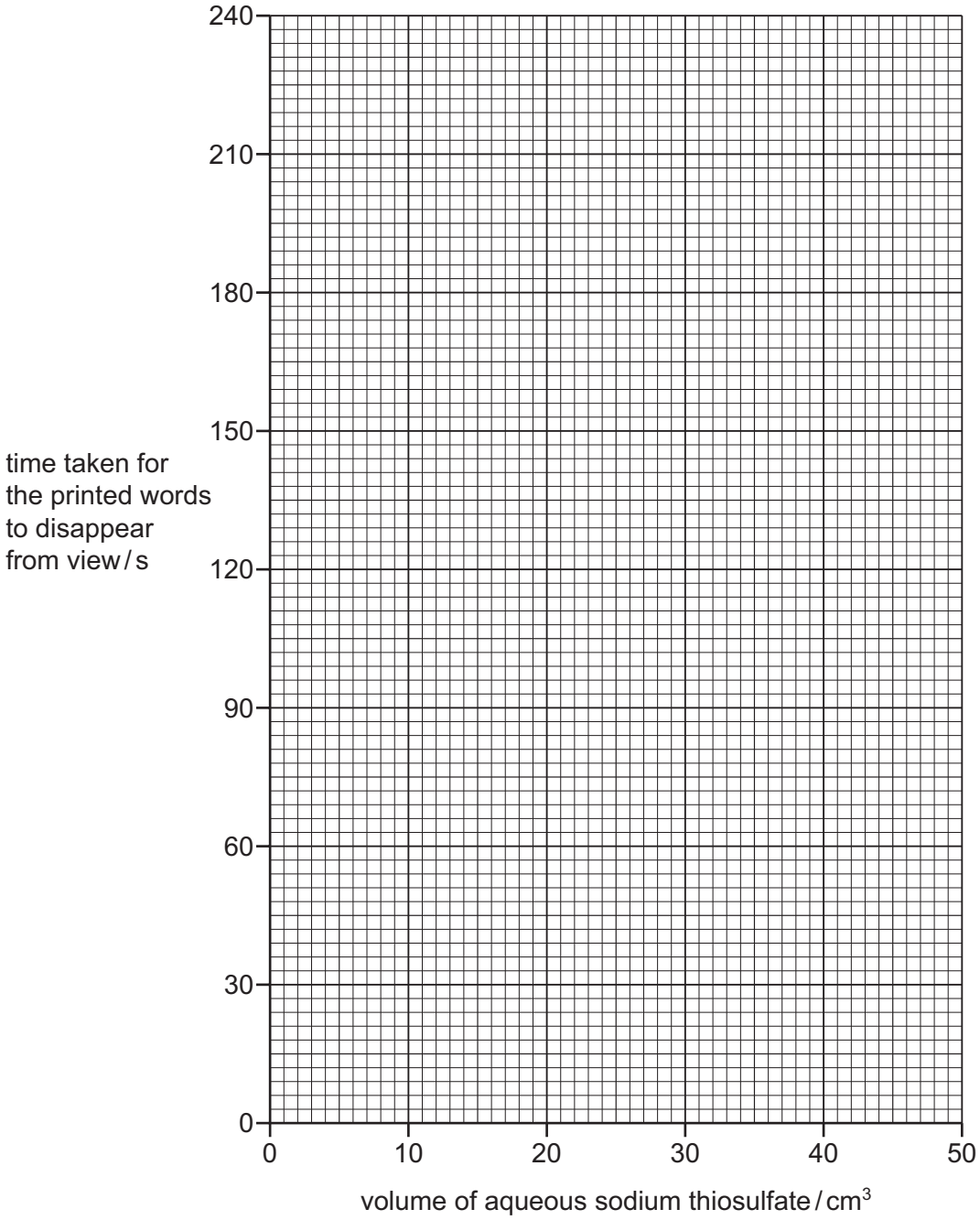
[Turn over

(a) Record the volumes of distilled water used in the table. Use the stop-clock diagrams to record the results in the table.

experiment	volume of aqueous sodium thiosulfate / cm^3	volume of distilled water / cm^3	stop-clock diagram	time taken for the printed words to disappear from view / s
1	50			
2	40			
3	35			
4	30			
5	10			

[3]

(b) Plot the results from Experiments 1–5 on the grid. Draw a smooth line graph.



[3]

(c) (i) **From your graph**, deduce the time taken for the printed words to disappear from view if Experiment 2 were repeated using 20 cm^3 of aqueous sodium thiosulfate and 30 cm^3 of distilled water.

Show clearly **on the grid** how you worked out your answer.

..... s [2]

(ii) The rate of reaction can be calculated using the equation shown.

$$\text{rate of reaction} = \frac{1}{\text{time taken}}$$

Calculate the rate of reaction using your answer from **(c)(i)**.

..... [1]

(d) (i) In which experiment, 1, 2, 3, 4 or 5, was the rate of reaction greatest?

..... [1]

(ii) Explain, in terms of particles, why the rate of reaction was greatest in this experiment.

.....

.....

..... [2]

(e) Give the name of a more accurate piece of apparatus for measuring volumes than a measuring cylinder.

..... [1]

(f) Suggest the effect on the results of using a 100 cm^3 conical flask instead of a 250 cm^3 conical flask. Explain your answer.

.....

..... [2]

(g) Sketch **on the grid** the graph you would expect if all of the experiments were repeated at a **lower** temperature. Clearly label your graph. [1]

[Total: 16]

3 Two substances, solution **A** and solid **B**, were analysed.

tests on solution A

Some of the tests and observations are shown.

tests on solution **A**	observations
Solution **A** was divided into three equal portions in three test-tubes. **test 1** The pH of the first portion of solution **A** was tested.	pH = 1
test 2 Magnesium ribbon was added to the second portion of solution **A**. The gas produced was tested.	effervescence gas 'popped' with a lighted splint
test 3 Dilute nitric acid and aqueous barium nitrate were added to the third portion of solution **A**.	white precipitate formed

(a) Identify the gas produced in **test 2**.

..... [1]

(b) Identify solution **A**.

..... [2]

[Turn over

tests on solid B

Solid **B** was zinc carbonate.

Complete the expected observations.

(c) Dilute nitric acid was added to solid **B**. The gas produced was tested.

observations .....

..... [2]

The zinc nitrate solution formed in the test in **(c)** was divided into two portions in two test-tubes.

(d) (i) Drops of aqueous sodium hydroxide were added to the first portion of the zinc nitrate solution.

observations ..... [2]

(ii) An excess of aqueous sodium hydroxide was then added to the mixture.

observations ..... [1]

(e) (i) Drops of aqueous ammonia were added to the second portion of the zinc nitrate solution.

observations ..... [1]

(ii) An excess of aqueous ammonia was then added to the mixture.

observations ..... [1]

[Total: 10]

4 Potassium chloride is a salt that dissolves in water.
The solubility of a salt is the mass in grams of the salt that dissolves in 100 cm^3 of water at a particular temperature.

Plan an investigation to determine the solubility of potassium chloride in water at 40 °C.

You are provided with potassium chloride and common laboratory apparatus.

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..... [6]

[Total: 6]

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