Centre Number	Candidate Number	Name

CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CHEMISTRY **0620/06**

Paper 6 Alternative to Practical

May/June 2003

1 hour

Candidates answer on the Question Paper.
No additional materials required.

READ THESE INSTRUCTIONS FIRST

Write your name, Centre number and candidate number at the top of this page.
Write in dark blue or black pen in the spaces provided on the Question Paper.
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.
The number of marks is given in brackets [ ] at the end of each question or part question.

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

For Examiner's Use	
1	
2	
3	
4	
5	
6	
TOTAL	

This document consists of **12** printed pages.

University of Cambridge
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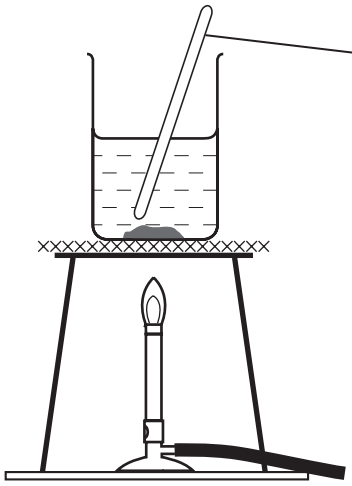
For Examiner's Use

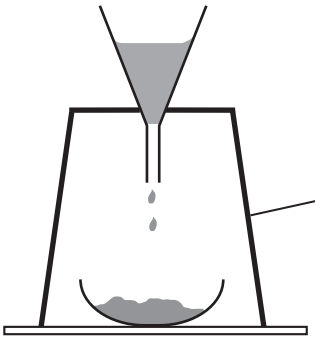
1 Look at the diagrams of common laboratory apparatus.

A

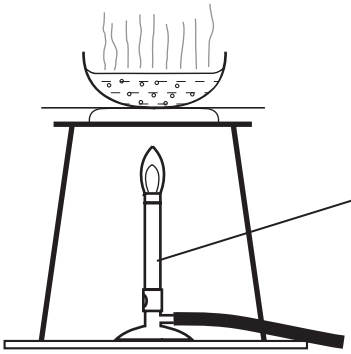
B



C



D



(a) Complete the empty boxes to identify the pieces of apparatus labelled. [4]

(b) What name is given to the separation method in **C**?

.....[1]

(c) Which apparatus would be most suitable to obtain crystals from an aqueous solution of copper(II) sulphate?

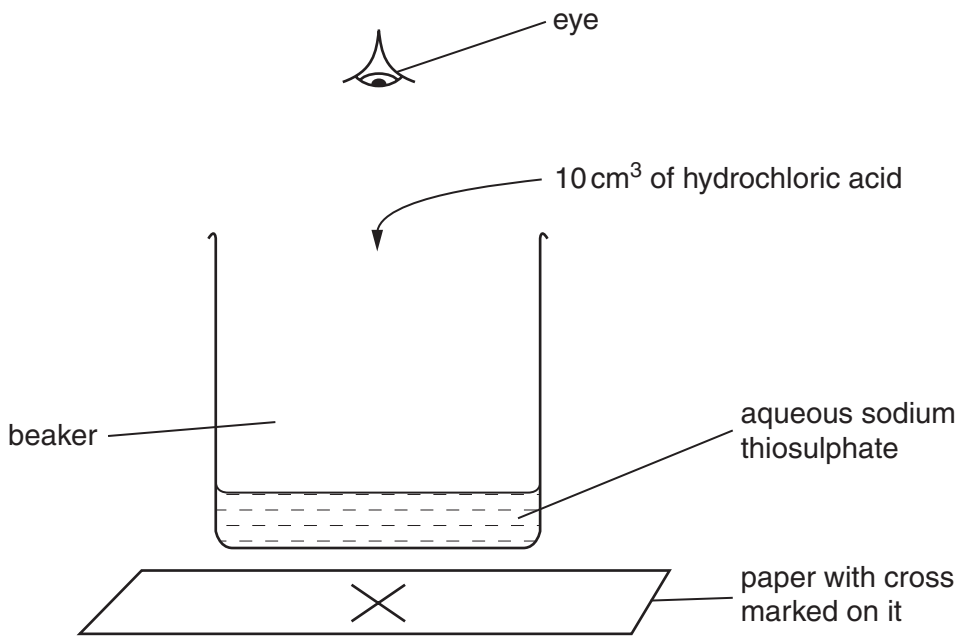
.....[1]

