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KU	PS

Total Marks

0500/401

NATIONAL QUALIFICATIONS 2005

MONDAY, 9 MAY
9.00 AM – 10.30 AM

CHEMISTRY
STANDARD GRADE
General Level

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Date of birth
Day Month Year

Scottish candidate number

Number of seat

1 All questions should be attempted.

2 Necessary data will be found in the Data Booklet provided for Chemistry at Standard Grade and Intermediate 2.

3 The questions may be answered in any order but all answers are to be written in this answer book, and must be written clearly and legibly in ink.

4 Rough work, if any should be necessary, as well as the fair copy, is to be written in this book.

Rough work should be scored through when the fair copy has been written.

5 Additional space for answers and rough work will be found at the end of the book.

6 The size of the space provided for an answer should not be taken as an indication of how much to write. It is not necessary to use all the space.

7 Before leaving the examination room you must give this book to the invigilator. If you do not, you may lose all the marks for this paper.

SCOTTISH QUALIFICATIONS AUTHORITY

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1. The names of some elements are shown.

A zinc	B magnesium	C sulphur
D sodium	E carbon	F copper

(*a*) Identify the element with the symbol Na.
You may wish to use page 8 of the data booklet to help you.

A	B	C
D	E	F

1

(*b*) Identify the **two** elements which react together to form a covalent compound.
You may wish to use page 8 of the data booklet to help you.

A	B	C
D	E	F

1

(*c*) Identify the element used to galvanise iron.

A	B	C
D	E	F

1

(3)

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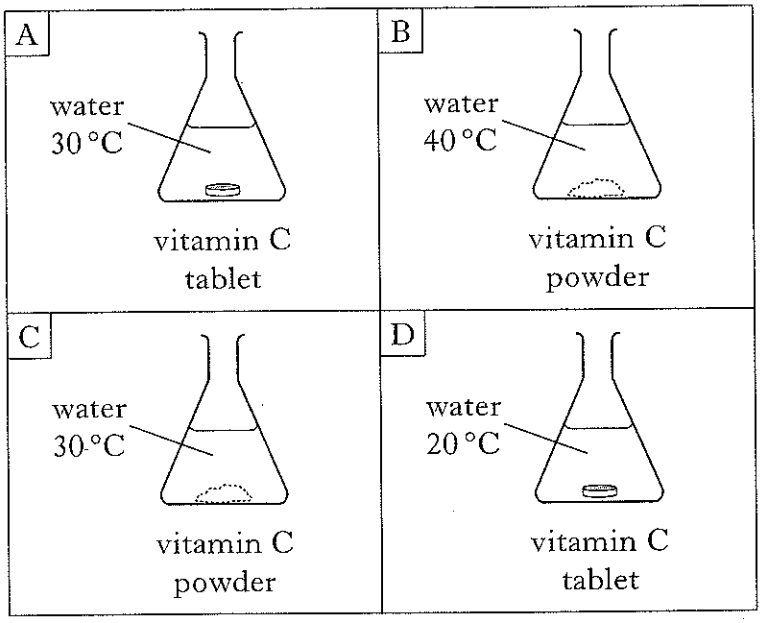
2. A pupil tested the solubility of vitamin C.
The same mass of vitamin C was used in each experiment.



(*a*) Identify the **two** experiments which would be compared to show the effect of particle size on the speed of dissolving.

A	B
C	D

1

(*b*) Identify the experiment in which the vitamin C would take longest to dissolve.

A	B
C	D

1

(2)

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

3. The names of some gases are shown in the grid.

A helium	B carbon dioxide	C hydrogen
D nitrogen	E sulphur dioxide	F oxygen

(*a*) Identify the gas **produced** during respiration.

A	B	C
D	E	F

1

(*b*) Identify the gas produced when a carbonate reacts with dilute acid.

A	B	C
D	E	F

1

(*c*) Identify the gas which causes acid rain.

A	B	C
D	E	F

1

(*d*) Identify the **two** gases which react together to form ammonia in the Haber Process.

A	B	C
D	E	F

1

(4)

[Turn over

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4. Various solutions can be used to identify substances.

A iodine solution	B lime water	C ferroxyl indicator
D Benedict's solution	E bromine solution	F pH indicator

(*a*) Identify the solution used to test for $Fe^{2+}(aq)$ ions.

