بسم الله الرحمن الرحيم

مقابل هذا المجهود ارجو منكم الدعاء لي بالمغفرة ولابنائي الهداية والنجاح والتوفيق

أرجو ان يساعد هذا المجهود على مساعدة ابنائنا طلبة ال IGCSE الثانوية البريطانية وتحصيلهم على افضل واحسن واعلى الدرجات انشاء الله.
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ابو احمد

للاستفسار والمساعدة اكتب لي على العنوان البريدي التالي :-
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In the name of god

Pry for me and my sons to success, mitigating and proselyting

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IGCSE

CHEMISTRY

Examination

PAPER

6

Good luck

UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE
INTERNATIONAL EXAMINATIONS

Chemistry O.L

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Centre Number | Candidate Number

Candidate Name ....

0620/6 IGCSE JUNE

CHEMISTRY

PAPER 6 ALTERNATIVE-TO-PRACTICAL

Tuesday 18 MAY 1993 Morning 1 hour

Candidates answer on the question paper.
No additional materials are required.

UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

Instructions to candidates

Write your name and examination number in the spaces provided at the top of this page.

Answer **all** *the questions.*

The intended marks for questions or parts of questions are given in brackets [ ].

This Question Paper consists of 10 printed pages and 2 blank pages.

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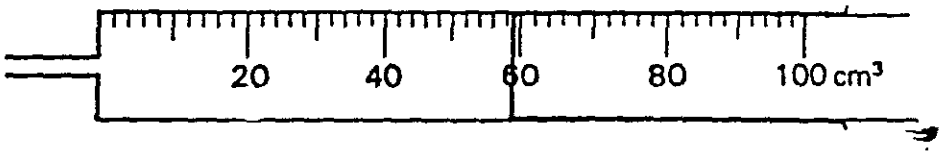
1 What is the volume, to the nearest cm^3, of gas in the syringe below?



..... [1]

2 A large crystal of copper(II) sulphate was placed carefully at the bottom of a beaker of water. After several hours, what would be observed in the beaker?

.....

.....

..... [3]

3 A student was asked to extract and investigate the orange dye from a piece of cloth.

The student planned his method as follows.

1. Collect a piece of the orange cloth, a glass rod, a beaker, a watch glass, 50 cm^3 of aqueous ammonia and eye protection.
2. Place the cloth in the beaker containing the 50 cm^3 of aqueous ammonia and cover with a watch glass.
3. Boil the solution for thirty minutes.
4. *Decant* off the liquid and concentrate it by evaporation in a fume-cupboard until the colour is dark orange.
5. Investigate which colours are present in the orange dye.

(a) Why should the experiment be carried out in a well-ventilated laboratory?

..... [2]

(b) What other safety precautions should the student have taken?

.....

..... [2]

(c) What necessary apparatus was missing in instruction 1?

..... [2]

(d) Suggest the *purpose* of the glass rod.

..... [1]

(e) Explain the term *decant*.

..... [1]

(f) Outline how the student could carry out instruction 5.

.....

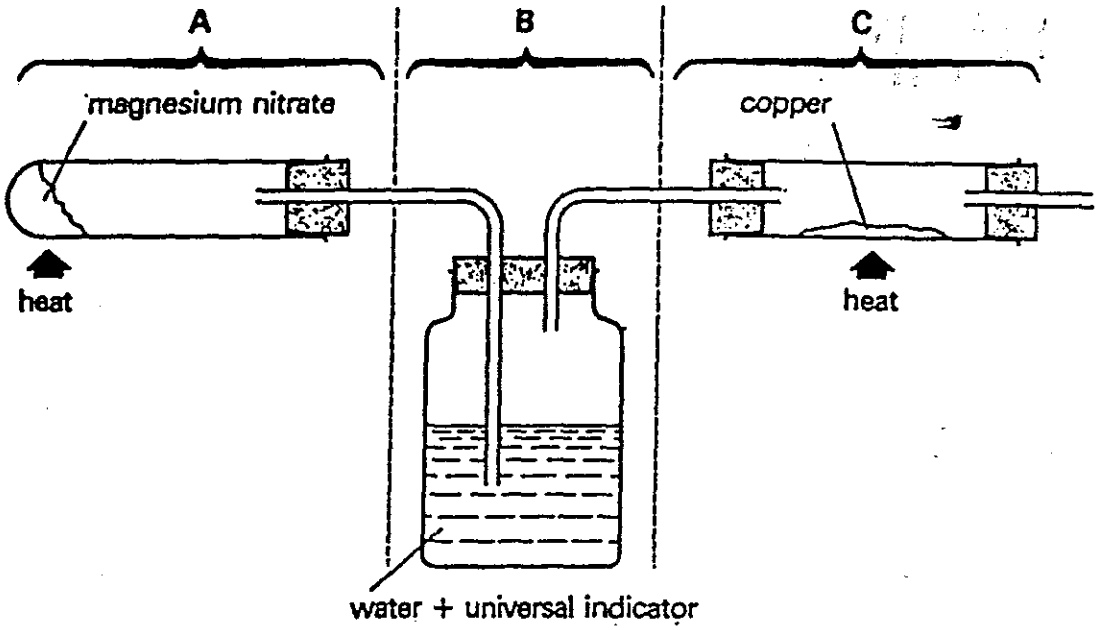
.....

.....

.....

..... [3]

4 Nitrogen dioxide is an acidic gas that is soluble in water. Nitrogen dioxide and oxygen are produced when magnesium nitrate crystals are heated.



(a) What would be observed in Parts A, B and C of the apparatus above?

(i) Part A

.....

(ii) Part B

.....

(iii) Part C

..... [3]

(b) Explain your observations in (a).

(i) Part A

.....

(ii) Part B

.....

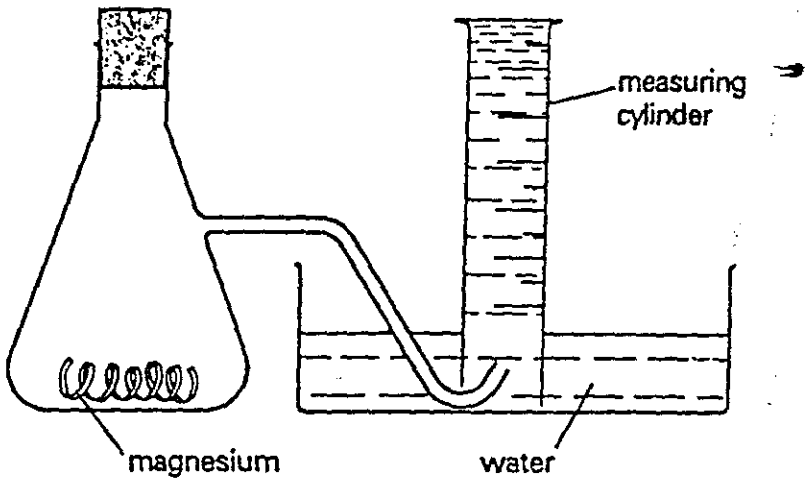
(iii) Part C

..... [3]

5 A student investigated the reaction between magnesium and an aqueous solution of substance A.

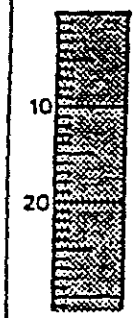
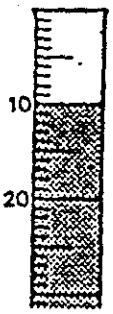
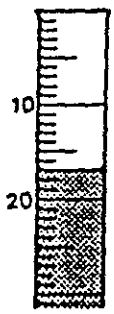
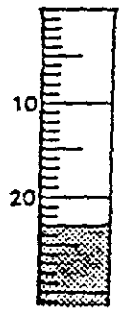
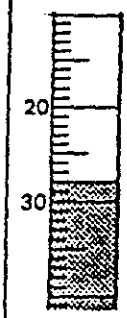
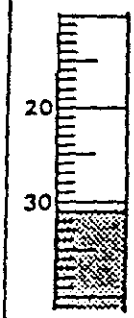
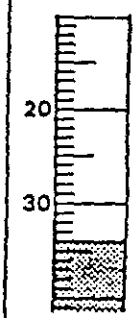
Experiment 1

The apparatus was set up as shown in the diagram.



The bung was removed from the flask and the measuring cylinder was moved away from the delivery tube. The mass of the sample of magnesium (*an excess*) placed in the flask was 0.3 g and a mixture of 25 cm^3 of aqueous A and 25 cm^3 of water was added. The bung was replaced. The measuring cylinder was placed back over the delivery tube and the timer was started.

The volume of gas collected in the measuring cylinder was recorded every minute for six minutes. Use the diagrams to complete the table.

time/min	0	1	2	3	4	5	6
volume of gas in measuring cylinder/cm^3							
volume of gas /cm^3							

[3]

xperiment 2

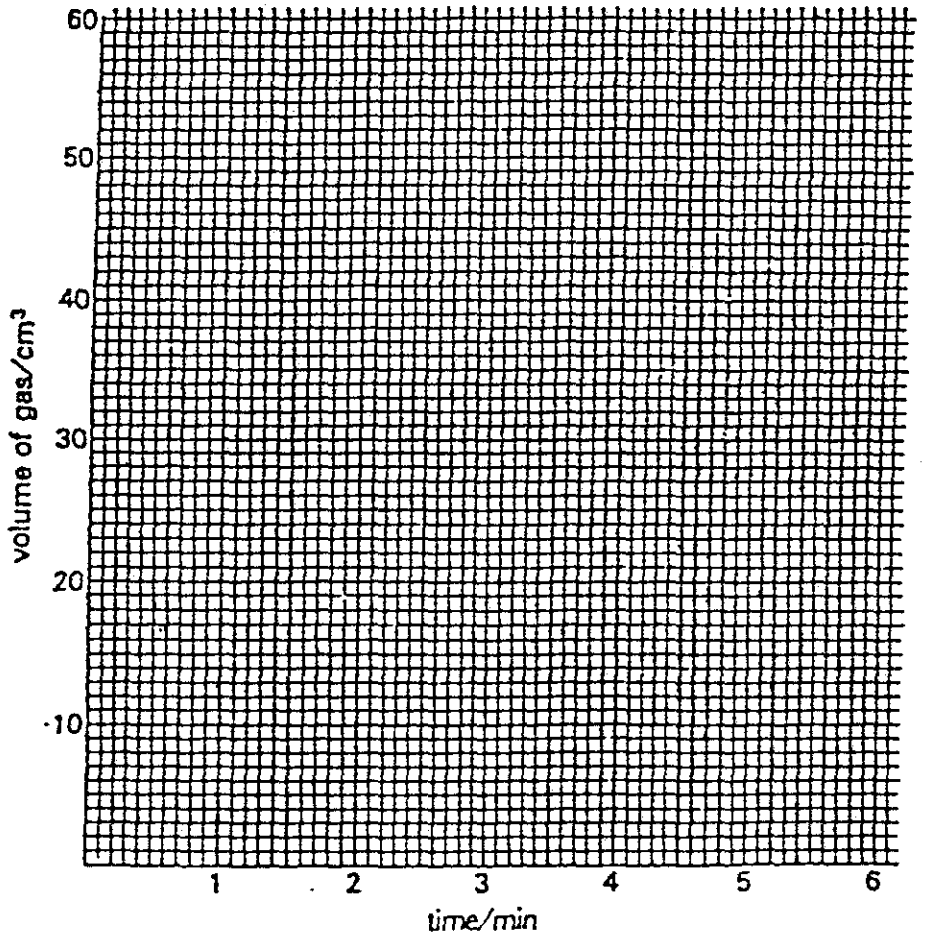
xperiment 1 was repeated using 50 cm^3 of aqueous A with no added water.

The volume of gas collected in the measuring cylinder was recorded every minute until 50 cm^3 of gas were collected.

The table shows the results obtained.

time/min	0	1	2	$2\frac{1}{2}$
volume of gas /cm^3	0	23	39	50

(a) Plot the results for **both** experiments on the grid below. For each set of results, draw a smooth line graph. Indicate clearly which line represents *Experiment 1* and which line represents *Experiment 2*.



[6]

(b) From your graphs, deduce the times required to collect 20 cm^3 of gas in

Experiment 1 .....

Experiment 2 .....

Show clearly on your graph how you worked out your answers. [2]

(c) In which experiment was the reaction faster? Explain your answer.

.....

..... [2]

(d) Why does the reaction slow down?

.....

..... [2]

(e) Why, eventually, will no more gas be produced?

.....

..... [2]

(f) Why was the measuring cylinder moved away from the delivery tube while the solution of **A** was added to the flask?

.....

.....

..... [2]

(g) Suggest **one** improvement that could be made to the experimental procedure to obtain more accurate results.

.....

.....

..... [2]

Experiment 3

(a) Magnesium was added to aqueous **A** in a test-tube. Rapid fizzing occurred and, when tested with a lighted splint, the gas made a loud pop.

(b) Addition of aqueous barium chloride to aqueous **A** resulted in the formation of a white precipitate.

(i) Name the gas given off in part **(a)**.

..... [1]

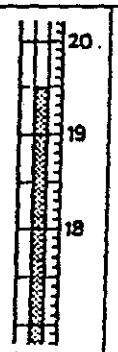
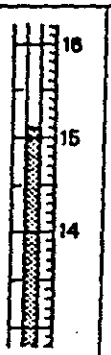
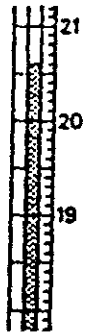
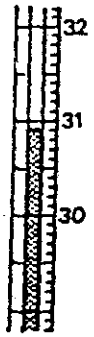
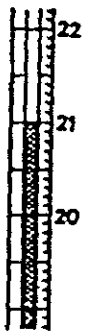
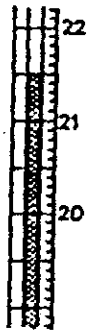
(ii) Suggest an identity for **A**.

..... [2]

6 Three solids B, C and D were separately added to different liquids. In each experiment, the initial temperature of the liquid was measured. The solid was added to the liquid, the mixture stirred and the maximum or minimum temperature reached measured. Any observations were also recorded.

(a) Use the thermometer diagrams to complete the temperatures in the table. Write your answers in the blank column alongside each diagram.

Table of results

Experiment	*Temperature/°C*		*Observations*
	initial	*maximum or minimum*	
1. Solid B was added to 25 cm^3 of water			solid completely dissolved
2. Solid C was added to 25 cm^3 of aqueous copper(II) sulphate			a red/brown solid formed and the solution turned a lighter colour
3. Solid D was added to 25 cm^3 of aqueous lead(II) nitrate			a yellow precipitate formed

[3]

(b) (i) In which of these experiments was the reaction endothermic?

.....

(ii) In which of these experiments was the reaction exothermic?

(c) Suggest an identity for solid C. Explain your answer.

.....

..... [2]

(d) What type of substance is solid D?

..... [1]

7 An **ANTACID** indigestion tablet of mass 600 milligrams has the following composition:

insoluble calcium carbonate, 500 milligrams;

soluble magnesium compounds, 100 milligrams.

Given one **ANTACID** tablet, how would you prove by experiment that it contained 500 milligrams of an insoluble substance?

.....

.....

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..... [7]

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Centre Number	Candidate Number

Candidate Name ....

0620/6 IGCSE NOV

CHEMISTRY

PAPER 6 ALTERNATIVE-TO-PRACTICAL

Monday 15 NOVEMBER 1993 Morning 1 hour

Candidates answer on the question paper.
No additional materials are required.

UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

Instructions to candidates:

Write your name and examination number in the spaces provided at the top of this page.

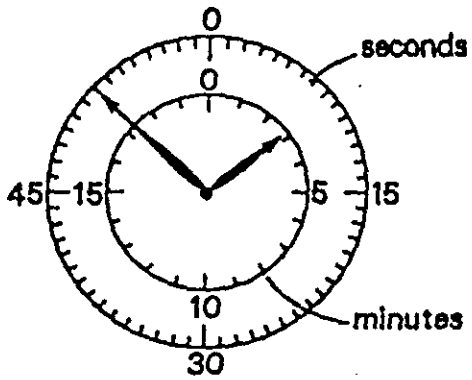
Answer **all** *the questions.*

The intended marks for questions or parts of questions are given in brackets [ ].

This Question Paper consists of 10 printed pages and 2 blank pages.

[Turn over

1 Write down the time indicated in the diagram of a stop-clock.



.....

[1]

2 The following table gives information about three solids: nickel, wax and magnesium.

solid	*solubility in ethanol*	*attracted by a magnet*
nickel	insoluble	yes
wax	soluble	no
magnesium	insoluble	no

(a) Suggest how a mixture of nickel powder and magnesium powder could be separated.

.....

..... [2]

(b) Suggest how a sample of wax could be obtained from a mixture of wax and magnesium.

.....

.....

.....

..... [4]

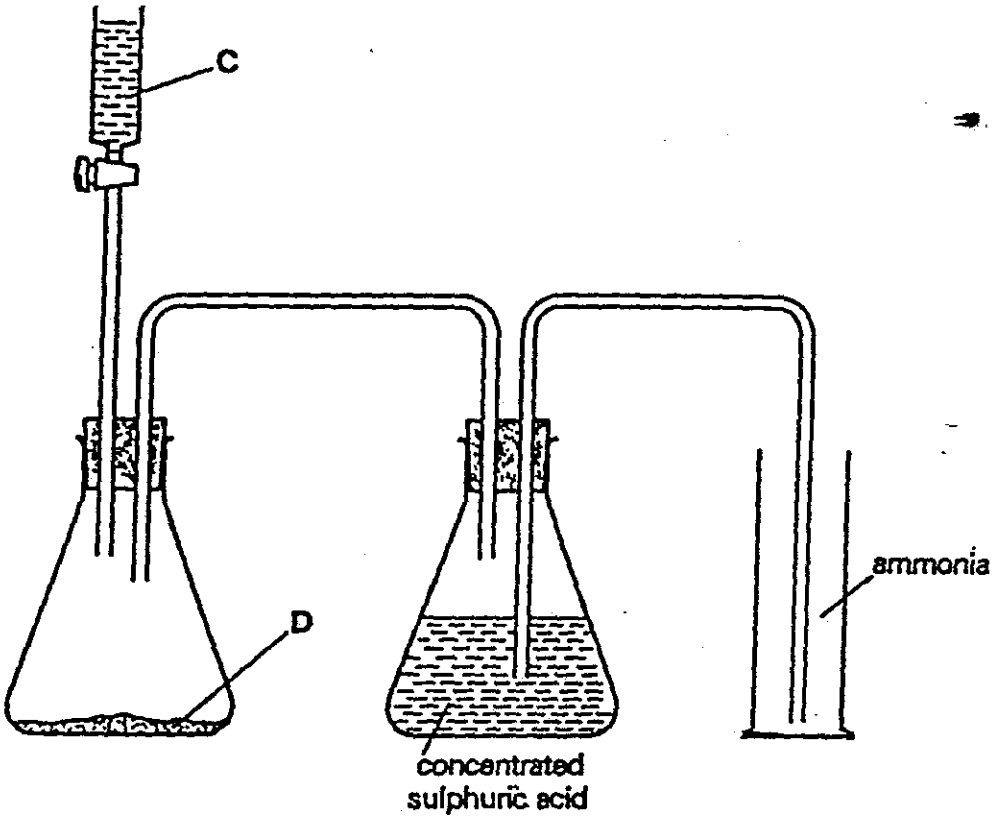
3 A sample of natural gas was passed through aqueous bromine. The colour of the solution of bromine changed from orange to colourless. Comment on this observation.

.....

..... [2]

4 Ammonia is produced when aqueous sodium hydroxide is warmed with an ammonium salt. *Ammonia is less dense than air and very soluble in water.*

The following apparatus was used to prepare a sample of dry ammonia gas.



(a) Name substance C ..... [1]

(b) Name substance D ..... [1]

(c) What laboratory equipment, necessary for the preparation of ammonia, is missing in the diagram?

.....

..... [2]

(d) Suggest why concentrated sulphuric acid should not be used to dry ammonia.

..... [1]

(e) There are two other mistakes in the apparatus shown in the diagram. Identify these mistakes.

Mistake 1 .....

.....

Mistake 2 .....

..... [2]

5 A student investigated the reaction between hydrochloric acid and aqueous solutions of potassium hydroxide of different concentrations, labelled P, Q and R.

Experiment 1

A burette was filled to the zero mark with hydrochloric acid. A 20 cm^3 sample of aqueous potassium hydroxide P was added to a conical flask, together with 4 drops of phenolphthalein indicator. The acid was added gradually to the flask. When the colour of the phenolphthalein changed, the burette reading was noted.

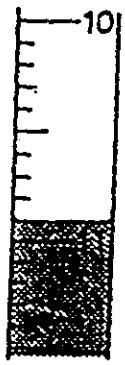
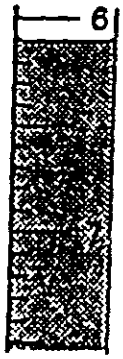
Experiment 2

Experiment 1 was repeated, using solution Q instead of solution P.

Experiment 3

Experiment 2 was repeated, using solution R instead of solution Q.

(a) Use the diagrams to complete the table of the volumes of hydrochloric acid used.

Experiment	*Solution*	*Diagram of burette*	*Volume of hydrochloric acid /cm^3*
1	P		
2	Q		
3	R		

(b) What colour change would be observed when hydrochloric acid was added to the flask?

From ..... to ..... [2]

(c) Complete the gaps in the following statements.

(i) Aqueous potassium hydroxide labelled ..... needed the smallest volume of hydrochloric acid to change the colour of the indicator. [1]

(ii) Aqueous potassium hydroxide labelled ..... needed the largest volume of acid to change the colour of the indicator. [1]

Therefore, the order of concentration of the solutions of potassium hydroxide is

1. ..... (most concentrated)

2. .....

3. ..... (least concentrated) [2]

(d) What could be used to measure the 20 cm^3 portions of aqueous potassium hydroxide?

..... [1]

(e) If Experiment 1 were repeated, would the volume of hydrochloric acid used be the same as in the original experiment? Explain your answer.

.....

.....

..... [3]

(f) Suggest another method of investigating the order of concentration of these solutions of potassium hydroxide. Explain how your method works.

.....

.....

..... [3]

6 Two different salts were tested. One salt was labelled W and the other one was calcium carbonate. The tests and some of the observations are in the following table.

Tests	*Observations*	
(a) Appearance Salt W	Pale green crystals	
Calcium carbonate	.....	[1]
(b) Tests on W An aqueous solution of W was divided into three equal portions.		
(i) An excess of aqueous sodium hydroxide was added to the first portion. The mixture was left to stand for a few minutes.	A dirty green precipitate formed which turned brown at the surface of the mixture.	
(ii) An excess of aqueous ammonia was added to the second portion.	.....	
(iii) A few drops of dilute hydrochloric acid and aqueous barium chloride were added to this portion.	A white precipitate formed.	[2]
(c) Tests on calcium carbonate A little hydrochloric acid was added to the calcium carbonate. The gas given off was tested with a lighted splint and then with limewater.	....	[3]
The solution formed was divided into two portions. (i) An excess of aqueous sodium hydroxide was added. (ii) An excess of aqueous ammonia was added.	....	[3]

(a) Complete the *Observations* column.

(b) Suggest an identity for salt W.

..... [3]

(c) Name the gas given off in part (c).

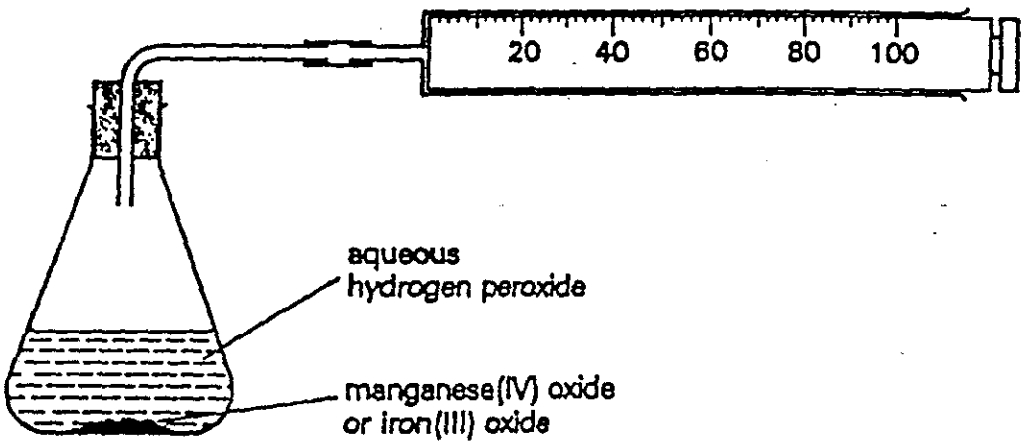
..... [1]

(d) Name the solution formed in part (c).

..... [1]

7 A student investigated the breakdown of aqueous hydrogen peroxide using two different catalysts. When aqueous hydrogen peroxide breaks down, oxygen is formed. The two catalysts used were manganese(IV) oxide and iron(III) oxide. The following experiment was carried out.

1. Aqueous hydrogen peroxide was put into two flasks.
2. A 2 g sample of manganese(IV) oxide was added to one flask and a 2 g sample of iron(III) oxide was added to the other flask.
3. The volume of oxygen given off was measured every minute using a gas syringe.



(a) State two precautions which should have been taken in part 1 to make this a fair comparison between the two catalysts.

.....

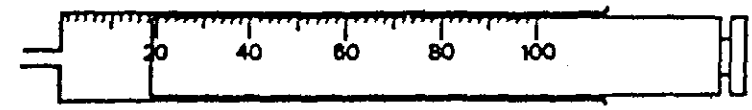
..... [2]

(b) State one precaution which should have been taken in part 2 to make this a fair test.

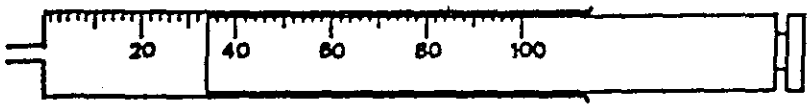
.....

..... [1]

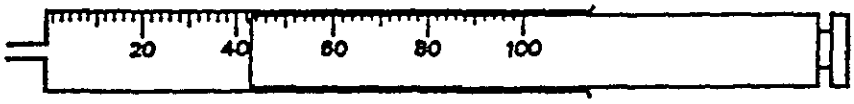
(c) The syringe diagrams represent the results obtained for the experiment using manganese(IV) oxide.



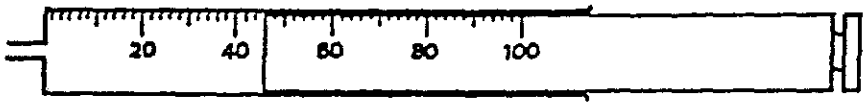
at 60 seconds



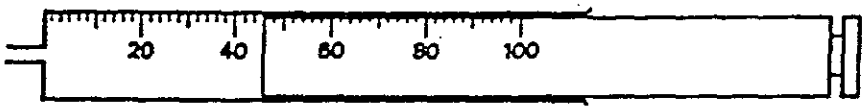
at 120 seconds



at 180 seconds



at 240 seconds



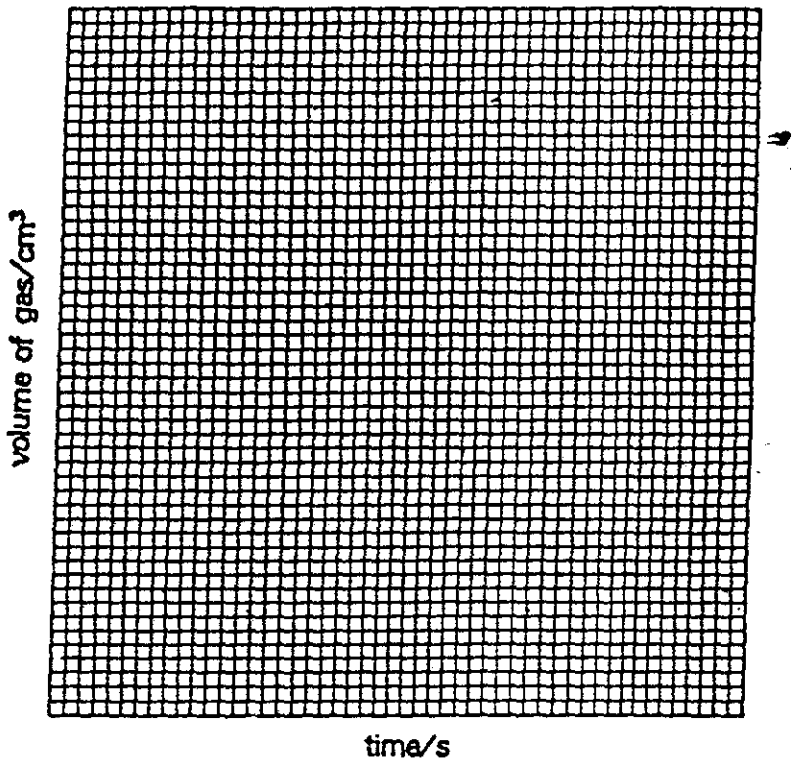
at 300 seconds

(i) Using the diagrams, complete the table.

time /s	*total volume of oxygen /cm³*
0	
60	
120	
180	
240	
300	

[2]

(ii) Plot the points on the grid below. Draw a smooth line graph. [2]



(d) Iron(III) oxide is not as good a catalyst as manganese(IV) oxide. Sketch on the grid another line to show the possible results for iron(III) oxide. Label this line. [2]

8 You are provided with samples of three metals: copper, zinc and magnesium. Outline an experiment that could be carried out to show their order of reactivity. Marks will be awarded for practical details and expected observations.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

Centre Number	Candidate Number

Candidate Name _____

International General Certificate of Secondary Education
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

CHEMISTRY 0620/6

PAPER 6 Alternative to Practical

Tuesday **17 MAY 1994** Morning 1 hour

Candidates answer on the question paper.
No additional materials are required.

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.
Answer all questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

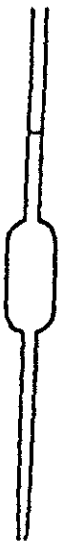
The number of marks is given in brackets [ ] at the end of each question or part question.

FOR EXAMINER'S USE

This question paper consists of 10 printed pages and 2 blank pages.

1 (a) Name each piece of apparatus shown in the diagrams below.

(I)



Name .....

(II)

Name ..... [2]

(b) What is the use of these pieces of apparatus?

.....[2]

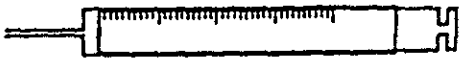
2 How could a mixture of ethanol and methanol be separated?

methanol, boiling point 65 °C;
ethanol, boiling point 78 °C.

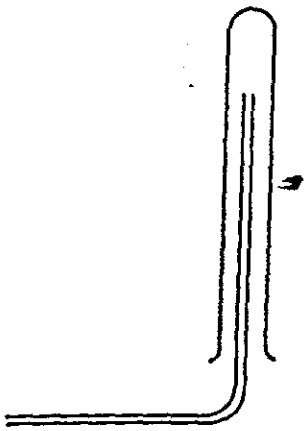
.....

.....[2]

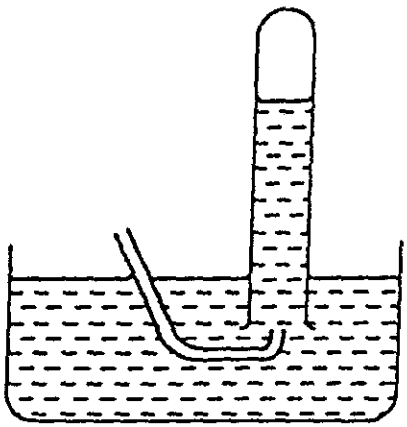
3 Four sets of apparatus are shown in the diagram below.



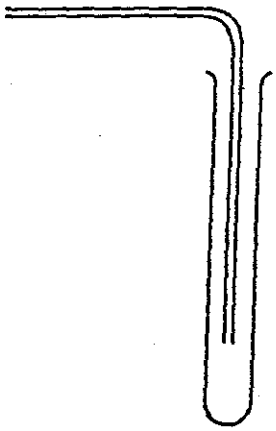
(I) .....



(II) .....



(III) .....



(IV) .....

These could be used for:

A, collecting a gas which is denser than air;

B, collecting and measuring the volume of a gas;

C, collecting a gas which is less dense than air;

D, collecting a gas which is insoluble in water.

Using each letter A to D once only, write the appropriate letter in the spaces provided. [4]

4 Four unlabelled bottles of chemicals each contained one of the following liquids:

aqueous copper(II) sulphate;
pure water;
hexene (an alkene);
limewater.

State observations or tests by which you could correctly label each bottle.

.....

.....

.....

.....

.....

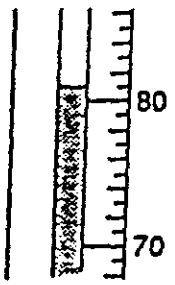
.....[4]

5 A student investigated the solubility of potassium nitrate in water at various temperatures.

Experiment 1

A 6 cm^3 sample of water was added to a boiling tube containing 10 g of potassium nitrate. The mixture was carefully heated until all of the solid had dissolved. The boiling tube was removed from the heat and allowed to cool while the solution was stirred. The boiling tube was dipped in a beaker of cold water to speed up the cooling.

The temperature at which crystals of solid **first appeared** was measured. Use the thermometer diagram to read the temperature and record the value in the table.



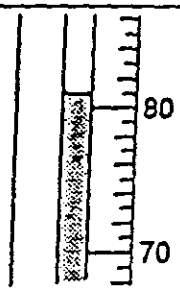
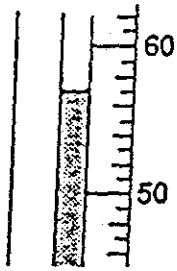
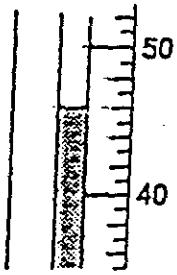
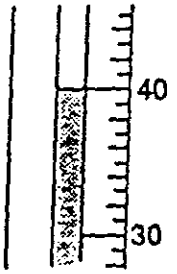
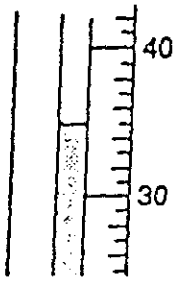
Experiment 2

A further 2 cm^3 of water was added to the boiling tube and contents from *Experiment 1*. The experiment was repeated exactly as before to find the temperature at which crystals **first appeared.**

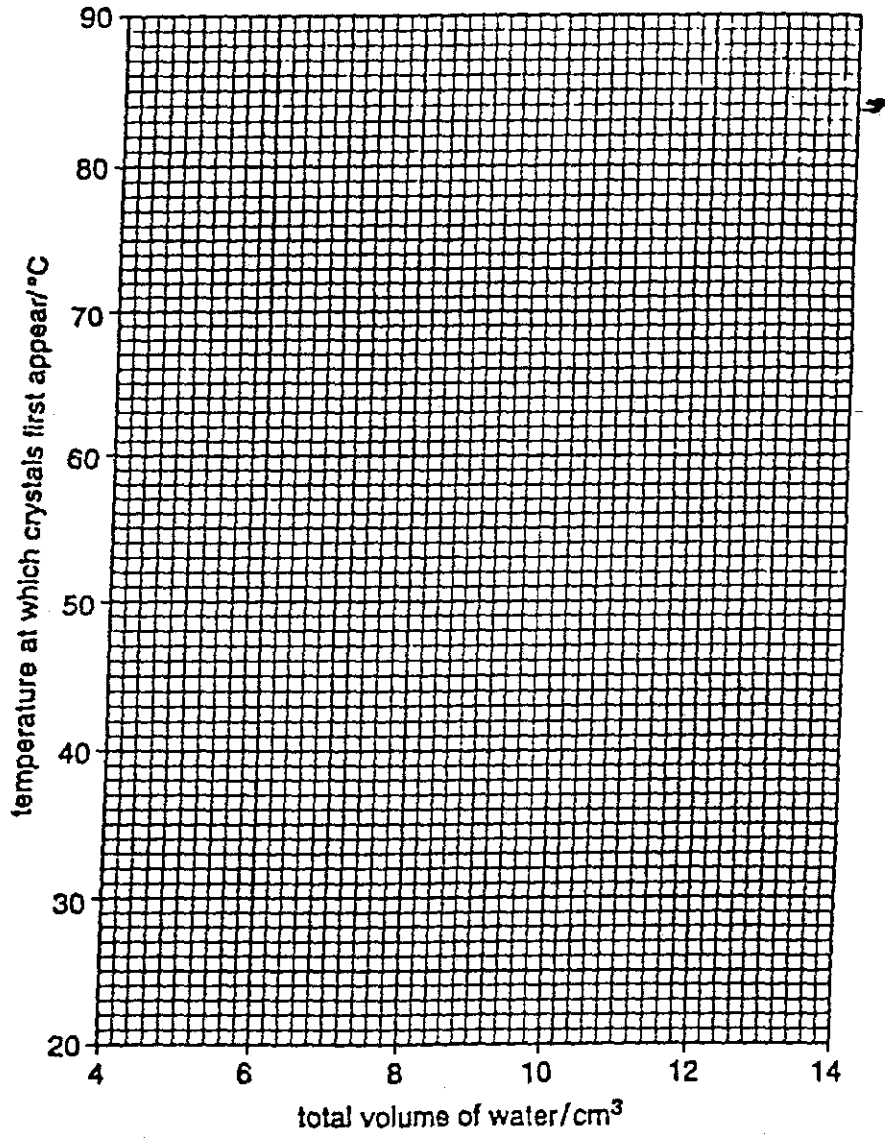
In the table, record the new **total** volume of water in the boiling tube and, by using the thermometer diagram, the new temperature at which crystals first appeared.

Experiments 3, 4 and 5

The experiment was repeated three more times, adding 2 cm^3 more water each time.
Complete the table below using the thermometer diagrams to note the temperatures. [6]

experiment	total volume of water/cm^3	thermometer diagram	temperature/°C
1	6		
2			
3			
4			
5			

(a) Plot a graph of 'temperature at which crystals first appear' against 'total volume of water'. [4]



(b) **Use your graph** to find the temperature at which crystals of potassium nitrate would first appear if the total volume of water in the solution was 7 cm^3. Show on the grid how you obtained your answer.

.....

..... [3]

(c) How would the student know when all of the potassium nitrate had dissolved in the water?

.....

.....[1]

(d) Suggest, with a reason, how the results would be different if 5 g of potassium nitrate were used instead of 10 g.

.....

.....

.....[2]

(e) (i) Give two possible sources of experimental error in this investigation.

1. .....

2. .....[2]

(ii) Suggest, with reasons, two changes the student could make to improve the accuracy of these experiments.

.....

.....

..... [3]

6 (a) A farmer needed to analyse the soil on his farm. He carried out the experiment below to find the acidity of the soil.

He took a sample of soil from one place on his farm, added water and stirred the mixture.

He then added some barium sulphate to the mixture to clear the liquid. The clear liquid was tested with a suitable indicator to find the pH: this was found to be 8.

The farmer concluded that the soil on the whole farm was weakly acidic.

(i) Name a suitable indicator that the farmer could have used.

.....[1]

(ii) Suggest *one* property of barium sulphate that makes it suitable for testing soil.
Explain your answer.

.....

.....

.....[2]

(iii) Explain fully why the farmer's conclusion was wrong.

.....

.....

.....

.....[4]

(b) The farmer was given bags of three different fertilisers.
Describe an experiment he could carry out to find out which fertiliser would give the best crop of beans.

.....

.....

.....

.....

.....

.....

.....[5]

7 Tests were carried out on a green solid **B**, which was a mixture of an insoluble copper(II) salt and a soluble, white salt.

The solid was added to a boiling tube containing water. The mixture was shaken and filtered.

Complete the observations in the following table.

tests	observations
(a) <u>on the filtrate</u> (i) To about 1 cm^3 of the filtrate, an equal volume of aqueous sodium hydroxide was added.	A white precipitate formed which dissolved in excess of the sodium hydroxide.
(ii) To another portion of the filtrate, an excess of aqueous ammonia was added.	A white precipitate formed which did not dissolve in the excess of aqueous ammonia.
(iii) To another portion of the filtrate, a few drops of dilute hydrochloric acid were added, followed by aqueous barium chloride.	A white precipitate formed.
(b) <u>on the residue on the filter paper</u> (i) colour of residue	..... [1]
(ii) A little of the residue was put into a test-tube and dilute hydrochloric acid added. Any gases evolved were passed through limewater.	.... [3]

(c) What do the tests on *the filtrate* tell you about B?

.....

.....[2]

(d) What do the tests on *the residue* tell you about B?

.....

.....[2]

8 The speed of reaction between aqueous potassium manganate(VII), and aqueous glycerol was investigated. Potassium manganate(VII) is purple but glycerol is colourless. When they react, a colourless solution is formed.

In a series of experiments, equal volumes of aqueous potassium manganate(VII) and an excess of aqueous glycerol were mixed. The initial concentration of the aqueous potassium manganate(VII) was the same in each experiment but the glycerol concentration was varied. The following results were obtained.

experiment	time for reaction to be completed/s	volume of glycerol/cm^3	volume of water/cm^3
1	300	5	95
2	150	10	90
3	102	15	85
4	72	20	80
5	60	25	75

Describe, with practical details, how these results could have been obtained. The answer has been started for you.

By using a measuring cylinder, add a mixture of 5 cm^3 of glycerol and 95 cm^3 of water to a flask. .....

.....

.....

.....

.....

.....

.....

.....[5]

Candidate Name _____

Centre Number	Candidate Number

International General Certificate of Secondary Education
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

CHEMISTRY 0620/6

PAPER 6 Alternative to Practical

Monday 21 NOVEMBER 1994 Morning 1 hour

Candidates answer on the question paper.
No additional materials are required.

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer all questions.

Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

This question paper consists of 11 printed pages and 1 blank page.

MML 149903 1/94 OK42311

[Turn over

1 A student wanted to add 15.30 cm^3 of water to 2.0 g of sodium chloride to make a solution.

Name the pieces of apparatus she should use to measure

(a) the water, ...

(b) the sodium chloride. ..... [2]

2 Zinc carbonate is insoluble in water but zinc nitrate is soluble.

Outline how you could obtain from a mixture of zinc carbonate and zinc nitrate

(a) a pure, dry sample of zinc carbonate;

.....

.....

.....

(b) crystals of zinc nitrate.

.....

.....

..... [6]

3 Suggest the identities of A, B and C from the descriptions given below.

(a) A is a dark red liquid: it has a low boiling point and gives off a brown vapour.

..... [1]

(b) B is a soft metal which reacts so violently with cold water that it catches fire.

..... [1]

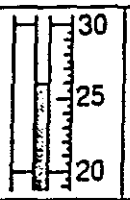
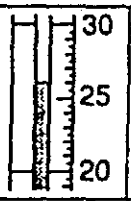
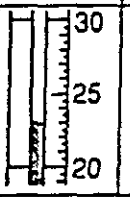
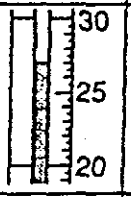
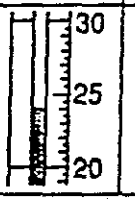
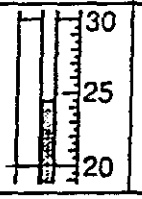
(c) C is a blue solid which produces ammonia when heated with a mixture of aluminium and aqueous sodium hydroxide.

..... [2]

4 A student investigated the reaction of marble chips (calcium carbonate) with separate samples of dilute solutions of sulphuric acid, hydrochloric acid and ethanoic acid.