2 A student carried out an experiment to investigate the speed of the reaction between sodium thiosulphate and dilute hydrochloric acid.

$$Na_2S_2O_3 + 2HCl \longrightarrow 2NaCl + S + H_2O + SO_2$$

Experiment 1

By using a measuring cylinder, 50 cm^3 of sodium thiosulphate solution was poured into a 100 cm^3 beaker. The beaker was placed on a cross drawn on a piece of paper. 10 cm^3 of hydrochloric acid was added to the beaker and the timer started.



The time was taken until the cross could not be seen. The time was recorded in the table.

[Turn over

Experiments 2, 3, 4 and 5

Experiment 1 was repeated using different volumes of sodium thiosulphate as shown in the table. All experiments were carried out at 25 °C.

Table of results

Experiment	volume of sodium thiosulphate/cm^3	volume of water/cm^3	time for cross to disappear/s
1	50	0	45
2	40	10	60
3	30	20	80
4	20	30	130
5	10	40	255

(a) Why does the cross on the paper disappear?

.....

.....[2]

(b) Why was the total volume of solution kept constant?

.....

.....[1]

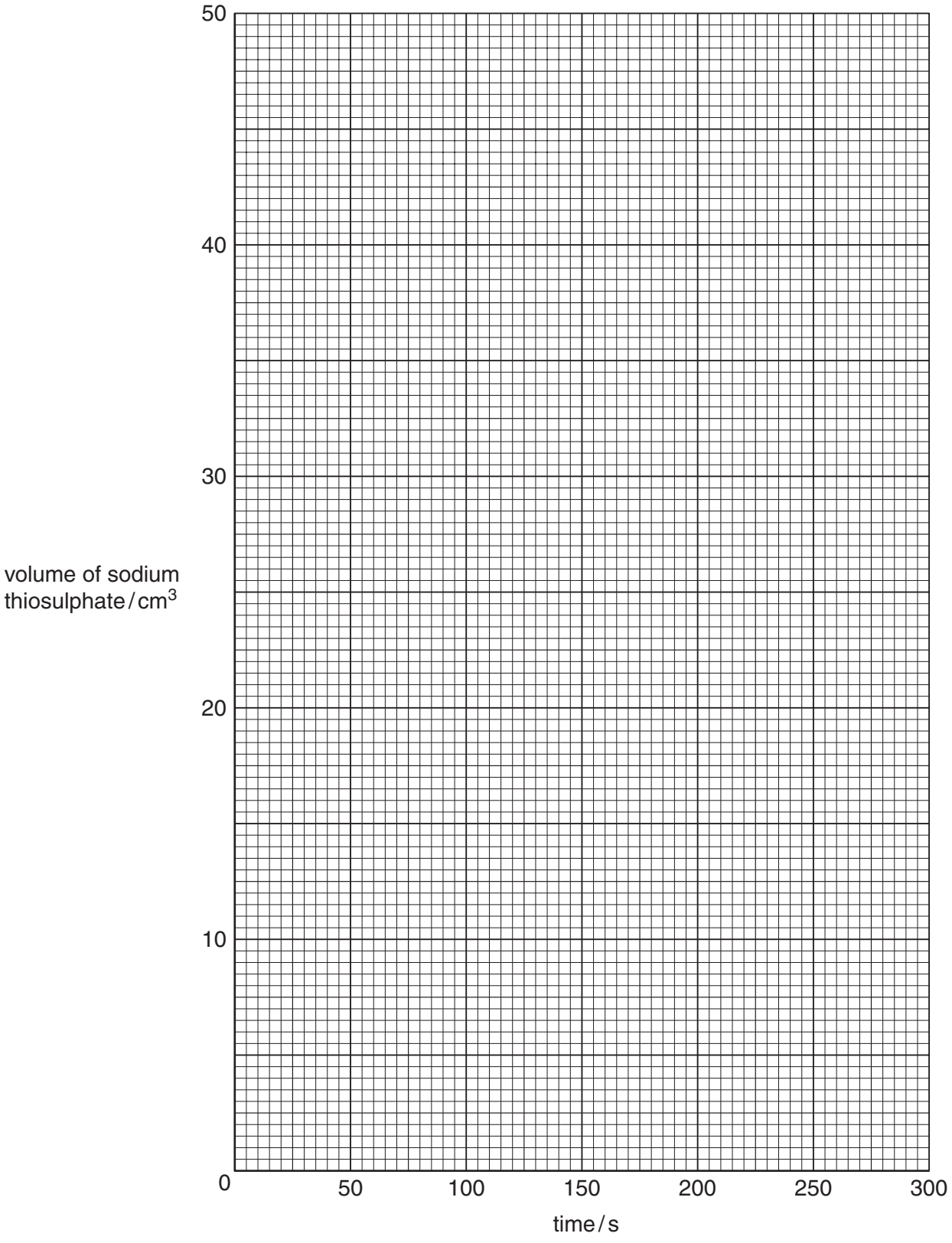
(c) In which order should the water, hydrochloric acid and sodium thiosulphate solution be added to the beaker?