A	B	C
D	E	F

1

(*b*) Identify the solution used to test for glucose.

A	B	C
D	E	F

1

(*c*) Identify the solution used to test for carbon dioxide gas.

A	B	C
D	E	F

1

(3)

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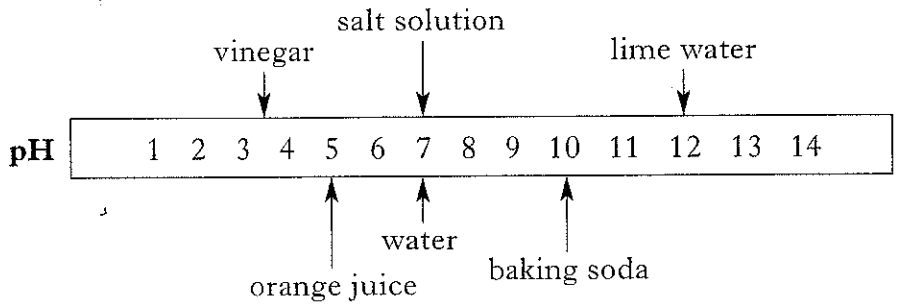
5. The chart shows the pH of different substances.



A vinegar	B salt solution	C lime water
D orange juice	E water	F baking soda

(*a*) A wasp sting is alkaline.
Which **two** substances could be used to neutralise a wasp sting?

A	B	C
D	E	F

1

(*b*) Identify the substance which is the most alkaline.

A	B	C
D	E	F

1

(2)

[Turn over

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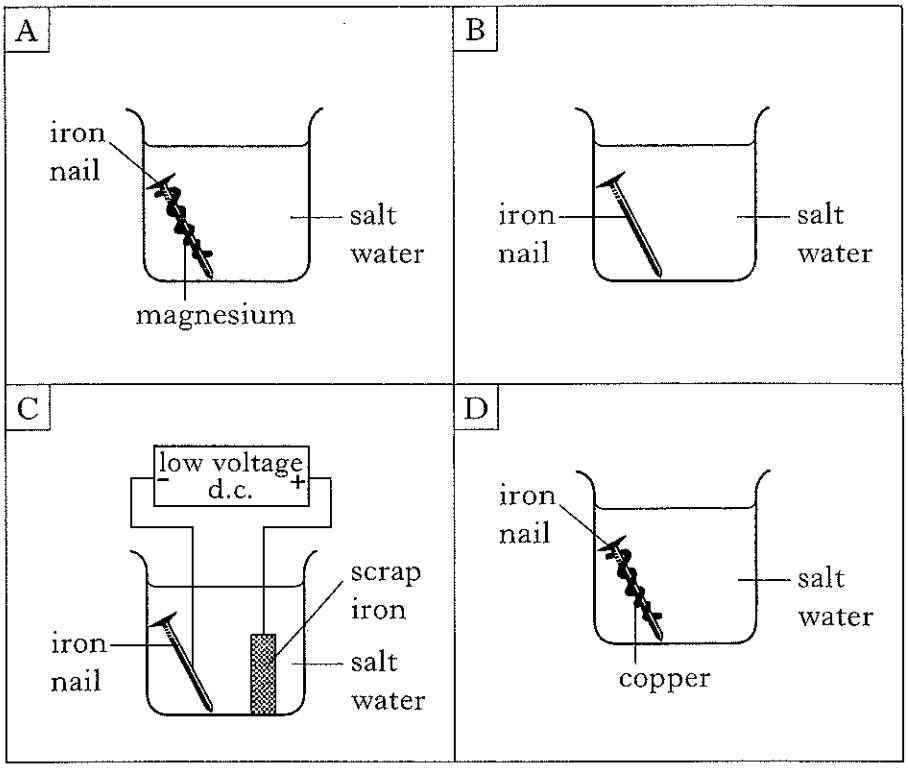
Marks | KU | PS

6. Kevin was investigating corrosion.

He set up four experiments as shown in the grid below.



Identify the experiment in which the corrosion of the **nail** was the most rapid.

A	B
C	D

(1)

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

7. The names of some hydrocarbons are shown.

A ethene	B propene	C methane
D butane	E hexene	F pentene

(*a*) Identify the hydrocarbon which is the first member of the alkene family.