A 4 cm^3 sample of each acid was added to separate test-tubes and the initial temperatures of the acids were measured. A marble chip was added to each acid and the maximum temperatures reached were measured. Other observations were recorded in the table.

(a) Use the thermometer diagrams shown in the table to record the temperatures. [3]

dilute acid used	*initial temperature of acid / °C*	*final temperature of acid / °C*	*observations*
sulphuric acid			evolution of gas for a few seconds which then stopped
hydrochloric acid			rapid evolution of gas
ethanoic acid			slow evolution of gas

(b) (i) From the results and the given observations, answer the following questions.

Which acid reacts most readily with a marble chip?

..... [1]

(ii) Give two reasons for your answer in (i) above.

.....

.....

..... [2]

(c) The student also investigated the reaction of zinc with hydrochloric acid.

A 2 cm^3 sample of the acid was added to a test-tube and its initial temperature was measured. Two pieces of zinc were added to the test-tube and the maximum temperature was measured. When a few crystals of copper(II) sulphate were added, the speed of reaction increased.

(I) Use the thermometer diagrams in the table to record the temperatures. [2]

initial temperature of acid / °C		*maximum temperature of acid / °C*	
			

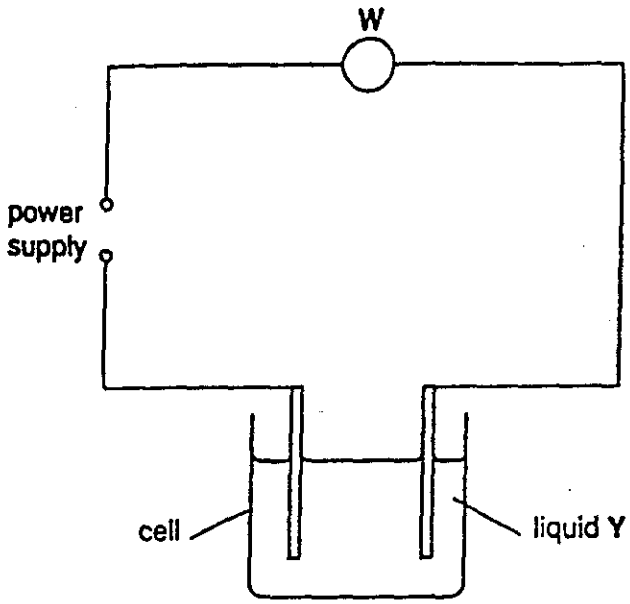
(II) How do the results show that the reaction between zinc and hydrochloric acid is exothermic?

..... [1]

(III) What term is used to describe the effect of copper(II) sulphate on this reaction?

..... [1]

5



(a) What piece of apparatus could be connected at W to show that liquid Y is an electrolyte?

..... [1]

(b) A metal object is to be coated with copper using electrolysis. State what you would use in the cell as

(i) the positive electrode,

.....

(ii) the negative electrode,

.....

(iii) liquid Y, i.e. the electrolyte.

..... [3]

6 A student analysed a sample of rust. An extract from the student's notebook is given below. Answer the questions which follow.

> 1. *The sample of rust was dried carefully in a desiccator containing a solid drying agent M.*
>
> 2. *The rust was heated strongly in the absence of air - water condensed on the cold parts of the test-tube.*
>
> 3. *The solid residue, N, was heated strongly in dry hydrogen gas. Water condensed on the cold parts of the apparatus and a grey magnetic solid O which conducted electricity was left.*

(a) (i) Why was it necessary to dry the rust carefully in step 1?

.....

..... [1]

(ii) Name a possible drying agent which fits the description of **M**.

..... [1]

(b) Where did the water come from in step 2?

..... [1]

(c) (i) Suggest why water was produced when the residue **N** was heated with hydrogen in 3.

.....

..... [1]

(ii) Suggest what **N** could be.

..... [1]

(d) (i) Name solid **O**.

..... [1]

(ii) Suggest what elements rust contains.

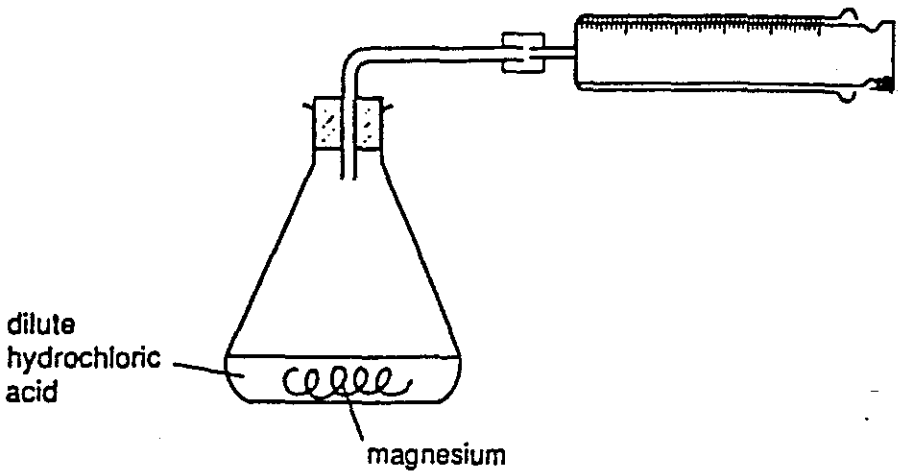
..... [2]

7 Complete the table below.

gas	*test on gas*	
	effect on damp litmus paper	*test with splint*
chlorine	.....	lighted splint goes out
oxygen	no effect	....
ammonia	.....	lighted splint goes out
hydrogen	no effect	....

[5]

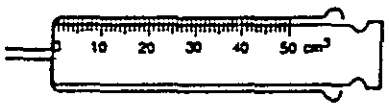
8 The speed of reaction between magnesium and an excess of dilute hydrochloric was investigated using the apparatus below.



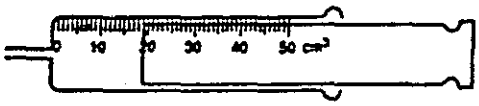
The volume of gas given off was measured every twenty seconds.

(a) Use the gas syringe diagrams to complete the results table.

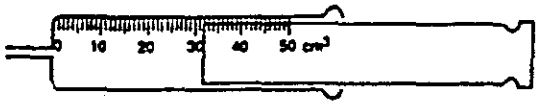
At 0 seconds



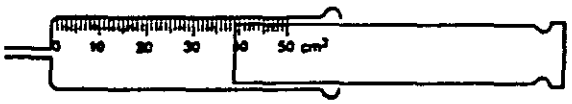
At 20 seconds



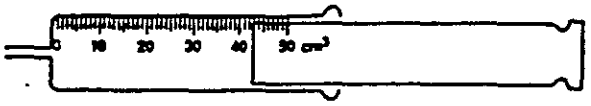
At 40 seconds



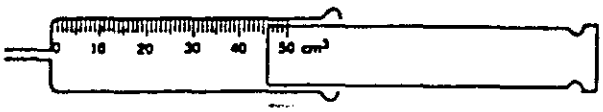
At 60 seconds



At 80 seconds



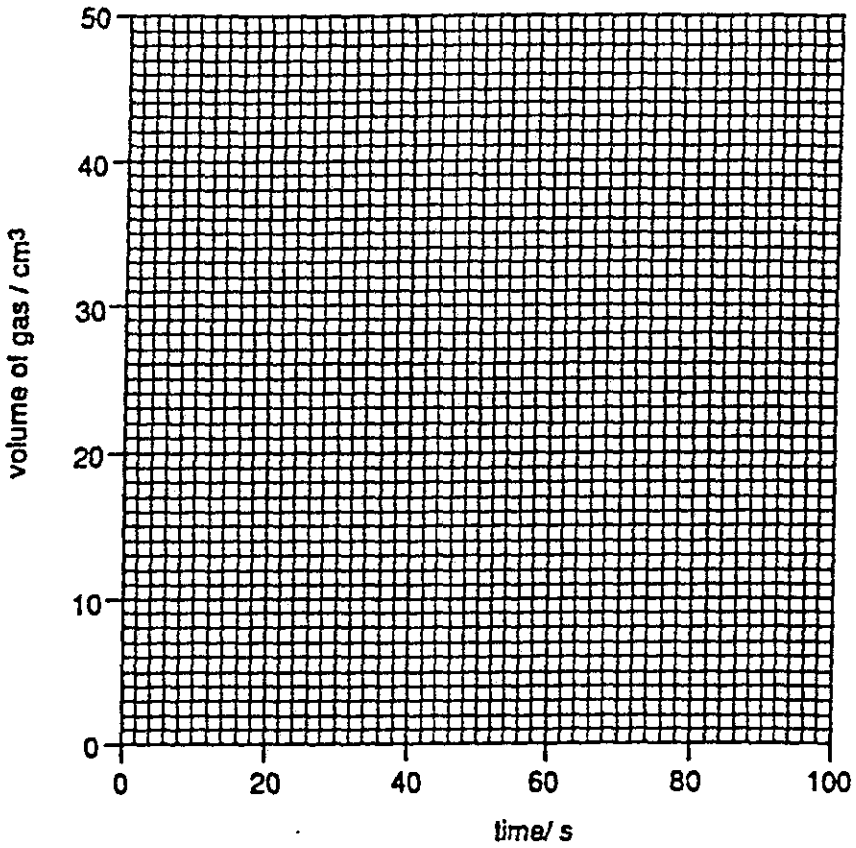
At 100 seconds



time / s	volume of gas / cm^3
0	
20	
40	
60	
80	
100	

[3]

(b) Plot a graph of the results on the grid below. [4]



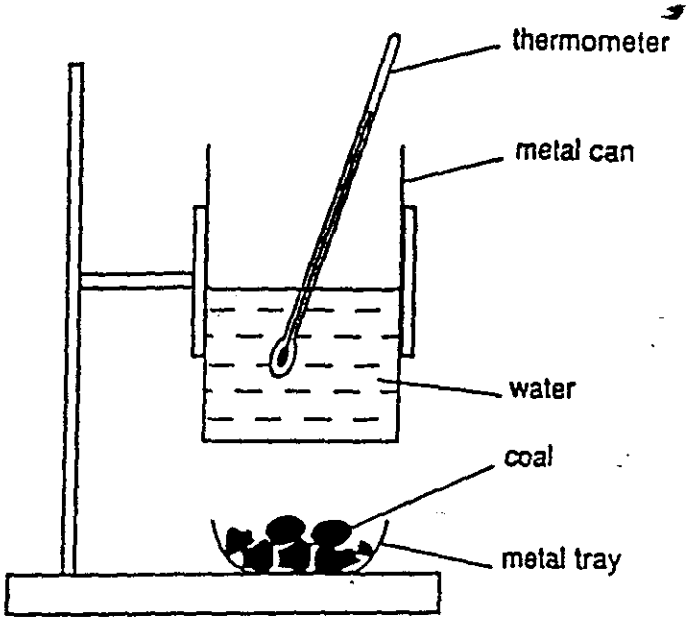
(c) Use the graph to work out how long it took to produce 25 cm^3 of hydrogen.

..... [1]

(d) Sketch on the graph the curve you would expect if the piece of magnesium ribbon had been cut into many small pieces. Label the curve P. [2]

9 The burning of coal releases heat energy and the pollutant sulphur dioxide is formed. Sulphur dioxide turns aqueous potassium dichromate(VI) from orange to green.

(a) An experiment was carried out to compare the amounts of energy produced by burning two different types of coal. The apparatus used is shown below.



(i) What measurements should have been taken?

.....

.....

.....

.....

..... [4]

(ii) State **three** different sources of error in this experiment.

1. .....

2. .....

3. ..... [3]

(b) Outline a different experiment to find out which type of coal produces most sulphur dioxide, on burning. You may find it useful to draw a diagram.

.....

.....

.....

.....

.....

..... [4]

Candidate Name _____

Centre Number	Candidate Number

International General Certificate of Secondary Education
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

CHEMISTRY 0620/6

PAPER 6 Alternative to Practical

Tuesday 16 MAY 1995 Morning 1 hour

Candidates answer on the question paper.
No additional materials are required.

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.
Answer all questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

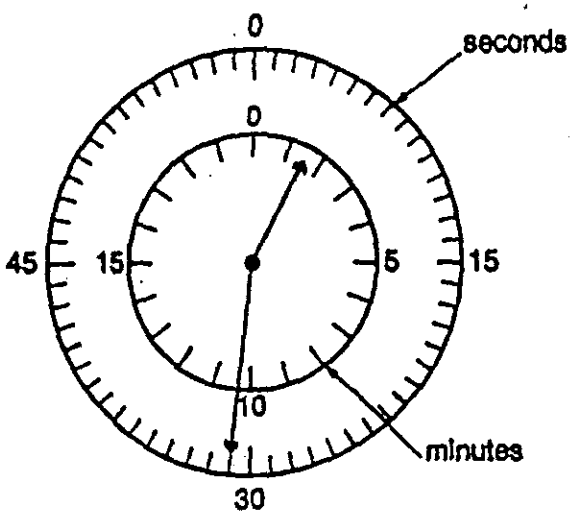
The number of marks is given in brackets [ ] at the end of each question or part question.

FOR EXAMINER'S USE

This question paper consists of 12 printed pages.

For Examiner's Use

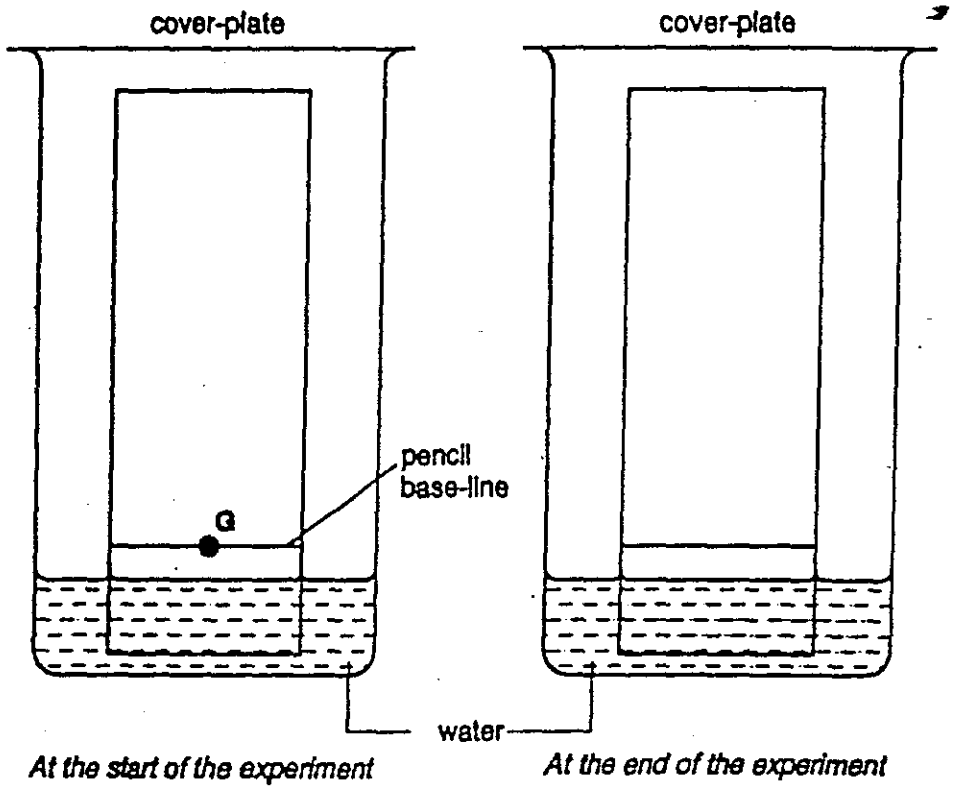
1 Record the time, in seconds, indicated by the stop-clock below.



Time = ... s [1]

2 A substance **G** contains three dyes. Two are water-soluble and one is insoluble.

(a) On the diagram, sketch the result you would expect if **G** were separated by paper chromatography. [2]



(b) Why was pencil used to mark the base-line instead of ink?

.....

.....[2]

(c) Why must the base-line be placed above the level of the water at the start?

.....[1]

For Examiner's Use

3 Two experiments were carried out on substance H.

Experiment 1

A white powder H was made by grinding some dry plant material. Some of the powder was heated in a test-tube. The powder turned black and a vapour J was formed which turned anhydrous copper(II) sulphate blue. Carbon dioxide gas was also given off.

(a) Name suitable apparatus that could be used to grind the dry plant material.

.....[2]

(b) (i) Suggest an identity for the black solid.

.....[1]

(ii) Suggest an identity for vapour J.

.....[1]

(c) How would you test for the presence of carbon dioxide?

.....

.....[2]

Experiment 2

A fresh sample of H was dissolved in water and some yeast added to the solution. Fermentation took place.

(a) State a suitable temperature for the fermentation.

.....[1]

(b) Give two expected observations during a fermentation.

1. .....

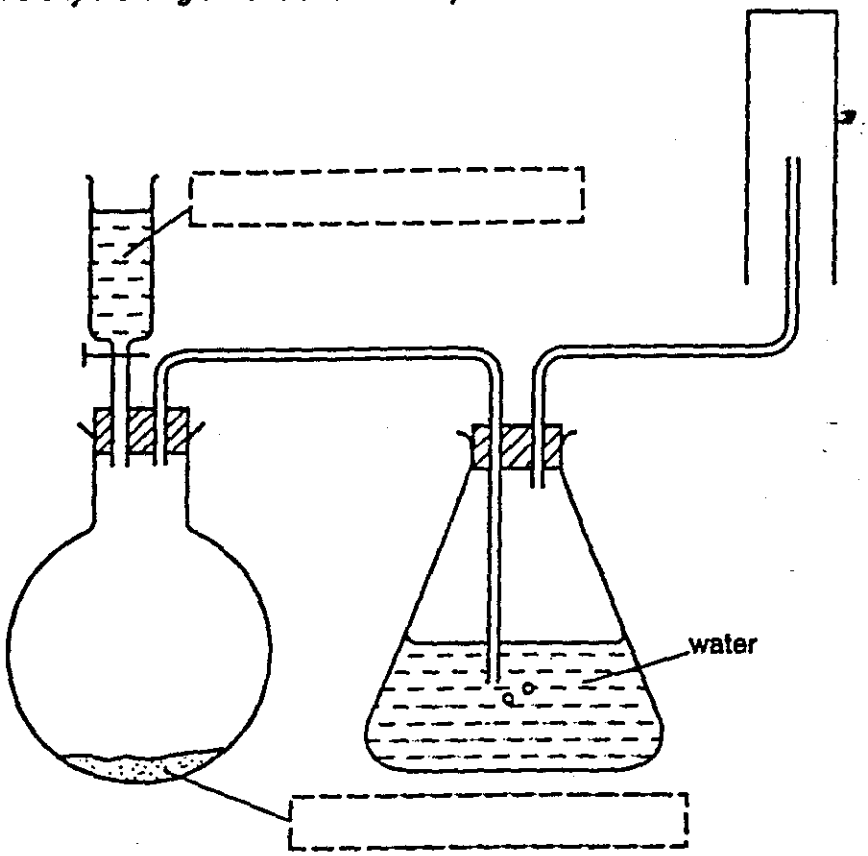
2. .....[2]

(c) What type of substance is H?

.....[1]

For Examiner's Use

4 Nitrogen dioxide gas is strong-smelling, denser than air and soluble in water. A sample of nitrogen dioxide can be prepared by adding concentrated nitric acid to copper and warming the mixture. Study the diagram and answer the questions.



(a) (i) Fill in the boxes in the diagram above to show the chemicals used. [2]

(ii) Indicate where heat is applied. [1]

(b) Identify and explain two mistakes in the diagram.

Mistake 1. .....

.....[2]

Mistake 2. .....

.....[2]

(c) State and explain two precautions that should be taken when carrying out this experiment.

Precaution 1. .....

.....[2]

Precaution 2. .....

.....[2]

For Examiner's Use

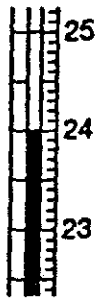
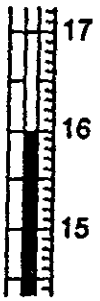
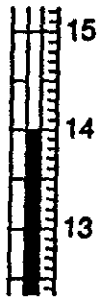
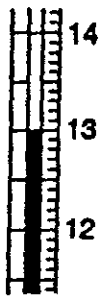
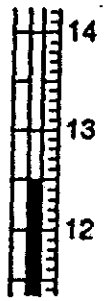
5 A student investigated the dissolving of substance A in water.

Experiment 1

A 50 cm^3 sample of distilled water was poured into a polystyrene cup and the initial temperature of the water measured.

Substance A was added to the water while stirring the solution. The temperature of the solution was measured every thirty seconds for three minutes.

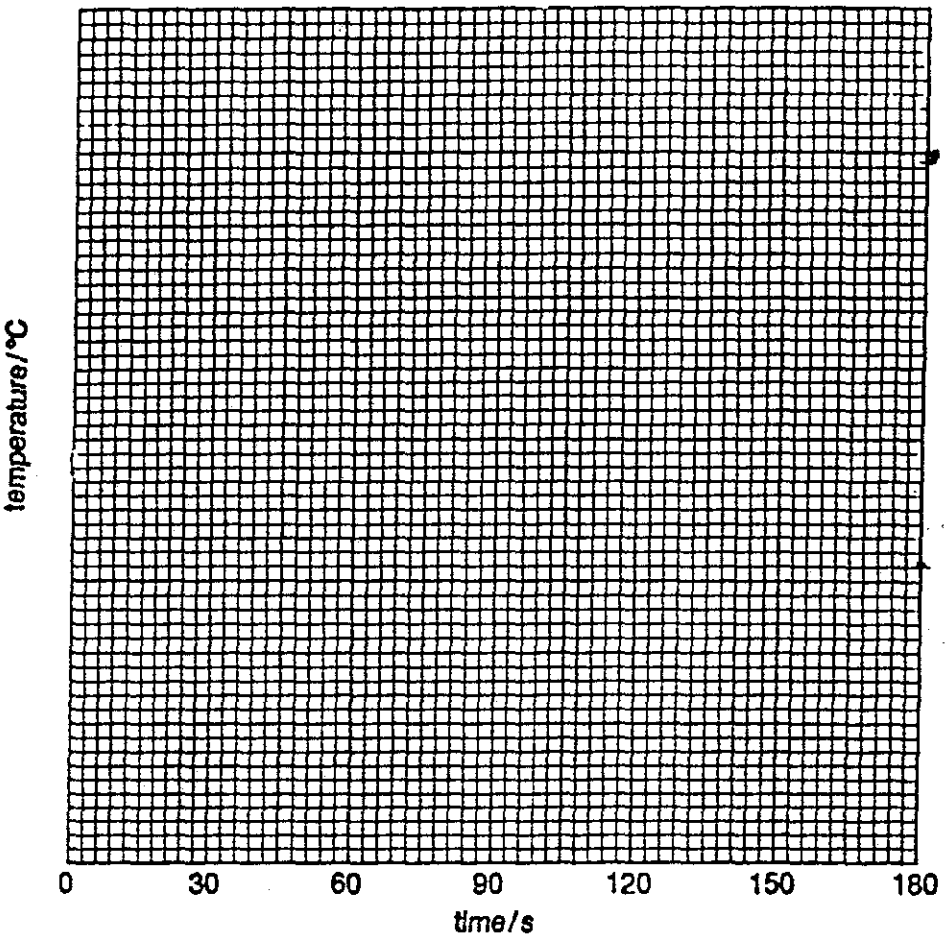
Using the thermometer diagrams, record the temperatures in the table.

time/s	0	30	60	90	120	150	180
thermometer diagrams							
temperature of liquid/ °C							

[3]

For Examiner's Use

(a) (i) Plot your results on the grid and draw a smooth line graph. [4]



(ii) **Use your graph** to find the temperature of the solution after **15 s.**

Show clearly on the graph how you obtained your answer.

.....[2]

(iii) What type of energy change occurs when substance A dissolves in water?

.....[1]

(iv) Explain **one** improvement that could be made to the experimental procedure to obtain more accurate results.

.....

.....[2]

(v) Predict what the temperature of the solution would have been after 1 hour.

Explain your prediction.

.....

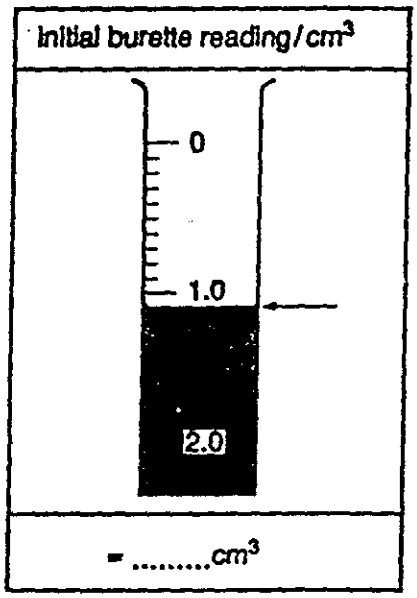
.....[2]

(b) *Experiment 2*

The student used the solution from *Experiment 1* to investigate one chemical reaction of an aqueous solution of substance A.

A burette was filled with the aqueous solution of substance A from *Experiment 1*.

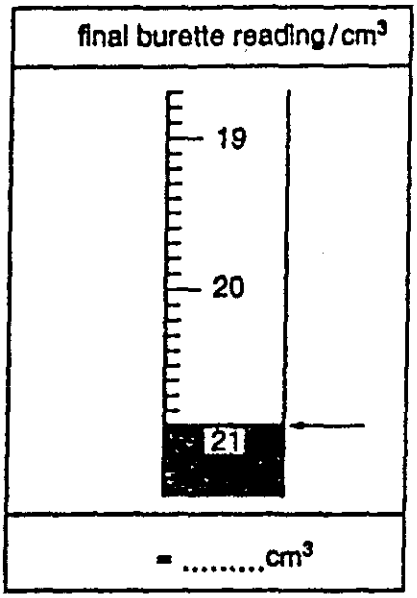
Record in the table the initial burette reading using the burette diagram below.



Then, 10 cm^3 of aqueous potassium manganate(VII) and 20 cm^3 of sulphuric acid were added to a conical flask, followed by a solid B. The flask was shaken and the solution of A was added from the burette to the contents of the flask until the solution was colourless.

For Examiner's Use

Record in the table the final burette reading, using the burette diagram below.



(i) Volume added/cm³ = ...[3]

(ii) What piece of apparatus should have been used to measure the aqueous potassium manganate(VII) and the sulphuric acid?

.....[1]

For Examiner's Use

6 Tests were carried out on a salt **C** which contained chloride ions. Complete any gaps in the observations column in the following table.

tests	*observations*
(a) The appearance of salt **C**.	White crystals
(b) One spatula-measure of **C** was added to a test-tube. The test-tube was heated. Any gases given off were tested with Universal Indicator paper.	 Drops of water formed at the top of the tube. Indicator paper turned red.
(c) One measure of **C** was dissolved in water. The solution was divided into four equal portions. **(i)** To the first portion was added an equal volume of aqueous ammonia. Then an excess of aqueous ammonia was added.	 White precipitate formed. In excess, no change.
(ii) To the second portion was added an equal volume of aqueous sodium hydroxide. Then an excess of aqueous sodium hydroxide was added.	White precipitate formed. Precipitate dissolved in excess.
(iii) To the third portion was added Universal Indicator solution.	Colour turned red. pH .....[1]
(iv) To the fourth portion was added a few drops of dilute nitric acid. Then aqueous silver nitrate was added.	....[2]

For Examiner's Use

(d) What does test (a) tell you about C?

.....[1]

(e) What does test (b) tell you about C?

.....

.....[2]

(f) What does test (c) tell you about C?

.....

.....[2]

(g) Suggest an identity for C.

.....[1]

For Examiner's Use

7 Malachite is an ore of copper. Malachite is a green substance which consists mainly of copper(II) carbonate which is insoluble in water. Copper metal may be extracted from malachite.

A student tried to obtain copper metal from malachite. This summary was taken from the student's notebook.

Summary

Step 1. An excess of malachite was added to dilute sulphuric acid and a vigorous reaction occurred.

Step 2. The mixture was filtered.

Step 3. I added a powdered metal to the solution and copper was formed.

(a) What would have been observed in *Step 1*? Explain.

.....

.....[1]

(b) Draw a labelled diagram of the apparatus used in *Step 2*. [2]

(c) Name a suitable metal that could be used in *Step 3*. Explain your choice.

.....

.....[2]

(d) Name a different method by which copper could be extracted from the solution.

.....[1]

END OF EXAMINATION

Centre Number	Candidate Number

Candidate Name _____

International General Certificate of Secondary Education

UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

CHEMISTRY 0620/6

PAPER 6 Alternative to Practical

Monday 20 NOVEMBER 1995 Morning 1 hour

Candidates answer on the question paper.
No additional materials are required.

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

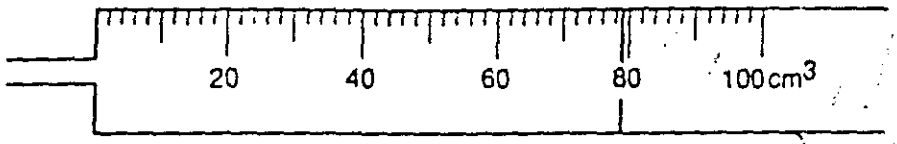
The number of marks is given in brackets [ ] at the end of each question or part question.

FOR EXAMINER'S USE

This question paper consists of 12 printed pages.

SB (SC) OK54839

1 What is the volume, to the nearest cm^3, of gas in the syringe below?



volume = ... cm^3 [1]

2 Zinc powder reacts with dilute sulphuric acid. Copper powder does not react with dilute sulphuric acid. How could a **pure** sample of copper be obtained from a mixture of zinc and copper?

.....

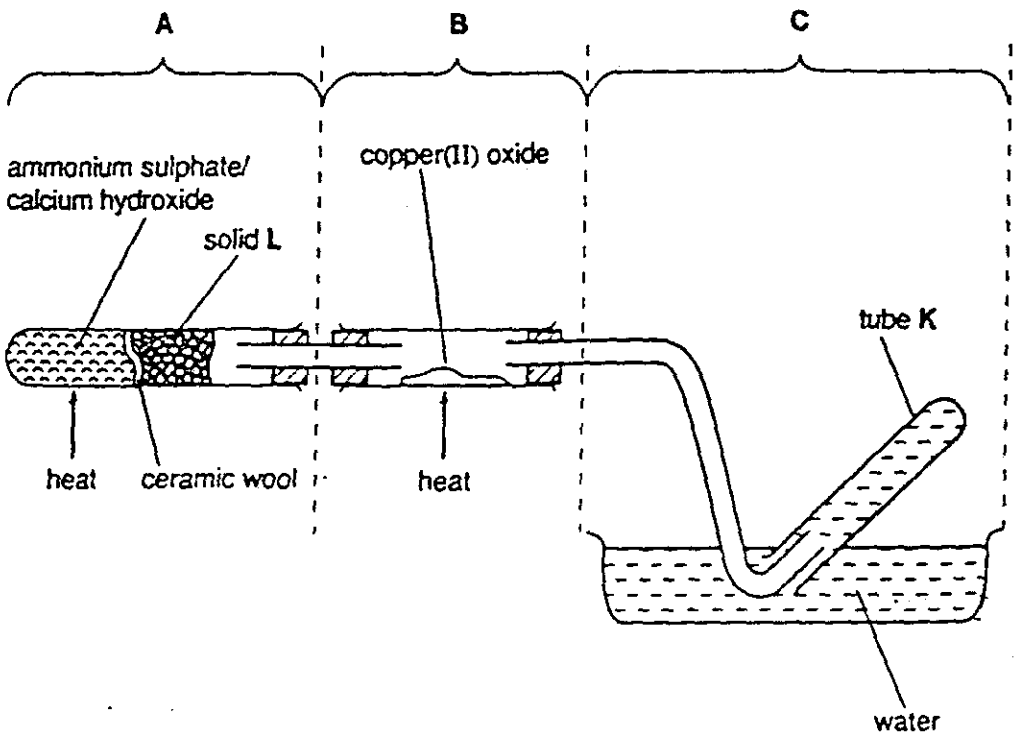
.....

.....

.....

..... [4]

3 When a mixture of an ammonium salt and an alkali is heated ammonia is formed. Dry ammonia gas was passed over heated copper(II) oxide using the apparatus below. Copper, nitrogen and water were produced.



(a) (i) What is the purpose of solid L?

..... [1]

(ii) What is the purpose of the ceramic wool?

..... [1]

(b) What would be observed in parts B and C of the apparatus during the experiment?

(i) Part B .....

(ii) Part C ..... [2]

(c) Why is tube K filled with water at the start of the experiment?

..... [1]

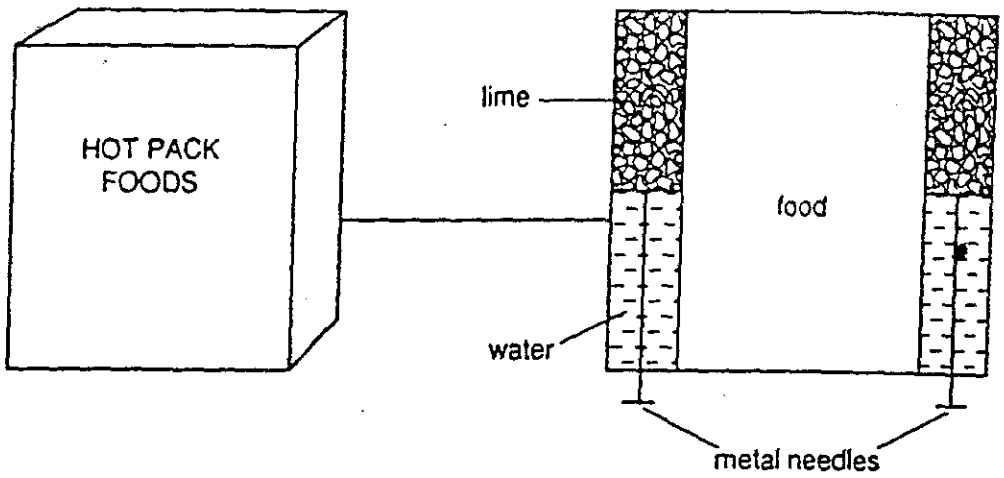
(d) Explain what precaution must be taken before removing the heat from parts A and B of the apparatus.

.....

.....

..... [2]

4



When water and lime react, heat is produced. To heat the food in HOT PACK FOODS the water bags are punctured with a metal needle as shown in the diagram.

Some samples of lime almost explode when water is added to them, other samples of lime do not react for hours when placed in water.

In HOT PACK FOODS the reaction must heat the food to 90 °C and keep it at a high temperature for at least ten minutes.

Provided with six different samples of lime, describe how you would investigate which was most suitable for use in HOT PACK FOODS.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [7]

5 A student investigated the reaction between aqueous potassium manganate(VII) (P) and two different liquids Q and R in a series of experiments.

Solution P was aqueous potassium manganate(VII).

Solution Q was aqueous iron(II) sulphate.

Solution R was aqueous hydrogen peroxide.

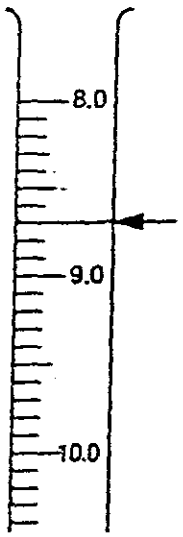
Experiment 1

10 cm^3 of solution Q was poured into a conical flask.
A burette was filled with solution P and the initial reading was recorded.
Solution P was added to the flask with shaking until the mixture just turned permanently pink.

Use the diagrams below to record the burette readings.

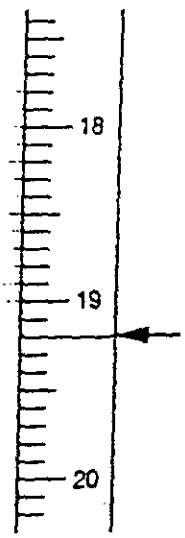
The contents of the conical flask were poured away and the flask rinsed with distilled water.

initial burette reading/cm^3



= .....cm^3

final burette reading/cm^3



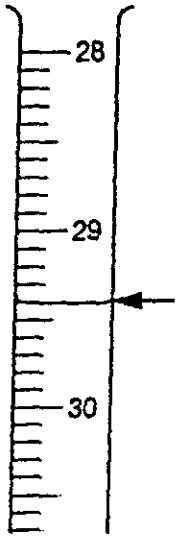
= .....cm^3 [2]

Experiment 2

8 cm^3 of solution **Q** and 2 cm^3 of solution **R** were poured into a conical flask. A burette was filled with solution **P** and the initial reading was recorded.

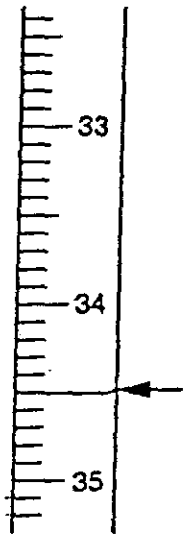
The rest of the instructions were repeated as in Experiment 1. Use the diagrams to record all of the burette readings.

initial burette reading/cm^3



= .....cm^3

final burette reading/cm^3

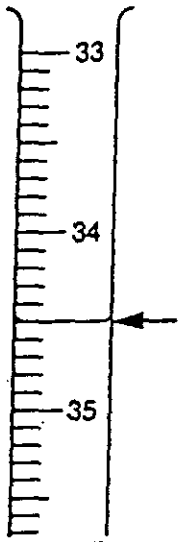


= .....cm^3 [2]

Experiment 3

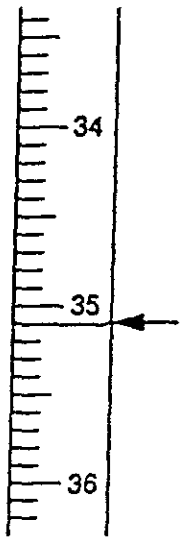
Experiment 2 was repeated using 5 cm^3 of solution Q and 5 cm^3 of solution R. Use the diagrams to record the burette readings.

initial burette reading/cm^3



= .....cm^3

final burette reading/cm^3



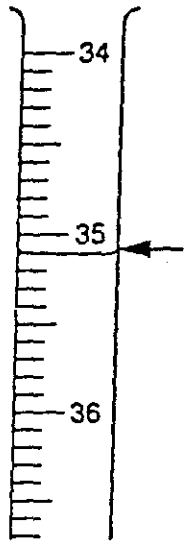
= .....cm^3 [2]

Experiment 4

Experiment 2 was repeated using 2 cm^3 of solution Q and 8 cm^3 of solution R.

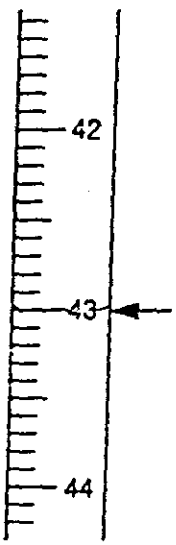
Record the measurements below.

initial burette reading/cm^3



= .....cm^3

final burette reading/cm^3



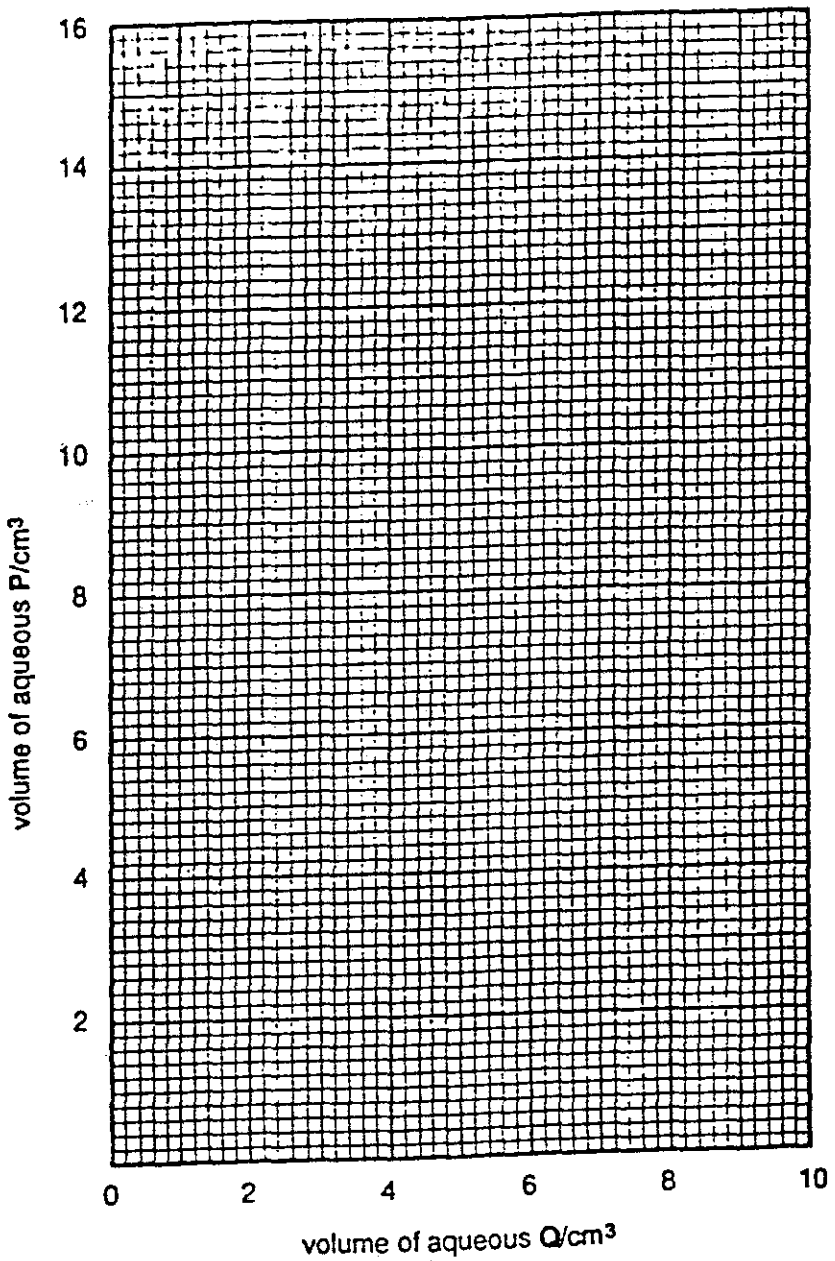
= .....cm^3 [2]

(a) (i) Use the diagrams to complete the table.

Experiment number	*Volume of aqueous Q used/cm^3*	*Volume of aqueous P added/cm^3*
1	10	
2	8	
3	5	
4	2	

[2]

(ii) Plot a graph of the results on the grid below. Join up the points with one smooth line.



[4]

For Examiners Use

(b) Use the graph to estimate the volume of solution P which would just have reacted with:

(i) a mixture of 9 cm^3 of solution Q and 1 cm^3 of solution R;

..... [1]

(ii) 10 cm^3 of solution R.

..... [2]

Show clearly on your graph how you worked out your answers. [2]

(c) Why was the flask rinsed with distilled water at the end of each experiment?

.....

..... [2]

(d) Suggest, with a reason, the effect on the results of using a less concentrated solution of P.

.....

..... [2]

For Examiner's Use

6 Tests were carried out on a coloured solid S, a mixture of an insoluble metal carbonate and a soluble brown salt.

The solid was added to a boiling tube containing water. The mixture was shaken and filtered.