first .....

second .....

last .....[1]

(d) (i) Plot the results on the grid below. Draw a smooth line graph and label it 25 °C. [5]



(ii) Sketch on the grid the graph you would expect if the experiments were repeated at 50 °C. Label this graph. [2]

(e) The experiments were repeated using a 250 cm^3 beaker instead of a 100 cm^3 beaker.

Suggest how the results would differ. Explain your answer.

.....

.....

.....

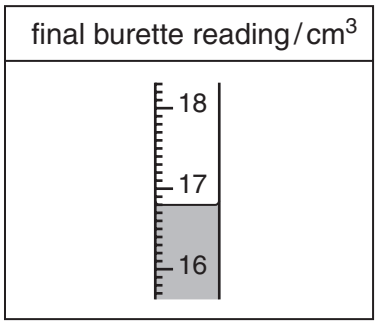
.....[2]

3 A student investigated the redox reaction between potassium iodate(V) and iodide ions. Two experiments were carried out.

Experiment 1

A burette was filled up to the 0.0 cm^3 mark with the solution **A** of sodium thiosulphate. By using a measuring cylinder, a 10 cm^3 sample of the solution **B** of potassium iodate(V) was added into a conical flask. A 10 cm^3 sample of dilute sulphuric acid was added to the flask followed by 20 cm^3 of aqueous potassium iodide.

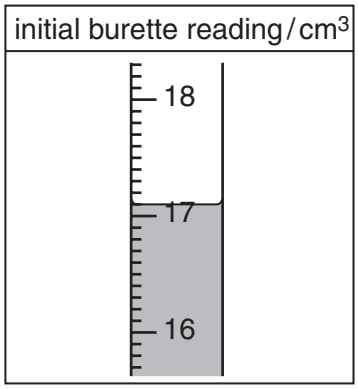
Solution **A** was added slowly to the flask until there was a pale yellow colour in the contents of the flask. Starch solution was then added into the flask and the colour changed to blue-black. Solution **A** was added to the flask until the colour just disappeared. Use the burette diagram to record the volume in the table.



Experiment 2

Experiment 1 was repeated using solution **C** of potassium iodate(V) instead of solution **B**.

Use the burette diagrams to record the volumes in the table and complete the table.



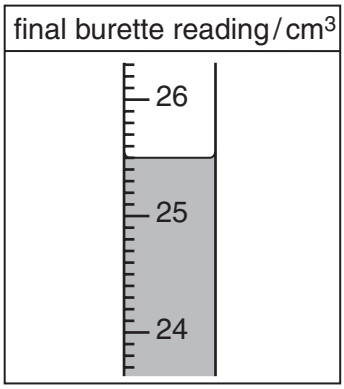


Table of results

Burette readings/cm^3		
	Experiment 1	Experiment 2
Final reading		
Initial reading	0.0	
Difference		

[4]

The reaction of the mixture of potassium iodate(V), sulphuric acid and potassium iodide in the flask produces iodine. Sodium thiosulphate then reacts with the iodine.

(a) (i) In which Experiment was the greatest volume of aqueous sodium thiosulphate used?

.....[1]

(ii) Compare the volumes of sodium thiosulphate used in Experiments 1 and 2.

.....

.....[1]

(iii) Suggest an explanation for the difference in the volumes.