A	B	C
D	E	F

1

(*b*) Identify the hydrocarbon with **five** carbon atoms in each molecule.

A	B	C
D	E	F

1

(*c*) Identify the hydrocarbon with a boiling point of 30 °C.
You may wish to use page 6 of the data booklet to help you.

A	B	C
D	E	F

1
(3)

[Turn over

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

8. Gold and silver are both used to make jewellery.
Identify the **two** statements which are true for **both** gold **and** silver.
You may wish to use the data booklet to help you.

A	They are alkali metals.
B	They conduct electricity.
C	They are more reactive than copper.
D	They react with dilute hydrochloric acid.
E	They are found uncombined in the Earth's crust.

A
B
C
D
E

(2)

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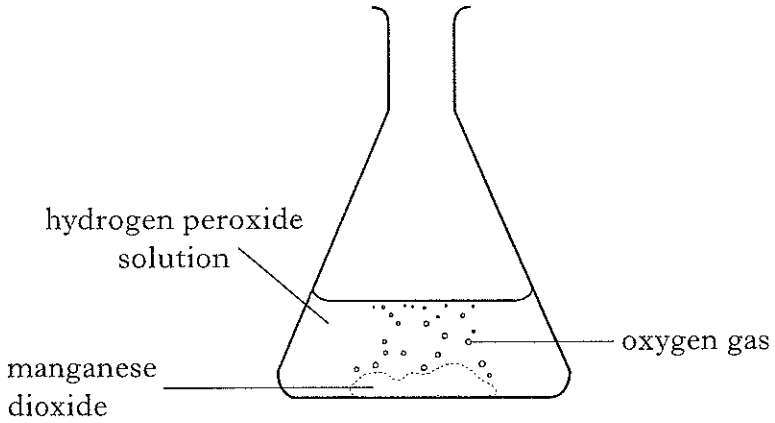
PART 2

A total of 40 marks is available in this part of the paper.

9. When manganese dioxide is added to hydrogen peroxide solution, oxygen gas is produced.



(*a*) Oxygen gas exists as diatomic molecules.
What does **diatomic** mean?

_____

_____ **1**

(*b*) Heat is produced in the above reaction.
What name is given to a chemical reaction which releases heat?

_____ **1**

(*c*) In this reaction manganese dioxide is acting as a catalyst.
What is a catalyst?

_____

_____

_____ **1**

(3)

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Marks	KU	PS

10. Chlorine and iodine are both members of the same group in the Periodic Table.

(*a*) (i) What is the family name for the group to which chlorine and iodine belong?

_____ **1**

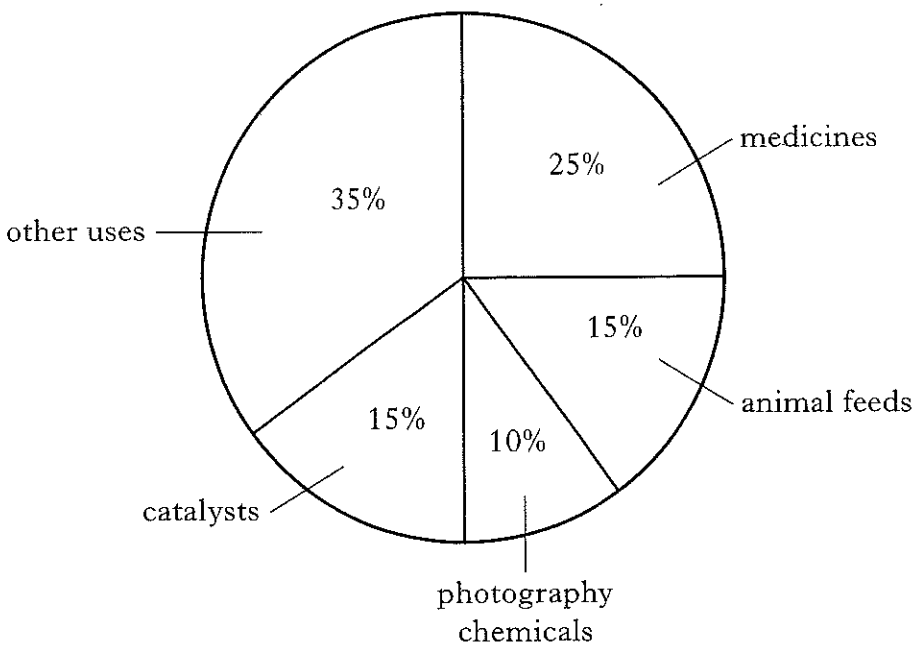
(ii) Why are chlorine and iodine in the same group of the Periodic Table?