Complete the observations column in the table below.

tests	*observations*
(a) *tests on the filtrate:* (i) An equal volume of aqueous sodium hydroxide was added to about 1 cm^3 of the filtrate.	A rusty brown precipitate was formed
(ii) An excess of aqueous ammonia was added to another portion of the filtrate.	..... [2]
(iii) A few drops of aqueous sodium hydroxide and a little aluminium powder were added to another portion of the filtrate. The mixture was warmed.	A strong smelling gas was given off which turned red litmus blue.
(b) *tests on the residue on the filter paper:* (i) colour of residue	white solid
(ii) A little of the residue was placed in a test-tube and dilute hydrochloric acid added. Any gases given off were passed through limewater.	.... [3]

(c) What do the tests on the filtrate tell you about S?

.....

.....

..... [3]

(d) What is the identity of the gas in (b) (ii)?

..... [1]

(e) (i) What does the test in (b) (i) tell you about the metal in the residue?

..... [1]

7 Four bottles of liquids have lost their labels. The liquids are known to be aqueous sodium chloride, dilute sulphuric acid, ethanol and water. Outline chemical tests you would do to identify the liquid in each bottle.

aqueous sodium chloride solution	
dilute sulphuric acid	
ethanol	
water	

[8]

Candidate Name _____

Centre Number	Candidate Number

Inte: ıational General Certificate of Secondary Education
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

CHEMISTRY 0620/6

PAPER 6 Alternative to Practical

Tuesday **14 MAY 1996** Morning 1 hour

Candidates answer on the question paper.
No additional materials are required.

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

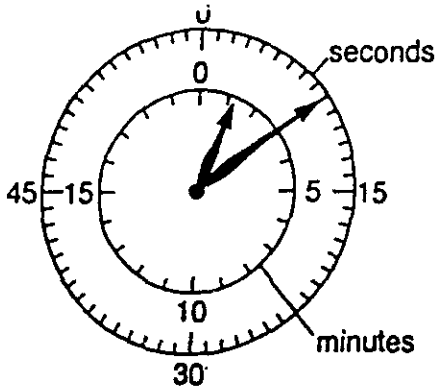
INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

FOR EXAMINER'S USE

This question paper consists of 11 printed pages and 1 blank page.

1 Write down the time indicated in the diagram of a stop clock.



..... [1]

2 The following table gives information about three solids: cobalt, iodine and sulphur. Use the information to answer the questions.

solid	*attracted by a magnet*	*solubility in ethanol*
cobalt	yes	insoluble
iodine	no	soluble
sulphur	no	insoluble

(a) Suggest how a mixture of cobalt powder and sulphur powder could be separated.

.....

.....[2]

(b) Suggest how a pure sample of iodine could be obtained from a mixture of iodine and sulphur.

.....

.....

.....

.....

.....[4]

3 A student investigated the removal of various stains from cotton cloth using seven different solvents.

The stains were left to dry for the same time. All were tested with each solvent under the same conditions. Samples of unstained cotton were also treated.

The results are summarised in the table.

solvents \ *stain*	*blood*	*tomato sauce*	*chocolate*	*tea*	*oil*	*lemon squash*	*red wine*	*black ink*
A						✓	✓	
B					✓			
C	✓	✓	✓		✓	✓	✓	
D	✓	✓	✓		✓	✓		
E	✓	✓			✓	✓	✓	
F	✓	✓	✓					
G		✓		✓		✓	✓	

Key ✓ = stain removed

(a) (i) Explain why an unstained sample of cotton was first tested with each solvent.

.....

.....[2]

(ii) Explain why the stains were left to dry for the same time.

.....

.....[2]

(b) (i) From the results which stain was the most difficult to remove?

.....[1]

(ii) Which solvent was least effective?

.....[1]

(iii) Which solvent was most effective? Explain your answer.

.....

.....[2]

(c) Suggest why labels on many solvents have the following message:

Use in a well-ventilated area.

.....

.....[1]

4 A student investigated the reaction between aqueous sodium hydroxide and two different acids **A** and **B**.

Experiment 1

A burette was filled with acid **A**.

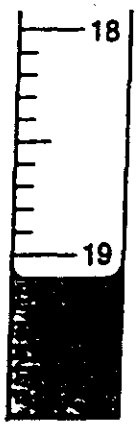
A 20 cm^3 sample of aqueous sodium hydroxide was added to a conical flask with 6 drops of methyl orange indicator.

The temperature of the aqueous sodium hydroxide was measured.

5 cm^3 of acid **A** was added to the sodium hydroxide and the temperature of the mixture measured.

A further 5 cm^3 of acid **A** was added to the flask and the temperature of the mixture measured.

Further 5 cm^3 portions of acid **A** were added to the flask until a total volume of 40 cm^3 of acid **A** had been added. The temperatures were measured after each 5 cm^3 portion had been added. The reading on the burette when the indicator changed colour is shown in the diagram.

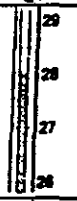
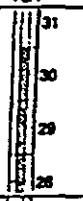
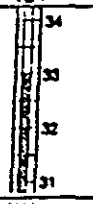
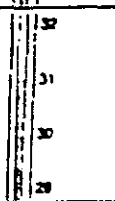


(a) From the burette diagram, note the reading when the indicator colour changed

= ..... cm^3. [1]

(b) Use the thermometer diagrams to complete the temperature readings in the table. Write your answers in the blank column alongside each diagram.

Table of results

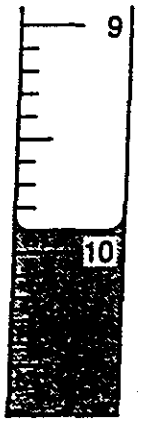
Volume of acid A added/cm³	*temperature/°C*	
0		
5		
10		
15		
20		
25		
30		
35		
40		

[4]

Experiment 2

Experiment 1 was repeated using acid **B** instead of acid **A**.

The reading on the burette when the indicator changed colour is shown in the diagram below.

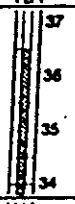
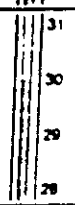


(c) From the burette diagram, note the reading when the indicator colour changed

..... cm^3. [1]

(d) Use the thermometer diagrams to complete the readings in the table. Write your answers in the blank column alongside each diagram.

Table of results

Volume of acid B added/ cm³	*temperature/°C*	
0		
5		
10		
15		
20		
25		
30		
35		
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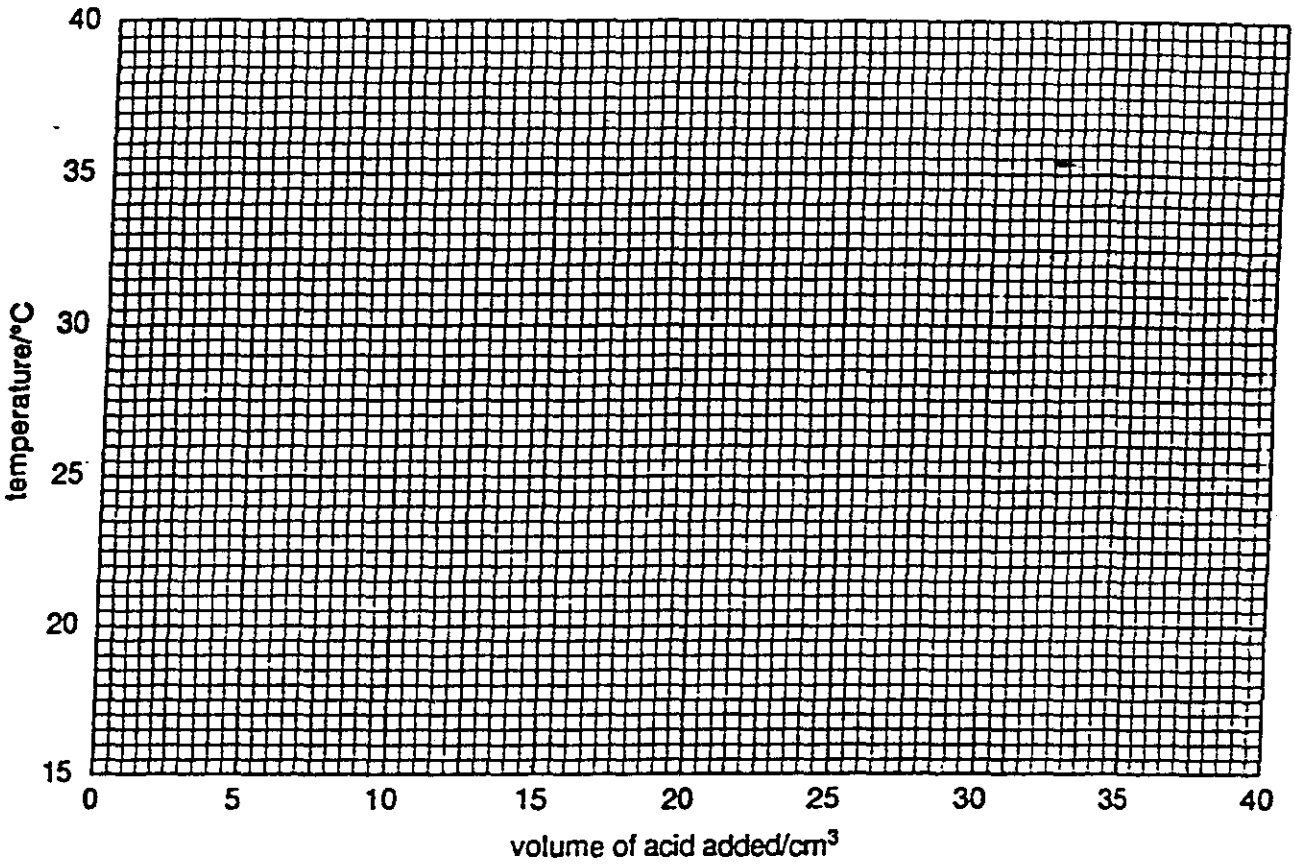
[4]

(e) Plot your results for Experiments 1 and 2 on the grid and draw two smooth line graphs. Clearly label your graphs. [6]



(f) **From your graph,** deduce the temperature of the mixture when 8 cm^3 of acid **B** reacts with sodium hydroxide in Experiment 2.

Show clearly on your graph how you worked out your answer.

.....[2]

(g) What type of chemical reaction occurs when acids **A** and **B** react with sodium hydroxide?

.....[1]

(h) **(i)** In which experiment is the temperature change greater?

.....[1]

(ii) Suggest why the temperature change was greater.

.....

.....

.....[2]

(i) *Predict the temperature of the reaction mixture in Experiment 1 after 1 hour. Explain your answer.*

.....

.....[2]

(j) Explain **one** improvement that could be made to the experiments to obtain more accurate results.

.....

.....[2]

5 An aqueous solution **C** was tested. The solution contained nitric acid and an unknown metal nitrate **D**. The tests and some of the observations are in the following table.

Complete the observations column.

tests	*observations*
(a) Describe the appearance of solution **C**.	yellow liquid
(b) Test a little of solution **C** with Universal Indicator paper. Record the pH.	colour ..... pH .....[2]
(c) To 2 cm^3 of solution **C**, add a spatula measure of *copper(II) carbonate*. Leave the mixture to stand for one minute. Decant off the liquid and add an equal volume of aqueous ammonia. Now add an excess of aqueous ammonia.	....[6]
(d) *To 2 cm^3 of solution **C**, add an equal volume of* aqueous sodium hydroxide. Now add a small piece of aluminium foil and warm the mixture **carefully**. Test any gases given off.	*brown precipitate* insoluble in excess ....[2]

(e) **(i)** What conclusion can you draw about the identity of salt **D**?

.....[2]

(ii) Which test proves that a nitrate is present?

.....[1]

6 Cerussite is a naturally occurring form of lead(II) carbonate. Lead(II) carbonate is insoluble in water.

Outline how a sample of lead metal could be obtained from cerussite. Lead is of similar reactivity to copper. Your answer should include any chemicals used and conditions.

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.....

.....

.....[5]

Centre Number | Candidate Number

Candidate Name _____

International General Certificate of Secondary Education
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

CHEMISTRY 0620/6

PAPER 6 Alternative to Practical

Monday 18 NOVEMBER 1996 Morning 1 hour

Candidates answer on the question paper.
No additional materials are required.

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

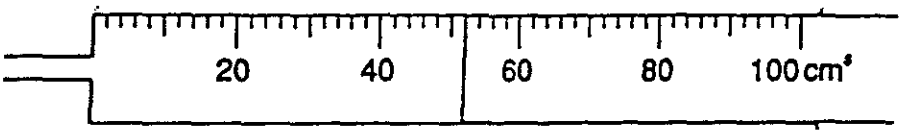
FOR EXAMINER'S USE

This question paper consists of 10 printed pages and 2 blank pages.

MFK (0131) QK67856

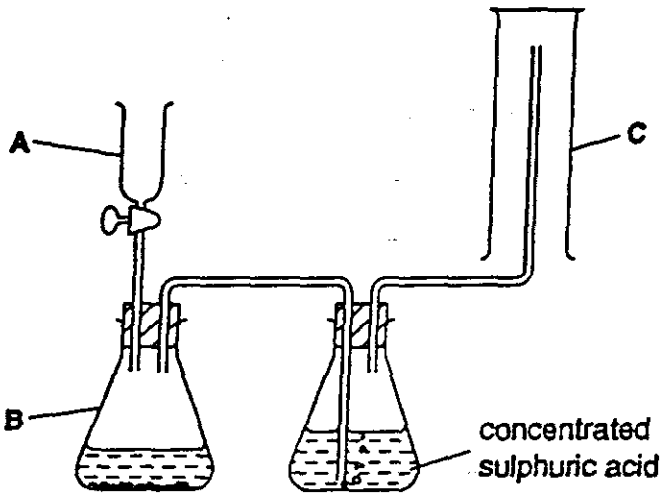
[Turn over

1 What is the volume, to the nearest cm^3, of gas in the syringe below?



..... [1]

2 The diagram below shows some apparatus used to prepare a gas in the laboratory.



(a) Name the three pieces of apparatus labelled:

A .....

B .....

C .....

[3]

(b) What two properties of the gas can you deduce from the diagram?

1 .....

2 ..... [2]

(c) Name a gas that could be prepared using this apparatus.

..... [1]

3 A student was asked to extract and investigate the yellow colour in a lemon.

The student followed these instructions.

1. Collect a lemon, a beaker, a watch glass, eye protection and 50 cm^3 of ethanol.
2. Chop up and crush the lemon.
3. Place the crushed lemon in the beaker containing the 50 cm^3 of ethanol. Cover with a watch glass.
4. Boil the mixture for thirty minutes.
5. Decant the liquid and concentrate it by evaporation until the colour is dark yellow.
6. Investigate which colours are present in the yellow solution.

(a) Why should the lemon be chopped and crushed?

.....[2]

(b) Why should the experiment be carried out in a well-ventilated laboratory?

.....[1]

(c) State **one** safety precaution that the student should have taken, other than carrying out the experiment in a well-ventilated laboratory and using eye protection.

.....[1]

(d) What necessary pieces of apparatus were missing in instruction 1?

.....[2]

(e) State the purpose of the watch glass.

.....[1]

(f) Explain the term *decant*.

.....[1]

(g) Outline how the student could carry out instruction 6. You may draw a diagram to help you answer the question.

.....

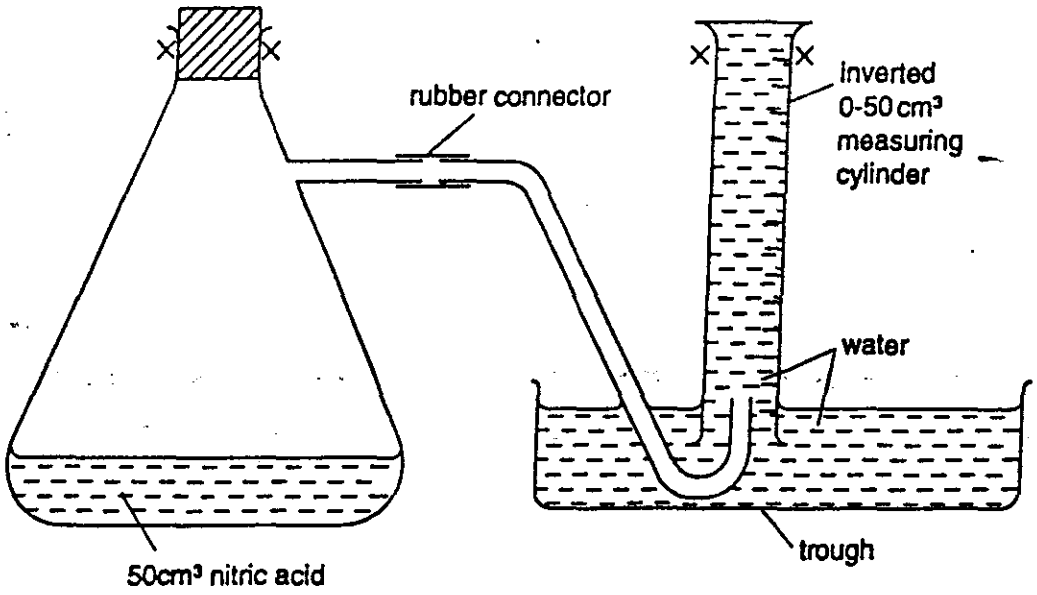
.....

.....

.....

..... [5]

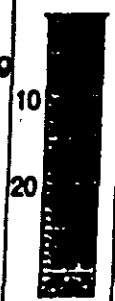
4 A student investigated the speed of reaction between dilute nitric acid and marble chips. The apparatus was set up as shown in the diagram.



× × = clamp

Experiment 1

50 cm³ of nitric acid, labelled W, was poured into the conical flask. Three marble chips were added to the conical flask. The bung was quickly put in the flask and the timer started. The volume of gas collected in the measuring cylinder was measured every 10 seconds up to 80 seconds. Use the diagrams to complete the table.

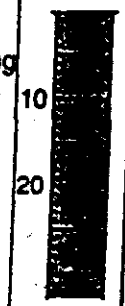
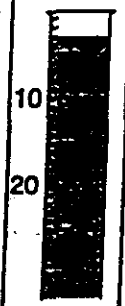
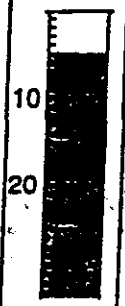
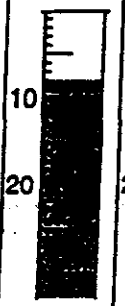
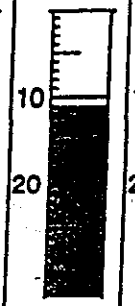
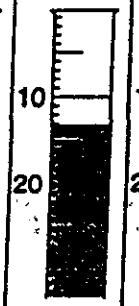
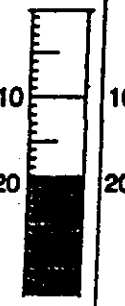
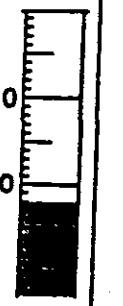
time/s	0	10	20	30	40	50	60	70	80
volume of gas in measuring cylinder /cm³									
volume of gas /cm³									

[4]

Experiment 2

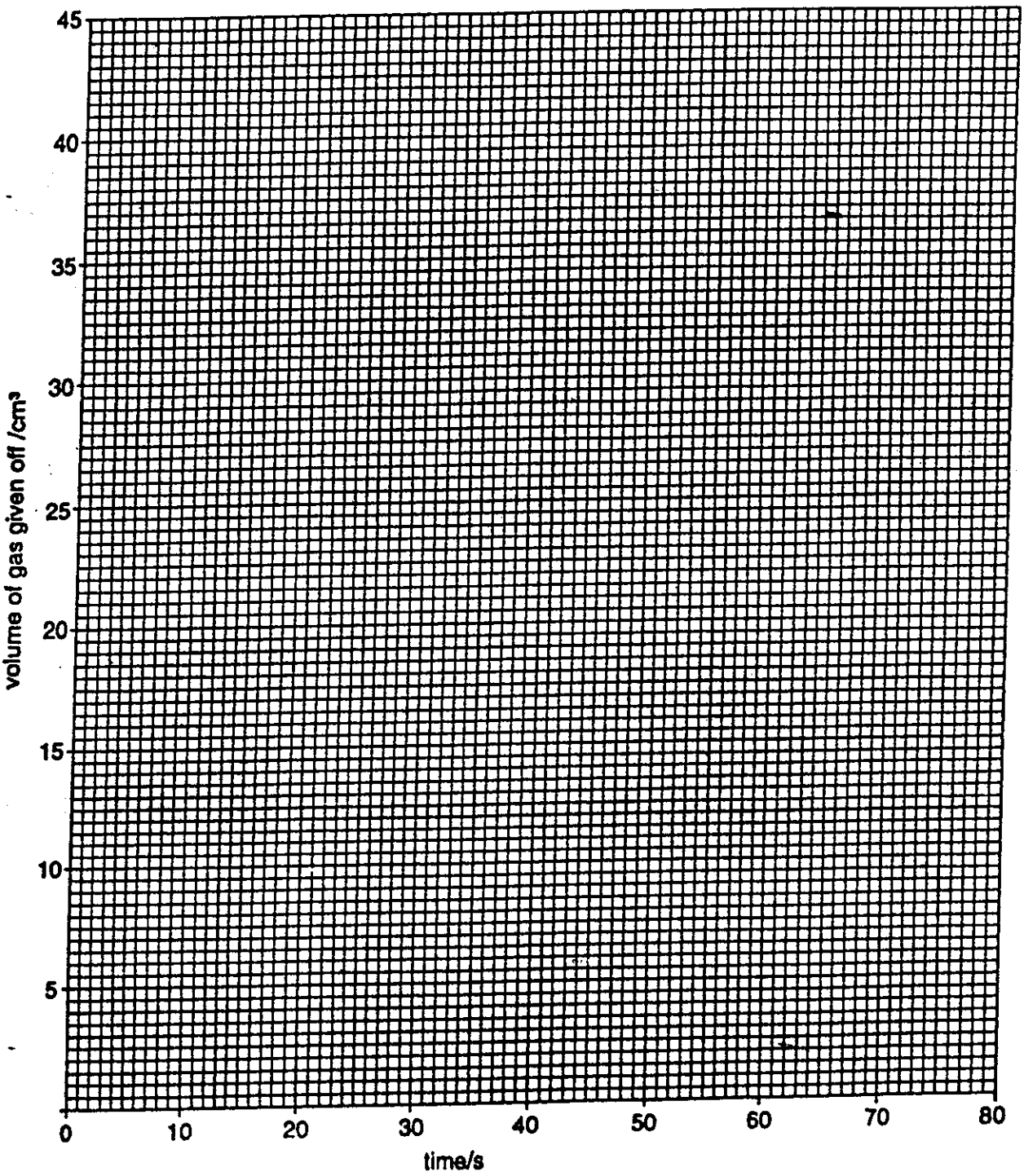
Experiment 1 was repeated using 50 cm^3 of a different solution of nitric acid, labelled **X**. The volume of gas collected in the measuring cylinder was recorded every 10 seconds up to 80 seconds. Use the diagrams to complete the table.

Table of Results

time/s	0	10	20	30	40	50	60	70	80
volume of gas in measuring cylinder /cm^3									
volume of gas /cm^3									

[4]

(a) Plot your results on the grid. Join up the points with **two** straight lines. Label the lines. [6]



(b) From your graph, estimate the total volume of gas which is given off in each Experiment between 0 and 65 seconds:

(i) Experiment 1;

..... [1]

(ii) Experiment 2.

..... [1]

Show clearly on your graph how you worked out your answers. [2]

(c) (i) Which solution of nitric acid reacted more quickly with the marble chips?

..... [1]

(ii) Suggest why this solution reacted more quickly than the other one.

.....

.....

..... [2]

(d) (i) State two possible sources of error in the two experiments.

1 .....

2 ..... [2]

(ii) Suggest two improvements to reduce the errors in the two experiments.

1 .....

2 ..... [2]

5 A mixture of two substances, S and T, was tested. S was a water-soluble aluminium salt and T was an insoluble black solid. The tests and some of the observations are in the following table. Complete the observations column.

tests	*observations*
The mixture was added to about 15 cm^3 of distilled water in a boiling tube. The contents of the tube were shaken and filtered. The following tests were carried out. **(a)** Tests on the filtrate. **(i)** Drops of aqueous sodium hydroxide were added to the filtrate.	.....
Excess aqueous sodium hydroxide was added.	.... [3]
(ii) Test (i) was repeated using aqueous ammonia instead of aqueous sodium hydroxide.	.... [2]
(iii) Aqueous barium chloride was added to the filtrate.	white precipitate
(b) Tests on the residue. **(i)** What colour was the residue?	..... [1]
Some of the residue was transferred into 2 test-tubes. **(ii)** A small volume of aqueous hydrogen peroxide was added to one test-tube.	
The gas was tested with a splint.	a glowing splint relit
(iii) A small volume of hydrochloric acid was added to the second test-tube.	
The mixture was boiled and the gas given off tested with damp blue litmus paper.	litmus paper turned red then white

(c) What is substance S?

.....

..... [2]

(d) Identify the gases given off when T reacts in part (b)(ii) and (b)(iii)

gas given off in (b)(ii) .....

gas given off in (b)(iii) ..... [2]

6 Saucepans can be made from copper, aluminium or steel. You are provided with samples of the three different metals. Outline chemical experiments that could be carried out to show which would be most suitable to make saucepans. Marks will be awarded for practical details and expected observations.

.....

.....

.....

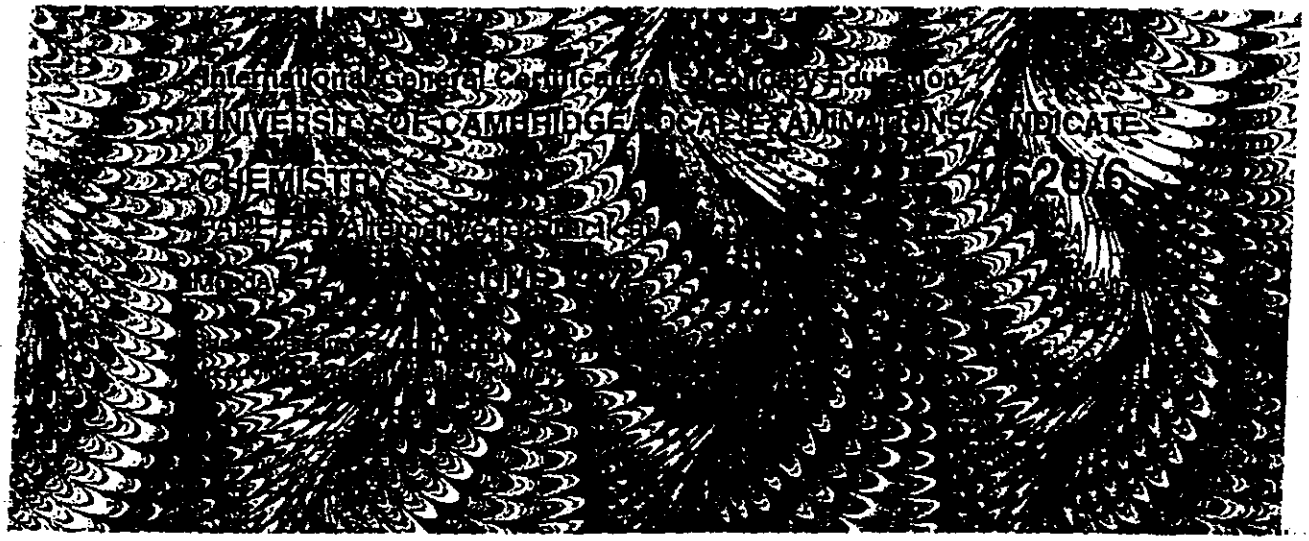
.....

.....

..... [5]

Centre Number	Candidate Number

Candidate Name _____



TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

FOR EXAMINER'S USE

This question paper consists of 11 printed pages and 1 blank page.

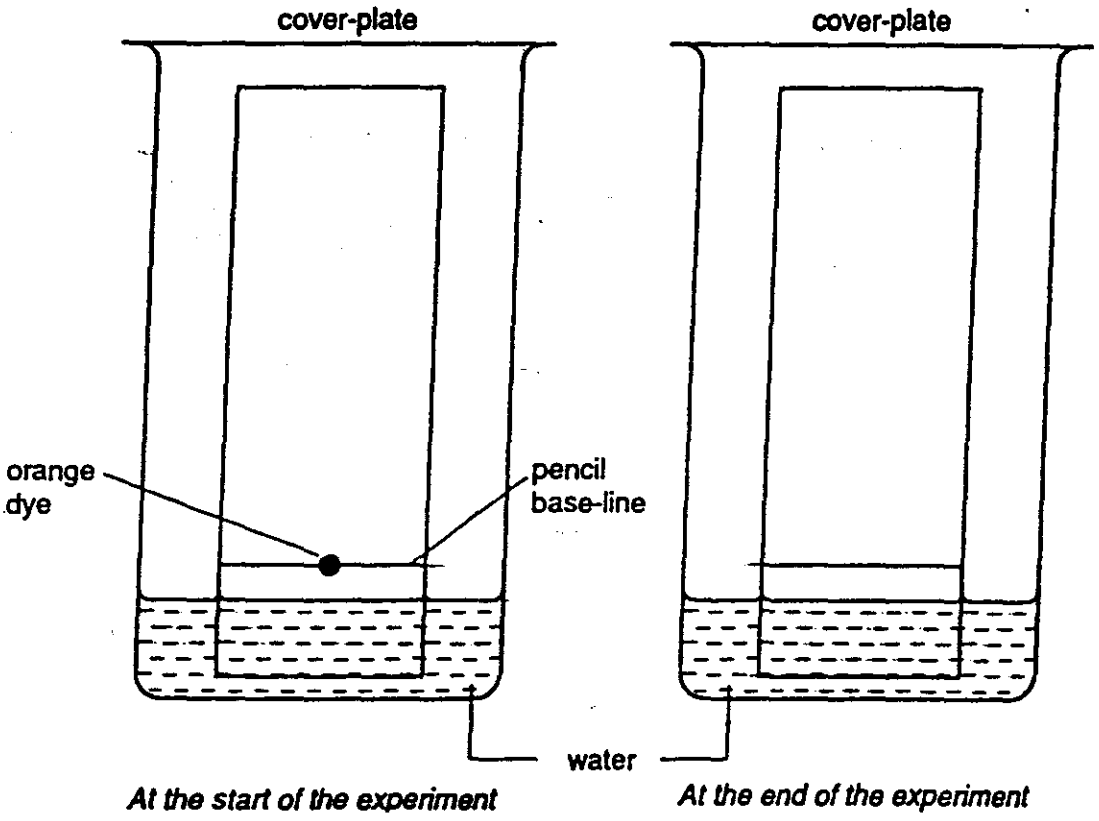
1 A student added 17.2 cm^3 of water to 5 g of an orange dye. The orange dye was a mixture of two water-soluble compounds.

(a) Name the pieces of apparatus he should use to measure:

(i) the volume of water, ...

(ii) the mass of orange dye. .....[2]

(b) (i) On the diagram, sketch the result you would expect if the orange dye were separated by paper chromatography.



[2]

(ii) Why was pencil used to mark the base line instead of ink?

.....

.....[2]

2 Suggest the identities of W, X and Y from the descriptions given below.

(a) W is a yellow/green gas which changes damp blue litmus paper to red and then white.

.....[1]

(b) X is a colourless organic liquid formed from the fermentation of sugar.

.....[1]

(c) Y is a green solid which produces ammonia when heated with a mixture of aluminium and aqueous sodium hydroxide.

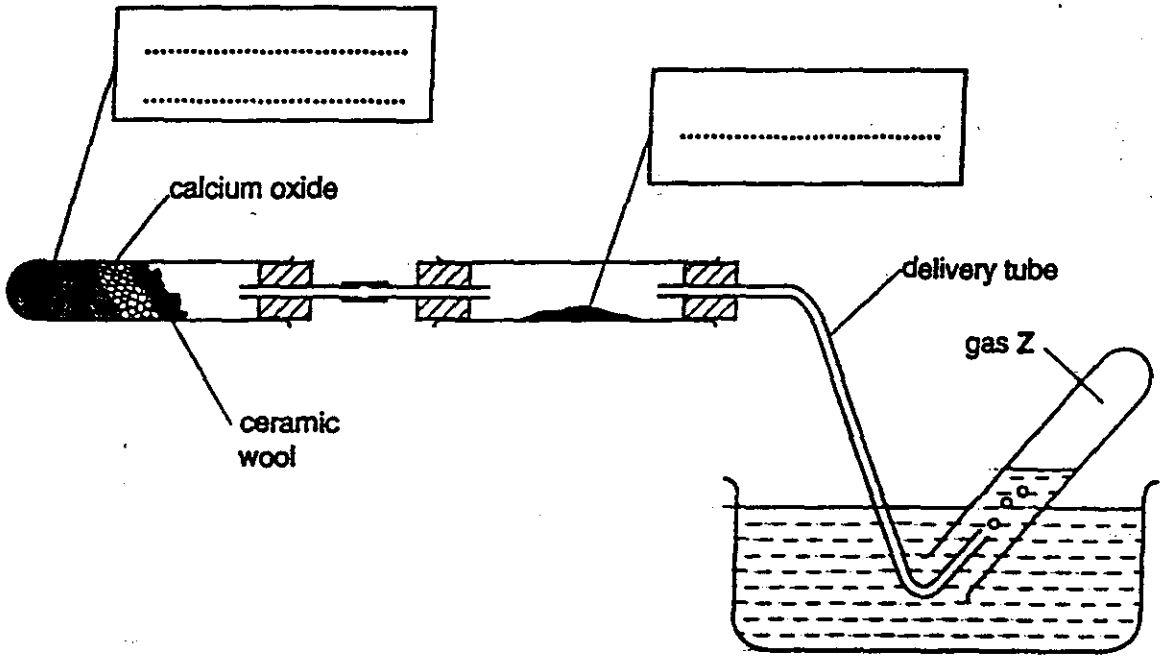
.....[2]

3 Ammonia gas can be prepared by heating a mixture of calcium hydroxide and ammonium sulphate.

$$(NH_4)_2SO_4 + Ca(OH)_2 \longrightarrow CaSO_4 + 2NH_3 + 2H_2O$$

The ammonia was dried and passed over hot copper(II) oxide using the apparatus below. A reaction occurred which can be represented by the following word equation.

ammonia + copper(II) oxide ⟶ copper + water + gas Z
(NH_3) (CuO) (Cu) (H_2O)



(a) (i) Fill in the boxes in the diagrams to show the chemicals used.

(ii) Indicate on the diagram where heat is applied. [4]

(b) Suggest the function of:

(i) the calcium oxide;

.....

(ii) the ceramic wool.

.....

.....[2]

(c) What was the colour of the copper(II) oxide,

(i) at the start of the experiment, ...

(ii) at the end of the experiment? .....

[2]

(d) Suggest an identity for gas Z.

.....[1]

(e) Why must the delivery tube be removed from the water before heating is stopped?

.....

.....[2]

4 A student investigated the reaction of magnesium with dilute hydrochloric acid.

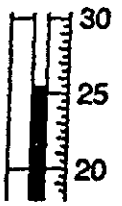
Experiment 1

A 10 cm^3 sample of dilute hydrochloric acid was placed in a boiling tube. The initial temperature of the acid was measured. A 2.5 cm length of magnesium ribbon was added to the acid in the boiling tube. The maximum temperature reached was measured. The gas given off was tested and gave a pop with a lighted splint.

(a) Name the gas given off .....[1]

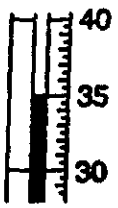
(b) Record the temperatures in the space next to the thermometer diagrams. [2]

Initial temperature of hydrochloric acid



= .....°C

Maximum temperature reached when magnesium was added



= .....°C

Temperature rise produced by 2.5 cm of magnesium ribbon

= .....°C

Experiment 2

A 10 cm^3 sample of the same hydrochloric acid was added to a boiling tube. The initial temperature of the acid was measured. A 3 cm length of magnesium ribbon was added to the acid in the boiling tube and the maximum temperature reached was measured.

Experiment 3

Experiment 2 was repeated using a 4 cm length of magnesium ribbon.

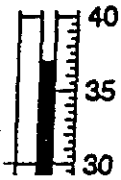
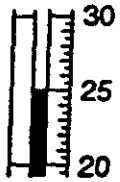
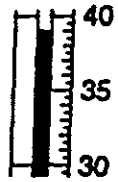
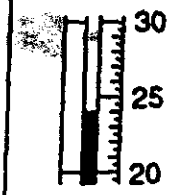
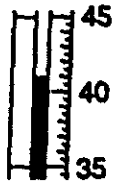
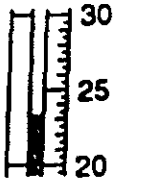
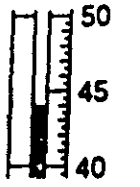
Experiment 4

Experiment 2 was repeated using a 5 cm length of magnesium ribbon.

Experiment 5

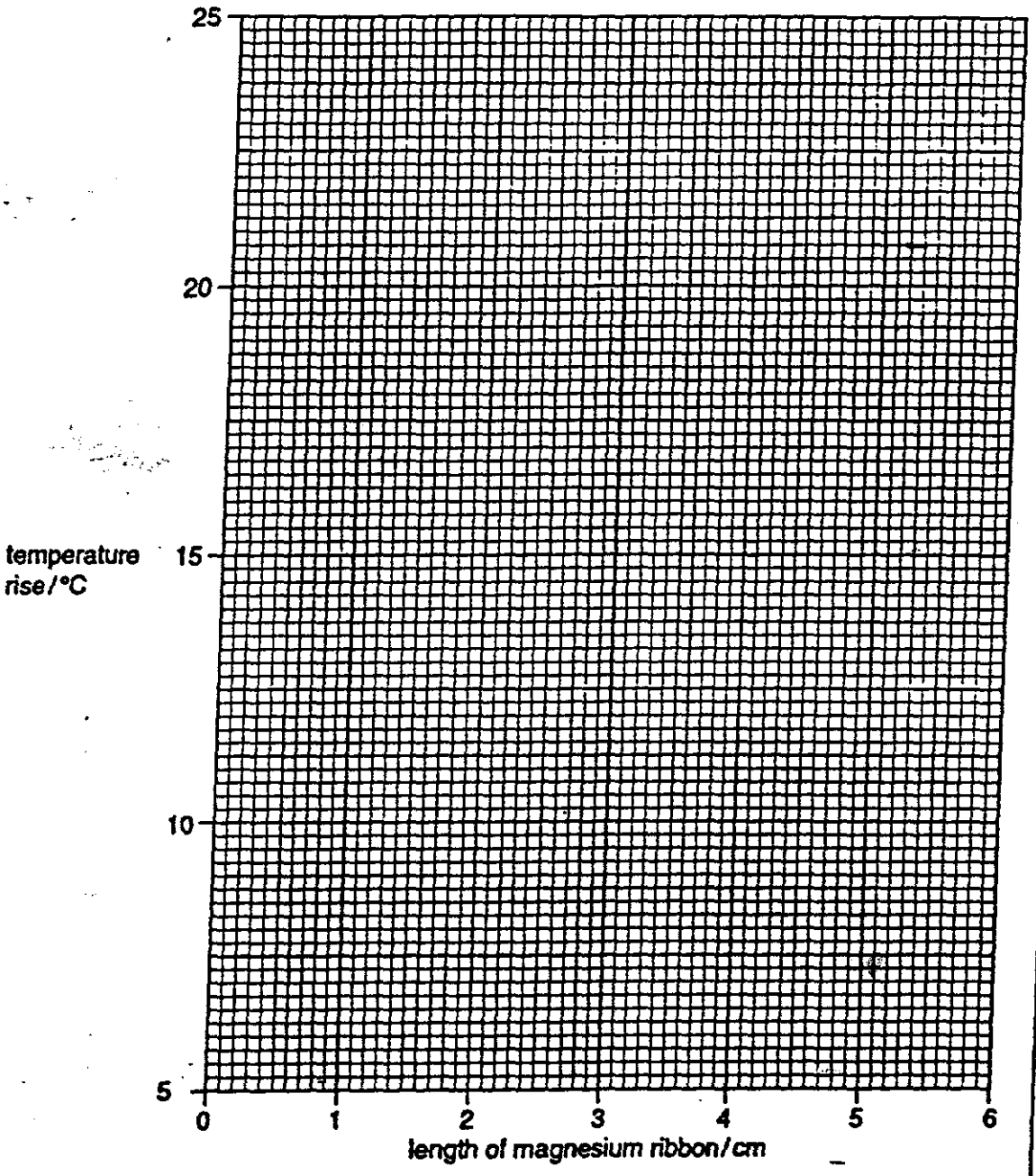
Experiment 2 was repeated using a 6 cm length of magnesium ribbon.

(c) Record the temperatures in the spaces next to the thermometer diagrams shown and calculate the temperature rise in each case.

experiment	*length of ribbon*	*initial temperature of acid/°C*	*maximum temperature reached/°C*	*temperature rise/°C*
2	3 cm			
3	4 cm			
4	5 cm			
5	6 cm			

[5]

(d) Plot the results for Experiments 1 to 5 on the grid and draw a straight line graph.



[4]

(e) From your graph, deduce the temperature rise of the mixture when a 1 cm length of magnesium ribbon reacts with 10 cm^3 of hydrochloric acid of the same concentration.

Show clearly on your graph how you worked out your answer.

.....[2]

(f) What word is used to describe a chemical reaction where the temperature increases?

.....[1]

(g) Give **two** observations, other than temperature increase, expected when magnesium reacts with hydrochloric acid.

1 .....

.....

2 .....

.....[2]

(h) Predict the temperature of the reaction mixture in Experiment 5 after 1 hour. Explain your answer.

.....

.....[2]

(i) Explain **one** improvement that could be made to the experimental procedure to obtain more accurate results.

.....

.....

.....[2]

5 'Grow Well' is a common garden fertiliser which is partly soluble in water. A student investigated the solubility of 'Grow Well' in water at room temperature using the following procedure.

Stage 1. Water was added to 10 g of 'Grow well' in a beaker. The mixture was boiled, allowed to cool to room temperature and then filtered.

Stage 2. A 100 cm^3 sample of the filtrate was evaporated to dryness. The solid remaining had a mass of 7.5 g.

(a) Why, in Stage 1, was the water heated to boiling and then allowed to cool to room temperature?

.....

.....[2]

(b) What piece of apparatus could have been used to measure the filtrate in Stage 2?

.....[1]

(c) How could the student show that all of the water had been evaporated in Stage 2?

.....

.....[2]

6 Tests were carried out on a mixture of two white solids **C** and **D**. Solid **C** was water-soluble and **D** was zinc carbonate.

The solid was added to water in a boiling tube. The mixture was shaken and filtered.

Complete the observations in the following table.

Tests	*Observations*
tests on the filtrate **(a)** To the solution, a few drops of nitric acid and then aqueous lead(II) nitrate was added.	yellow precipitate
tests on the solid on the filter paper **(b)** **(i)** Colour of solid.	.....[1]
(ii) A little of the solid was put into a test-tube and dilute hydrochloric acid added. Any gases evolved were passed through limewater. The contents of the test-tube were kept for part **(c)**.	.... [3]

Tests	*Observations*
(c) The contents of the test-tube were divided into two equal portions.	
(i) To the first portion, an equal volume of aqueous sodium hydroxide was added	....[2]
An excess of aqueous sodium hydroxide was then added.	....[1]
(ii) To the second portion, an equal volume of aqueous ammonia was added.	....[2]
An excess of aqueous ammonia was then added.	....[1]

(d) What does test (a) tell you about solid C?