.....

.....[2]

(iv) Predict the volume of solution **A** which would be needed to react completely if Experiment 1 was repeated with 20.0 cm^3 of the solution of potassium iodate. Explain your prediction.

volume of solution **A** .....

explanation .....

.....[3]

(b) Suggest the reason starch solution was added.

.....

.....

.....[2]

4 A mixture of two solid compounds **D** and **E** was analysed. Solid **D** was a zinc salt which is soluble in water. Solid **E** was an insoluble metal carbonate. The tests on the mixture and some of the observations are in the following table.
Complete the observations in the table.

tests	observations
(a) About half of the mixture of **D** and **E** was placed in a test-tube. The mixture was heated	green to black condensation formed
(b) The rest of the mixture of **D** and **E** was added to distilled water in a boiling tube. The contents of the tube were filtered. The filtrate and the residue were kept for the following tests.	
test on residue **(c)** The residue was transferred from the filter paper in to a test-tube. About 3 cm^3 of dilute sulphuric acid was added. The gas was tested with limewater.	....[2]
The solution obtained in **(c)** was divided into two equal portions. **(d)** **(i)** To the first portion was added excess aqueous sodium hydroxide, a little at a time. **(ii)** To the second portion was added excess aqueous ammonia, a little at a time.	pale blue precipitate ....[4]

tests	observations
test on filtrate	
(e) The filtrate from **(b)** was divided into three approximately equal portions.	
(i) To the first portion were added drops of aqueous sodium hydroxide, a little at a time with shaking.	.....
	.....[2]
Excess aqueous sodium hydroxide was added.	.....[1]
(ii) To the second portion was added excess aqueous ammonia a little at a time.	.....
	.....
	.....[3]
(iii) To the third portion were added drops of dilute hydrochloric acid and aqueous barium chloride.	white precipitate

(f) What conclusions can you draw about the identity of solid **D**?

.....

.....[2]

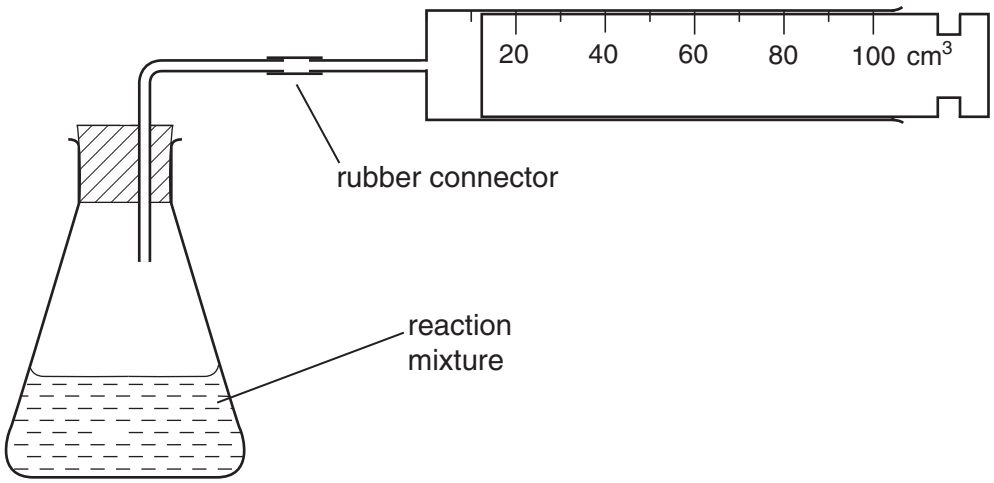
(g) What conclusions can you draw about the identity of the cation in solid **E**?

.....

.....[2]

[Turn over

5 An experiment was carried out using the apparatus below.



By using a measuring cylinder, 20 cm^3 of hydrogen peroxide was placed in the flask and 0.8 g of the catalyst, manganese(IV) oxide was added. The bung was replaced and the gas collected was measured at 1 minute intervals. The results were plotted on the grid (opposite).

(a) **(i)** Draw a smooth line graph on the grid. [1]

(ii) Which result appears to be inaccurate? Why have you chosen this result?

.....