_____

_____

_____ **1**

(*b*) The pie chart shows the percentages of iodine used to make other substances.



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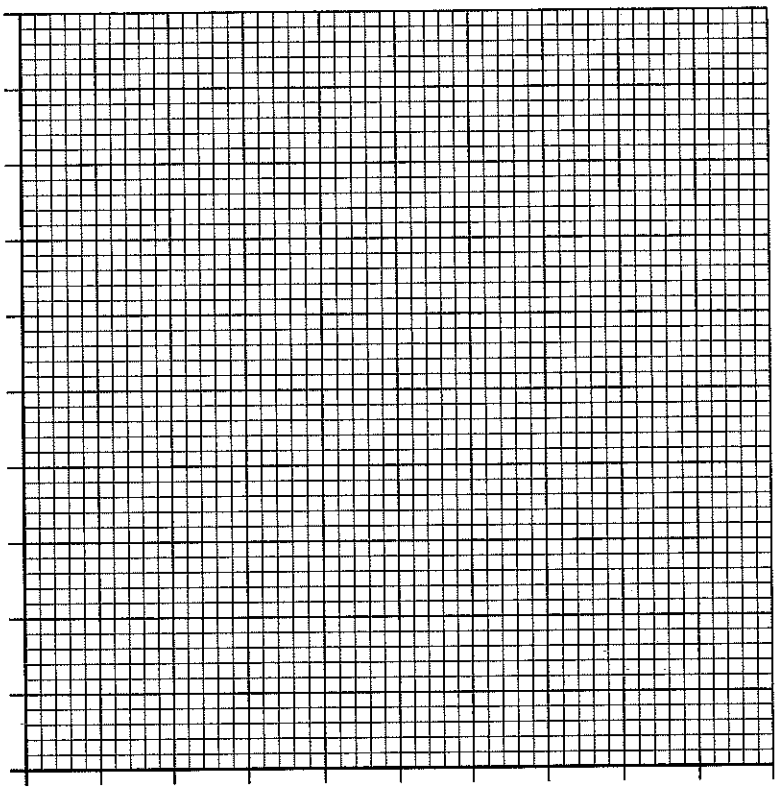
10. (*b*) (continued)

Present the information as a bar chart.

Use appropriate scales to fill most of the graph paper.

(Additional graph paper, if required, can be found on page 25.)

Percentage of iodine



Uses of iodine

2

(*c*) Calcium iodate is a compound which is added to animal feeds.
Name the elements present in calcium iodate.

_____

1

(5)

[Turn over

DO NOT WRITE IN THIS MARGIN

	Marks	KU	PS

11. Petrol and diesel are mixtures of hydrocarbons which are used as fuels for cars.

(*a*) What is a hydrocarbon?

_____

_____

_____ **1**

(*b*) Diesel has a higher boiling point than petrol.
Which is more flammable, diesel or petrol?

_____ **1**

(*c*) Octane is a hydrocarbon found in petrol.
It can be obtained by cracking larger hydrocarbon molecules.

$$C_{18}H_{38} \rightarrow C_8H_{18} + \mathbf{X}$$

Write the molecular formula for **X.**

_____ **1**

(3)

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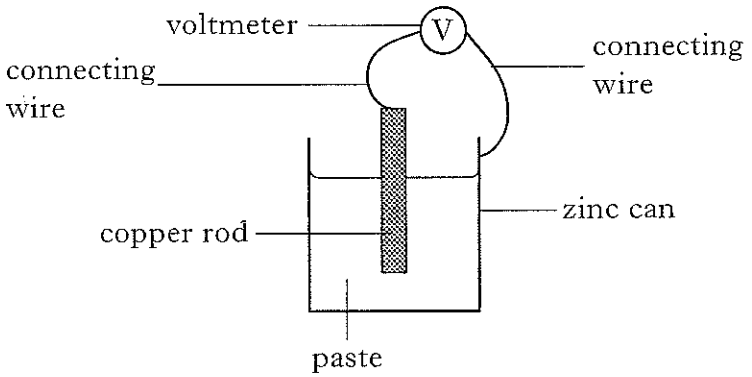
Marks | KU | PS