.....

.....[1]

(e) State **two** expected differences in the observations if the mixture had contained calcium carbonate instead of zinc carbonate.

1.....

.....

2 .....

.....[2]

Centre Number	Candidate Number

Candidate Name _____

International General Certificate of Secondary Education
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

CHEMISTRY 0620/6

PAPER 6 Alternative to Practical

Monday 17 NOVEMBER 1997 Morning 1 hour

Candidates answer on the question paper.
Additional materials:
Mathematical tables

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.
Answer all questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

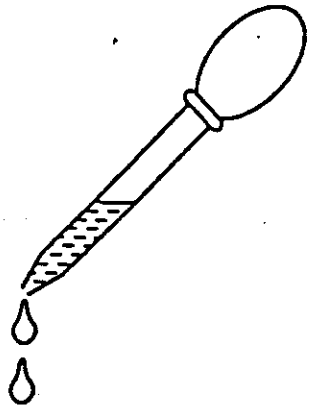
FOR EXAMINER'S USE

This question paper consists of 11 printed pages and 1 blank page.

100

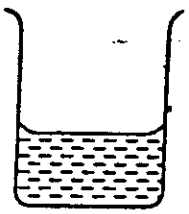
1 Name each piece of apparatus shown in the diagrams below.

(i)



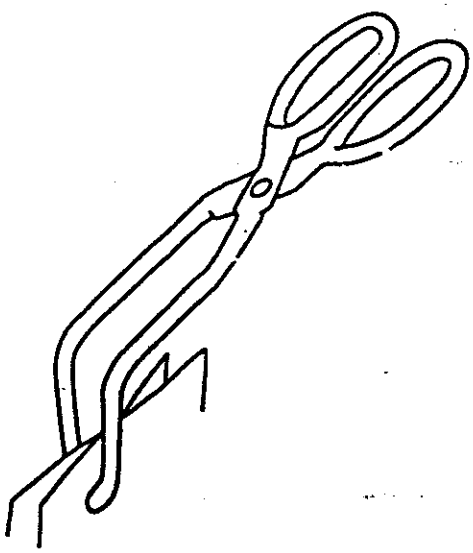
name .....[1]

(ii)



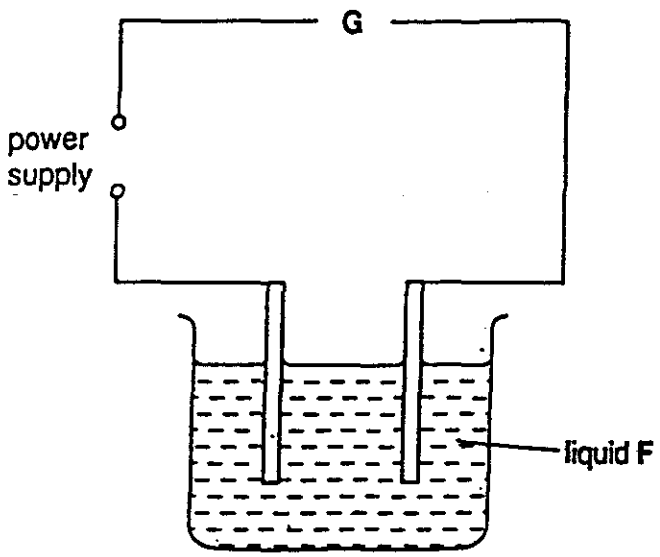
name .....[1]

(iii)



name .....[1]

2 The diagram shows an electrolysis experiment.



(a) What piece of apparatus could be connected at G to show that liquid F is an electrolyte?

.....[1]

(b) An ornament is to be coated with silver using electrolysis. State what you would use in this experiment as:

(i) the positive electrode;

.....[1]

(ii) the negative electrode;

.....[1]

(iii) liquid F, i.e. the electrolyte.

.....[2]

3 Tea leaves contain caffeine and tannic acid. Caffeine is soluble in water and in a liquid called chloroform. A student extracted caffeine by the following method.

Stage 1. Tea leaves were added to boiling water for 10 minutes.

Stage 2. The insoluble tea leaves were separated from the water.

Stage 3. Calcium carbonate was added to the solution of tea to remove the tannic acid as a *precipitate* of calcium tannate.

Stage 4. The solution was shaken with chloroform to extract the caffeine from the water.

Stage 5. The caffeine was crystallised from the chloroform solution.

Stage 6. The caffeine crystals were checked for purity.

(a) What was the function of the water in stage 1?

.....[1]

(b) Draw a diagram of the apparatus used in stage 2.

[2]

(c) What is meant by the term *precipitate*?

.....[1]

(d) What laboratory equipment would be needed in stage 5?

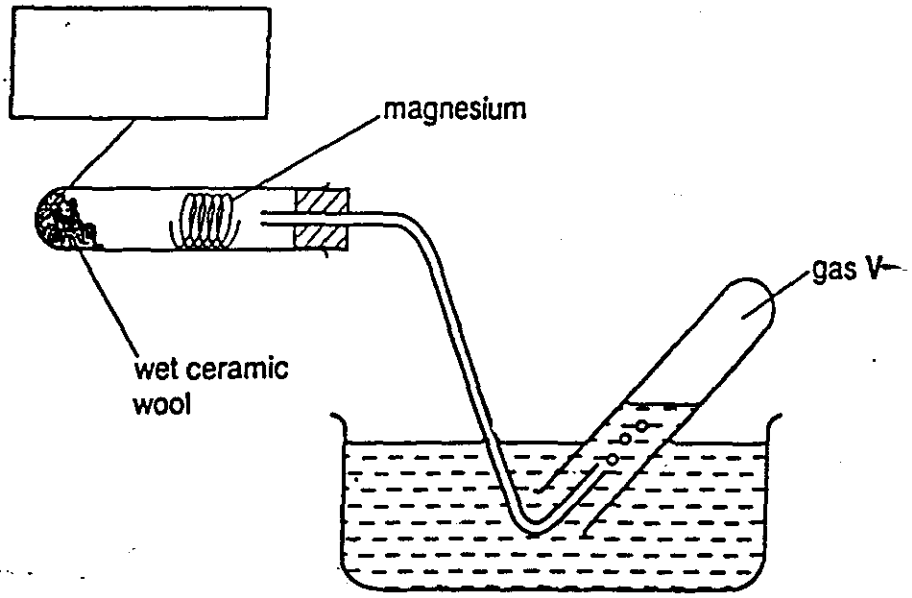
.....

.....[2]

(e) What method could be used in stage 6?

.....[1]

4 A student passed steam over heated magnesium ribbon using the apparatus below.



A reaction occurred which can be represented by the following word equation:

steam + magnesium ⟶ magnesium oxide + gas V

Gas V burns in air to form a liquid which boils at 100°C.

(a) (i) Fill in the box in the diagram to show the chemical used.

(ii) Indicate on the diagram where heat is applied.

[2]

(b) What is the purpose of the ceramic wool?

.....[1]

(c) What was the appearance of the magnesium.

(i) before the experiment, ...

(ii) after the experiment? .....

[2]

(d) (i) Suggest an identity for gas V

.....[1]

(ii) How could you test gas V?

.....[2]

(e) Suggest why the tube containing the magnesium often cracks on cooling.

.....[1]

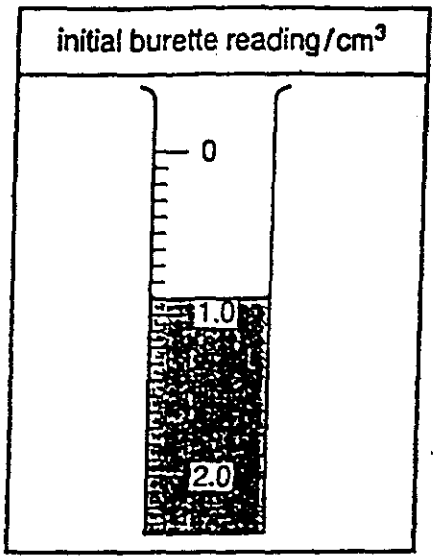
5 A student investigated the reaction between sodium hydrogencarbonate and two different acids, A and B.

Experiment 1

A $20\,cm^3$ sample of distilled water was measured into a conical flask. A $0.2\,g$ sample of sodium hydrogencarbonate was added to the conical flask and shaken to dissolve the solid. Methyl orange indicator solution was added to the flask.

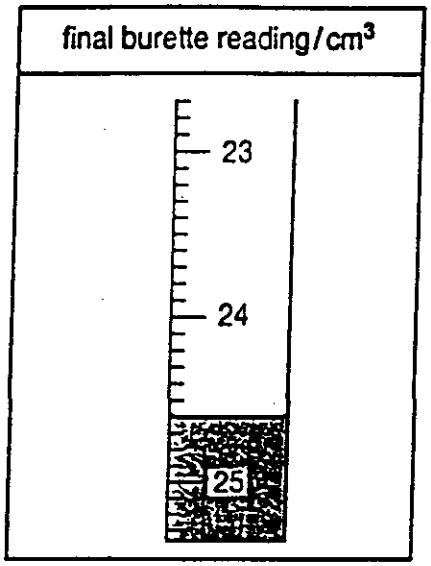
A burette was filled with the aqueous solution of acid A. Acid A was added from the burette to the contents of the flask, until the solution just changed colour.

(a). Record the initial burette reading using the burette diagram below.



initial burette reading/cm^3 = ...[1]

(b) Record the final burette reading using the burette diagram below.



final burette reading/cm^3 = ...[1]

(i) Volume of Acid A added/cm^3 =.....[1]

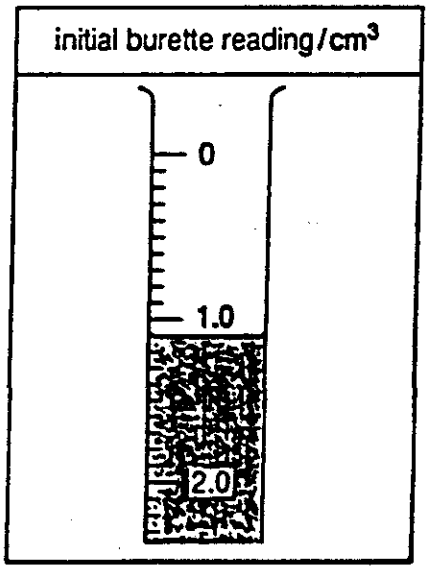
(ii) What apparatus was used to measure the mass of the sodium hydrogencarbonate?

.....[1]

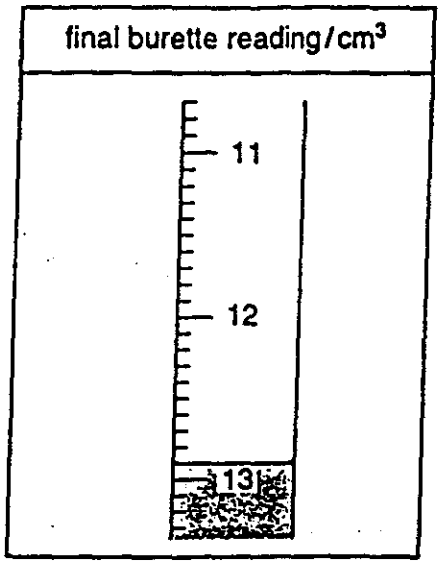
Experiment 2

Experiment 1 was repeated, using acid B instead of acid A.

(c) Record the burette readings, using the burette diagrams below.



initial burette reading/cm^3 = ...[1]



final burette reading/cm³ = ...[1]

Volume of B added/cm³ =.....[1]

(d) *Answer the following questions.*

(i) How did the colour of the methyl orange indicator change when acid A was added to the sodium hydrogencarbonate solution?

from .....to .....[2]

(ii) What type of chemical reaction occurs when an acid reacts with sodium hydrogencarbonate solution?

.....[1]

(iii) Which experiment used the larger volume of acid?

Experiment ..... [1]

(iv) Suggest two possible reasons why the results for Experiments 1 and 2 were different.

Reason 1 .....

.....

Reason 2 .....

.....[2]

(e) Predict the volume of acid A that would be needed if 0.4 g of sodium hydrogencarbonate had been used in Experiment 1. Explain your answer.

Volume of acid.....[1]

Explanation .....

.....[2]

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

.....

.....[2]

6 Tests were carried out on a green solution **C**, which was a mixture of ammonium chloride and a metal chloride dissolved in water.

Complete any gaps in the observations column in the following table.

Tests	*Observations*
(a) To about 3 cm^3 of **C**, a few drops of nitric acid and then aqueous silver nitrate was added.	....[2]
(b) To about 3 cm^3 of solution **C**, an equal volume of aqueous sodium hydroxide was added. The mixture was warmed and the gas given off tested with damp Universal Indicator paper. The pH was recorded.	pale blue precipitate ....[2]
The mixture was heated until no further change in colour and left to settle for five minutes. The liquid was decanted off. Dilute sulphuric acid was added to the solid and boiled gently.	black solid formed ....[2]
(c) To about 3 cm^3 of solution **C** in a test-tube, an equal volume of aqueous ammonia was added. An excess of aqueous ammonia was added.	....[2] ....[2]

(d) Identify the gas given off in test (b)

.....[1]

(e) Name the black solid formed in test (b).

.....[1]

(f) Suggest the identity of the metal chloride in solution **C**.

.....[1]

7 When lemonade is heated carbon dioxide gas is given off.

(a) Draw a labelled diagram of apparatus that could be used to find the volume of carbon dioxide dissolved in 100 cm^3 of lemonade.

[3]

(b) How could it be shown that all of the carbon dioxide gas had been removed from the lemonade?

.....

.....[2]

Centre Number | Candi Num

Candidate Name _____

International General Certificate of Secondary Education
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

CHEMISTRY 0620/6

PAPER 6 Alternative to Practical

Monday 1 JUNE 1998 Afternoon 1 hour

Candidates answer on the question paper.
No additional materials are required.

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.
Answer all questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

FOR EXAMINER'S USE

This question paper consists of 11 printed pages and 1 blank page.

1 What piece of laboratory apparatus would be most suitable to measure:

(a) 32 g of sugar;

.....

(b) 15.7 cm^3 of water?

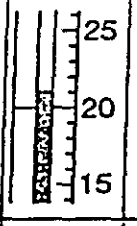
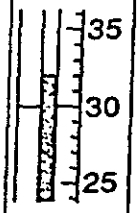
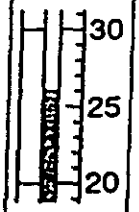
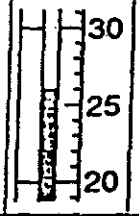
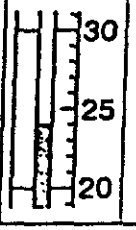
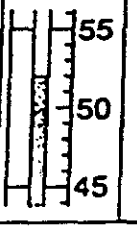
.....

[2]

2 An investigation was carried out on the reaction of an aqueous solution F with zinc, copper and magnesium.

Solution F was added to each of three test-tubes and the temperature of the liquid measured. Zinc was added to the first test-tube, copper to the second test-tube and magnesium to the third test-tube. Observations were recorded and the temperature of the mixture in each test-tube was measured after three minutes.

(a) Use the thermometer diagrams to complete the results table. [3]

metal added	*observations*	*temperature/°C*		*temperature difference/°C*
		initial	*final*	
zinc	gas given off slowly			.....
copper	no visible change			.....
magnesium	gas given off rapidly			.....

(b) Write the metals in order of reactivity, putting the **most** reactive first.

most reactive .....

.....

least reactive .....[2]

(c) What type of chemical reaction occurs when magnesium reacts with F?

.....[1]

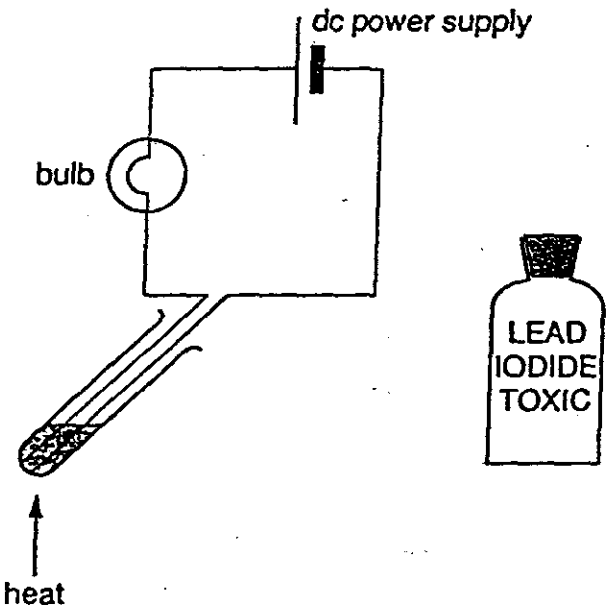
3 Lead(II) iodide was placed in a boiling tube and the electric circuit shown below was set up. The lead(II) iodide was heated until it melted. The following observations were made:

the bulb lit up;

purple fumes appeared at the anode;

silver-coloured drops formed at the cathode.

Heating was stopped and the contents of the boiling tube solidified. The bulb continued to glow.



(a) What is used to heat the boiling tube?

.....[1]

(b) Identify:

(i) the purple fumes;

.....

(ii) the silver-coloured drops.

.....

[2]

(c) Suggest a possible reason why the bulb glowed after the heating was stopped.

.....[1]

(d) Give two safety precautions which should be taken during this experiment.

1 .....

2 .....[2]

4 A student investigated the reaction between potassium iodate and sodium sulphite. The reaction produces iodine which gives a blue colour with starch.

Experiment 1

A 4 cm^3 sample of aqueous potassium iodate was added to a 100 cm^3 measuring cylinder. Distilled water was added to make up the volume to 100 cm^3 and the cylinder labelled A.

A 10 cm^3 sample of aqueous sodium sulphite was added to a second 100 cm^3 measuring cylinder and the volume made up to 50 cm^3 with distilled water. A 5 cm^3 sample of dilute sulphuric acid was added to this mixture and the volume made up to 95 cm^3 with distilled water. Finally, a 5 cm^3 sample of starch solution was added and the cylinder labelled B.

The contents of measuring cylinders A and B were poured at the same time into a beaker and a stop clock started. The contents of the beaker were stirred and the time was taken for a blue colour to appear.

Use the stop clock diagram to read the time taken and record the value in the table.

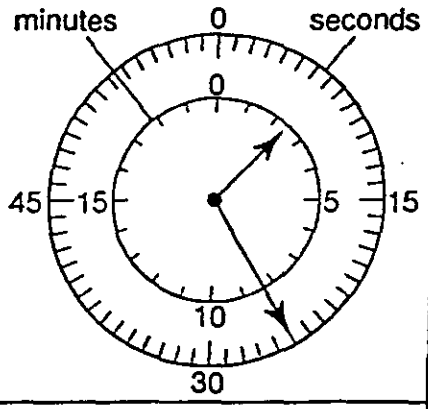
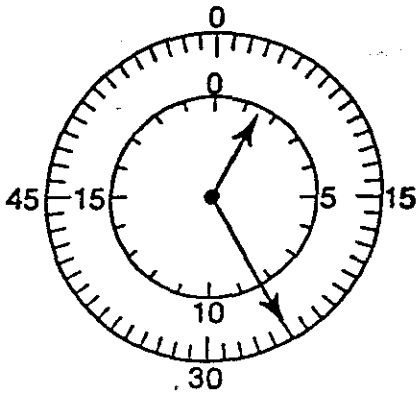
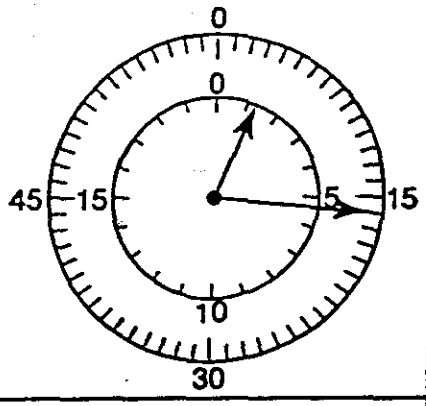
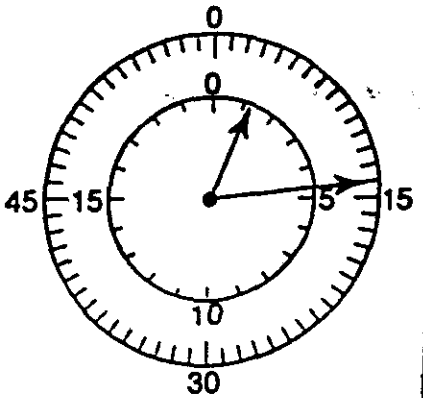
Experiment 2

Experiment 1 was repeated using 6 cm^3 of aqueous potassium iodate. Use the stop clock diagram to read the time taken and record the value in the table.

Experiments 3 and 4

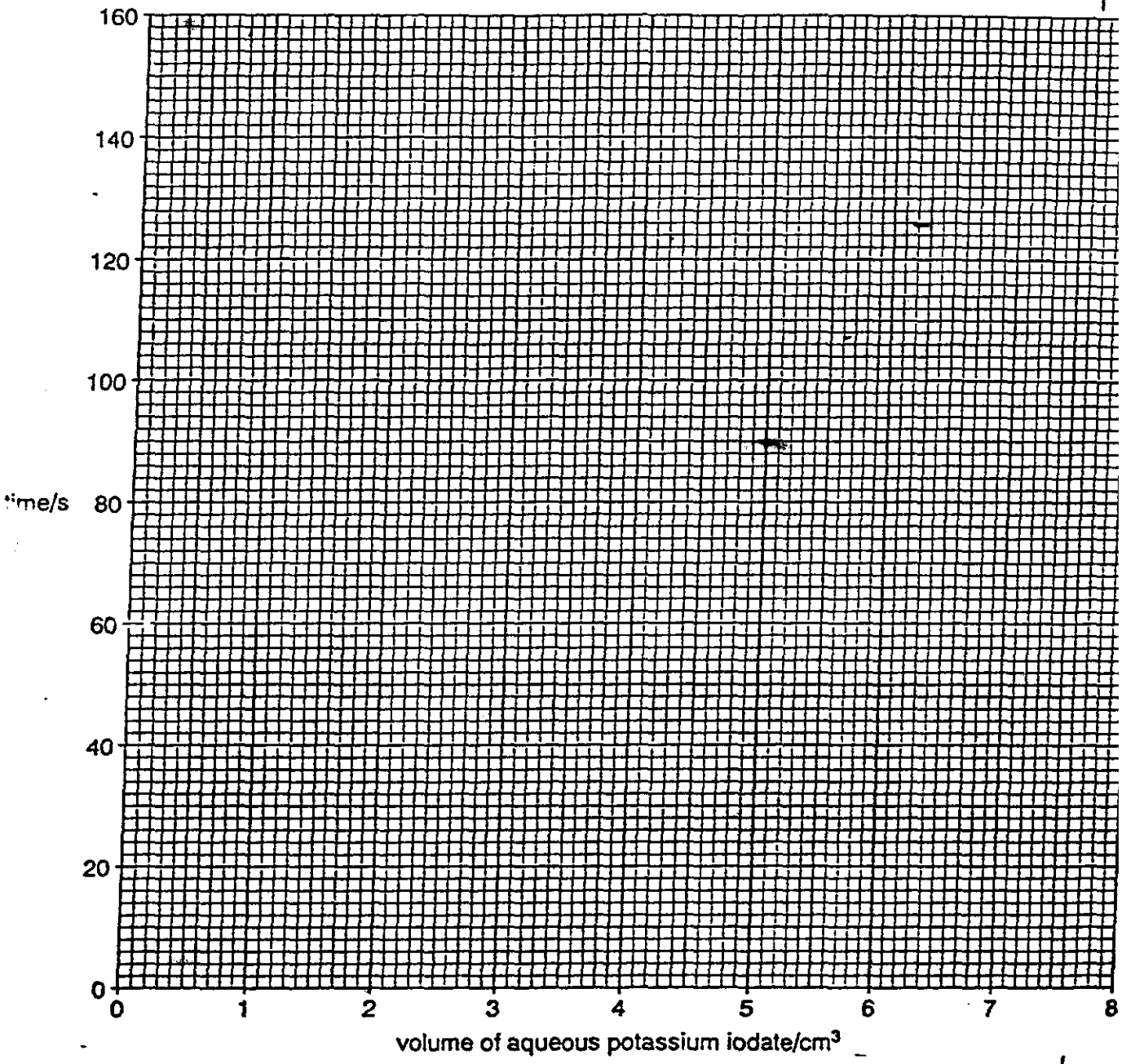
The experiment was repeated two more times adding 7 cm^3 and then 8 cm^3 of aqueous potassium iodate.

Use the stop clock diagrams to read the times taken and record the values in the table.

experiment	*volume of aqueous potassium iodate/cm³*	*stop clock diagram*	*time for blue colour to appears*
1	4		
2	6		
3	7		
4	8		

[3]

(a) Plot the results for *Experiments 1 to 4* on the grid and draw a smooth line graph. [3]



(b) **From your graph,** deduce the time taken for a blue colour to appear when **4.5 cm^3** of the aqueous potassium iodate in measuring cylinder A reacted with the contents of measuring cylinder B.

Show clearly on your graph how you worked out your answer.

.....[2]

(c) (i) In which experiment was the longest time noted?

.....[1]

(ii) Explain why this experiment took the longest time.

.....

.....

.....[2]

(d) Why were the contents of measuring cylinder B kept the same in all of the experiments?

.....

.....

.....[2]

(e) Suggest the purpose of the starch in the experiments.

.....

.....[1]

(f) Predict the effect on the results of increasing the temperature of the reaction mixture in Experiment 1. Explain your answer.

effect .....

explanation .....

.....

.....[2]

(g) Explain one improvement that could be made to the experimental procedure to obtain more accurate results.

improvement .....

explanation .....

.....[2]

5 Two different liquids, C and D were tested. The tests and some of the observations are in the following table. C was an aqueous solution of a zinc salt and D was a liquid alkane.

Complete the observations in the table.

tests	*observations*
(a) A little of solution C was tested with Universal Indicator paper. The pH was recorded.	colour orange pH 4
(b) Describe liquid D.	....[2]
(c) (i) To 1 cm^3 of solution C was added a few drops of hydrochloric acid and then aqueous barium chloride.	white precipitate formed
(ii) To 1 cm^3 of liquid D was added a few drops of hydrochloric acid and then aqueous barium chloride.	....[1]
(d) (i) To 1 cm^3 of solution C was added aqueous sodium hydroxide one drop at a time.	....[2]
An excess of aqueous sodium hydroxide was added.	....[1]
(ii) To 1 cm^3 of solution C was added aqueous ammonia one drop at a time.	....[2]
An excess of aqueous ammonia was added.	....[1]
(e) A few drops of liquid D were added to a watch glass. The surface of the liquid was touched with a lighted splint.	....[1]
(f) Test (e) was repeated using C.	....[1]

(g) From the results, what conclusions can you draw about the identify of solution C?

.....

.....

.....

.....[2]

6 *Magnesium sulphate crystals, $MgSO_4.7H_2O$, can be made from magnesium and dilute* sulphuric acid by the following method.

Step 1. Add an *excess* of magnesium to dilute sulphuric acid.

Step 2. *Filter.*

Step 3. Evaporate the solution from Step 2 to *crystallising point.* Leave to stand.

Step 4. Dry the crystals.

(a) *Explain why an excess of magnesium is used in* **Step 1.**

.....

.....[2]

(b) *How would you know that* **Step 1** *was complete?*

.....

.....[1]

(c) *Name the residue and the filtrate in Step 2.*

residue .....

filtrate .....[2]

(d) *What method could be used to show the crystallising point had been reached in* **Step 3?**

.....

.....[1]

(e) **What precaution would have to be taken in Step 4? Explain your answer.**

precaution .....

explanation .....

.....[2]

(f) How would the method differ if magnesium oxide were used instead of magnesium?

.....

.....[2]

7 The label on a bottle of lemon drink gave the following information:

'Contains two yellow colourings, E102 and E105'

Describe a simple experiment you could do to prove that **only two** yellow substances are present in the lemon drink. A diagram may help you answer this question.

.....

.....

.....

.....

.....

.....[5]

Centre Number	Candidate Number

Candidate Name _____

International General Certificate of Secondary Education
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

CHEMISTRY 0620/6

PAPER 6 Alternative to Practical

Monday 16 NOVEMBER 1998 Morning 1hour

Candidates answer on the question paper.
Additional materials:
Mathematical tables

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

FOR EXAMINER'S USE

This question paper consists of 12 printed pages.

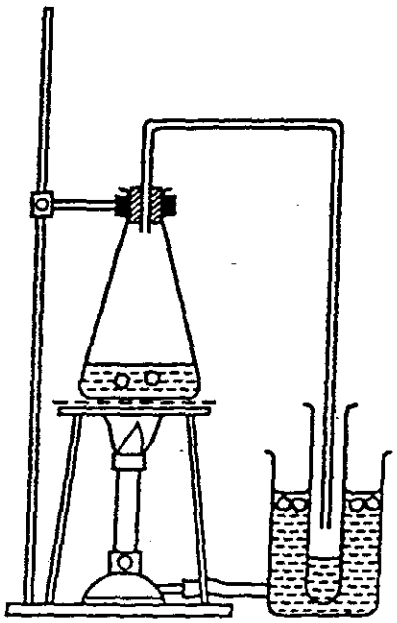
SB (SLC) OK87438/1

1 The diagram below shows the apparatus used to distil a liquid. Label the diagram to show the following items:

(a) beaker;

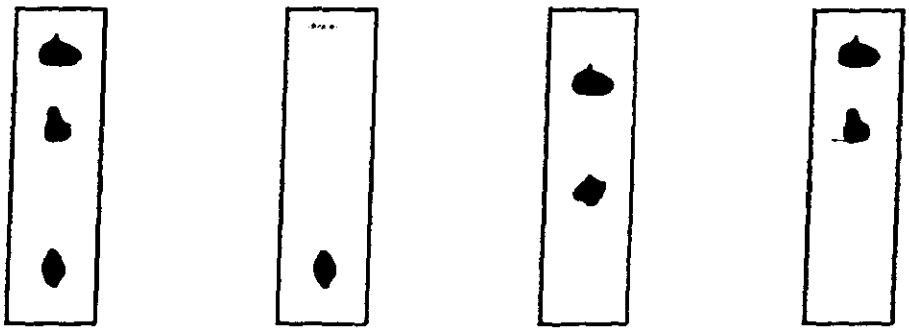
(b) tripod;

(c) retort stand.



[3]

2 The police investigated a case involving forged bank notes. The police chemist made chromatographs from the ink in the notes and the inks found on the premises of three suspects. The diagram below shows the results.



forged bank note ink | suspect 1 ink | suspect 2 ink | suspect 3 ink

What conclusions can you reach?

.....

.....

..... 123

3 The insoluble salt, lead(II) iodide, can be prepared by mixing aqueous lead(II) nitrate and aqueous potassium iodide.

(a) What type of chemical reaction takes place?

.....[1]

(b) How could a **pure dry** sample of lead(II) iodide be obtained from the mixture?

.....

.....

.....

.....

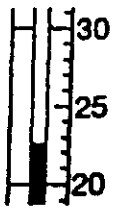
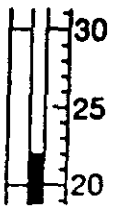
.....[3]

4 A student investigated the temperature changes which occur when solids dissolve in water.

Experiment 1

A 50 cm^3 sample of distilled water was added to a beaker. The temperature of the water was measured. A sample of sodium chloride was added to the water, which was stirred quickly with the thermometer to dissolve the solid. The final temperature reached was measured. Use the thermometer diagrams to read the temperatures and record the values and complete the table below.

Table of results

	thermometer diagram	*temperature /°C*
final temperature/°C		....
initial temperature/°C		.....
temperature difference/°C		.....

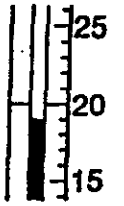
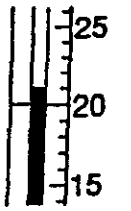
[3]

Experiment 2

The contents of the beaker were poured away and the beaker rinsed with distilled water. Experiment 1 was repeated, using ammonium chloride instead of sodium chloride.

Use the thermometer diagrams to read the temperatures and record the values and complete the table.

Table of results

	thermometer diagram	*temperature /°C*
final temperature/°C		.....
initial temperature/°C		.....
temperature difference/°C		.....

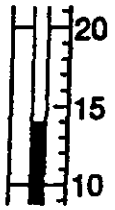
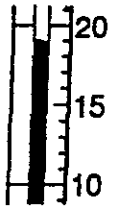
[3]

Experiment 3

The contents of the beaker were poured away and the beaker rinsed with distilled water. Experiment 1 was repeated, using sodium thiosulphate instead of sodium chloride. This solution was kept for Experiment 4.

Use the thermometer diagrams to read the temperatures and record the values and complete the table.

Table of results

	thermometer diagram	*temperature /°C*
final temperature/°C		.....
initial temperature/°C		.....
temperature difference/°C		.....

[3]

Using the results, answer the following questions.

(a) Which experiment showed the smallest temperature change?

..... [1]

(b) What type of reaction occurs when ammonium chloride dissolves in water?

.....[1]

(c) Why was the beaker rinsed with distilled water before starting Experiments 2 and 3?

.....[1]

(d) Suggest **one** possible reason why the results for Experiments 2 and 3 are different.

.....

.....[1]

Experiment 4

The student then investigated the reaction of aqueous sodium thiosulphate with dilute hydrochloric acid.

A 5 cm^3 sample of the aqueous sodium thiosulphate from **Experiment 3** and 45 cm^3 of distilled water were added to a conical flask. The flask was placed on a piece of graph paper.

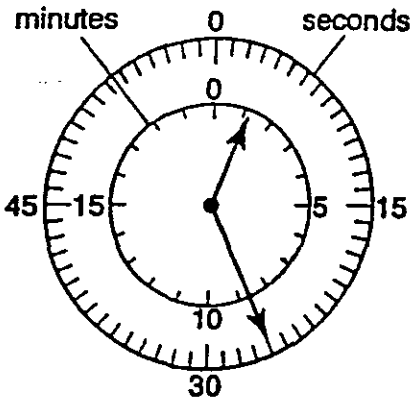
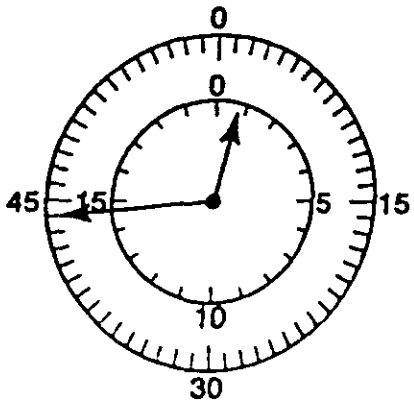
A 10 cm^3 sample of hydrochloric acid was added to the flask and the stop clock started. The clock was stopped when the grid on the graph paper underneath the flask could not be seen.

Experiment 5

The student repeated **Experiment 4** using 10 cm^3 of aqueous sodium thiosulphate and 40 cm^3 of distilled water.

Use the stop clock diagrams to read the times and record the values in the table.

Table of results

experiment number	*stop clock diagram*	*time taken for graph grid to disappears*
4		.....
5		.....

[2]

(e) Suggest what was observed when aqueous sodium thiosulphate reacted with dilute hydrochloric acid.

.....

(f) (i) In which Experiment, 4 or 5, was the longer time noted?

.....[1]

(ii) Explain why this experiment took the longer time.

.....

.....

.....[2]

(g) Predict the effect of increasing the temperature of the reaction mixture in **Experiment 4**. Explain your answer.

effect .....

explanation .....

.....[2]

(h) Explain **one** improvement the student could make to the experimental procedure to obtain more accurate results.

improvement .....

explanation .....

.....[2]

5 Tests were carried out on a solution **M** which was a mixture of ammonium sulphate and another salt dissolved in water.

Complete the observations in the following table.

tests	*observations*
(a) To about 2 cm^3 of solution **M** was added an equal volume of aqueous sodium hydroxide. The mixture was warmed and the gas given off tested with damp Universal Indicator paper	red/brown precipitate ....[2]
(b) To 2 cm^3 of solution **M** was added aqueous ammonia.	red/brown precipitate
(c) To 2 cm^3 of solution **M** was added an equal volume of dilute sulphuric acid and two or three pieces of zinc. The mixture was warmed and the gas tested with a lighted splint. The solution was filtered and the filtrate used for test (d).	bubbles gas pops
(d) Aqueous sodium hydroxide was added to the filtrate from (c).	dirty green precipitate
(e) To about 2 cm^3 of solution **M** was added an equal volume of aqueous barium chloride.	....[2]

(f) What gas is given off in test (a)?

.....[1]

(g) What do tests (a) and (b) tell you about solution M?

.....[2]

(h) What gas is given off in test (c)?

.....[1]

(i) Explain the result to test (d).

.....

.....[2]

6 Concrete is made from cement, sand and small stones. The ratio (by volume) of these three components varies with the use of the concrete.

Over a period of years, the cement slowly reacts with carbon dioxide in the air to form calcium carbonate. Calcium carbonate can be dissolved in hydrochloric acid.

Outline an experiment to find out the composition of a sample of old concrete.

.....

.....

.....

.....

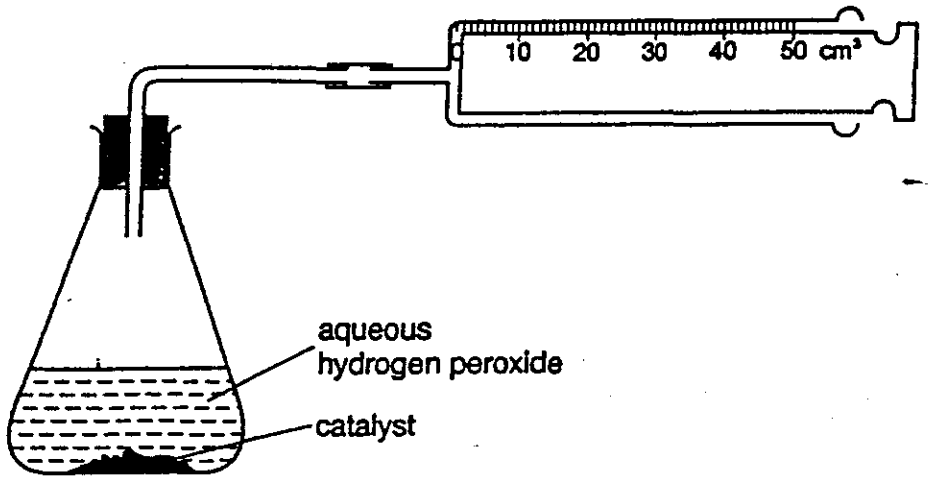
.....

.....

.....

.....[5]

7 Hydrogen peroxide can be broken down to form oxygen. The speed at which the oxygen was given off, using two different catalysts, A and B, was investigated using the apparatus below.



The volume of oxygen given off was measured every 10 seconds.

(a) Use the gas syringe diagrams to complete the results table.

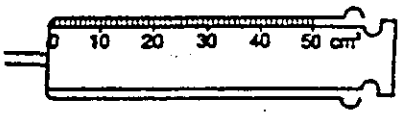
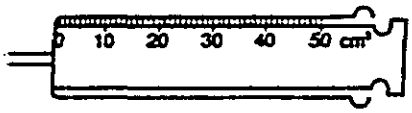
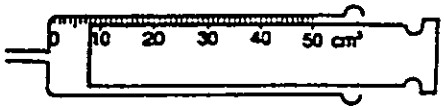
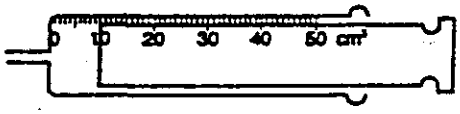
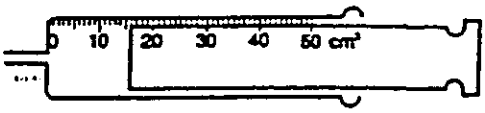
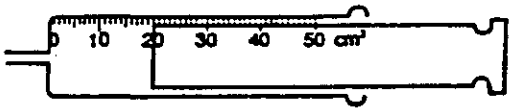
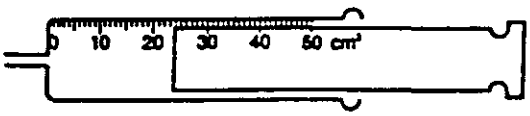
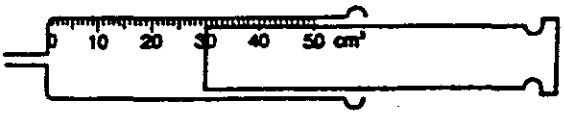
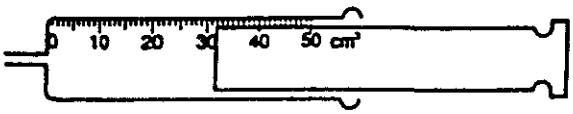
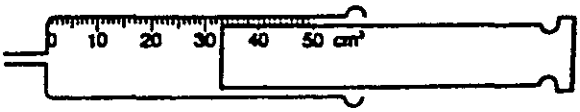
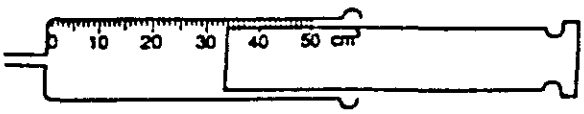
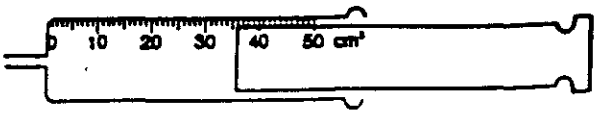
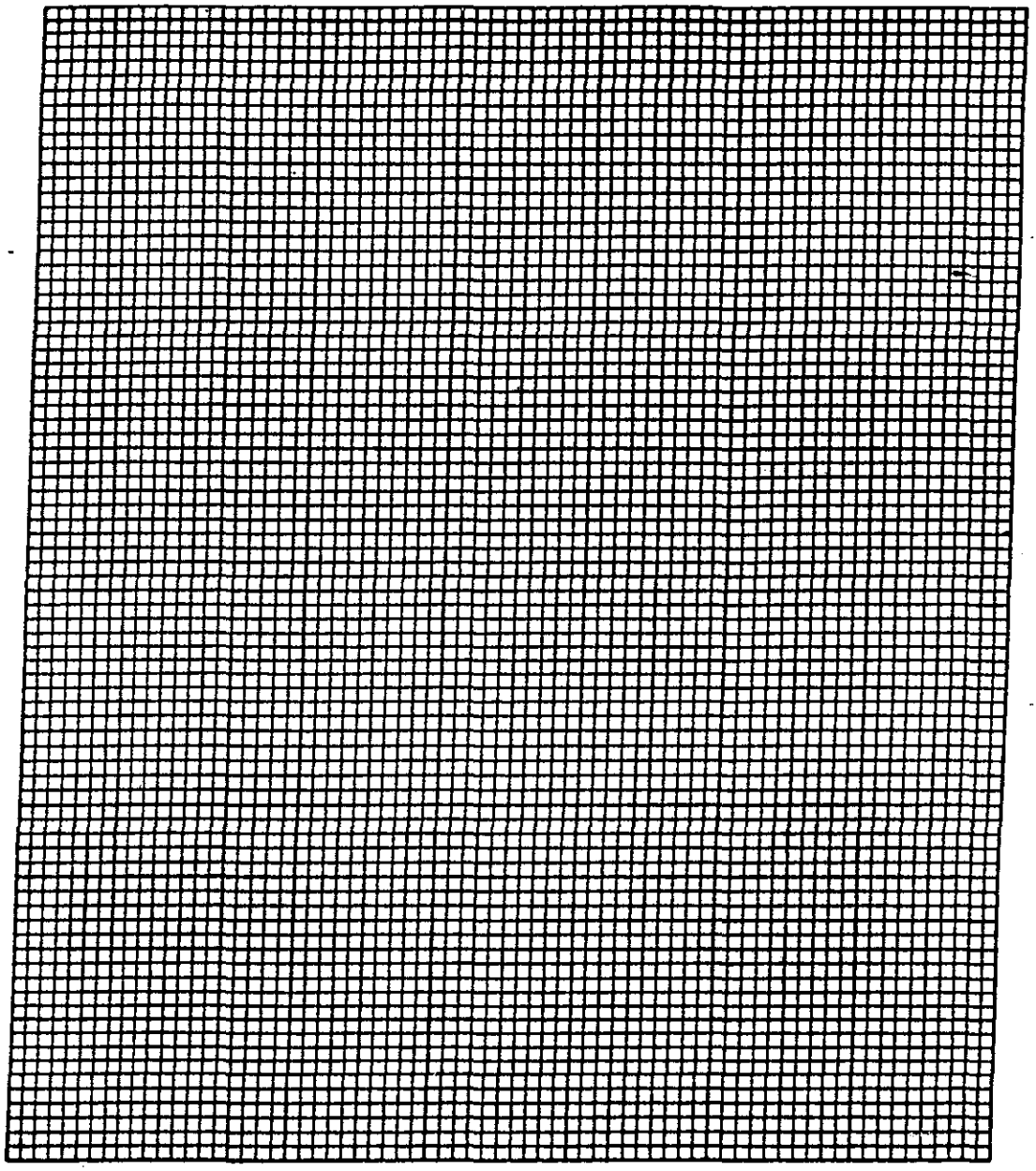
time/s	*using catalyst* **A**	*using catalyst* **B**
0		
10		
20		
30		
40		
50		
60		

Table of results

time/s	volume of oxygen/cm^3	
	with catalyst A	with catalyst B
0		
10		
20		
30		
40		
50		
60		

[3]

(b) Plot a graph to show each set of results. Clearly label the curves.