.....[2]

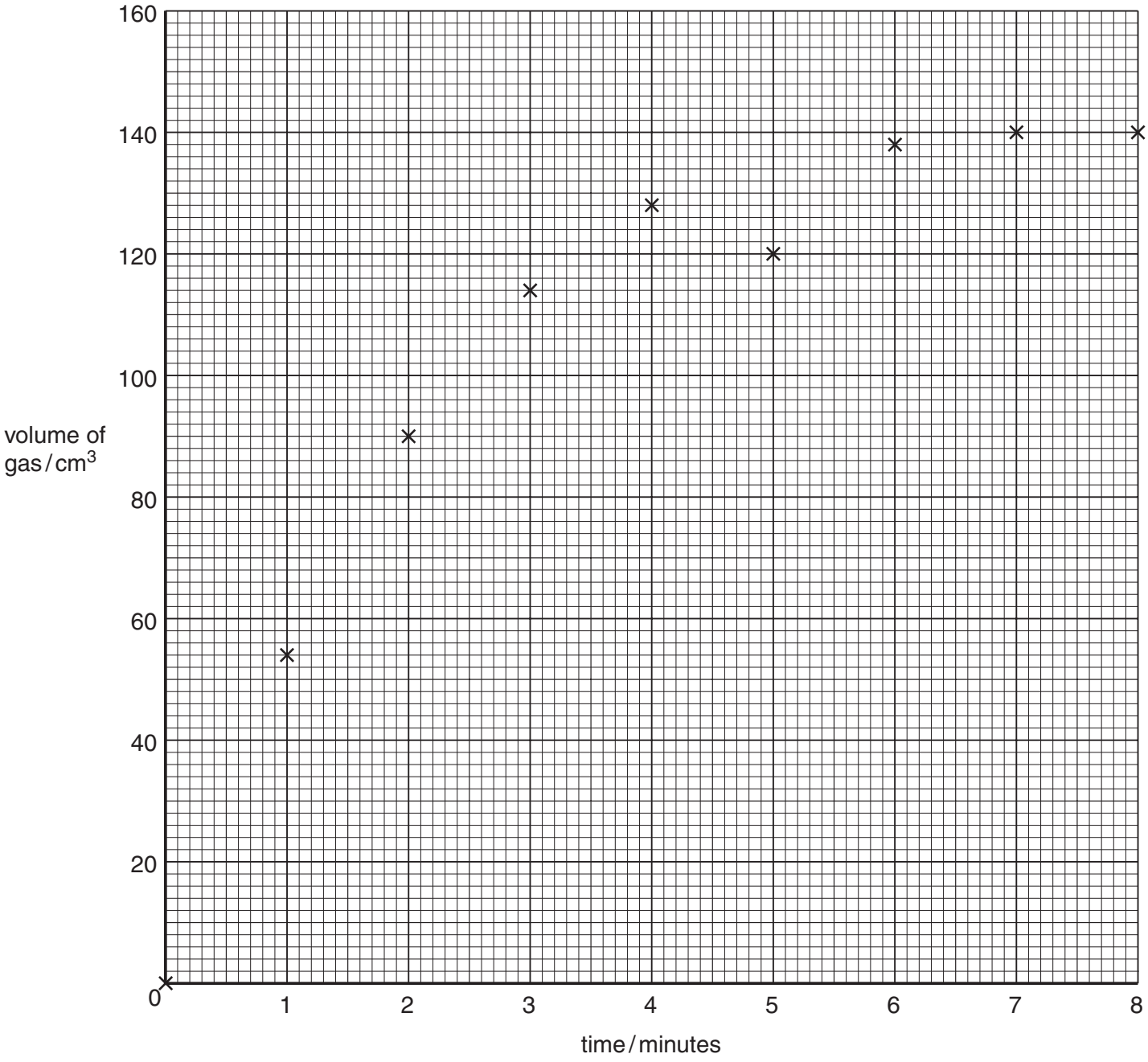
(b) What mass of manganese(IV) oxide would remain at the end of the experiment?

.....[1]

(c) What would be the effect of using a rubber connector with a hole in it?

.....

.....[2]



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6 Beach sand is a mixture of sand and broken shells (calcium carbonate). Calcium carbonate reacts with dilute hydrochloric acid to form a solution of calcium chloride.

Plan an investigation to find out the percentage of shell material in a given sample of beach sand.

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.....[6]