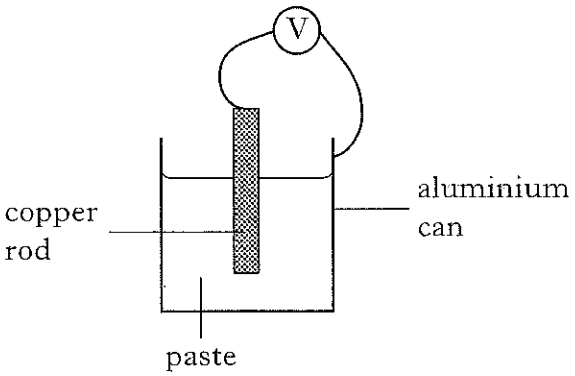
12. (*a*) A pupil set up the following cell and measured the cell voltage.

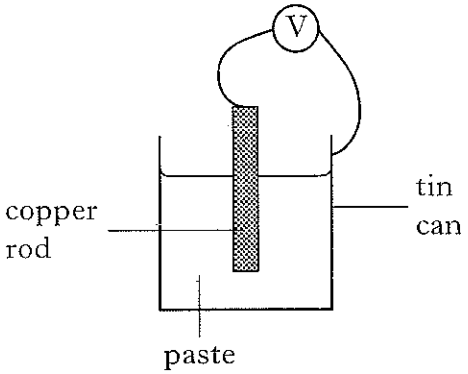


(i) Name the type of charged particle that flows through the connecting wires.

_____ 1

(ii) The pupil repeated the experiment using cans made from different metals.





The results are shown in the table.

Metal can	Cell voltage/V
aluminium	1·86
zinc	0·92
tin	

Complete the table to show a voltage you might expect for the cell using the tin can.
You may wish to use page 7 of the data booklet to help you. 1

(*b*) A battery is a number of cells joined together.
Give **one** advantage of using a battery rather than mains electricity.

_____

_____ 1

(3)

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Marks | KU | PS

13. Alloys have many uses. Water taps can be made from brass while solder is used to join metal pipes together. Duralumin is used to make the framework for aeroplanes, however cars and ships are made from steel.

(*a*) Present this information in a table with suitable headings.

2

(*b*) Solder is an alloy of tin and lead only.

The melting point of solder depends on the percentages of tin and lead mixed together.

Percentage of tin	**Melting point of solder/°C**
25	270
45	225
65	180
85	205

DO NOT WRITE IN THIS MARGIN

Marks	KU	PS

13. (*b*) (continued)

(i) What percentages of **tin** and **lead** are present in the solder with the **lowest** melting point?

Tin _____ %

Lead _____ % **1**

(ii) Solder is used in electronic circuit boards.

Apart from its low melting point, what other property of solder makes it suitable for use in electronic circuit boards?

_____

_____

_____ **1**

(4)

[Turn over

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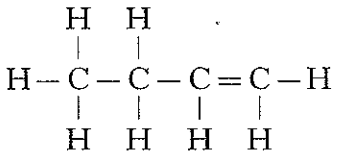
Marks	KU	PS

14. Butene has the structural formula shown below.



(*a*) Butene reacts with hydrogen gas.

(i) Name the type of chemical reaction which takes place when butene reacts with hydrogen gas, H_2.

_____ **1**

(ii) Write the molecular formula for the product of the reaction.

_____ **1**

(*b*) Butene can be converted into a polymer.

(i) Name the polymer made from butene.

_____ **1**

(ii) The polymer is **non**-biodegradable.
Suggest why this may be an advantage.