[5]

(c) Which is the better catalyst in this reaction? Give a reason for your choice.

catalyst .....

reason .....

.....[2]

(d) Why is the final volume of oxygen the same in each experiment?

.....[1]

(e) Sketch a line on your grid to show the shape of the graph you would expect if **no** catalyst was added to the hydrogen peroxide. Label this line V. [1]

Centre Number	Candidate Number

Candidate Name _____

International General Certificate of Secondary Education
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

CHEMISTRY 0620/6

PAPER 6 Alternative to Practical

Tuesday **25 MAY 1999** Morning 1 hour

Candidates answer on the question paper.
No additional materials are required.

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

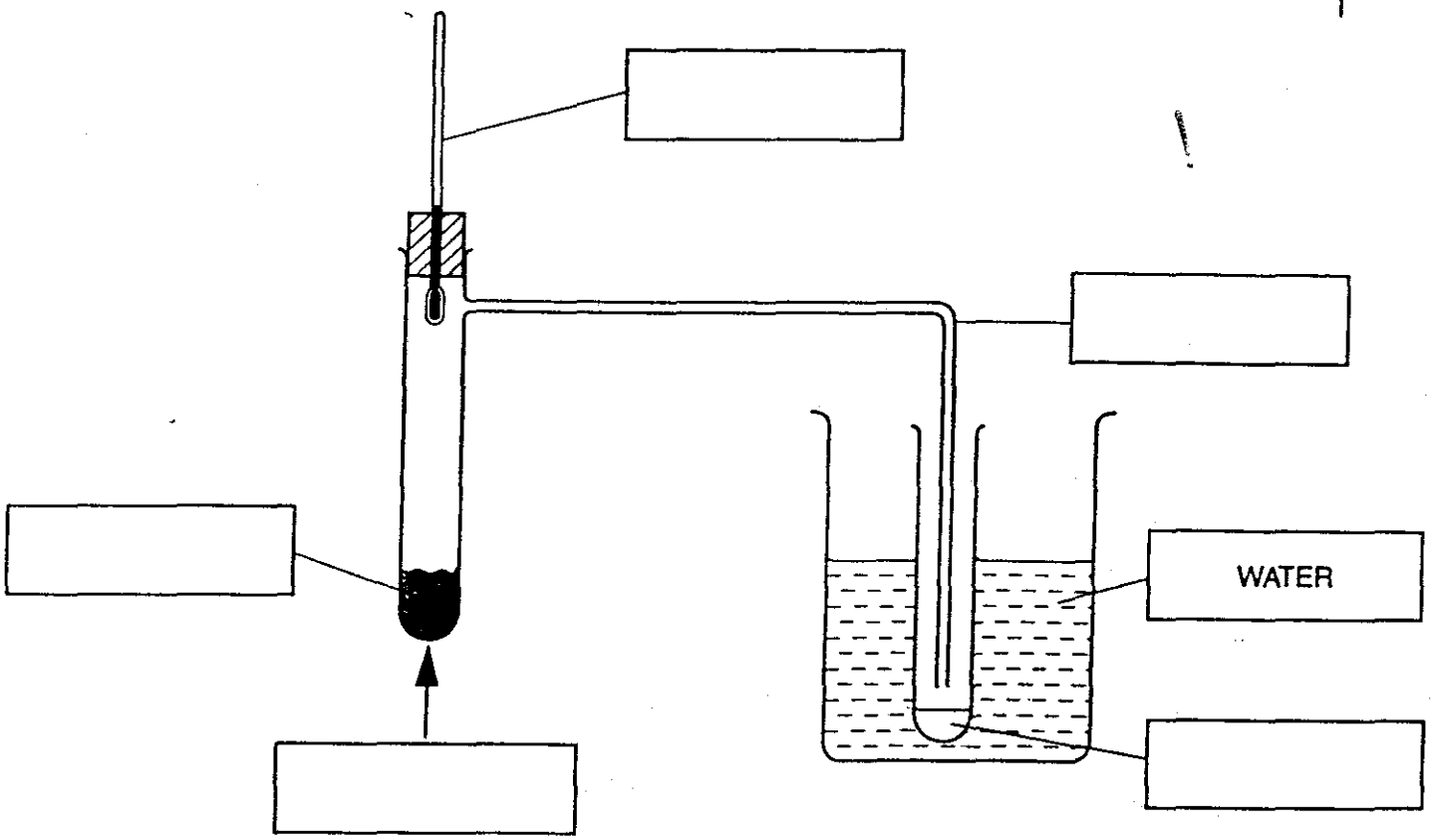
FOR EXAMINER'S USE

This question paper consists of 12 printed pages.

SB (SC/KG) QF91697/3

For Examiner's Use

1 Crude oil is a mixture of hydrocarbons which can be separated by fractional distillation. The apparatus below can be used to carry out such a separation in the laboratory.



(a) Complete the boxes by using these labels:

delivery tube mineral wool/crude oil

fraction collected thermometer heat [2]

(b) What is the purpose of the water?

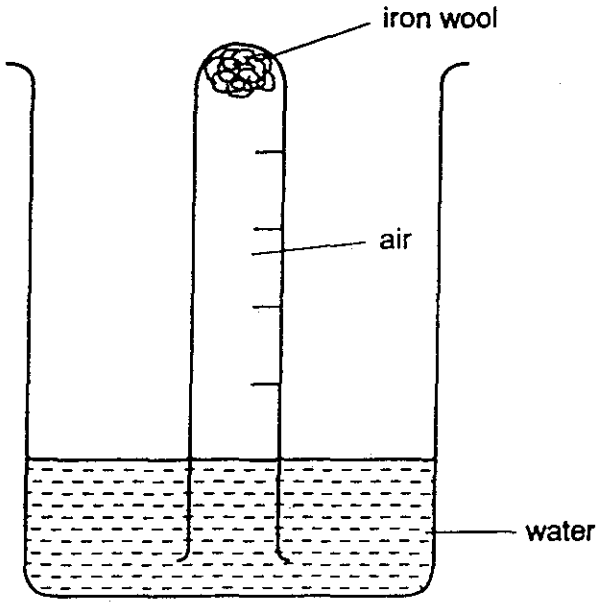
.....

.....[1]

(c) Why is the thermometer bulb placed where it is?

.....[1]

2 A student set up the experiment below to investigate the effect of water and air on iron wool.



(a) Describe the appearance of the iron after 1 week.

.....[1]

(b) Predict the level of the water in the tube after 1 week. Explain your prediction.

level of water .....

explanation .....

.....[2]

(c) Suggest what would happen if the air in the tube after 1 week was tested with a lighted splint. Explain your suggestion.

result of test .....

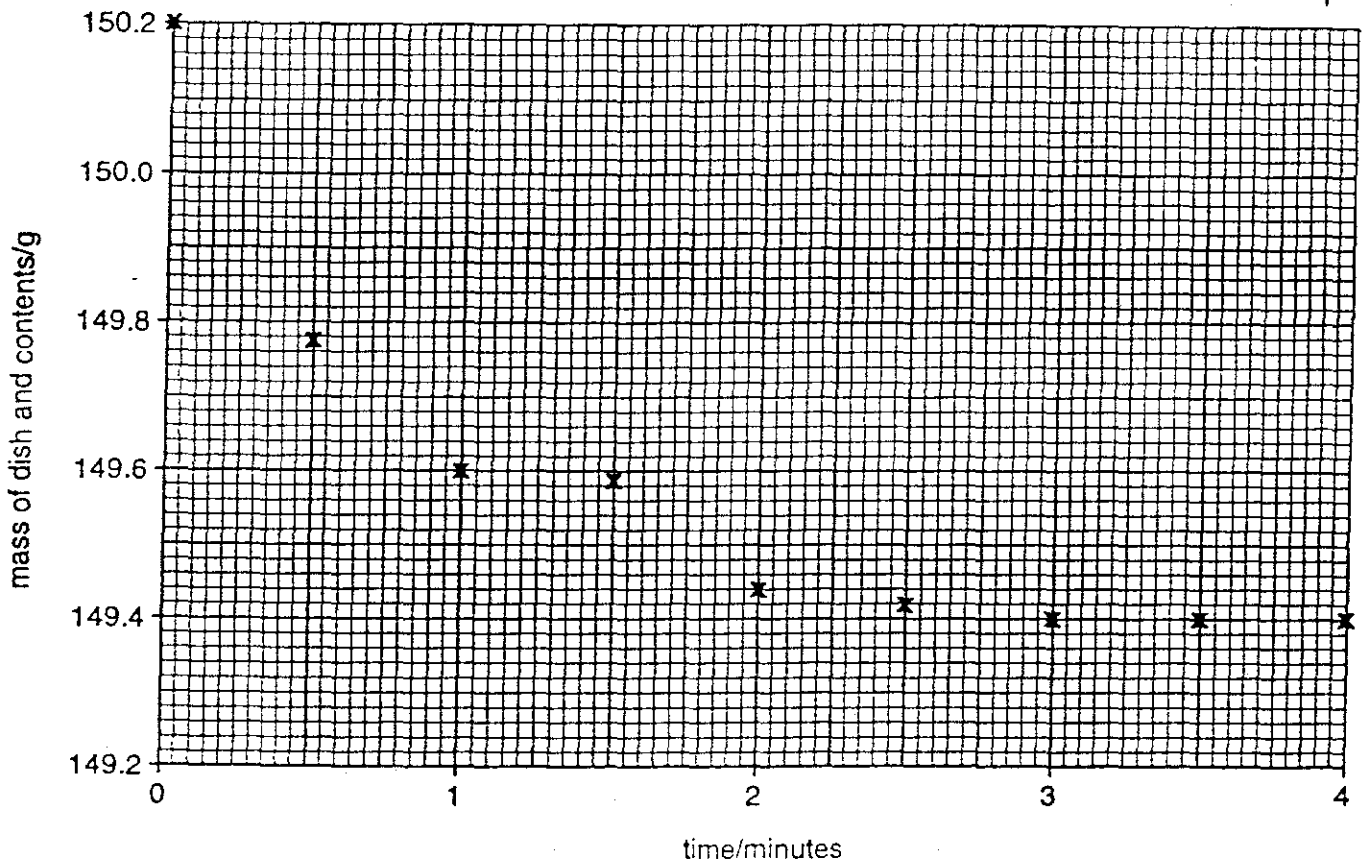
explanation .....

.....[2]

3 Hydrochloric acid reacts with marble chips (calcium carbonate).

$$CaCO_3 + 2HCl \longrightarrow CaCl_2 + H_2O + CO_2$$

A 50 cm^3 sample of dilute hydrochloric acid was added to a large quantity of marble chips in an evaporating dish, which was placed on the pan of a balance. The mass of the dish and its contents was recorded every 30 seconds. The results are shown in the graph below.



(a) (i) Draw a smooth curve through the points on the grid.

(ii) Which result appears to be incorrect? Why have you selected this result?

.....

.....[3]

(b) Use the graph to answer the following questions.

(i) How long did the reaction last?

.....

(ii) What mass of carbon dioxide was produced?

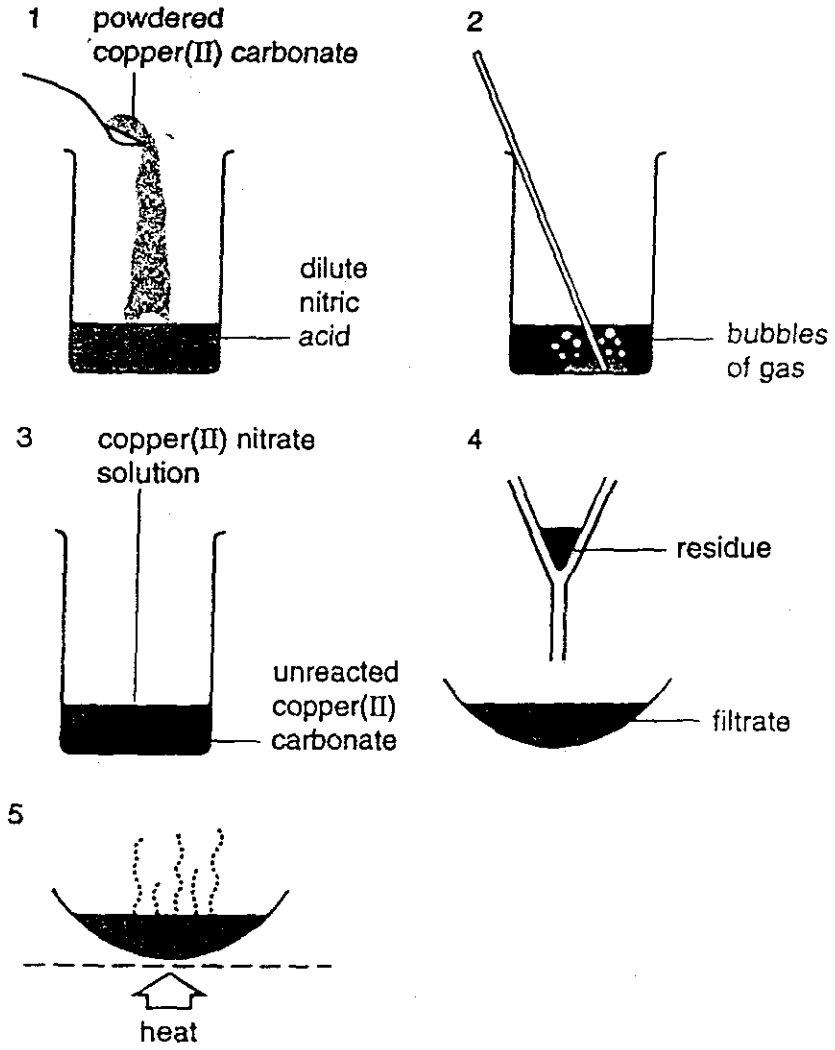
.....[2]

(c) Sketch on the grid the curve you would expect if 50 cm^3 of more concentrated hydrochloric acid had been used in the experiment. [2]

(d) What apparatus could be used, instead of an evaporating dish, to reduce any loss of acid by splashing?

.....[1]

4 The diagrams show the stages in the preparation of the salt copper(II) nitrate.



(a) Write a list of instructions for carrying out this preparation in the laboratory.

1. .....

.....

2. .....

.....

3. .....

.....

4. .....

.....

5. .....

.....

[5]

5 A student investigated the reaction between solutions of sodium hydroxide (**A** and **B**) and two different acids. Hydrochloric acid and sulphuric acid were used.

Experiment 1

By using a measuring cylinder, a 25 cm^3 sample of dilute hydrochloric acid was added into a plastic cup and the temperature of the solution measured and recorded.

By using another measuring cylinder, a 25 cm^3 sample of the aqueous sodium hydroxide labelled **A** was added to the acid. The mixture was stirred and the maximum temperature measured and recorded. Use the thermometer diagrams to read the temperatures and record the values in the table.

Universal Indicator paper was used to measure the pH of the final mixture which is recorded in the table.

Experiment 2

Experiment 1 was repeated using 25 cm^3 of aqueous sodium hydroxide labelled **B**. Use the thermometer diagrams to read the temperatures and record the values in the table.

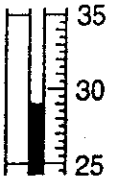
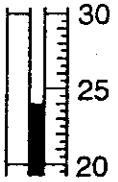
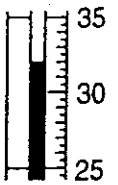
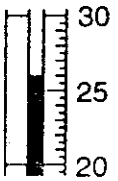
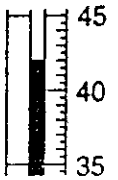
Experiment 3

Experiment 1 was repeated using aqueous sodium hydroxide labelled **A but** dilute sulphuric acid instead of hydrochloric acid. Use the thermometer diagrams to read the temperatures and record the values in the table.

Experiment 4

Experiment 1 was repeated but using aqueous sodium hydroxide labelled **B and** dilute sulphuric acid instead of hydrochloric acid. Use the thermometer diagrams to read the temperatures and record the values in the table.

Table of results

experiment	initial temperature of acid/°C		maximum temperature reached/°C		temperature difference/°C	pH of final mixture
1						7
2						14
3						3
4						7

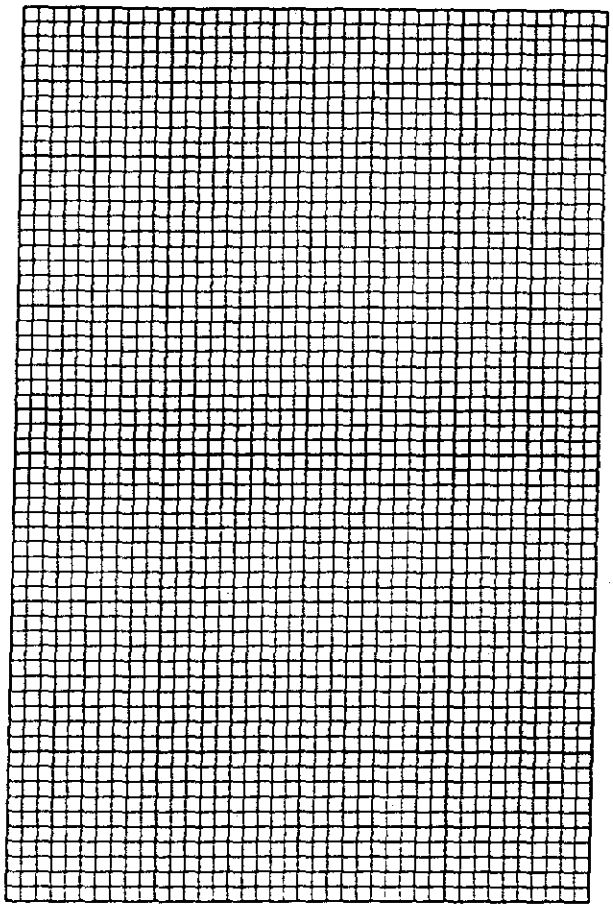
[4]

The equations for the reactions are given below.

$HCl + NaOH \longrightarrow NaCl + H_2O$

$H_2SO_4 + 2NaOH \longrightarrow Na_2SO_4 + 2H_2O$

(a) Plot the results of the experiments as a bar chart on the grid below. [3]



(b) (i) Compare the temperature changes in Experiments 1 and 3.

.....

.....[1]

(ii) Explain the pH values obtained

in Experiment 1, ...

.....[1]

in Experiment 2.

.....

.....[1]

(c) What type of chemical reaction occurred when the acids reacted with sodium hydroxide?

.....[1]

(d) (i) Compare the temperature changes in Experiments 2 and 4.

.....

.....[1]

(ii) Suggest an explanation for the difference in the temperature changes.

.....

.....

.....[1]

(e) Predict what the temperature of the reaction mixture in Experiment 4 would have been after 1 hour. Explain your answer.

.....

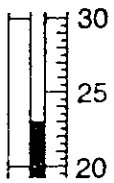
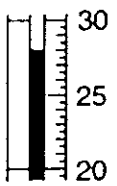
.....[2]

(f) Suggest **one** change that could be made to the apparatus used in the experiments to obtain more accurate results.

.....[1]

Experiment 5

Experiment 1 was repeated using 50 cm^3 of the aqueous sodium hydroxide labelled **A**. Use the thermometer diagrams to read the temperatures and record the values in the table.

	thermometer diagram	temperature /°C
Initial temperature of hydrochloric acid =		
Maximum temperature reached by mixture =		
Temperature difference =		

(g) (i) In which of the two experiments, 1 or 5, was the temperature change larger? Suggest an explanation for this difference.

experiment .....

explanation .....

.....[2]

For Examiner's Use

(h) Predict the temperature rise expected if Experiment 3 was repeated using 50 cm^3 of the sodium hydroxide labelled **A**.

temperature rise .....

explanation .....

.....

.....[3]

6 The aqueous solution **C** contained the barium cation and two non-metal anions. The tests on **C** and some of the observations are in the following table. Complete the observations in the table.

tests	observations
(a) A little of solution **C** was tested with Universal indicator paper. The pH was recorded.	colour orange pH 6
(b) To 1 cm^3 of solution **C** was added an equal volume of aqueous magnesium sulphate.	....[2]
(c) To 1 cm^3 of solution **C** was added a few drops of dilute nitric acid followed by about 1 cm^3 of aqueous silver nitrate.	white precipitate formed
(d) (i) To 1 cm^3 of solution **C** was added an equal volume of aqueous sodium carbonate. (ii) Several drops of dilute hydrochloric acid were added to the mixture.	white precipitate formed ....[2]
(e) To 1 cm^3 of solution **C** was added an equal volume of aqueous sodium hydroxide and aluminium powder. The mixture was warmed and the gas given off tested.	pungent gas given off which turned red litmus blue

(f) What does test **(a)** tell you about solution **C**?

.....[2]

(g) What does test **(c)** tell you about one of the anions present in solution **C**?

.....[1]

(h) (i) Name the white precipitate formed in test **(d)**.

.....[1]

(ii) Explain the observation in test **(d)(ii)**.

.....

.....[2]

(i) (i) Name the gas given off in test **(e)**.

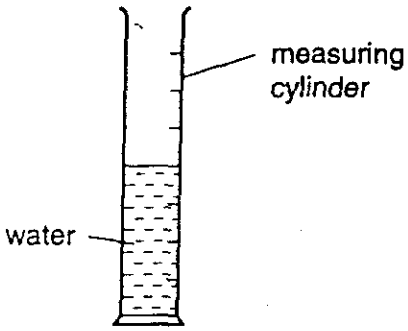
.....

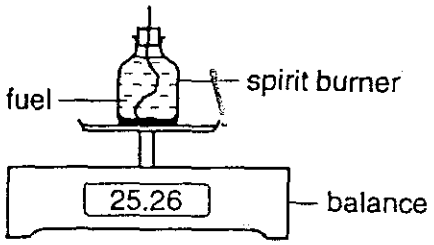
(ii) What does test **(e)** tell you about the other anion present in solution **C**?

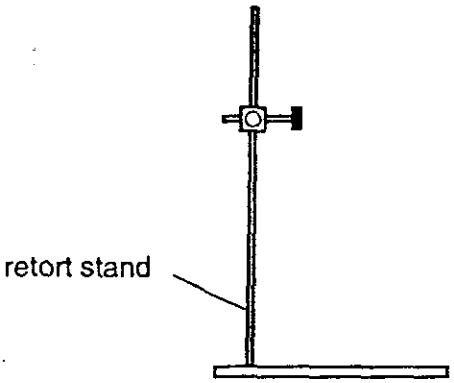
.....[2]

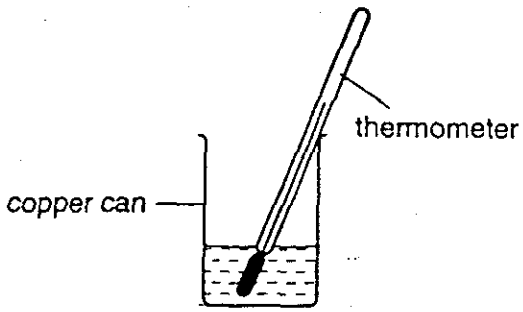
For Examiner's Use

7 Alcohols are liquid fuels which burn in air to produce heat energy. Provided with the following apparatus, plan an experiment to investigate which alcohol, methanol or ethanol, produces *more energy. You may draw a diagram to help your answer.*









Plan .....

.....

.....

.....

.....

.....

.....[5]

Candidate Name _____

Centre Number	Candidate Number

International General Certificate of Secondary Education
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

CHEMISTRY 0620/6

PAPER 6 Alternative to Practical

Monday **15 NOVEMBER 1999** Morning 1 hour

Candidates answer on the question paper.
Additional materials:
Mathematical tables
Ruler

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

FOR EXAMINER'S USE

This question paper consists of 10 printed pages and 2 blank pages.

1 Four sets of laboratory apparatus are shown below. These could be used for:

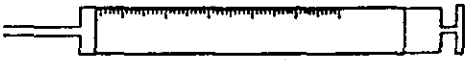
A, collecting a gas which is less dense than air;

B, collecting a gas which is insoluble in water;

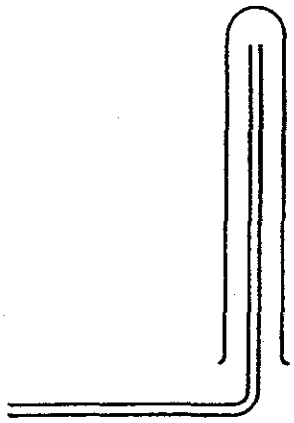
C, collecting and measuring the volume of a gas;

D, collecting a gas which is denser than air.

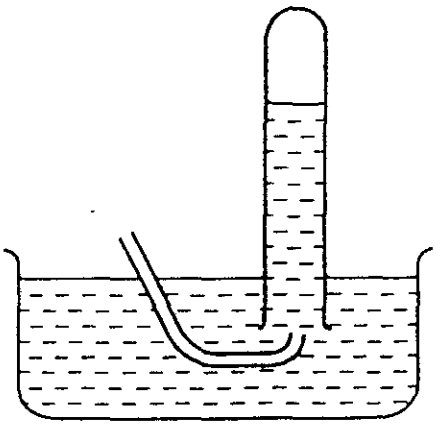
Using each letter **A** to **D** once only, write the appropriate letter in the spaces provided. [4]



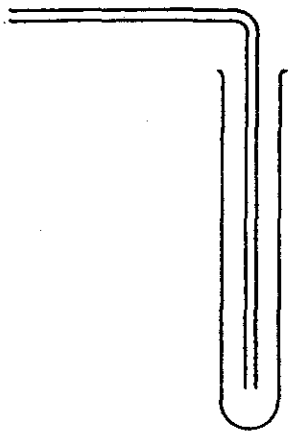
(i) .....



(ii) .....



(iii) .....



(iv) .....

For Examiner's Use

2 Barium carbonate is insoluble in water but barium nitrate is soluble.

Outline how you could obtain from a mixture of barium carbonate and barium nitrate:

(a) a pure dry sample of barium carbonate;

.....

.....

.....

(b) crystals of barium nitrate.

.....

.....

.....

[6]

3 Four unlabelled bottles of chemicals each contained one of the following liquids:

chlorine dissolved in water;

pure water;

pentene (an alkene);

aqueous ammonia.

Give tests by which you could correctly label each bottle. Descriptions of smells are **not** acceptable.

chlorine dissolved in water .....

.....

pure water .....

.....

pentene .....

.....

aqueous ammonia .....

.....[4]

For Examiner's Use

4 A student investigated the reaction between aqueous lead(II) nitrate and aqueous potassium iodide.

A burette was filled with aqueous lead(II) nitrate. By using the burette, 3 cm^3 of the aqueous lead(II) nitrate was added to each of six test-tubes labelled 1, 2, 3, 4, 5 and 6 respectively.

Experiment 1

A 1 cm^3 sample of aqueous potassium iodide was added to test-tube 1.

Experiment 2

A 2 cm^3 sample of aqueous potassium iodide was added to test-tube 2.

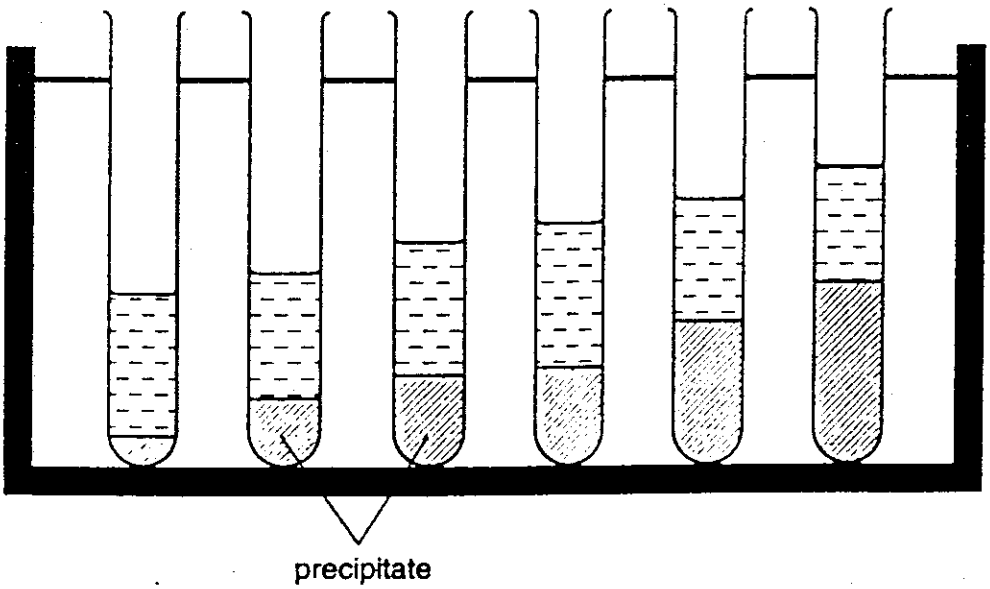
Experiments 3, 4, 5 and 6

A 3 cm^3, 4 cm^3, 5 cm^3 and 6 cm^3 sample of aqueous potassium iodide was added to test-tubes 3, 4, 5 and 6 respectively.

By using a glass rod, the contents of the six test-tubes were stirred.

The contents of the test-tubes were left to stand for ten minutes. After ten minutes, a ruler was used to measure the height of the precipitate (solid) in each test-tube.The diagrams show the six test-tubes in a rack. Use the diagrams to measure the heights of the precipitates. Record the heights of the precipitates in the table.

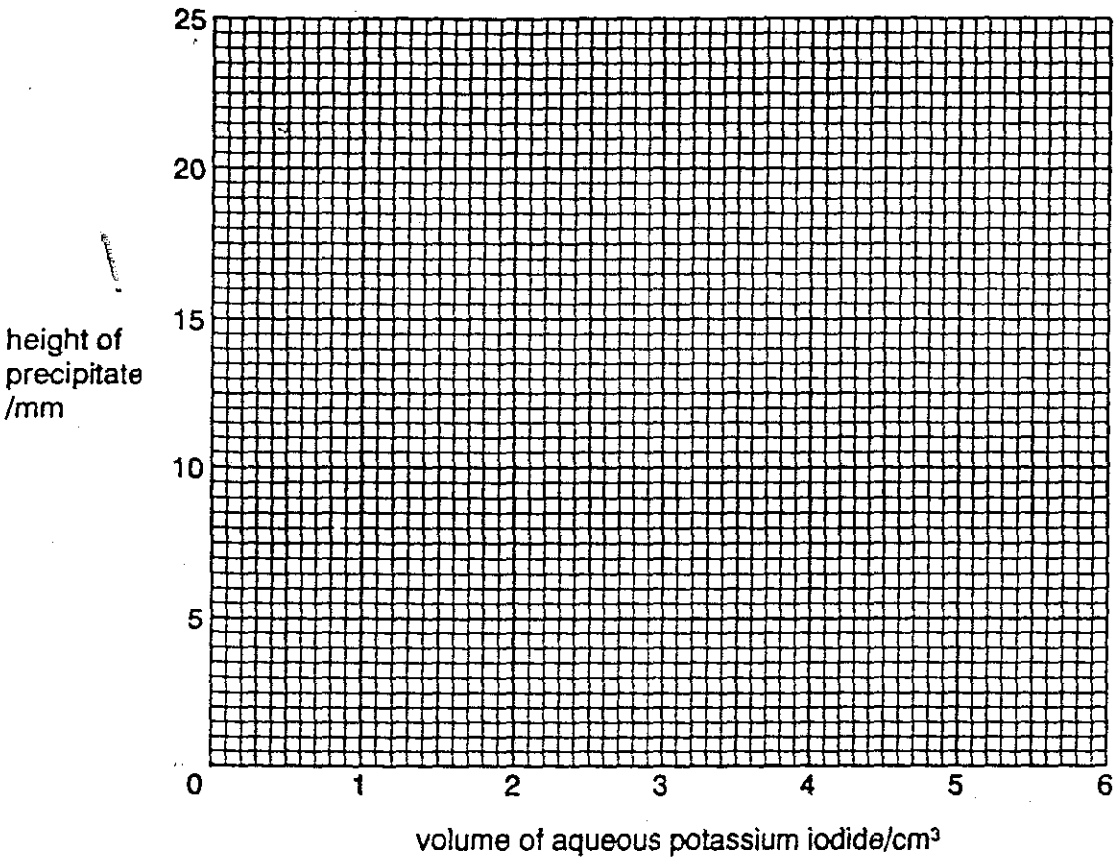
Table of results

test-tube number	1	2	3	4	5	6
volume of aqueous potassium iodide/cm^3						
tube 1 2 3 4 5 6  precipitate						
height of precipitate/mm						

[4]

For Examiner's Use

(a) Plot the results on the grid and draw a straight line graph.



[4]

(b) **From the graph,** find the height of the precipitate formed when 4.5 cm^3 of aqueous potassium iodide was added to 3 cm^3 of aqueous lead(II) nitrate.

.....[2]

Show on the graph how you arrived at your answer. [1]

(c) Describe what is observed when aqueous potassium iodide reacts with aqueous lead(II) nitrate.

.....[2]

(d) Write a word equation for the reaction in **(c)**.

.....[2]

(e) What would be observed if aqueous potassium chloride were used instead of aqueous potassium iodide?

.....

.....[2]

(f) Predict the effect on the results if 6 cm^3 of aqueous lead(II) nitrate were used.

.....[1]

(g) (i) Suggest **one** change in the apparatus which could be used to obtain more accurate results.

.....

.....[1]

(ii) Explain **one** improvement the student could make to **the experimental procedure** to obtain more accurate results.

improvement .....

explanation .....

.....[2]

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5 Tests were carried out on two aqueous solutions **D** and **E**. Solution **D** contained a copper(II) salt. Solution **E** contained a calcium salt.

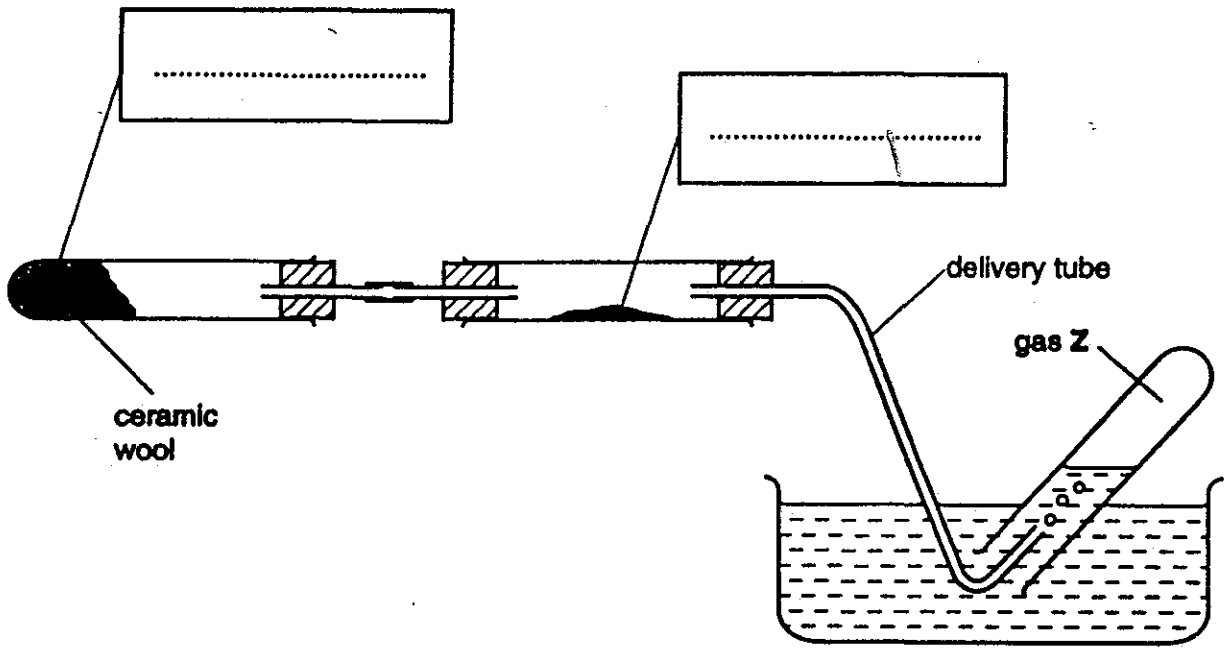
Complete the observations in the following table.

tests	observations
Tests on solution **D** **(a)** Colour of solution **D**	blue
(b) The solution was divided into two equal portions.	
(i) To the first portion, aqueous sodium hydroxide was added drop by drop with shaking.	....[2]
An excess of aqueous sodium hydroxide was added to the mixture.	.....[1]
(ii) To the second portion, aqueous ammonia was added drop by drop with shaking.	....[2]
An excess of aqueous ammonia was added to the mixture.	....[2]

tests	observations
Tests on solution **E** **(c)** Colour of solution **E**	.....[1]
(d) The solution was divided into two equal portions. **(i)** To the first portion, aqueous sodium hydroxide was added drop by drop with shaking. An excess of aqueous sodium hydroxide was added to the mixture. **(ii)** To the second portion, aqueous ammonia was added drop by drop with shaking. An excess of aqueous ammonia was added to the mixture.	....[2] .....[1] ....[2] ....[1]

For Examiner's Use

6 The apparatus below was used to investigate the reaction between steam and hot iron powder, which produces gas Z.



(a) (i) Fill in the boxes in the diagram to show the chemicals used.

(ii) Indicate on the diagram where heat is applied.

[4]

(b) Suggest the function of the ceramic wool.

.....[1]

(c) Gas Z burns with a squeaky pop. Identify gas Z.

.....[1]

7 Indigestion tablets contain calcium carbonate.The tablets work by neutralising the excess of acid in the stomach.

calcium carbonate + hydrochloric acid ----> carbon dioxide + calcium chloride + water

You are provided with 2 different brands of indigestion tablet, **F** and **G**, dilute hydrochloric acid and common laboratory apparatus.

Plan an investigation to find which brand of indigestion tablet is best at neutralising acid. Your answer should include details of the apparatus to be used and the main practical steps in the investigation.

apparatus .....

.....

plan of investigation .....

.....

.....

.....

.....[5]

Centre Number	Candidate Number

Candidate Name _____

International General Certificate of Secondary Education
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

CHEMISTRY 0620/6

PAPER 6 Alternative to Practical

MAY/JUNE SESSION 2000 1 hour

Candidates answer on the question paper.
No additional materials are required.

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

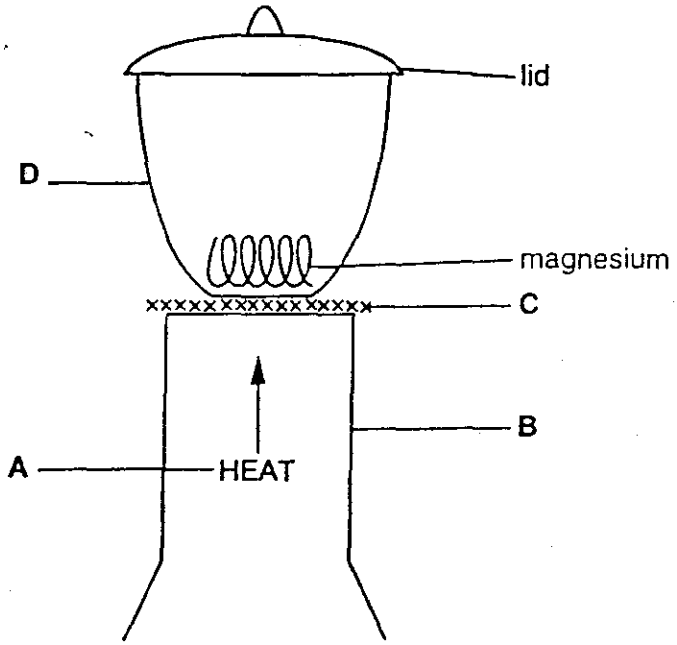
The number of marks is given in brackets [ ] at the end of each question or part question.

FOR EXAMINER'S USE

This question paper consists of 9 printed pages and 3 blank pages.

SB (SLC/DJ) OF05706/2

1 The diagram shows apparatus used for strongly heating some magnesium.



(a) Name each piece of apparatus.

A .....

B .....

C .....

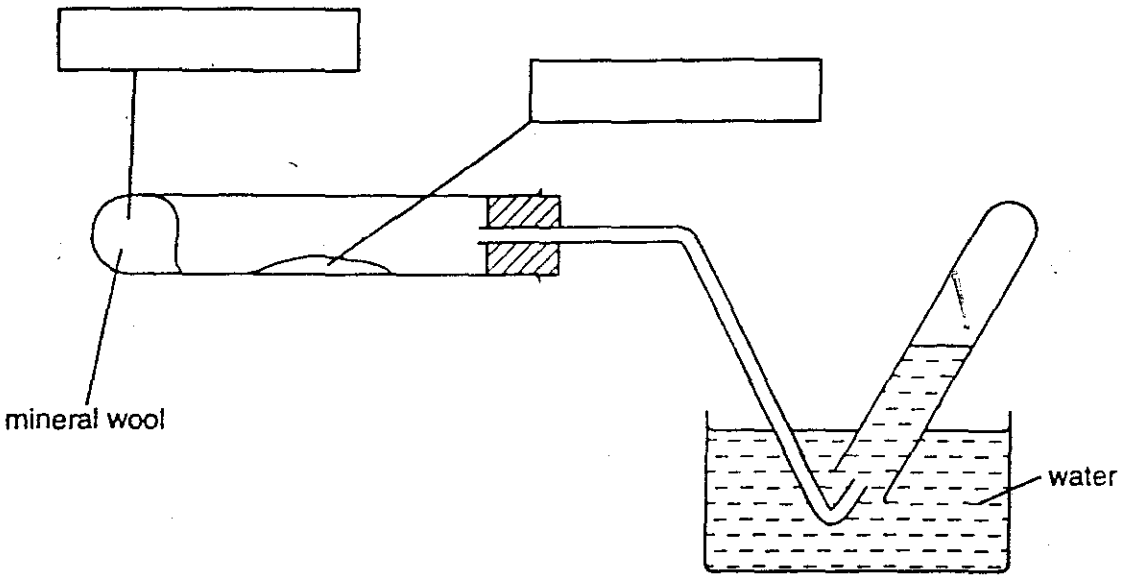
D .....[4]

(b) Give **two** expected observations if the lid were removed during the heating.