_____

_____

_____ **1**

(4)

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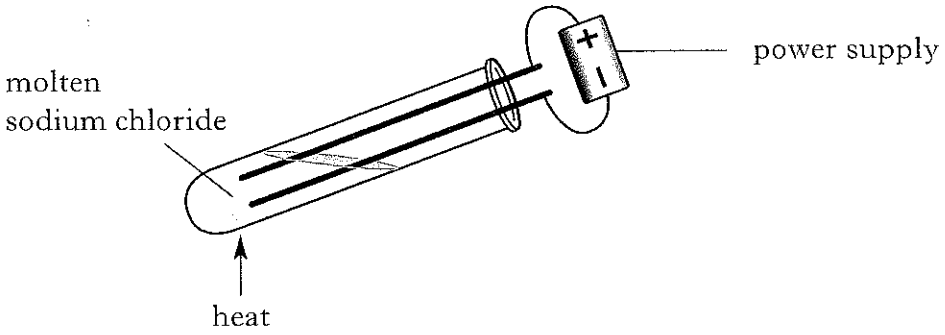
Marks | KU | PS

15. The following apparatus can be used to electrolyse molten sodium chloride in industry.



(*a*) State what is meant by electrolysis.

_____

_____

_____ **1**

(*b*) Why do ionic compounds, like sodium chloride, conduct electricity when molten?

_____

_____ **1**

(*c*) Name the product formed at the positive electrode.

_____ **1**

(*d*) A small amount of calcium chloride was added to lower the melting point of the sodium chloride.
Suggest why this would be an advantage in industry.

_____

_____ **1**

(4)

[Turn over

DO NOT WRITE IN THIS MARGIN

Marks | KU | PS

16. Information about the solubility of some barium salts in water is given in the table.

Salt	Solubility
barium nitrate	soluble
barium chloride	soluble
barium sulphate	insoluble
barium carbonate	insoluble

(*a*) A "barium meal" is given to some patients before taking an X-ray of their stomach. A barium meal contains barium sulphate which is poisonous.

(i) Suggest a reason why the "barium meal" does not poison the patient.

_____

_____

_____ **1**

(ii) The stomach produces dilute hydrochloric acid to help digestion. Suggest why barium carbonate is **not** used in a "barium meal".

_____

_____

_____ **1**

(*b*) Write the formula for barium carbonate.

_____ **1**

(3)

DO NOT WRITE IN THIS MARGIN

	Marks	KU	PS

17. Ethylene glycol has the formula $C_2H_6O_2$.

(*a*) Name the **two** products formed when ethylene glycol is burned completely in oxygen.

_____ **1**

(*b*) Ethylene glycol is used to make polyesters. Polyesters are thermoplastic. What does **thermoplastic** mean?

_____

_____ **1**

(*c*) Ethylene glycol is also used as antifreeze in car radiators. Salt could be used as antifreeze instead of ethylene glycol.
Suggest why salt is **not** used as antifreeze in steel radiators.

_____

_____ **1**

(3)

[Turn over

DO NOT WRITE IN THIS MARGIN

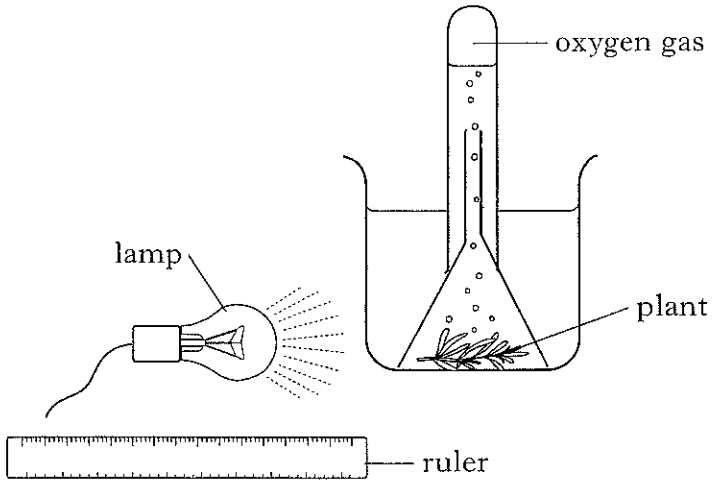
Marks | KU | PS

18. During photosynthesis green plants produce oxygen.

(*a*) Name the substance in green plants which absorbs light during photosynthesis.

_____ **1**

(*b*) A pupil set up the apparatus shown to investigate the rate of photosynthesis. Oxygen gas produced by the plant was collected in the test tube.