1 .....

2 .....[2]

2 Ethene is made when ethanol is passed over hot aluminium oxide.



(a) Complete the boxes to show the chemicals used. [2]

(b) Show on the diagram with an arrow where the heat is applied. [1]

(c) Label on the diagram where the ethene is collected. [1]

(d) Why must the delivery tube be removed from the water before the heating is stopped?

.....

.....

.....[2]

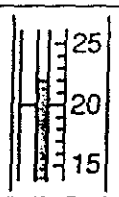
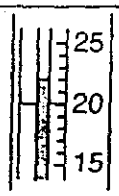
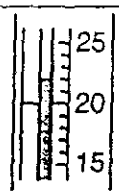
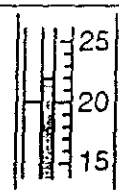
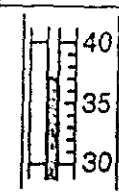
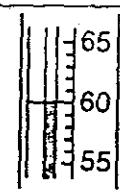
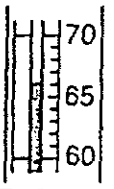
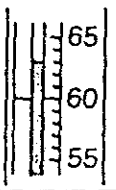
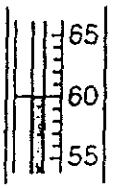
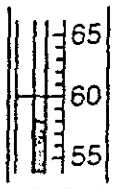
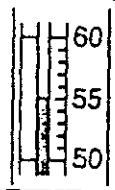
(e) When ethene is shaken with aqueous bromine, the colour changes from ..... to ..... . [2]

For Examiner's Use

3 A student investigated the reaction between aqueous copper(II) sulphate and two different metals. Zinc and an unidentified metal, **G** were used.

Experiment 1

A 25 cm^3 sample of aqueous copper(II) sulphate was added to a plastic cup from a measuring cylinder. The temperature of the solution was taken. The temperature was taken every half minute for one and half minutes. At exactly 2 minutes, 6 g of zinc powder was added to the cup and the mixture stirred with a thermometer. The temperature was taken every half minute for an additional three minutes. Use the thermometer diagrams to read the temperatures taken and record the values in the table.

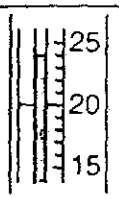
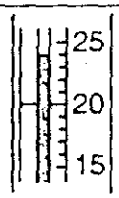
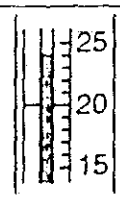
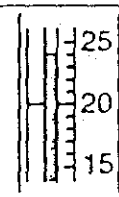
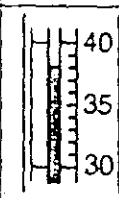
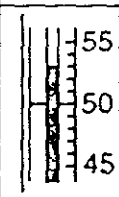
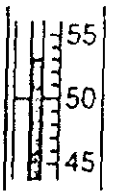
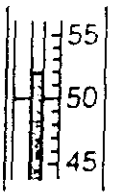
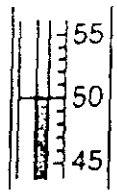
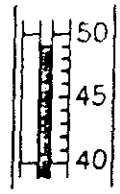
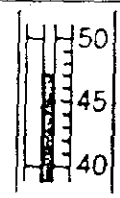
time/min	0.0	0.5	1.0	1.5	2.0	2.5
thermometer diagram						
temperature/°C						
time/min	3.0	3.5	4.0	4.5	5.0	
thermometer diagram						
temperature/°C						

[3]

Experiment 2

Experiment 1 was repeated using 6 g of metal G powder instead of the zinc powder. Use the thermometer diagrams to read the temperatures taken and record the values in the table.

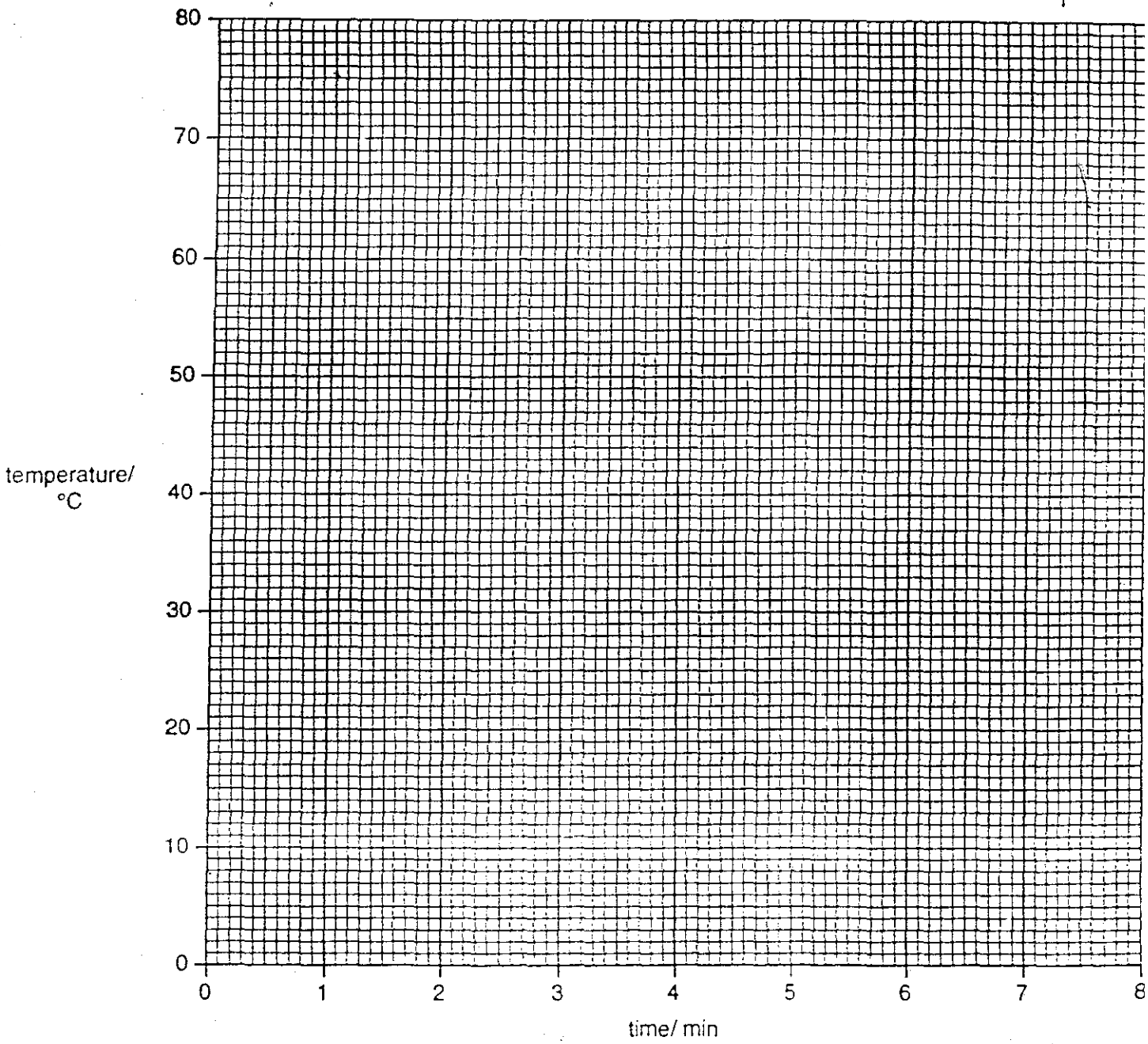
The mixture was then filtered. A reddish brown residue was left. To the filtrate was added an excess of aqueous sodium hydroxide. A green precipitate was formed.

time/min	0.0	0.5	1.0	1.5	2.0	2.5
thermometer diagram						
temperature/°C						
time/min	3.0	3.5	4.0	4.5	5.0	
thermometer diagram						
temperature/°C						

[3]

For Examiner's Use

(a) Plot the results of the experiments on the grid below. Draw two smooth line graphs. Clearly label the graphs. [5]



(b) (i) **Use the graph** to estimate the temperature of the reaction mixture in Experiment 1 after 7 minutes. Indicate **clearly** on your graph how you obtained your answer.

.....[2]

(ii) **From the graph** work out the temperature of the reaction mixture in Experiment 2 after 2 minutes 15 seconds. Indicate **clearly** how you used the graph.

.....[2]

(c) What type of chemical reaction occurs when metals react with aqueous copper(II) sulphate?

.....[1]

(d) (i) Compare the temperature changes in Experiments 1 and 2.

.....

.....

.....[2]

(ii) Suggest an explanation for the difference in the temperature changes.

.....

.....[1]

(e) Predict what the temperature of the reaction mixture in Experiment 2 would have been after 1 hour. Explain your answer.

.....

.....[2]

(f) Suggest **one** change that could be made to the apparatus used in the experiments to obtain more accurate results.

.....

.....[1]

(g) Suggest, with a reason the identity of metal G.

identity of **G** ..... [1]

reason .....[1]

4 An aqueous solution **H** and a solid **J** were tested. The tests and some of the observations are in the following table. **H** was hydrochloric acid and **J** was a metal oxide.

Complete the observations in the table.

tests	observations
(a) A little of solution **H** was tested with Universal indicator paper. The pH was recorded.	colour ..... pH .....[2]
(b) To 1 cm^3 of solution **H** was added one spatula measure of manganese(IV) oxide. The mixture was boiled. The gas was tested with damp blue litmus paper.	litmus paper turned pink, then white
(c) To 1 cm^3 of solution **H** was added about 1 cm^3 of aqueous silver nitrate.	.....[2]
(d) To 1 cm^3 of solution **H** was added one spatula measure of sodium carbonate. The gas given off was tested with limewater.	....[2]
(e) To 6 cm^3 of solution **H** was added solid **J**. The mixture was boiled gently. Two portions of the mixture were tested as follows. (i) To 1 cm^3 of the mixture was added an excess of aqueous sodium hydroxide a little at a time. (ii) To 1 cm^3 of the mixture was added an excess of aqueous ammonia a little at a time.	white precipitate, dissolved in excess. white precipitate, dissolved in excess.

(f) Name the gas given off in test **(b)**.

.....[1]

(g) Name the gas given off in test **(d)**.

.....[1]

(h) Identify the metal in oxide **J**.

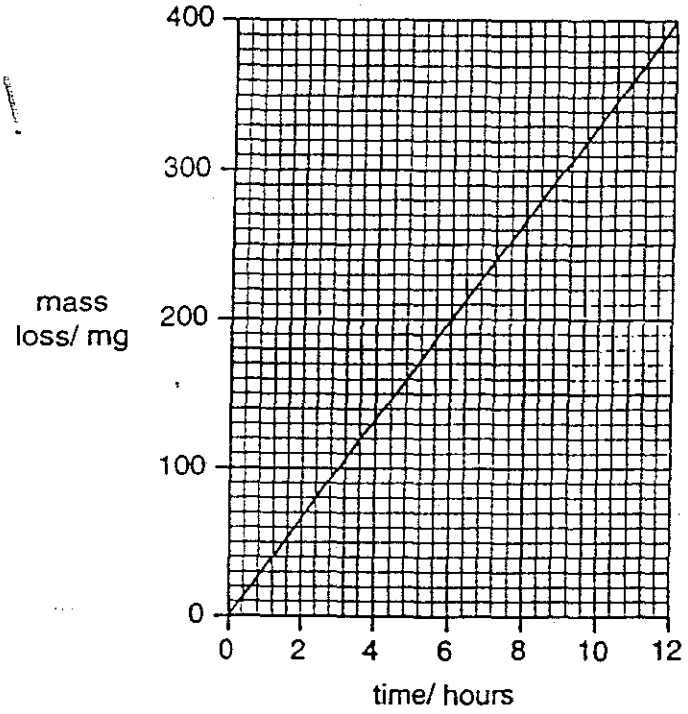
.....[1]

For Examiner's Use

5 Identical pieces of glass were placed in two different boiling liquids for 12 hours. The graphs below show how the mass of each piece of glass changed.

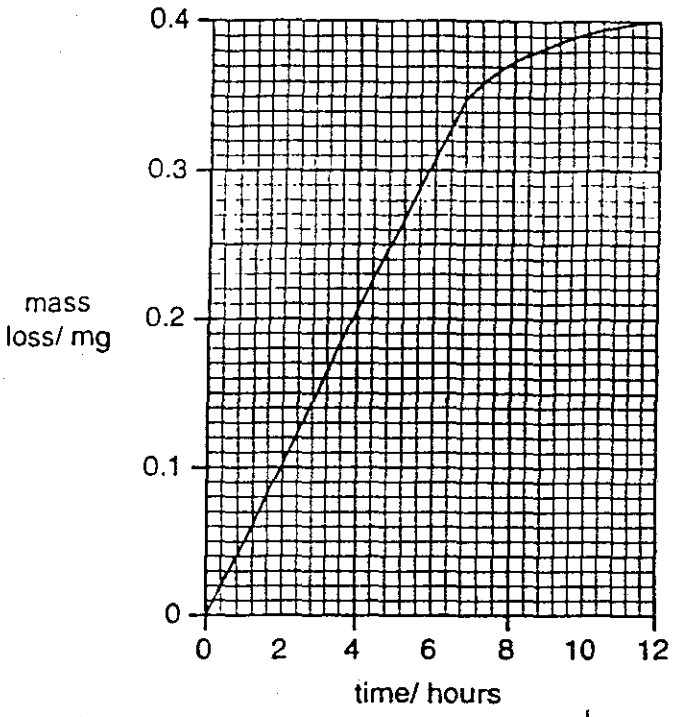
Graph **A**

Glass in boiling alkali solution



Graph **B**

Glass in boiling acid solution



(a) State **two** different safety precautions you would need to take when carrying out this experiment.

1 .....

2 .....[2]

(b) Give one similarity in the mass change of the glass in both liquids.

.....

.....[1]

(c) Describe **two** ways in which the mass loss shown in graph **A** is different from that shown in graph **B**.

1 .....

.....

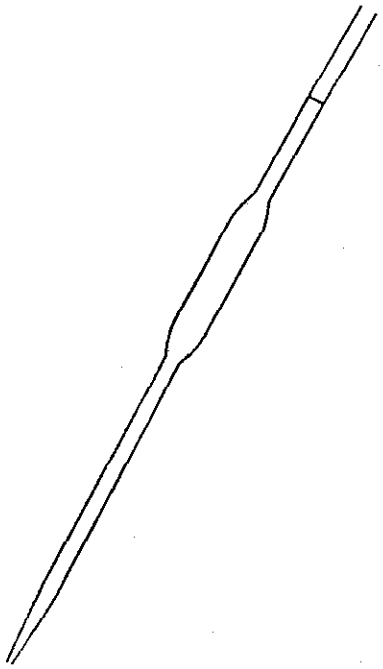
2 .....

.....[3]

6 A student used the pieces of equipment shown below to compare the concentration of alkali in two liquid oven cleaners.

Oven cleaners contain the alkali sodium hydroxide.

C



D

(a) Name the pieces of equipment.

C .....

D .....[2]

(b) Outline how these pieces of equipment could be used in an investigation to compare the concentration of alkali in the two liquid oven cleaners.

.....

.....

.....

.....

.....

.....[5]

Candidate Name _____

Centre Number	Candidate Number

International General Certificate of Secondary Education
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

CHEMISTRY 0620/6

PAPER 6 Alternative to Practical

Monday **13 NOVEMBER 2000** Morning 1 hour

Candidates answer on the question paper.
Additional materials:
Mathematical tables and/or calculator

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

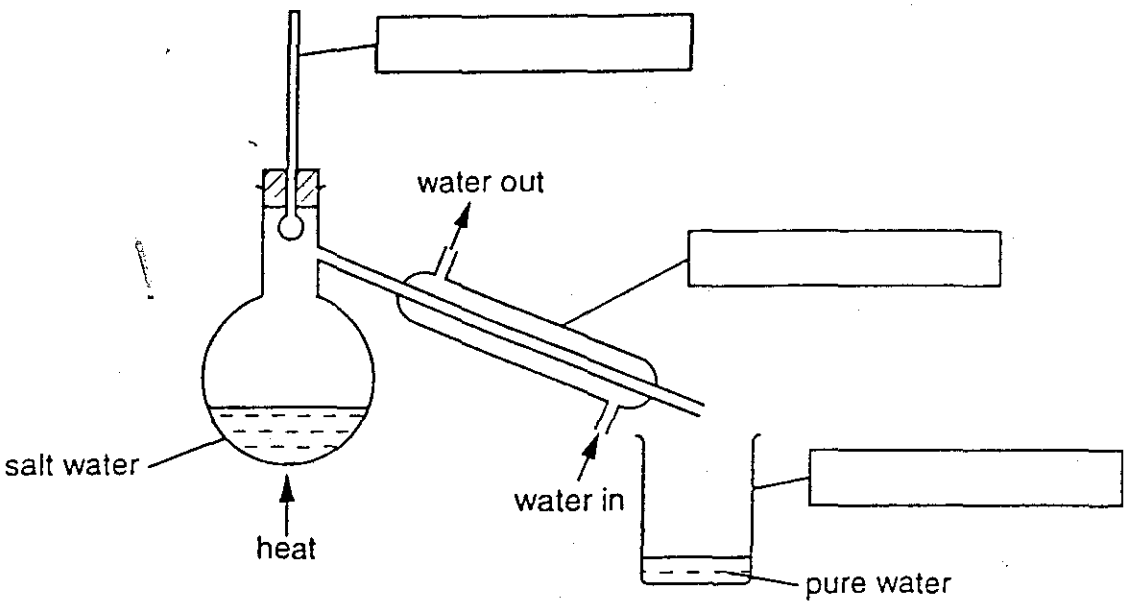
The number of marks is given in brackets [ ] at the end of each question or part question.
You may use a calculator.

FOR EXAMINER'S USE

This question paper consists of 11 printed pages and 1 blank page.

SB (SM/DJ) QK07572/3

1 Pure water was obtained from salt water using the apparatus shown in the diagram.



(a) Complete the boxes to name the 3 pieces of equipment. [3]

(b) Name the process used in this separation.

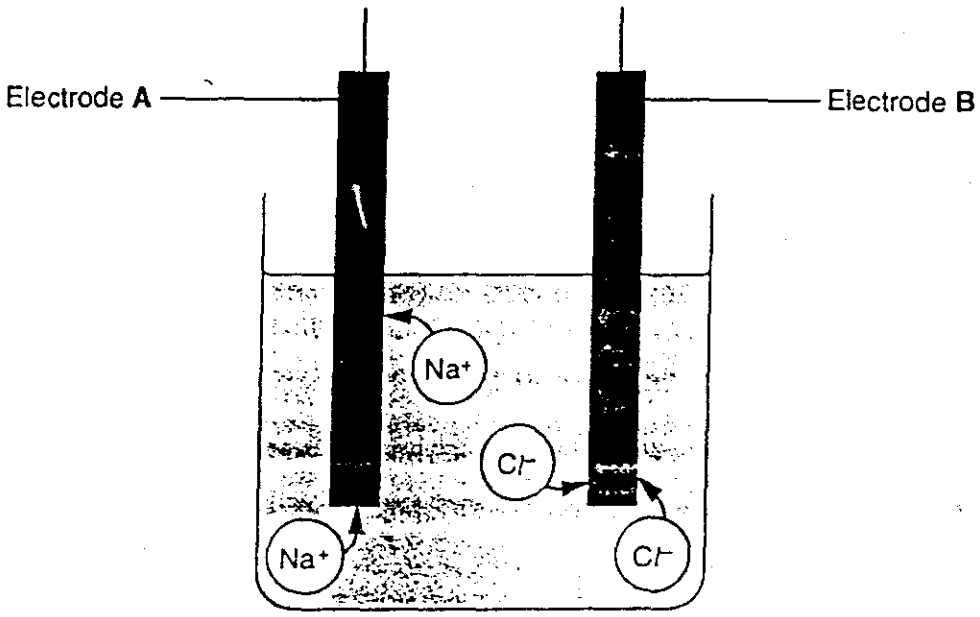
.....[1]

(c) How would you test the liquid produced to show that it was **pure** water?

test .....

result .....[2]

2 The diagram shows the movement of the ions Na^+ and Cl^- during the electrolysis of molten sodium chloride.



(a) Which electrode, **A** or **B**, is the positive electrode? Explain your choice.

.....

.....[2]

(b) Which ion is attracted to the cathode?

.....[1]

(c) Name the two elements formed by the electrolysis of molten sodium chloride.

1. .....

2. .....[2]

(d) Give **one** expected observation during this electrolysis.

.....[1]

3 A student investigated the solubility of potassium chlorate in water at various temperatures.

Experiment 1

The student was provided with a clean boiling tube containing 5 g of potassium chlorate.

A burette was filled with pure water and 12.0 cm^3 of water added to the boiling tube. The mixture of potassium chlorate and water was heated carefully until all of the solid had dissolved. The boiling tube was removed from the heat and the solution allowed to cool. The solution was stirred with a thermometer.

The temperature at which crystals of solid first appeared was taken.

Experiment 2

From the burette, 1.0 cm^3 more of water was added into the boiling tube and contents from Experiment 1. The experiment was repeated exactly as before to find the temperature at which crystals first appeared. The boiling tube was dipped for short periods of time in a beaker of cold water to speed up the cooling.

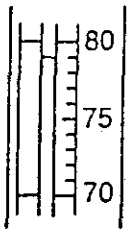
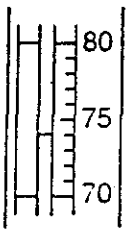
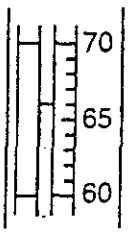
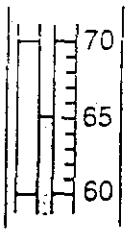
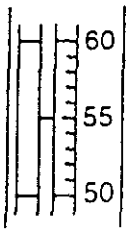
Experiment 3

From the burette, 1.0 cm^3 more of water was added into the boiling tube and contents from Experiment 2. The experiment was repeated as before. This procedure was repeated for *Experiments 4 and 5* with two more successive additions of 1.0 cm^3 of water.

At the end of Experiment 5, the total volume of water in the boiling tube was 16.0 cm^3.

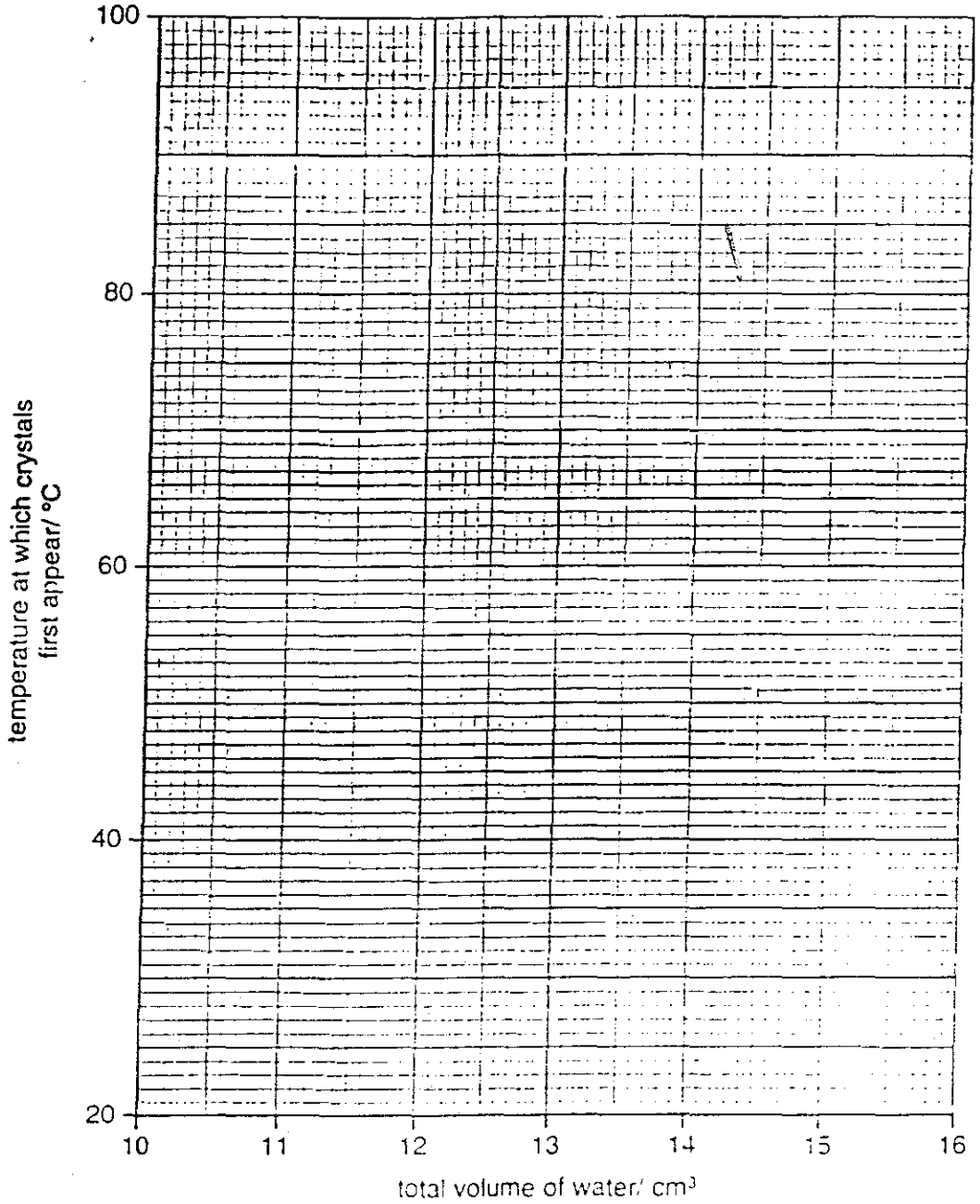
Record, in the table, the **total** volume of water used for each experiment. Use the thermometer diagrams to read the temperatures at which crystals first appear and record the values in the table.

Table of results

experiment	total volume of water/cm^3	thermometer diagrams	temperature at which crystals first appear/°C
1	12.0		
2			
3			
4			
5			

[5]

(a) Plot your results on the grid and draw a straight line graph. [4]



(b) **(i)** **From your graph**, find the temperature at which crystals of potassium chlorate would first appear if the total volume of water in the solution was 11.0 cm^3. **Show on the grid** how you obtained your answer.

.....[2]

(ii) Substance **N** is less soluble in water than potassium chlorate. Sketch on the grid the straight line graph you would expect for **N**. Label this line. [2]

(c) How would the student know when the potassium chlorate was completely dissolved in the water?

.....

.....[1]

(d) Suggest, with a reason, how the results would be different if 2.5 g of potassium chlorate were used instead of 5 g.

.....

.....

.....[2]

(e) **(i)** Which result appears to be inaccurate?

.....

.....[1]

(ii) Explain **one** improvement which could be made to the experimental procedure to obtain more accurate results.

improvement .....

explanation .....

.....[2]

4 Two different solutions, **O** and **P**, were tested. The tests and some of the observations are in the following table.

Solution **O** was aqueous ammonia and solution **P** was a calcium salt dissolved in water.

Complete the observations in the table.

tests	observations
Tests on solution **O** **(a)** Appearance of solution **O**.	....[1]
(b) Solution **O** was tested with Universal Indicator paper. Record the pH.	colour ..... pH .....[2]
(c) **(i)** To 1 cm^3 of aqueous copper(II) sulphate was added a few drops of solution **O**.	....[2]
(ii) An excess of solution **O** was added.	....[2]
Tests on solution **P**. (d) To 1 cm^3 of solution **P** was added a few drops of dilute hydrochloric acid and then aqueous barium chloride.	no visible reaction
(e) To 1 cm^3 of solution **P** was added aqueous sodium hydroxide drop by drop with shaking.	....[2]
An excess of aqueous sodium hydroxide was added to the mixture. To the mixture was added one spatula measure of aluminium powder. The mixture was boiled and the gas tested with damp Universal Indicator paper.	.....[1] paper turned blue

tests	observations
(f) To solution **P** was added solution **O**, drop by drop with shaking. An excess of solution **O** was added to the mixture.	....[1] ....[1]

(g) What gas is given off in test (e)?

.....[1]

(h) What conclusion can you draw about the identity of solution P?

.....[1]

5 The following is an account of the preparation of zinc sulphate crystals, $ZnSO_4.7H_2O$.

Pour 50 cm^3 of dilute sulphuric acid into a small beaker. Warm the acid. Add a spatula measure of zinc oxide and stir. Repeat until zinc oxide is in excess. Filter off the excess of zinc oxide. Heat the filtrate until it is on the *point of crystallising*. Leave it to cool. When crystals have formed, filter off the crystals and dry them with filter paper.

(a) Why is the acid heated?

.....[1]

(b) Why is the mixture stirred with a glass rod and not a metal spatula?

.....[1]

(c) Why does it not matter if the volume of sulphuric acid is not exactly 50 cm^3?

.....[1]

(d) Draw a diagram to represent the filtration apparatus.

[2]

(e) How would you know that the *point of crystallising* had been reached?

.....

.....[1]

(f) Why are the crystals dried with a filter paper and not in an oven?

.....

.....[1]

(g) How would the **method** differ if zinc carbonate were used instead of zinc oxide?

.....

.....[2]

6 # Are egg shells pure calcium carbonate?

Calcium carbonate is found in egg shells. All carbonates react with hydrochloric acid to form chlorides. Calcium carbonate is insoluble in water but calcium chloride is soluble. Most impurities in egg shells are insoluble. Plan an experiment to find out if egg shells are 100% calcium carbonate.

.....

.....

.....

.....

.....

.....

.....[6]

Candidate Name _____

Centre Number	Candidate Number

International General Certificate of Secondary Education
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

CHEMISTRY 0620/6

PAPER 6 Alternative to Practical

MAY/JUNE SESSION 2001 1 hour

Candidates answer on the question paper.
No additional materials are required.

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

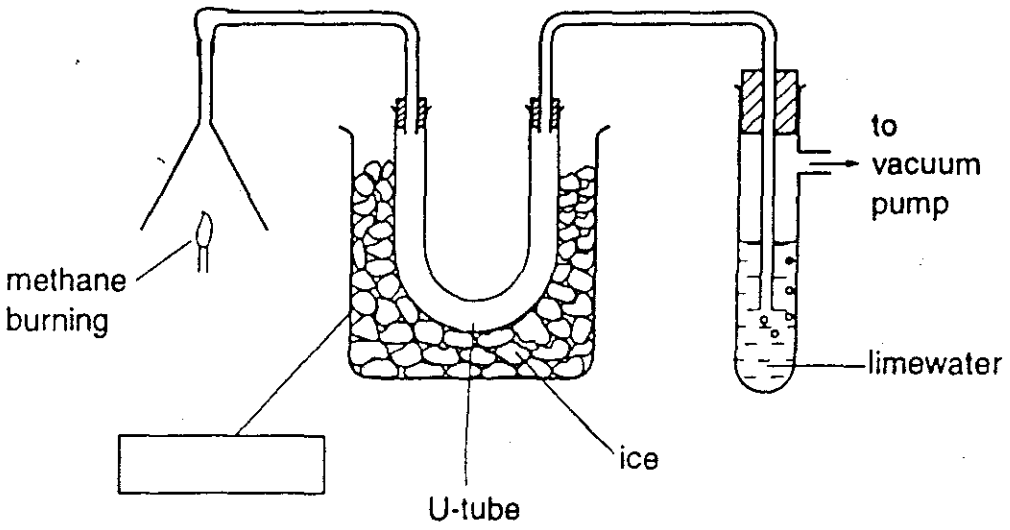
The number of marks is given in brackets [ ] at the end of each question or part question.

FOR EXAMINER'S USE

This question paper consists of 15 printed pages and 1 blank page.

SB (SM/JB) OF 10307/3

1 The apparatus below was used to test the gases formed when methane, CH_4 burns in air.



(a) Complete the empty box. [1]

(b) Explain why the water collects in the U-tube.

.....

.....

.....[2]

(c) Give a chemical test for water.

.....

.....[2]

(d) What is the purpose of the vacuum pump?

.....

.....[1]

2 Read the following instructions for making zinc sulphate crystals, $ZnSO_4.7H_2O$.

Step 1. Pour 25 cm^3 of dilute sulphuric acid into a beaker. Add a measure of zinc oxide. Warm and stir the mixture.

Step 2. Add more zinc oxide until all the acid is used up.

Step 3. Remove the excess of zinc oxide.

Step 4. Obtain zinc sulphate crystals from the solution.

(a) Name the apparatus used to measure the acid and the zinc oxide in Step 1.

acid .....

zinc oxide .....[2]

(b) How could you show that all of the acid had been used up in Step 2?

.....

.....

.....[2]

(c) What method is used in Step 3?

.....[1]

(d) How are zinc sulphate crystals obtained in Step 4?

.....

.....

.....

.....[2]

(e) How would the method differ if zinc carbonate were used instead of zinc oxide?

.....

.....[1]

3 A student investigated what happened when aqueous sodium hydroxide reacted with two different acids. Hydrochloric acid and sulphuric acid were used.

Experiment 1

By using a measuring cylinder, a 25 cm^3 sample of hydrochloric acid was poured into a polystyrene cup and the temperature of the solution measured and recorded.

A burette was filled up to the 0.0 cm^3 mark with aqueous sodium hydroxide. A 5.0 cm^3 sample of sodium hydroxide was added to the acid in the cup. The mixture was stirred with the thermometer and the maximum temperature of the mixture measured and recorded. A further 5.0 cm^3 of sodium hydroxide was added to the cup. The maximum temperature of the mixture was measured and recorded.

This procedure was repeated adding 5.0 cm^3 portions of sodium hydroxide until a total volume of 40.0 cm^3 had been added.

Use the thermometer diagrams to record the temperatures in the table.

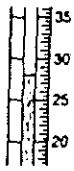
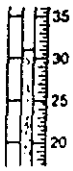
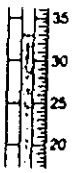
Experiment 2

Experiment 1 was repeated using dilute sulphuric acid instead of hydrochloric acid.

Use the thermometer diagrams to record all temperatures in the table.

Table of results

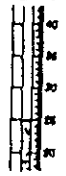
Experiment 1

Volume of sodium hydroxide added / cm^3	Thermometer diagram	Temperature of solution / °C
0		
5		
10		
15		
20		
25		
30		
35		
40		

[2]

Table of results

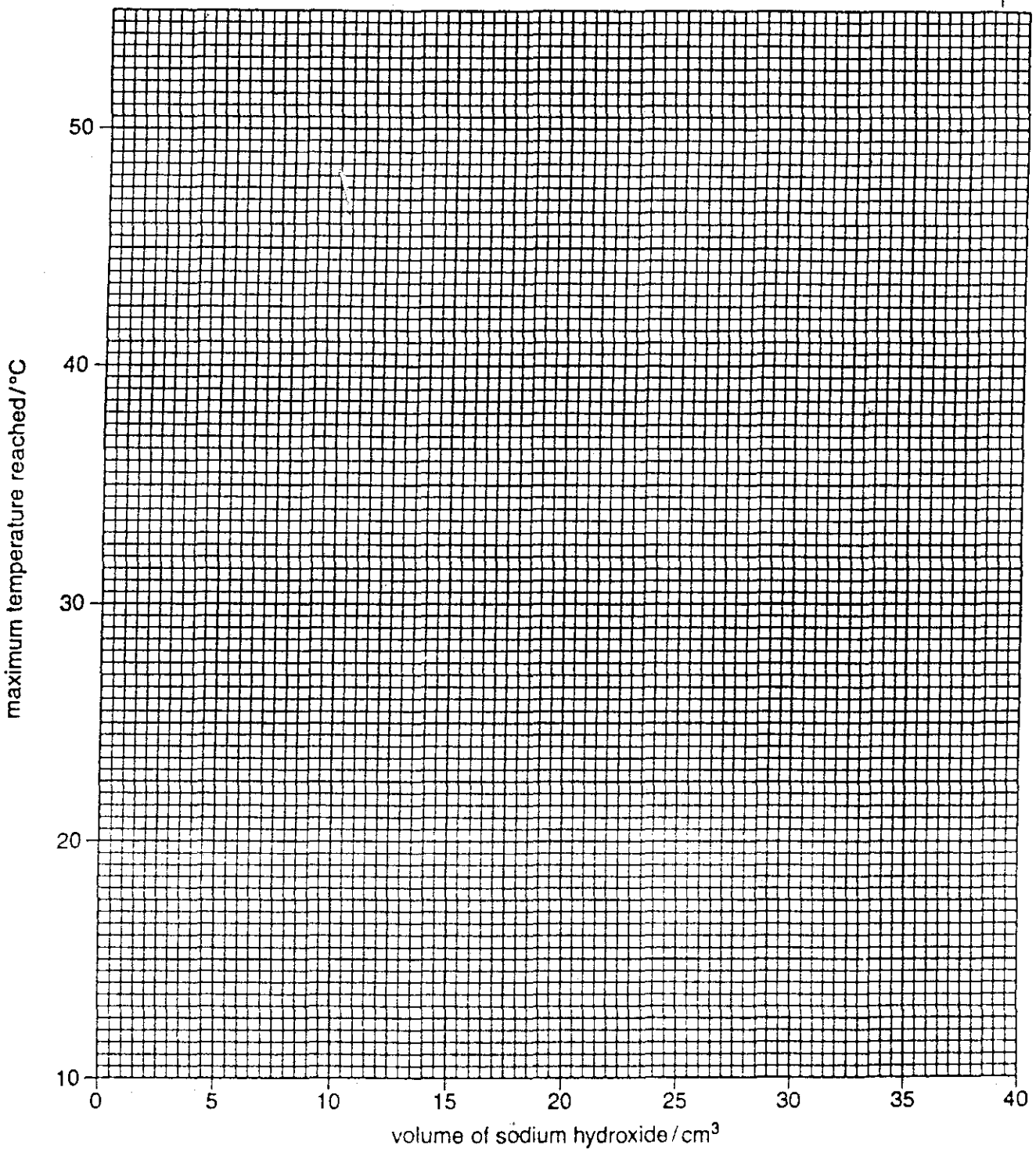
Experiment 2

Volume of sodium hydroxide added / cm^3	Thermometer diagram	Temperature of solution / °C
0		
5		
10		
15		
20		
25		
30		
35		
40		

[2]

For Examiner's Use

(a) Plot the results of the experiments on the grid below. Draw two smooth line graphs. Clearly label the graphs. [5]



(b) **Use your graph** to estimate the temperature of the reaction mixture in Experiment 1 after 28 cm^3 of sodium hydroxide had been added. Indicate **clearly** on the graph how you obtained your answer.

.....[2]

(c) What type of chemical reaction occurs when acids react with aqueous sodium hydroxide?

.....[1]

(d) (i) Compare the temperature changes in Experiments 1 and 2. Give a similarity and a difference.

similarity .....

.....

difference .....

.....[2]

(ii) Suggest an explanation for the difference in the temperature changes.

.....

.....[1]

(e) Predict what the temperature of the reaction mixture in Experiment 2 would be after 1 hour. Explain your answer.

.....

.....[2]

(f) Suggest **one** change you would make to the apparatus used in the experiments to obtain more accurate results.

.....

.....[1]

4 A mixture of two solids **A** and **B** was analysed. Solid **A** was potassium iodide, which is water-soluble. Solid **B** 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*
Distilled water was added to the mixture in a boiling tube. The contents of the tube were filtered. The filtrate and the residue were kept for the following tests.	[redacted]
test on the filtrate (a) To about 1 cm^3 of the solution, was added a few drops of dilute nitric acid and about 1 cm^3 of aqueous silver nitrate.	....[2]
(b) To about 1 cm^3 of the solution, was added a few drops of dilute nitric acid and about 1 cm^3 of aqueous lead(II) nitrate.	....[2]

Tests	*Observations*
tests on the residue	
(c) The solid residue from the filter paper was transferred into 2 test-tubes.	
(i) The solid was heated gently and then strongly until no further change.	green to black
(ii) Dilute hydrochloric acid was added to the second test-tube. The gas was tested with limewater. The contents of the test-tube were filtered.	....[2] colour of the filtrate was green
(d) The solution obtained was divided into two equal portions.	
(i) To the first portion was added excess aqueous sodium hydroxide, a little at a time.	pale blue precipitate

Tests	*Observations*
(ii) To the second portion was added **excess** aqueous ammonia, a little at a time.	....[4]

(e) Name the gas given off in test **(c)**.

.....[1]

(f) What conclusions can you draw about the cation in solid **B**?

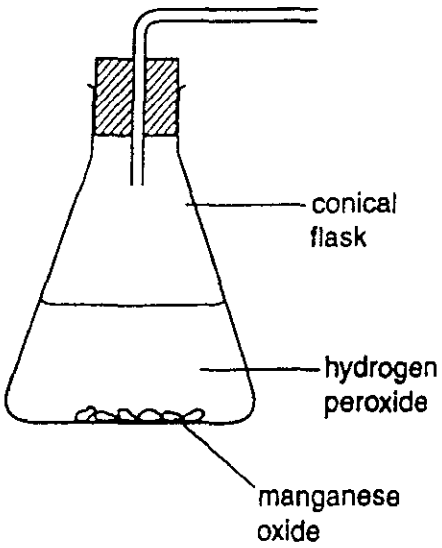
.....

.....

.....[2]

5 Hydrogen peroxide, H_2O_2, breaks down slowly at room temperature to form water and oxygen. Manganese(IV) oxide is a catalyst which can be used to speed up this decomposition.

(a) Complete the diagram to show how you could measure the volume of oxygen formed during the breakdown of a solution of hydrogen peroxide.



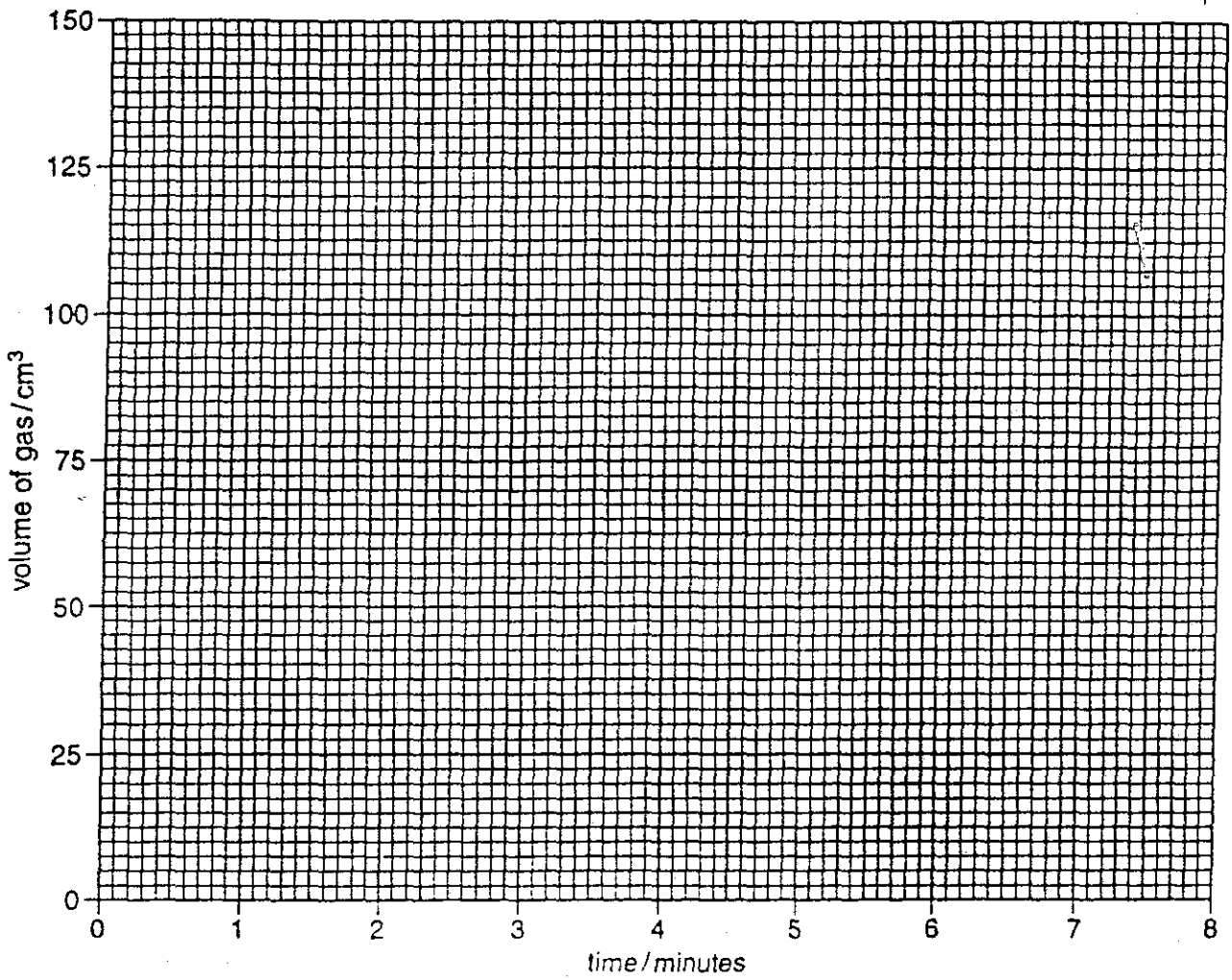
[2]

(b) An experiment was carried out to investigate the effect of adding 1 gram of manganese(IV) oxide to 25 cm^3 of a solution of hydrogen peroxide. The results are shown in the table.

Time / minutes	0	1	2	3	4	5	6	7	8
Volume of oxygen / cm^3	0	29	65	77	98	120	138	150	150

For Examiner's Use

(i) Draw a graph of these results on the grid below.



[2]

(ii) Which result appears to be incorrect? Why have you selected this result?

.....

.....

.....[2]

(iii) Why does the slope of the graph become less steep during the reaction?

.....[1]

(c) Use the graph to answer these questions.

(i) What was the total volume of oxygen produced?

.....[1]

(ii) How long did the reaction last?

.....[1]

(d) How would you check the accuracy of these results?

.....

.....[1]

6 When iron nails rust, the mass of the nails increases as the iron reacts with oxygen and water. You are provided with the following apparatus. Plan an experiment to investigate if iron rusts more quickly in sea water or fresh water.

clean iron nails

test-tubes

beakers

a balance

an oven

measuring cylinder

.....

.....

.....

.....

.....

.....

.....

.....[5]

Centre Number	Candidate Number

Candidate Name _____

International General Certificate of Secondary Education
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

CHEMISTRY 0620/6

PAPER 6 Alternative to Practical

OCTOBER/NOVEMBER SESSION 2001 1 hour

Candidates answer on the question paper.
Additional materials:
None

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.
Answer all questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

FOR EXAMINER'S USE

This question paper consists of 11 printed pages and 1 blank page.

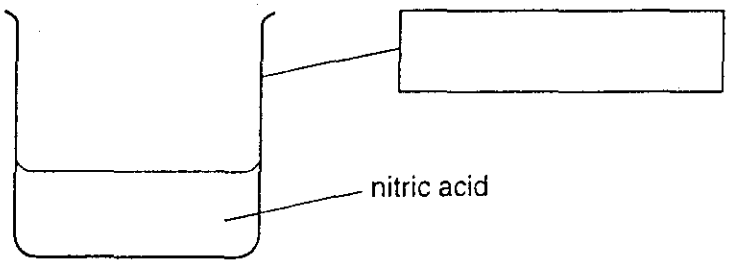
SB (SLC/JB) QK11135/3

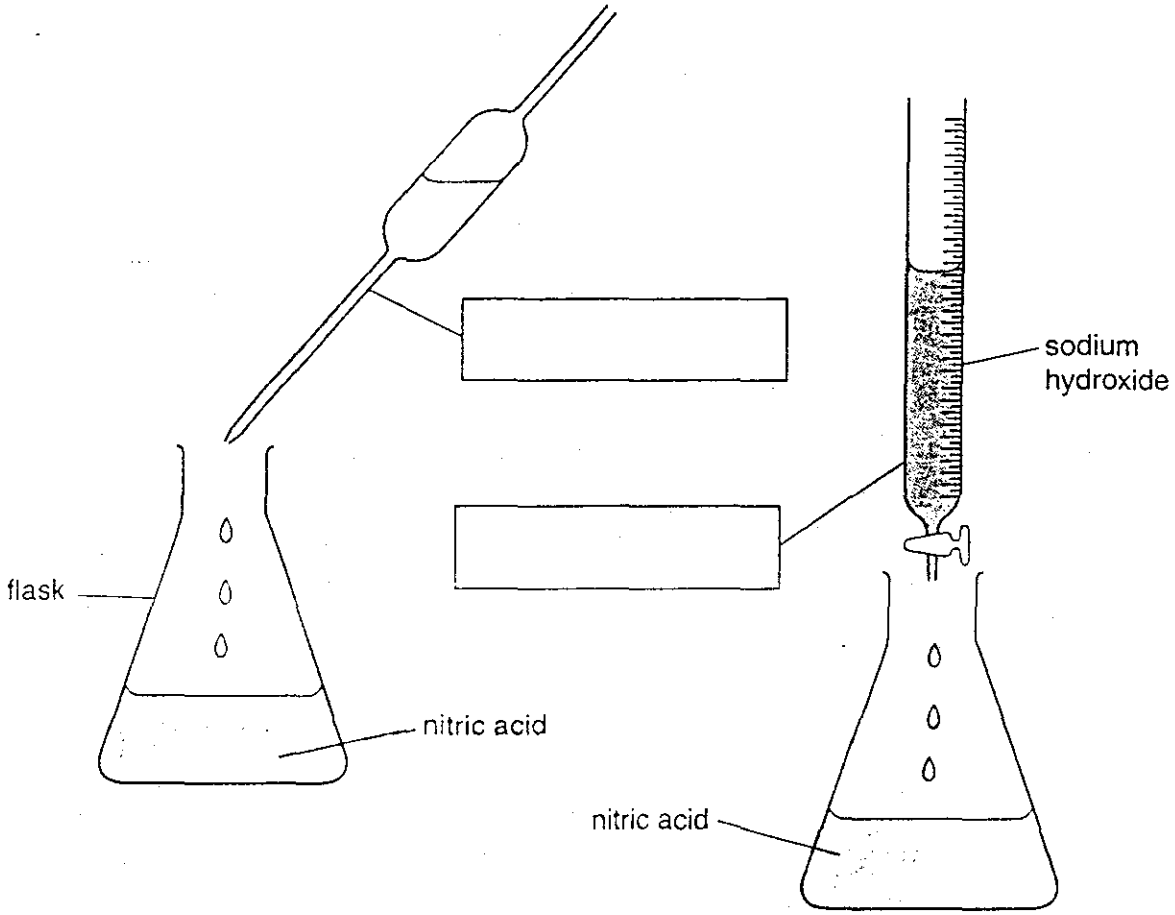
BLANK PAGE

1 The diagrams show the apparatus used to find the concentration of a nitric acid solution.

25.0 cm^3 of nitric acid was added to a flask.

Sodium hydroxide was added to the acid until the solution was neutral. The volume of the sodium hydroxide was noted.





(a) Complete the boxes to name the apparatus used. [3]

(b) How could you tell when the solution was neutral?

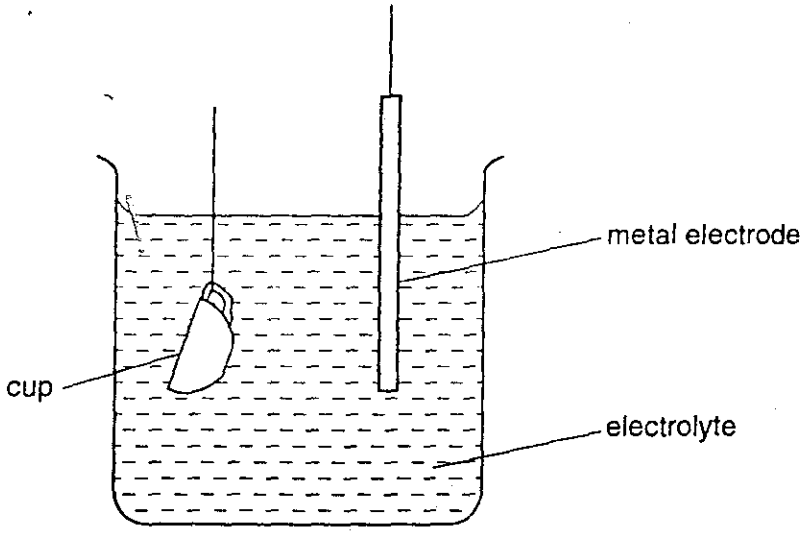
.....

.....[2]

(c) How could the accuracy of the results be checked?

.....[1]

2 A metal cup can be coated in silver by electrolysis. The cup must be very clean and also rotated during the process, which is known as electroplating.



(a) Should the metal cup be the anode or the cathode?

.....[1]

(b) Identify the metal from which the electrode is made.

.....[1]

(c) Suggest a suitable electrolyte that could be used to electroplate this cup.

.....[2]

(d) Suggest why the cup must be

(i) very clean, ...

.....[1]

(ii) rotated during the electrolysis. .....

.....[1]

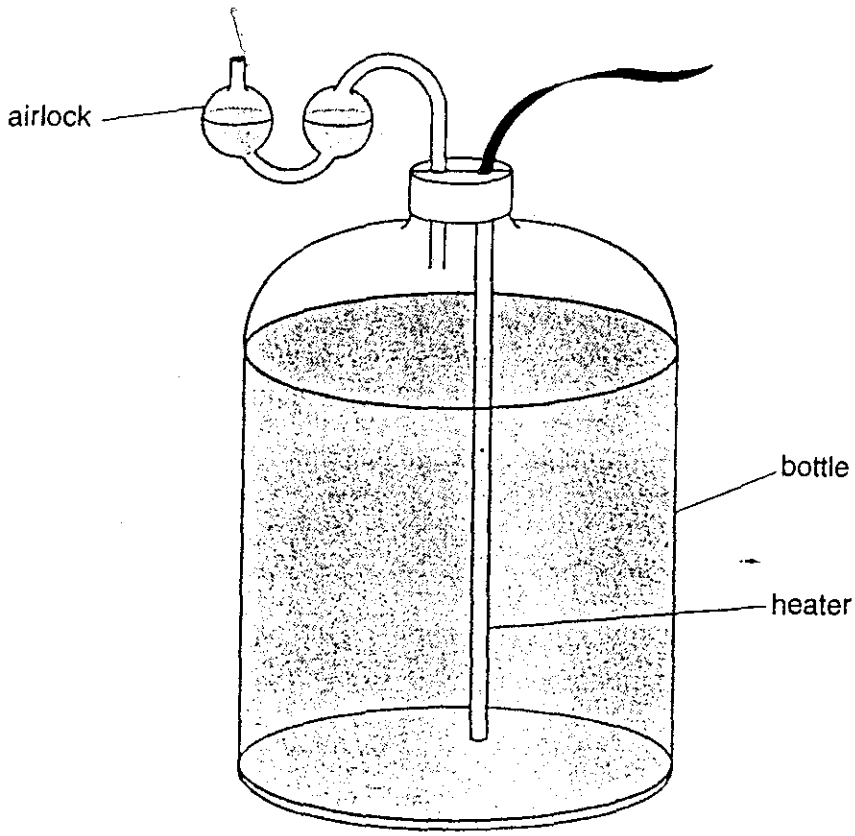
3 A student fermented some orange juice using the following instructions.

Step 1 Slice an orange and put the slices into a beaker and cover them with water. Boil the water for 10 minutes.

Step 2 Filter the mixture into a clean bottle.

Step 3 Add one measure of yeast to the juice when it has cooled.

Step 4 Set up the apparatus shown below and leave to ferment.



(a) Why was the orange sliced in Step 1?

.....[1]

(b) Why was the juice cooled before adding the yeast?

.....[1]

(c) What could be used to add the yeast in Step 3?

.....[1]

(d) Explain why it was important to keep the temperature of the mixture in the bottle at 30°C–40°C.

.....

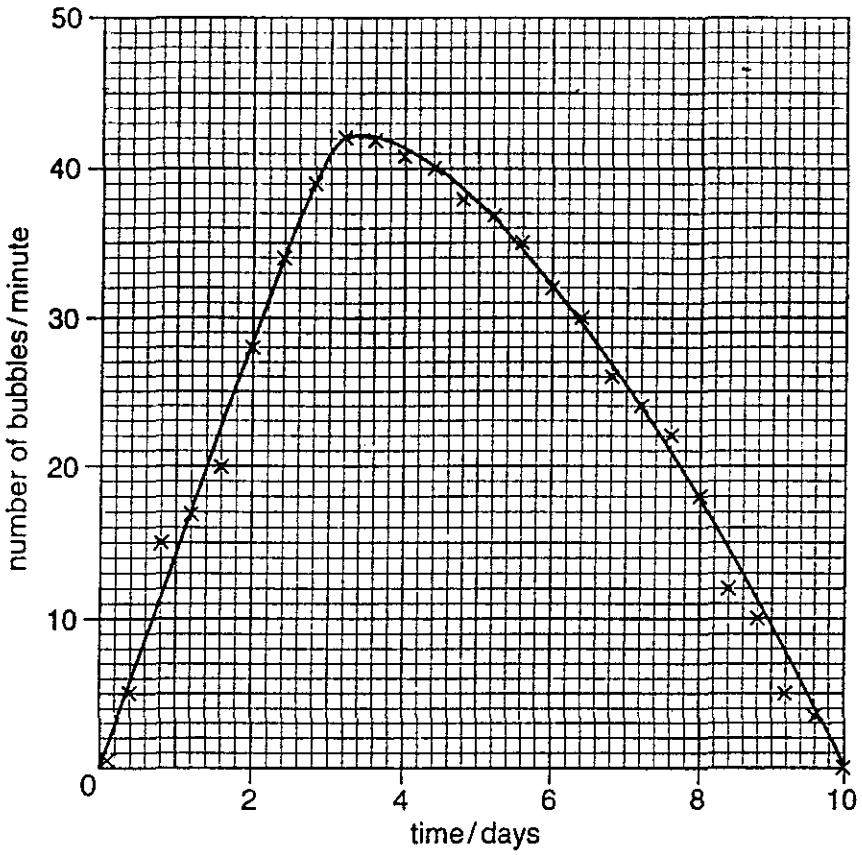
.....[2]

(e) Explain why an airlock was used.

.....

.....[2]

(f) The bubbles of gas coming through the airlock in one minute were counted over several days. The results are shown on the graph.



(i) When was the rate of formation of alcohol quickest?

.....[2]

(ii) When did the fermentation stop?

.....[1]

(iii) Give two reasons why the fermentation may have stopped.

1. .....

2. .....[2]

4 A student investigated the reaction between magnesium and sulphuric acid.

Experiment 1

Using a measuring cylinder, a 10 cm^3 sample of dilute sulphuric acid was added into a boiling tube. The initial temperature of the acid was measured and recorded. A 1 cm length of magnesium ribbon was added to the acid in the boiling tube. The mixture was stirred with a thermometer and the maximum temperature reached was measured and recorded.

(a) The gas given off was tested with a lighted splint.

result of test

.....

name of gas given off

.....

[2]

Experiment 2

Experiment 1 was repeated using a 2.5 cm length of magnesium.

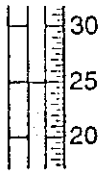
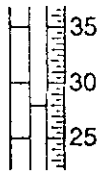
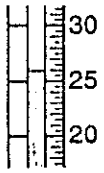
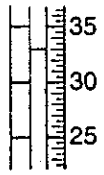
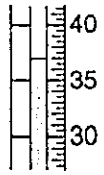
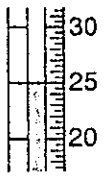
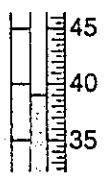
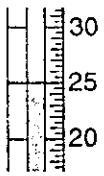
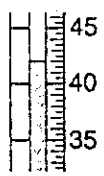
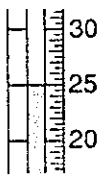
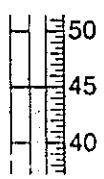
Experiment 3

Experiment 1 was repeated using a 3 cm length of magnesium.

This procedure was followed for *Experiments 4, 5 and 6* using 4 cm, 5 cm and 6 cm lengths of magnesium.

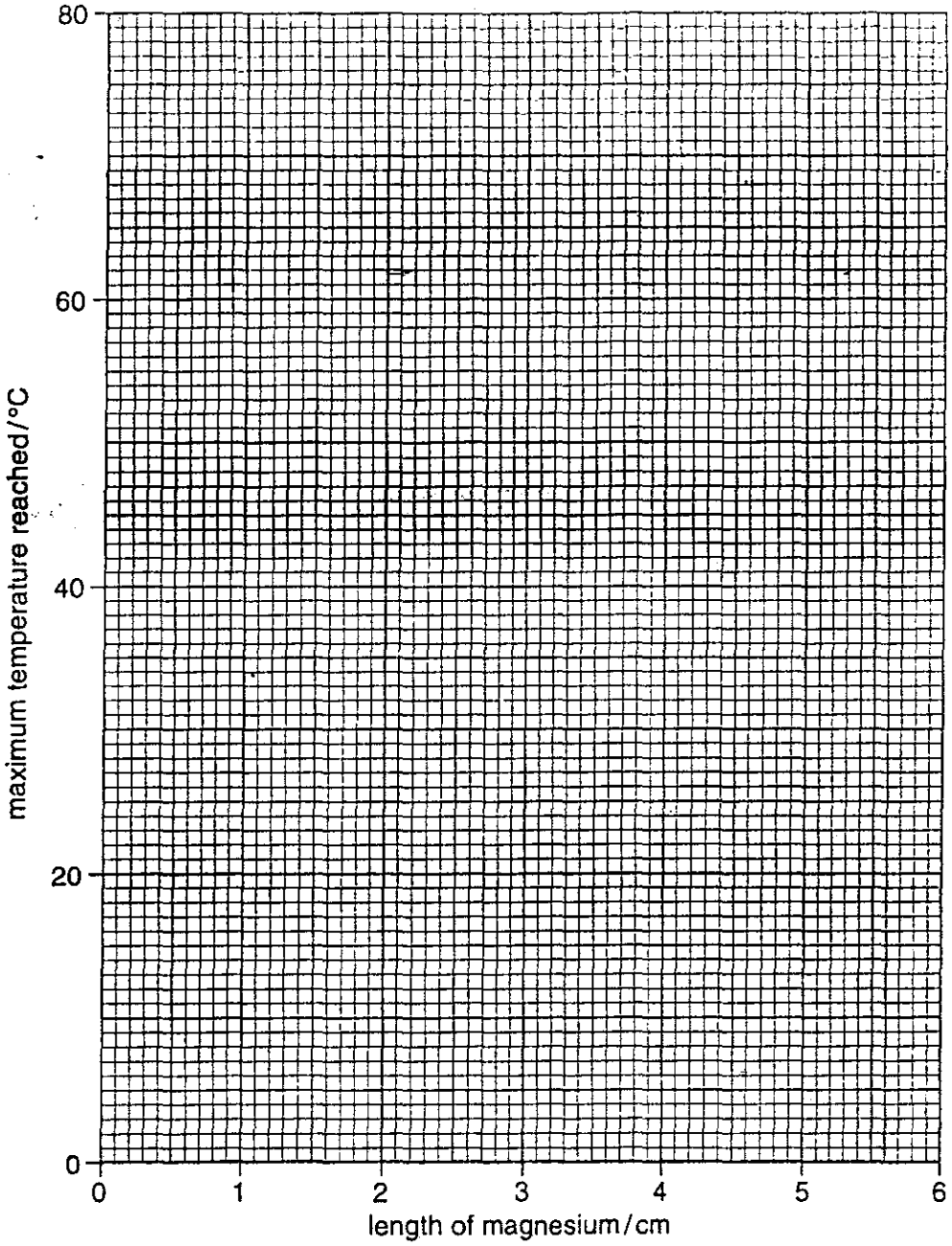
The results are shown on the next page.

Use the thermometer diagrams to read the temperatures and record the values in the table.

experiment	length of magnesium /cm	initial temperature of acid/°C		maximum temperature of acid/°C	
1	1				
2	2.5				
3	3				
4	4				
5	5				
6	6				

[3]

(b) Plot the maximum temperature reached for Experiments 1 to 6 on the grid and draw a straight line graph.



[4]

(c) **From your graph**, find the maximum temperature of the mixture when a 2 cm length of magnesium reacted with 10 cm^3 of sulphuric acid of the same concentration.

Show **clearly** on the grid how you obtained your answer.

.....[2]

(d) What word is used to describe a reaction where the temperature increases?

.....[1]

200

(e) (i) In which experiment was the largest temperature change noted?

.....[1]

(ii) Explain why this experiment gave the largest temperature change.

.....

.....[2]

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

improvement .....

explanation .....

.....[2]

5 The solid **P** contained the iron(II) cation, another cation and one anion.
The tests on an aqueous solution of **P** and some of the observations are in the following table.
Complete the observations in the table.

tests	observations
(a) (i) To about 1cm^3 of solution **P** was added excess aqueous sodium hydroxide and shaken	....[2]
(ii) The mixture was heated gently until boiling. The gas given off was tested with pH indicator paper.	Indicator paper turned blue pH 11
(b) To about 1 cm^3 of solution **P**, was added a few drops of dilute sulphuric acid and potassium manganate(VII) solution. The colour change was noted. The iron(II) ions were oxidised to iron(III) ions. Aqueous sodium hydroxide was added with shaking until no further change.	.....[2]
(c) To 1 cm^3 of solution **P**, was added aqueous ammonia with shaking until excess ammonia was present.	....[2]
After 5 minutes, describe the surface of the mixture.	....[1]
(d) To 1 cm^3 of solution **P** was added drops of dilute hydrochloric acid and then aqueous barium chloride.	white precipitate

(e) What gas is given off in test **(a)**?

.....[1]

(f) Identify the other cation present in solid **P**.

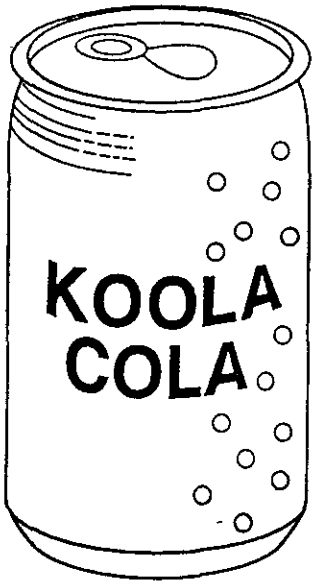
.....[1]

(g) Identify the anion present in solid **P**.

.....

For Examiner's Use

6 You are provided with cans of a fizzy drink – Koola cola.



Plan tests to investigate the cola so that you can answer the following four questions.

(a) What is the pH of the cola?

.....

.....[2]

(b) How many coloured pigments does the cola contain?

.....

.....

.....

.....

.....[3]

(c) What volume of gas is released when a can of cola is opened? [Note: The can will have to be opened under water.]

.....

.....

.....[2]

(d) Is the gas released carbon dioxide?

.....

.....[2]

Centre Number	Candidate Number

Candidate Name _____

International General Certificate of Secondary Education
CAMBRIDGE INTERNATIONAL EXAMINATIONS

CHEMISTRY 0620/6

PAPER 6 Alternative to Practical

MAY/JUNE SESSION 2002

1 hour

Candidates answer on the question paper.
No additional materials are required.

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.
Answer all questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

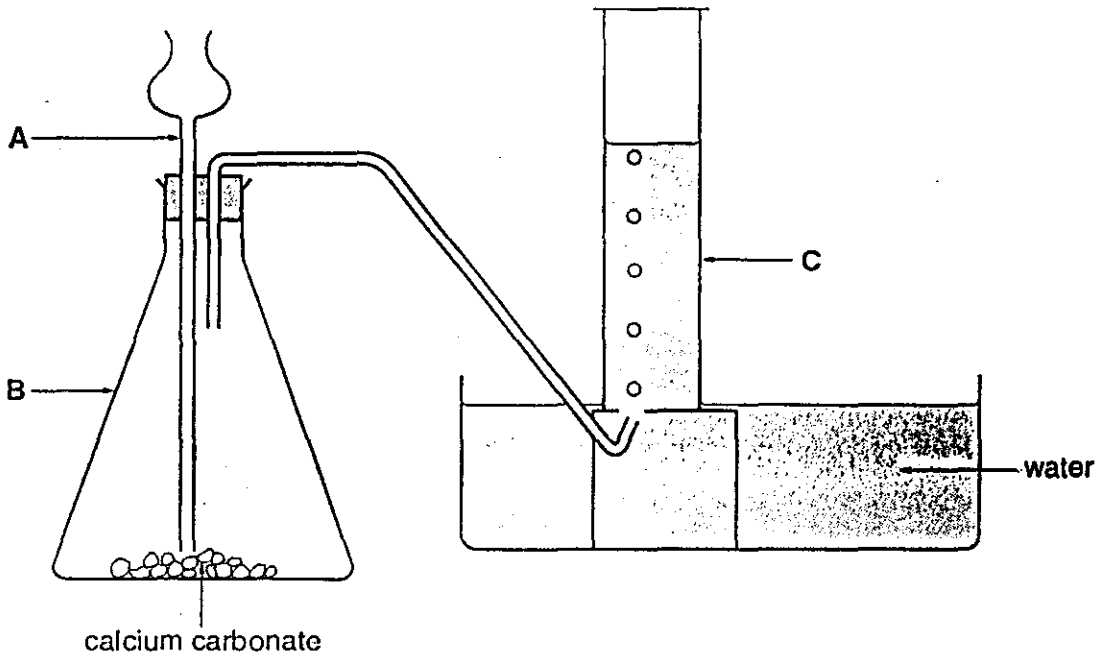
FOR EXAMINER'S USE

This question paper consists of 11 printed pages and 1 blank page.

(NH/PW) S12126/3

University of Cambridge
Local Examinations Syndicate

1 The apparatus below was used to make carbon dioxide. Dilute hydrochloric acid was added to calcium carbonate.



(a) Identify the pieces of apparatus labelled:

A .....

B .....

C ..... [3]

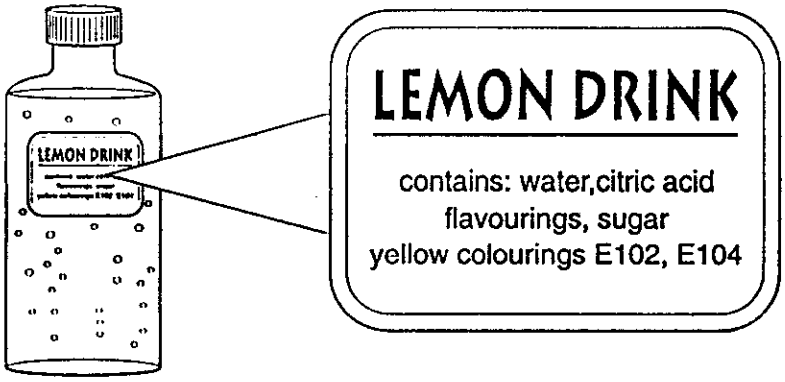
(b) Indicate on the diagram with an arrow where the acid was added. [1]

(c) State a test for carbon dioxide.

test .....

result .....[2]

2 The label shows the substances present in a bottle of lemon drink.



(a) A piece of litmus paper was dipped in the drink.

(i) What colour will the paper turn?

.....[1]

(ii) Why does using litmus paper give a better result than adding Universal Indicator solution to the drink?

.....

.....[1]

(b) How could a sample of pure water be obtained from the drink?

.....

.....

.....[2]

(c) Describe an experiment you could carry out to show that the drink contained **two** different yellow substances.

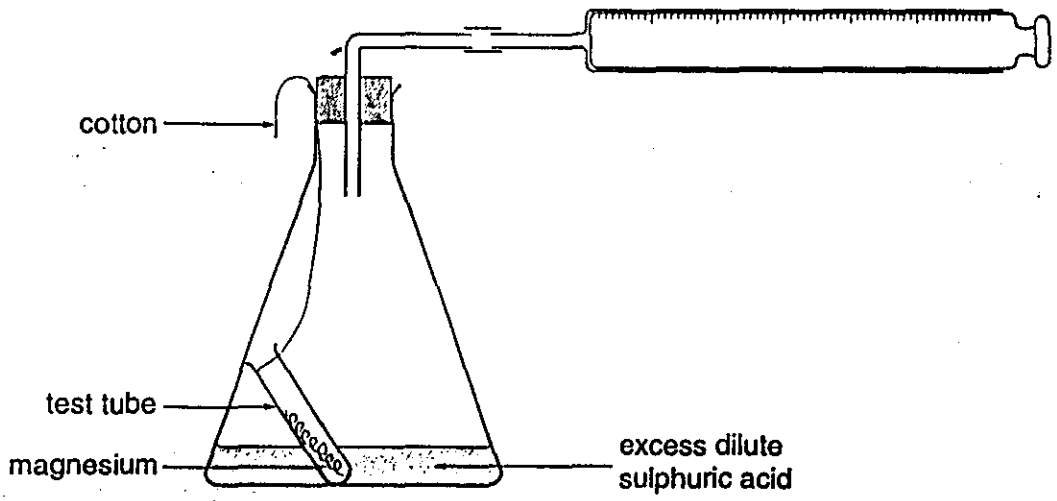
.....

.....

.....

.....[3]

3 The apparatus below was used to investigate the speed of the reaction between an **excess** of dilute sulphuric acid and 4 cm of magnesium ribbon.



(a) (i) What is the purpose of the test-tube?

.....[1]

(ii) What is the purpose of the gas syringe?

.....[1]

(b) How was the reaction started?

.....[1]

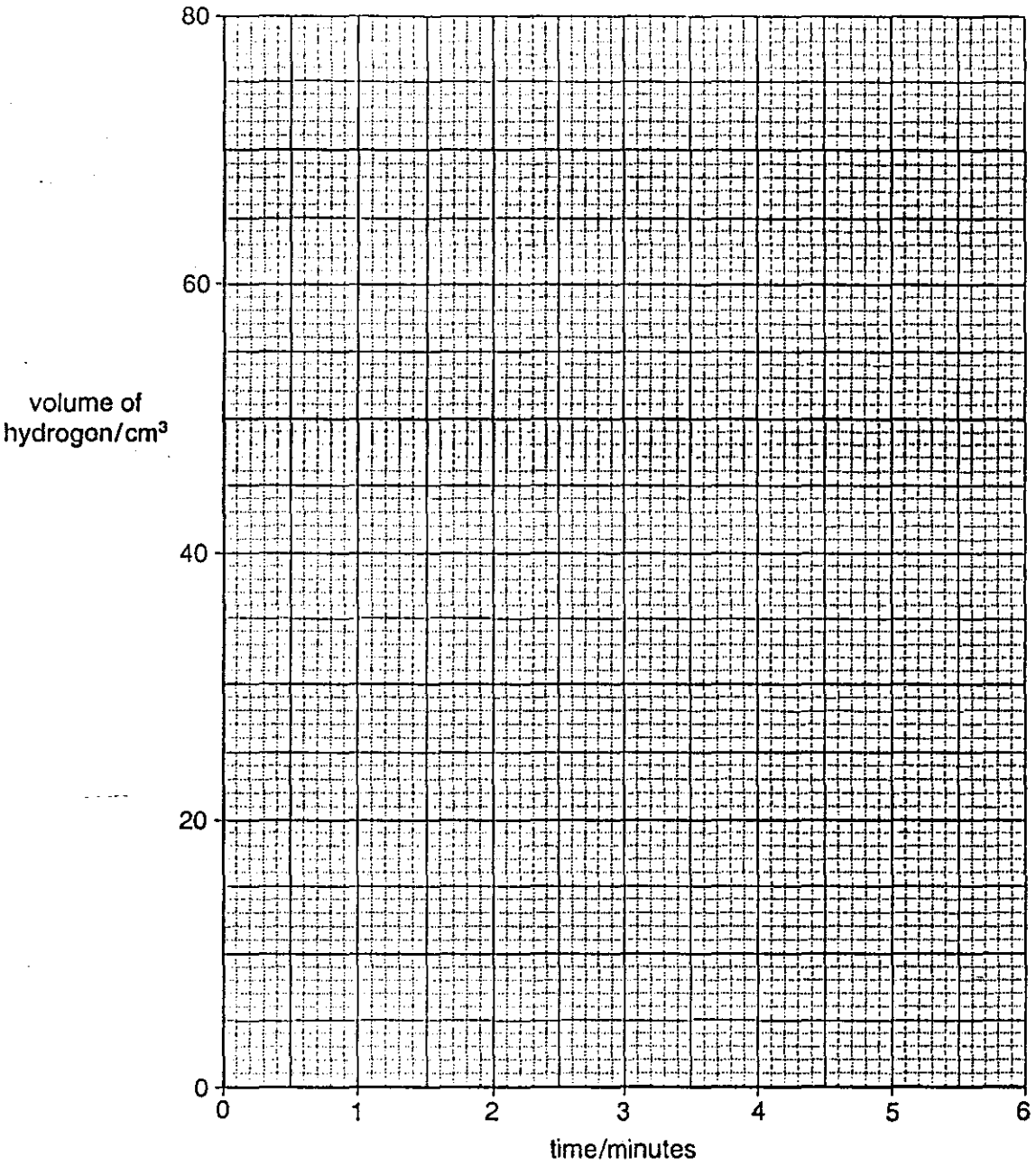
(c) What does an *excess* of sulphuric acid mean?

.....[1]

The reaction produced hydrogen. The results obtained are shown in the table.

Time/minutes	0	1	2	3	4	5	6
Volume of hydrogen /cm^3	0	28	42	64	76	80	80

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



[3]

(e) Which result appears to be incorrect? Why have you selected this result?

.....

.....[2]

(f) From the graph work out the volume of hydrogen produced after 30 seconds. Indicate clearly on the grid how you used the graph.

.....[2]

(g) Sketch on the grid the graph you would expect if the experiment were repeated using 2 cm of magnesium. Label this graph M. [1]

6

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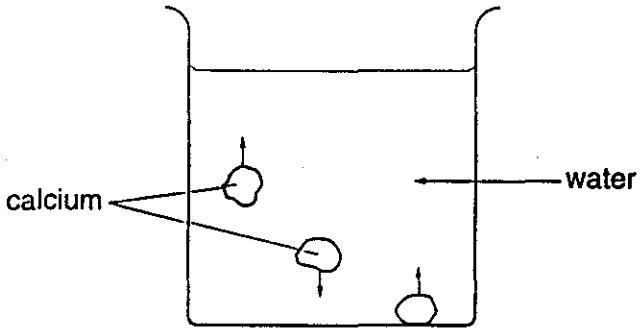
4 Small pieces of calcium are added to a beaker of cold water. The pieces of calcium move up and down.



(a) Give **one** other observation expected in this reaction.

.....[1]

(b) Suggest why the pieces of calcium move up and down.

.....[1]

(c) Suggest a value for the pH of the solution formed.

.....[1]

5 A student investigated the redox reaction between potassium manganate(VII) and iron(II) ions. Two different aqueous solutions of potassium manganate(VII), **A** and **B**, were used.

Experiment 1

A burette was filled to the 0.0 cm^3 mark with the solution **A** of aqueous potassium manganate(VII). A 25 cm^3 sample of aqueous iron(II) ions was added into a conical flask from a measuring cylinder.

Solution **A** was gradually added until there was just a **permanent** pale pink colour in the contents of the flask.

Use the burette diagram to read the volume added and record the volume in the table.

Experiment 2

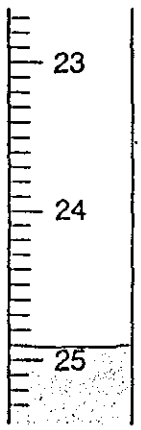
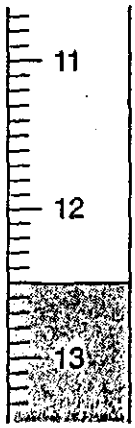
Experiment 1 was repeated using the solution **B** of potassium manganate(VII) instead of solution **A.**

Use the burette diagram to read the volume added and complete the table.

A little of the contents of the flask were poured into a test-tube. Excess aqueous sodium hydroxide was added to the tube.

A red-brown precipitate was formed.

Table of results

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

[2]

(a) (i) In which Experiment was the greatest volume of aqueous potassium manganate(VII) used?

.....[1]

(ii) Compare the volumes of potassium manganate(VII) used in Experiments 1 and 2.

.....

.....[2]

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

.....

.....[1]

(iv) Predict the volume of solution B which would be needed to completely react with 50 cm^3 of the solution of iron(II) ions.

.....

.....[2]

(b) What product is formed in the flask at the end of the reaction? Give a reason for your answer.

product .....

reason .....[2]

(c) Explain **one** change you could make to the **apparatus** used in the experiments to obtain more accurate results.

change .....

explanation.....[2]

For Examiner's Use

6 Two solid compounds S and T were tested. The tests on S and T and some of the observations are in the following table. S was copper(II) oxide. Complete the observations in the table.

Tests	*Observations*
(a) Appearance of **S** and **T**.	**S** black solid **T** black solid
(b) **(i)** Solid **S** was added to aqueous hydrogen peroxide.	no reaction
The mixture was boiled. The gas given off was tested with a glowing splint.	splint extinguished
(ii) Solid **T** was added to aqueous hydrogen peroxide.	rapid effervescence
The gas given off was tested with a glowing splint.	splint relit
(c) **(i)** Solid **T** was added to hydrochloric acid and heated.	
The gas given off was tested with damp blue litmus paper.	litmus paper bleached
(ii) Test **(c)(i)** was repeated using solid **S**.	
The colour of the solution was noted.	green solution
(d) The solution from **(c)(ii)** was divided into two equal portions of 1 cm^3.	
(i) To the first portion was added excess aqueous sodium hydroxide.	....[2]
(ii) To the second portion was added excess aqueous ammonia.	....[3]

(e) Name the gas given off in test (b)(ii).

.....[1]

(f) Name the gas given off in test (c)(i).

.....[1]

(g) What conclusions can you draw about solid T?

.....

.....

.....[2]

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

potassium chloride and potassium iodide

test: add aqueous lead(II) nitrate

result: potassium chloride gives a white precipitate, potassium iodide gives a yellow precipitate

(a) hydrochloric acid and aqueous sodium chloride

test .....

result .....

.....[2]

(b) propane and propene

test .....

result .....

.....[2]

(c) sulphuric acid and nitric acid

test .....

result .....

.....[2]

For Examiner's Use

8 ELECTROPLATING A COPPER KEY

Electroplating is when a metal is coated with another metal using electricity.

To electroplate a metal a very clean surface is needed.

Describe an experiment to nickel plate a copper key. You are provided with the following items.

6 V bulb and holder

6 V battery and connecting wires

250 cm^3 beaker

steel wool/sandpaper

copper key

distilled water

nickel rod

solid nickel(II) sulphate, $NiSO_4$

You can use a labelled diagram to help you answer the question.

.....

.....

.....

.....

.....

.....[5]

Candidate Name _____

Centre Number	Candidate Number

International General Certificate of Secondary Education
CAMBRIDGE INTERNATIONAL EXAMINATIONS

CHEMISTRY 0620/6

PAPER 6 Alternative to Practical

OCTOBER/NOVEMBER SESSION 2002

1 hour

Candidates answer on the question paper.
No additional materials are required.

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

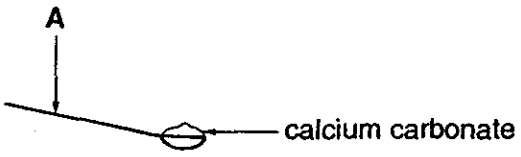
FOR EXAMINER'S USE

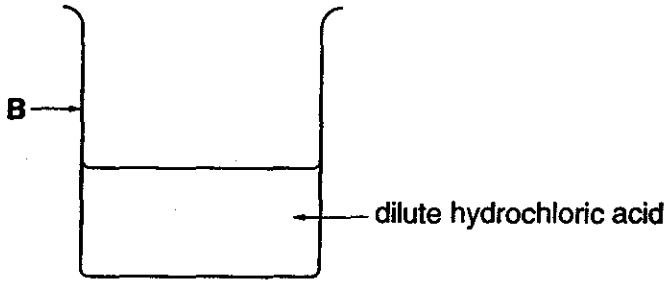
This question paper consists of 11 printed pages and 1 blank page.

University of Cambridge
Local Examinations Syndicate

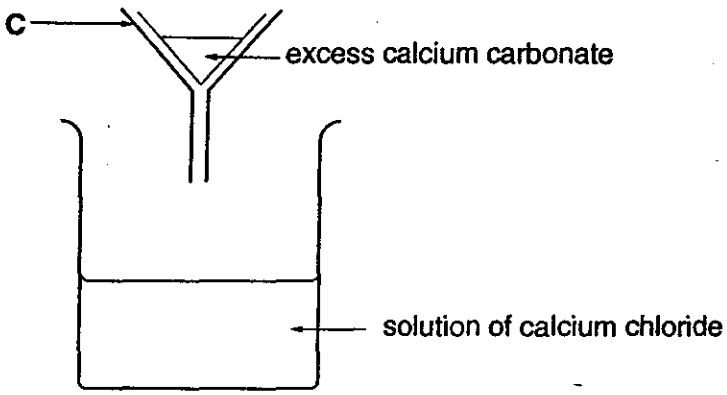
1 A student investigated the neutralisation of dilute hydrochloric acid, using an excess of calcium carbonate.

Step 1 Excess calcium carbonate was added to hydrochloric acid.





Step 2. Excess calcium carbonate was removed from the solution.



Step 3. The solution of calcium chloride was tested with indicator paper.

(a) Identify the pieces of apparatus labelled:

A.....

B.....

C.....[3]

(b) What does the term *excess* mean?