Distance of lamp from plant/cm	Number of bubbles of oxygen gas produced in one minute
30	24
40	19
60	10
100	4

(i) What effect does the distance of the lamp from the plant have on the number of bubbles of oxygen gas produced?

_____

_____

_____ **1**

DO NOT WRITE IN THIS MARGIN

	Marks	KU	PS

18. (*b*) (continued)

(ii) Give **one** factor that needs to be kept the same to make this experiment fair.

_____ **1**

(*c*) During photosynthesis glucose is also produced.
Name the process used to convert glucose to alcohol.

_____ **1**

(4)

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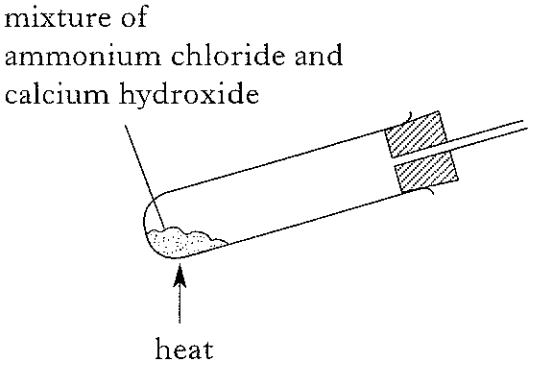
Marks | KU | PS

19. Ammonia gas can be prepared in the laboratory by heating a mixture of ammonium chloride and calcium hydroxide.



(*a*) Ammonia gas is soluble in water and is lighter than air.

Complete the diagram to show how a sample of ammonia gas could be collected.

(An additional diagram, if required, can be found on page 26.) **1**

(*b*) Describe a chemical test to show the presence of ammonia gas.

_____

_____ **1**

(*c*) Ammonia can be used to make ammonium nitrate fertiliser.

(i) Name the essential element which plants obtain from ammonium nitrate.

_____ **1**

(ii) Over the last 100 years there has been an increase in the demand for fertilisers.

Why is this?

_____

_____

_____ **1**

(4)

[END OF QUESTION PAPER]

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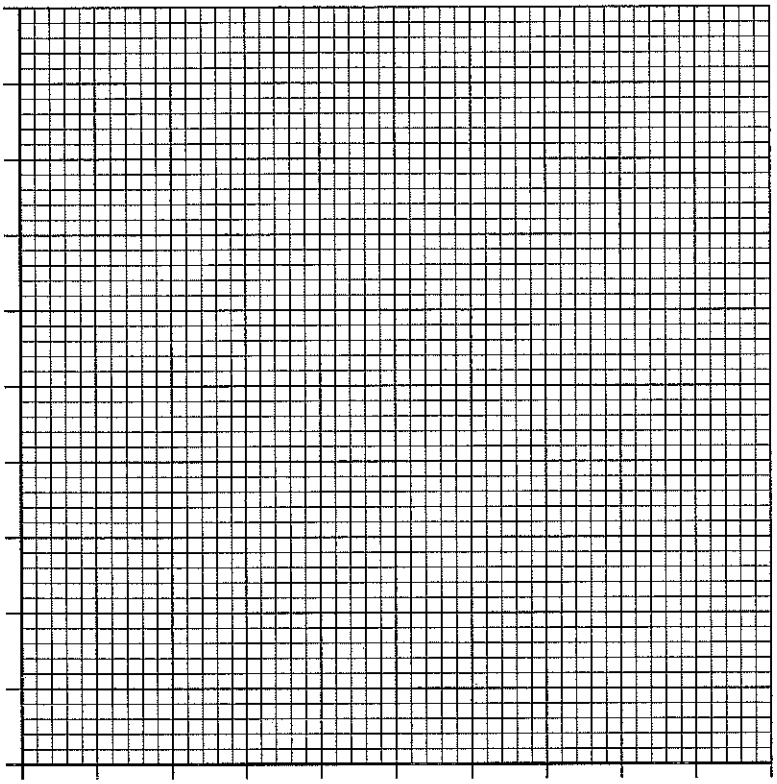
ADDITIONAL SPACE FOR ANSWERS

ADDITIONAL GRAPH PAPER FOR QUESTION 10(*b*)

Percentage of iodine



Uses of iodine