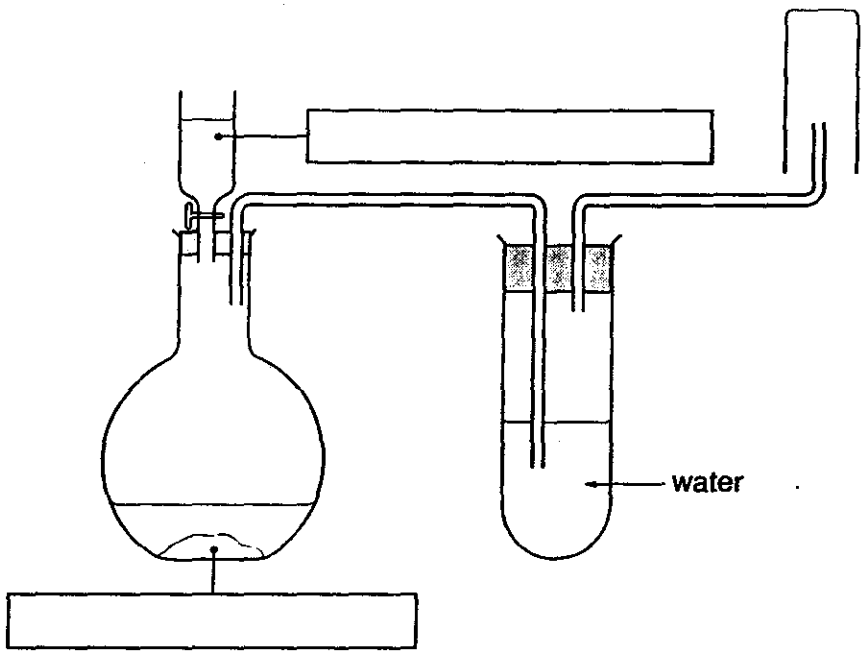
.....

.....[1]

(c) Suggest the pH value of the solution of calcium chloride.

.....[1]

2 Hydrogen chloride gas is strong-smelling, denser than air and soluble in water. A sample of hydrogen chloride gas can be prepared by adding concentrated sulphuric acid to sodium chloride. Study the diagram of the apparatus used.



(a) Fill in the boxes to show the chemicals used. [2]

(b) Identify and explain **two** mistakes in the diagram.

Mistake 1 .....

.....[2]

Mistake 2 .....

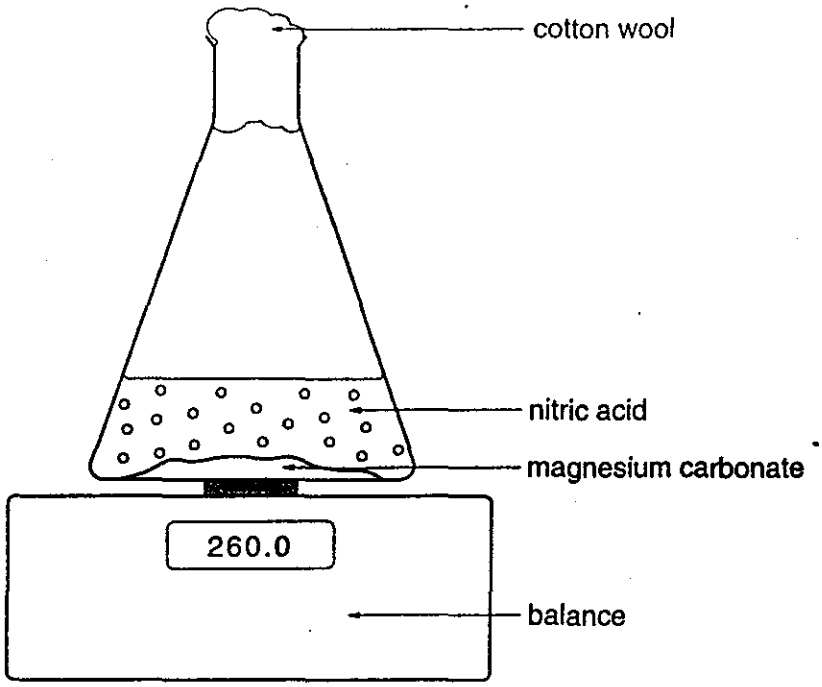
.....[2]

(c) State **one** precaution that should be taken when carrying out this experiment.

.....

.....[1]

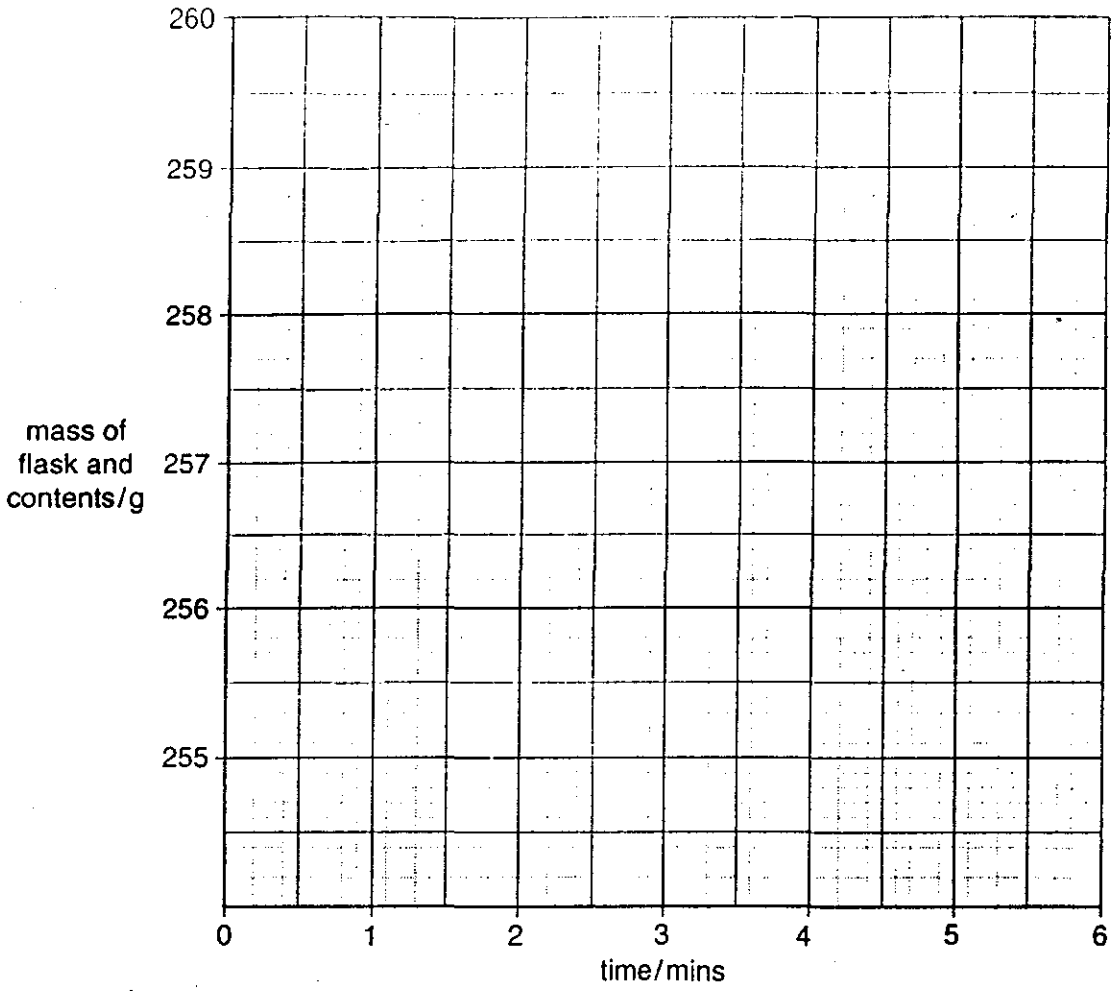
3 Dilute nitric acid was added to a large amount of magnesium carbonate in a conical flask as shown.



The flask was placed on a balance and the mass of the flask and contents recorded every minute. The results are shown in the table.

time / min	0	1	2	3	4	5	6
mass of flask and contents / g	260.0	257.9	256.8	256.6	255.8	255.6	255.6

(a) Plot the results on the grid and draw a smooth line graph. [3]



(b) Which result appears to be inaccurate? Why have you selected this result?

.....

.....[2]

(c) Why does the mass of the flask and contents decrease?

.....[1]

(d) Suggest the purpose of the cotton wool.

.....[1]

(e) At what time did the reaction finish?

.....[1]

(f) On the grid, sketch the graph you would expect if the experiment were repeated using nitric acid at a higher temperature. [2]

4 An investigation was carried out on the reactions of four different metals. Equal masses of copper, magnesium, iron and zinc were used.

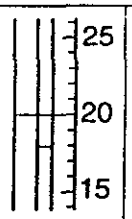
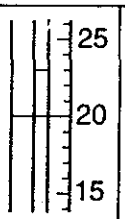
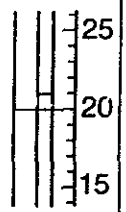
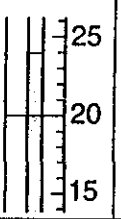
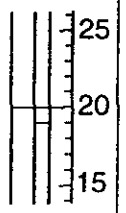
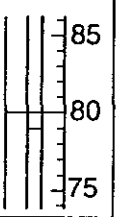
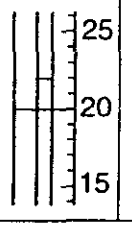
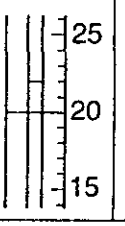
Experiment 1

A 15 cm^3 sample of dilute sulphuric acid was added to each of four boiling tubes. The initial temperature of the acid was measured. Zinc was added to the first tube, iron to the second tube, magnesium to the third tube and copper to the fourth tube.

The maximum temperature reached in each tube was measured and any observations were recorded in the table.

(a) Use the thermometer diagrams to complete the results table.

Table of results

metal added	temperature of acid/°C		temperature difference/°C	observations
	initial	maximum		
zinc				gas given off slowly
iron				gas given off very slowly
magnesium				gas given off rapidly: lighted splint pops
copper				no visible reaction

[6]

Use your results and observations to answer the following questions.

(i) Which metal is most reactive with sulphuric acid?

.....[1]

(ii) Give **two** reasons why you chose this metal.

1. .....

2. .....[2]

(iii) Name the gas given off.

.....[1]

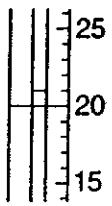
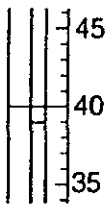
The reaction between magnesium and aqueous copper(II) sulphate was then investigated.

Experiment 2

A 5 cm^3 sample of aqueous copper(II) sulphate was measured into a test-tube. The initial temperature of the solution was measured.

Magnesium powder was added to the test-tube and the maximum temperature reached was measured. Use the thermometer diagrams to complete the results table.

Table of results

initial temperature of aqueous copper(II) sulphate		
maximum temperature reached after magnesium added		

[2]

(b) How do your observations show that the reaction of magnesium with aqueous copper(II) sulphate is exothermic?

.....[1]

(c) What type of exothermic reaction occurs when magnesium is added to aqueous copper(II) sulphate?

.....[1]

(d) Use your results from Experiments 1 and 2 to put the four metals in order of reactivity.

least reactive .....

.....

.....

most reactive .....[1]

5 Two liquids, **F** and **G**, were tested. The tests and some of the observations are in the following table. **G** was an aqueous solution of a metal iodide.

Complete the observations in the table.

tests	*observations*
(a) (i) Appearance of liquid **F**.	colourless smells like petrol
(ii) Appearance of liquid **G**.	colourless no smell
(b) (i) About 1 cm^3 of liquid **F** was added to a crystal of iodine. The test-tube was shaken.	purple solution
(ii) About 1 cm^3 of liquid **G** was added to a crystal of iodine. The test-tube was shaken.	red/brown solution
The mixture from **(b)(i)** was added to the mixture in **(b)(ii)**.	two layers formed
(c) A few drops of **F** were placed on a dry watch glass. The liquid was touched with a lighted splint.	....[2]
(d) To about 1 cm^3 of liquid **G** was added a few drops of dilute nitric acid followed by aqueous lead(II) nitrate.	....[2]
(e) To about 1 cm^3 of liquid **G** was added a few drops of dilute nitric acid followed by aqueous silver nitrate.	....[2]

(f) What type of substance is liquid **F**?

.....

.....[2]

For Examiner's Use

6 The following paragraph was taken from a student's notebook.

To make potassium chloride

25.0 cm^3 of aqueous potassium hydroxide were placed in a flask and a few drops of indicator were added. Dilute hydrochloric acid was added to the flask until the indicator changed colour. The volume of acid used was 19.0 cm^3.

(a) What piece of apparatus should be used to measure the aqueous potassium hydroxide?

.....[1]

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

.....[1]

(ii) The indicator colour would change

from.....

to..... [2]

(c) Which solution was more concentrated? Explain your answer.

.....

.....[2]

(d) How could **pure** crystals of potassium chloride be obtained from this experiment?

.....

.....

.....

.....[3]

225

For Examiner's Use

7 **FASTGROW FERTILISER**

Fertilisers are used to increase the growth of plants. Fertilisers have to dissolve in water if they are to be used by plants.

Plan an experiment to find the solubility, in g/100 cm^3, of FASTGROW fertiliser at 30 °C.

.....

.....

.....

.....

.....

.....[6]

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	

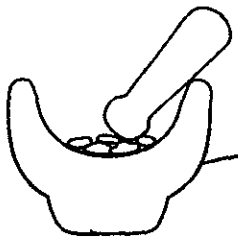
This document consists of 12 printed pages.

SP (SM) S33031/3

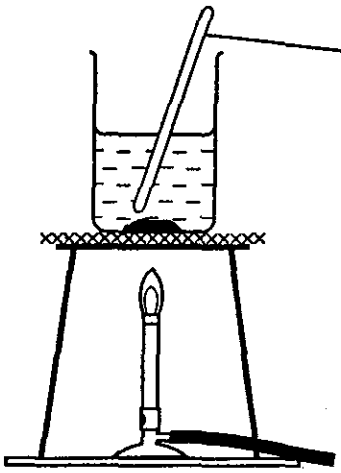
University of Cambridge
Local Examinations Syndicate

1 Look at the diagrams of common laboratory apparatus.

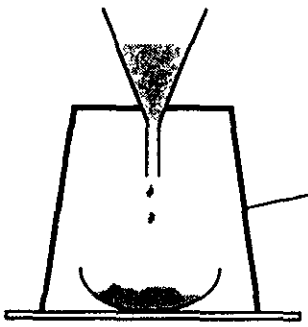
A



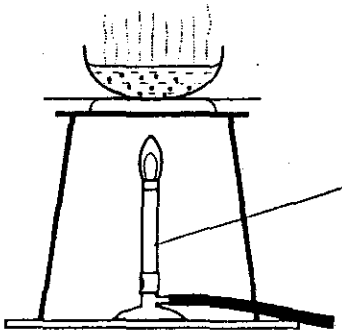
B



C



D



For Examiner's Use

(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?

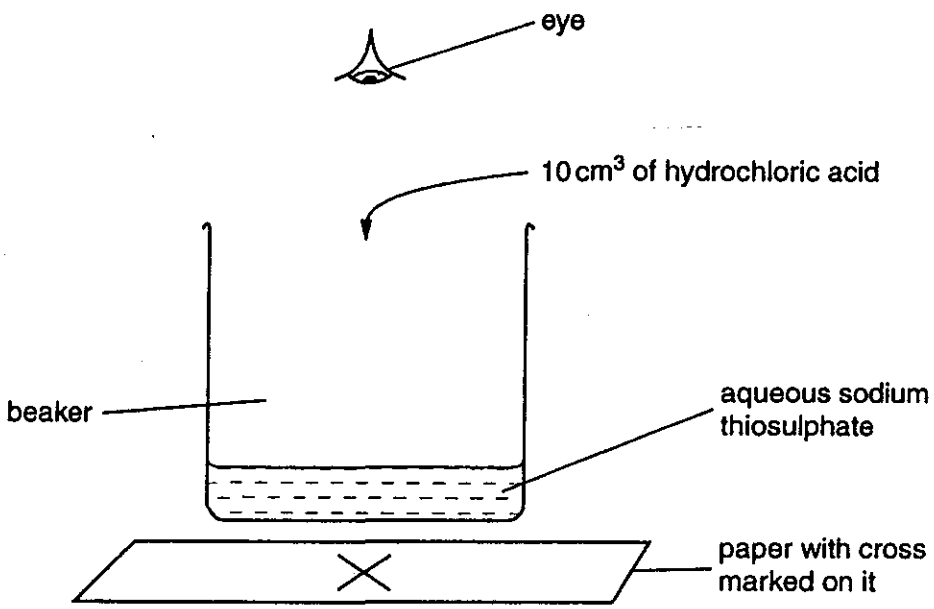
.....[1]

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.

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 .....

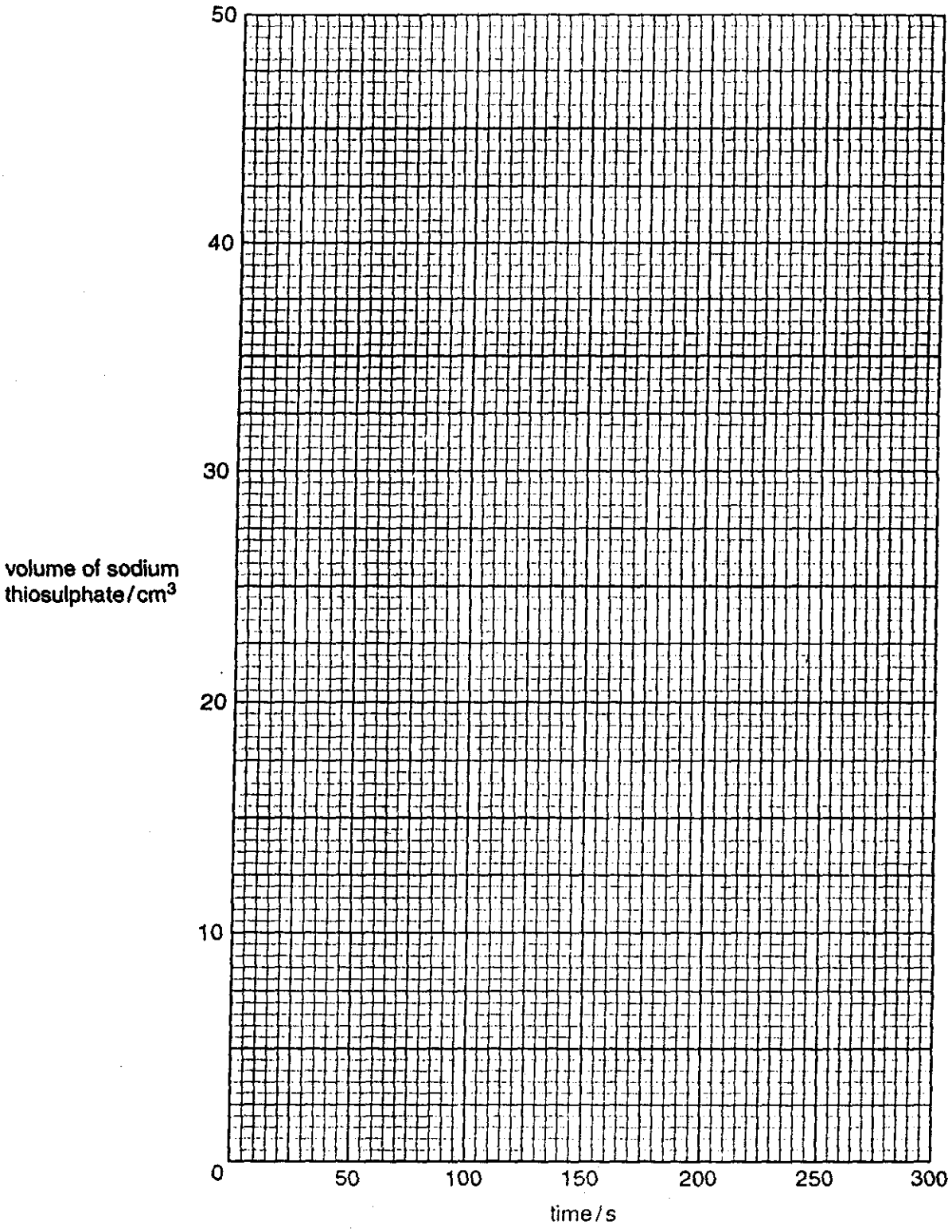
second .....

last .....[1]

230

For Examiner's Use

(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.

.....

.....

.....

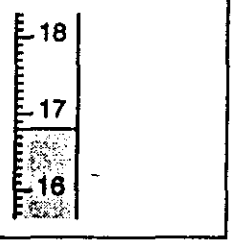
.....[2]

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.

final burette reading/cm^3


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.

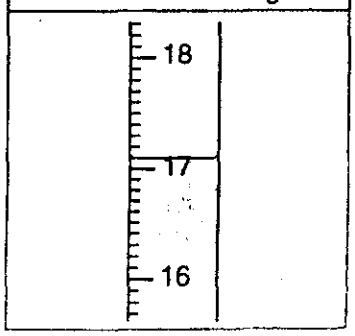
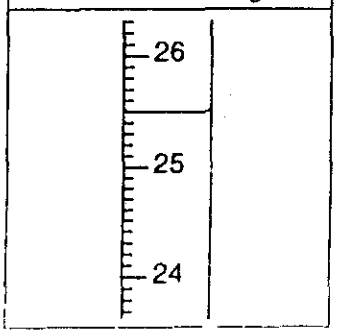
initial burette reading/cm^3	final burette reading/cm^3
	

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**?

.....

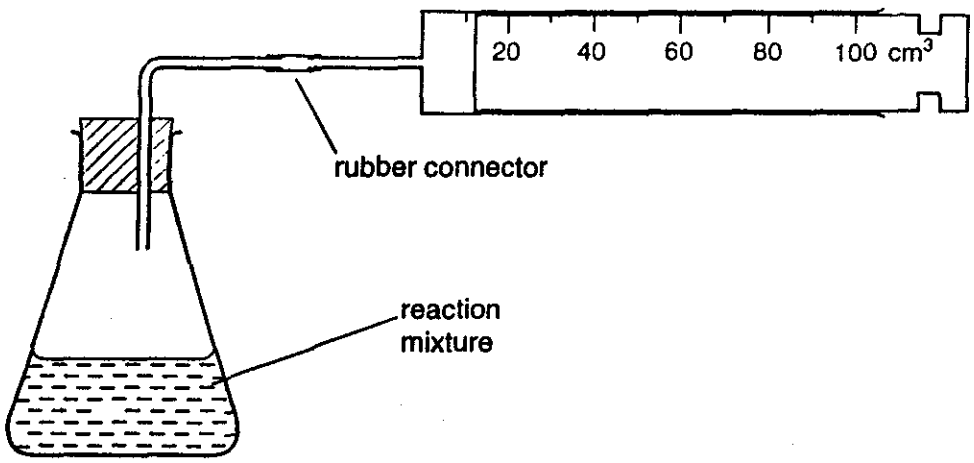
.....[2]

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

.....

.....[2]

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?

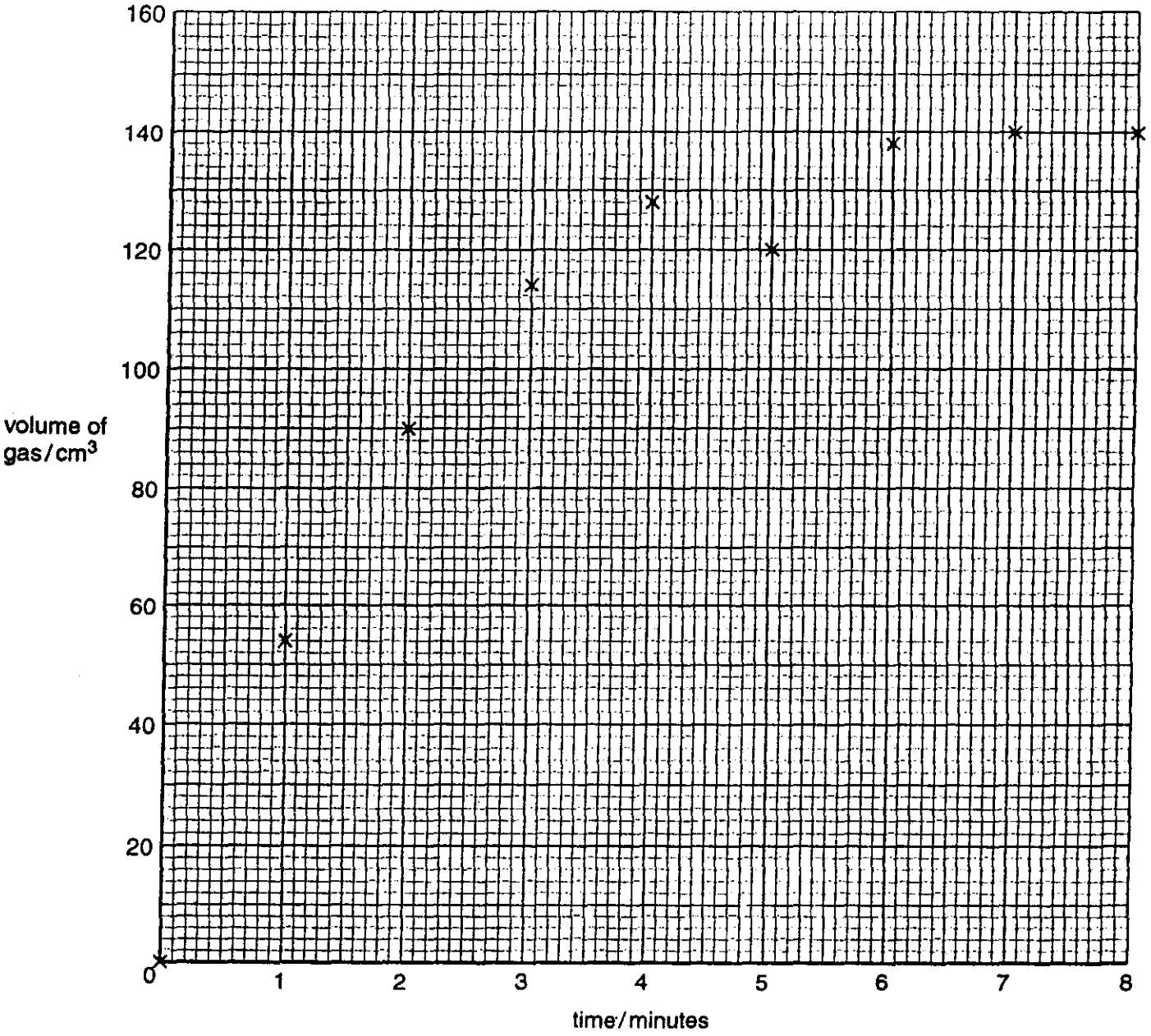
.....[1]

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

.....

.....[2]

11


160
140
120
100
80
60
40
20
0
volume of gas/cm3
1
2
3
4
5
6
7
8
time/minutes

For Examiner's Use

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.

.....

.....

.....

.....

.....

.....

.....

.....[6]

Centre Number	Candidate Number	Name

CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CHEMISTRY **0620/06**

Paper 6 Alternative to Practical

OCTOBER/NOVEMBER 2003

1 hour 15 minutes

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

READ THESE INSTRUCTIONS FIRST

Write your name, centre number and candidate number in the spaces provided 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.

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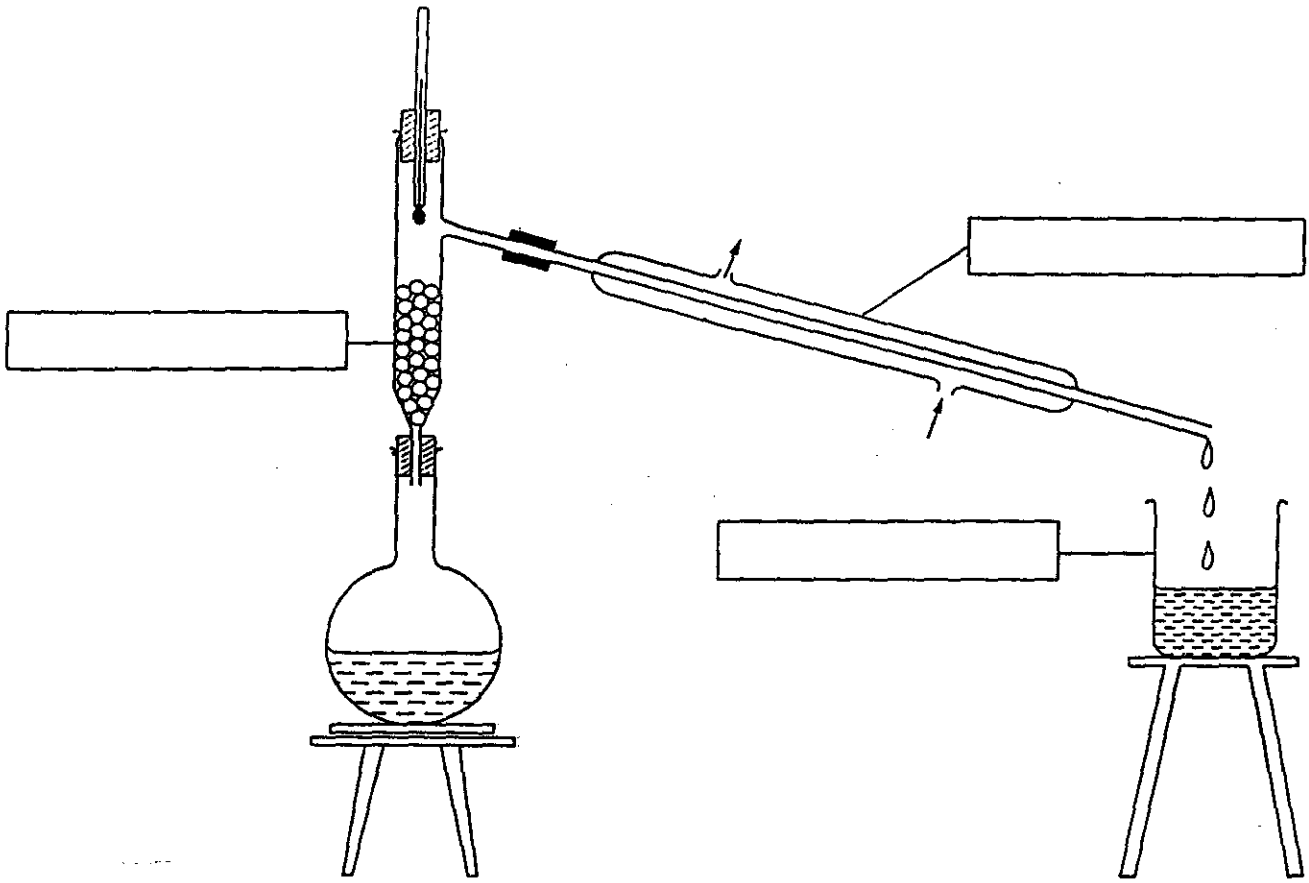
TOTAL	

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

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

1 The apparatus below was used to separate ethanol from water.



(a) Complete the empty boxes to name the pieces of apparatus. [3]

(b) Indicate by an arrow where heat is applied. [1]

(c) Name this separation process.

.....[2]

3 A student investigated the speed of reaction between aqueous potassium bromate and potassium iodide solution.

A burette was filled up to the 0.0 cm^3 mark with aqueous potassium iodide.

To each of 5 test-tubes was added 6 cm^3 of aqueous potassium iodide to be used in the 5 following experiments.

Experiment 1

By using a measuring cylinder 12 cm^3 of aqueous potassium bromate was poured into a small beaker. To this solution was added 4 cm^3 of water, 2 cm^3 of hydrochloric acid, 5 cm^3 of starch solution and 1 cm^3 of sodium thiosulphate solution.

The beaker was placed on a cross drawn on a piece of paper.

From one of the test-tubes 6 cm^3 of aqueous potassium iodide was added to the mixture in the beaker and the timer started. A dark blue colour formed. The timer was stopped when the cross on the paper could not be seen.

Use the stop clock diagram to record the time in the table.

Experiment 2

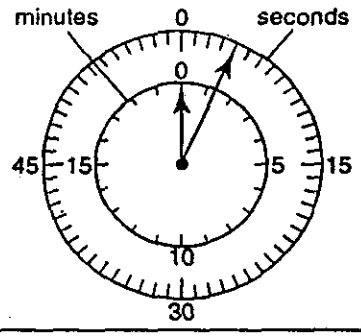
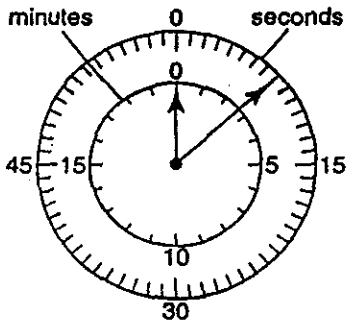
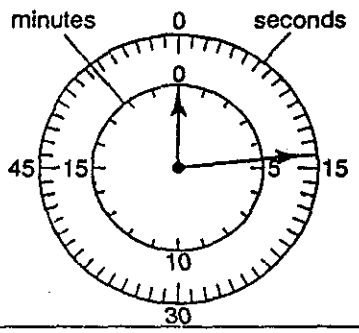
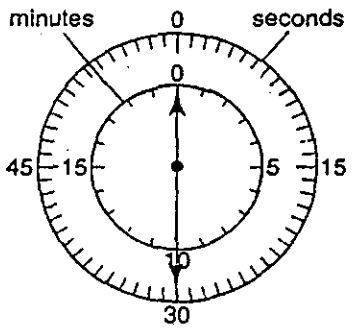
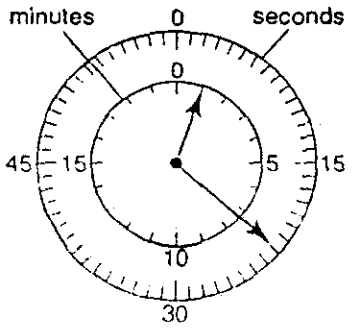
By using a measuring cylinder 10 cm^3 of potassium bromate solution was poured into a beaker. The instructions were repeated exactly as given for Experiment 1, but 6 cm^3 of water was added to the beaker.

Use the diagram to record the time in the table.

Experiments 3, 4 and 5

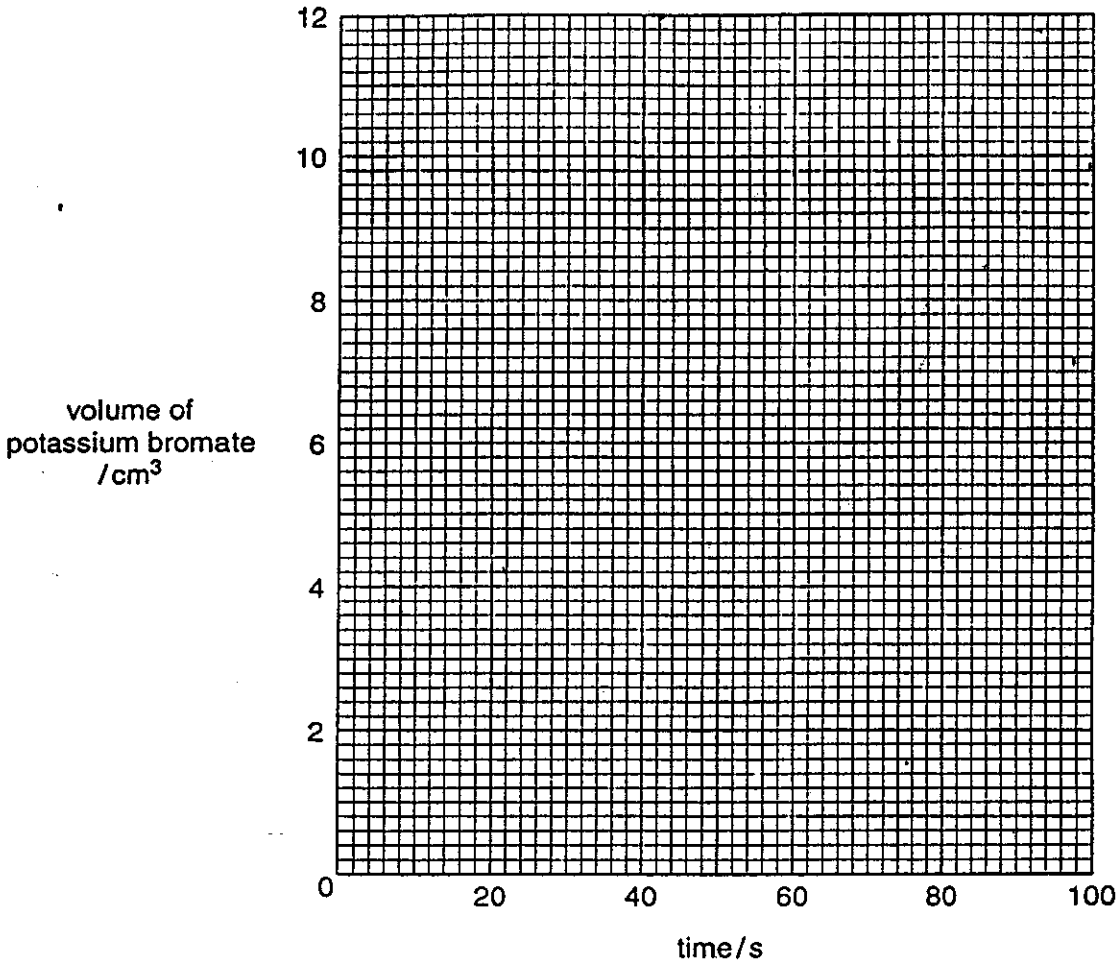
Experiment 1 was repeated using the volumes of aqueous potassium bromate and water specified in the table of results. Record the times in the table.

Table of results

Experiment	volume		clock diagram	time/s
	potassium bromate/cm^3	water/cm^3		
1	12	4		
2	10	6		
3	8	8		
4	6	10		
5	4	12		

[5]

(a) Plot the results on the grid. Draw a smooth line graph.



[4]

(b) From your graph estimate the time of the reaction if Experiment 1 was repeated using 5 cm^3 of potassium bromate and 11 cm^3 of water.

.....

Show clearly on your graph how you worked out your answers. [3]

(c) (i) Which experiment is the quickest?

.....

(ii) Explain why this experiment is the quickest.

.....

.....

.....[3]

(d) (i) State **two** possible sources of error in the experiments.

1 .....

.....

2 .....

.....

(ii) Suggest **two** improvements to reduce the sources of error in the experiments.

1 .....

.....

2 .....

.....[4]

4 An aqueous solution of substance **X** was analysed. Substance **X** was an iron(III) salt containing one other cation. The tests on **X** and some of the observations are in the following table. Complete the observations in the table.

Tests	*Observations*
(a) Colour of solution **X**	dark yellow
(b) **(i)** Drops of aqueous sodium hydroxide were added to about 2 cm^3 of the solution. Excess aqueous sodium hydroxide was added to the test-tube.	....[3]
(ii) The mixture was heated. The gas given off was tested with damp indicator paper.	pungent smell indicator turned blue, pH 10
(c) Experiment **(b)(i)** was repeated using aqueous ammonia instead of aqueous sodium hydroxide.	....[2]
(d) To about 2 cm^3 of solution **X** was added dilute sulphuric acid. Two pieces of zinc were added. The mixture was heated and the gas given off tested.	lighted splint popped
After 10 minutes the mixture was filtered and test **(b)(i)** was repeated.	green precipitate insoluble in excess
(e) A few drops of hydrochloric acid were added to about 2 cm^3 of solution **X**. About 1 cm^3 of barium chloride solution was added to the mixture.	white precipitate

For Examiner's Use

(f) (i) Name the gas given off in (d).

.....

(ii) What type of chemical reaction occurs in (d). Explain your answer.

.....

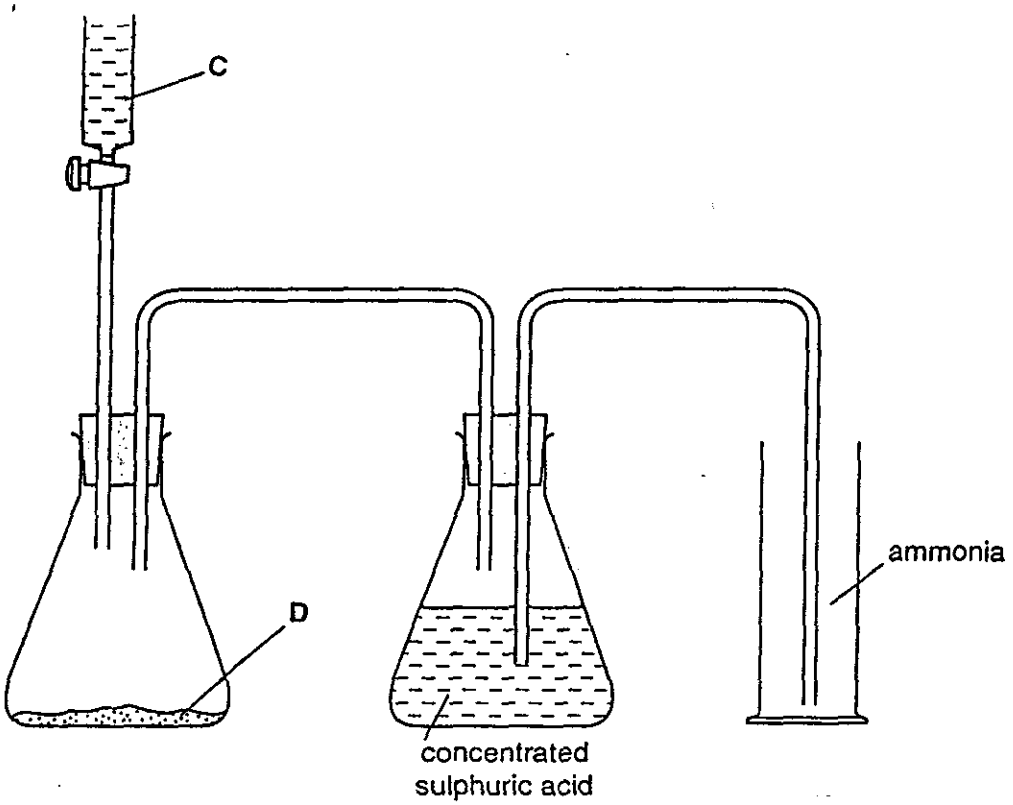
.....[3]

(g) What conclusions can you draw about the anion and the other cation in substance X?

anion .....

cation .....[2]

5 Ammonia is produced when aqueous sodium hydroxide is warmed with ammonium sulphate. Ammonia is less dense than air and very soluble in water. The apparatus below was used to prepare a sample of dry ammonia gas.



(a) Name substance C. .....[1]

(b) Name substance D. .....[1]

(c) What necessary piece of equipment is missing in the diagram?

.....[1]

(d) Suggest why concentrated sulphuric acid should **not** be used to dry ammonia.

.....[1]

(e) There are two other mistakes in the apparatus shown in the diagram. Identify and explain these mistakes.

mistake 1 .....

explanation .....

mistake 2 .....

explanation .....[4]

For Examiner's Use

6 Sulphur dioxide gas is a common pollutant formed when fossil fuels burn in air. Sulphur dioxide can be detected by using an acidic solution of potassium dichromate(VI). The dichromate solution changes colour from orange to green when a certain amount of sulphur dioxide has reacted with it.

Plan an experiment to investigate which of three different samples of coal produces most sulphur dioxide.

.....

.....

.....

.....

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.....

.....

.....[6]