

FOR OFFICIAL USE

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PS

Total Marks

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**0500/402**

NATIONAL  
QUALIFICATIONS  
2003

FRIDAY, 23 MAY  
10.50 AM - 12.20 PM

CHEMISTRY  
STANDARD GRADE  
Credit 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

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Scottish candidate number

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Number of seat

- All questions should be attempted.
- Necessary data will be found in the Data Booklet provided for Chemistry at Standard Grade and Intermediate 2.
- 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.
- 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.
- Additional space for answers and rough work will be found at the end of the book.
- 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.
- 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.

1. Atoms are made up of protons, neutrons and electrons.

A	The number of protons
B	The number of neutrons
C	The number of electrons
D	The number of outer electrons
E	The number of protons plus neutrons

(a) Identify the **two** numbers which are the same in a neutral atom.

A
B
C
D
E

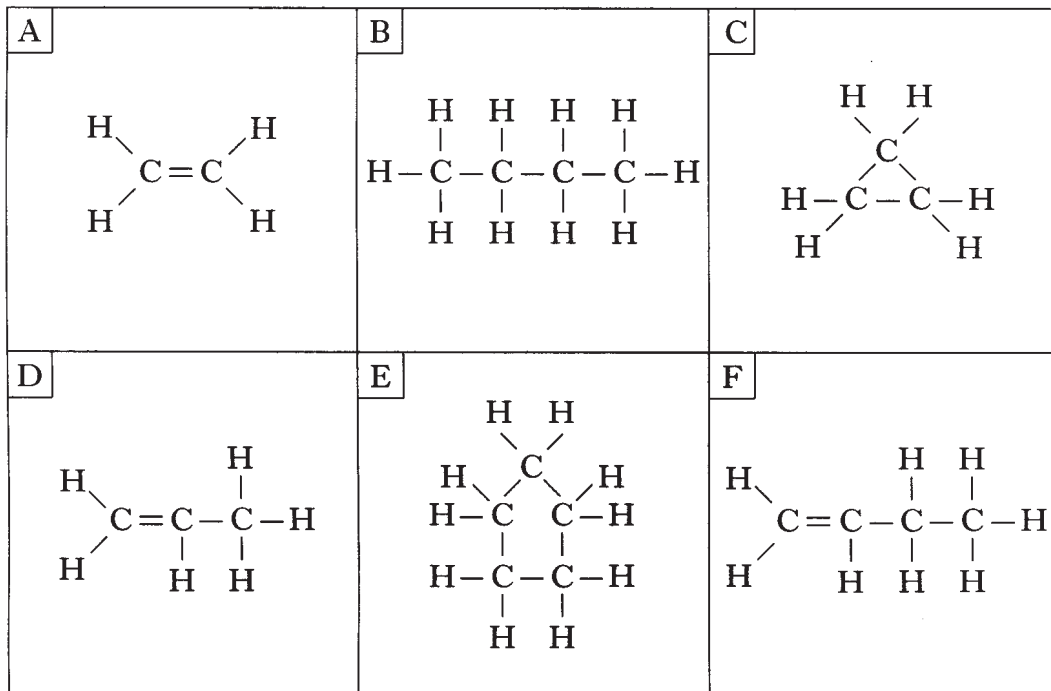
(b) Identify the mass number of an atom.

A
B
C
D
E

[Turn over



3. Hydrocarbons are compounds made from hydrogen and carbon only.



(a) Identify the hydrocarbon which reacts with hydrogen to form butane.

A	B	C
D	E	F

(b) Identify the **two** isomers.

A	B	C
D	E	F

(c) Identify the hydrocarbon(s) which is (are) the first member(s) of a homologous series.

A	B	C
D	E	F

[Turn over

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4. The grid shows some pairs of chemicals.

A	sodium + water	B	zinc + magnesium sulphate solution
C	copper carbonate + dilute sulphuric acid	D	lead nitrate solution + potassium iodide solution
E	silver + dilute hydrochloric acid	F	potassium hydroxide solution + dilute nitric acid

Which box(es) contain(s) a pair of chemicals that react to form a gas?

A	B
C	D
E	F

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5. Identify the result(s) obtained in the reaction between dilute sulphuric acid and barium hydroxide solution.

You may wish to use the data booklet to help you.

A	The pH of the acid went down.
B	Carbon dioxide was produced.
C	A precipitate was formed.
D	Hydrogen was produced.
E	Water was produced.

A
B
C
D
E

KU PS

**[Turn over**









9. Substances can be classified as conductors or non-conductors and also as solids or liquids.

Substance	State	Conductor or non-conductor
A	solid	non-conductor
B	liquid	non-conductor
C	solid	conductor
D	liquid	conductor

- (a) Which **two** substances could be sodium chloride?

A
B
C
D

- (b) Which substance could **not** be a compound?

A
B
C
D

[Turn over

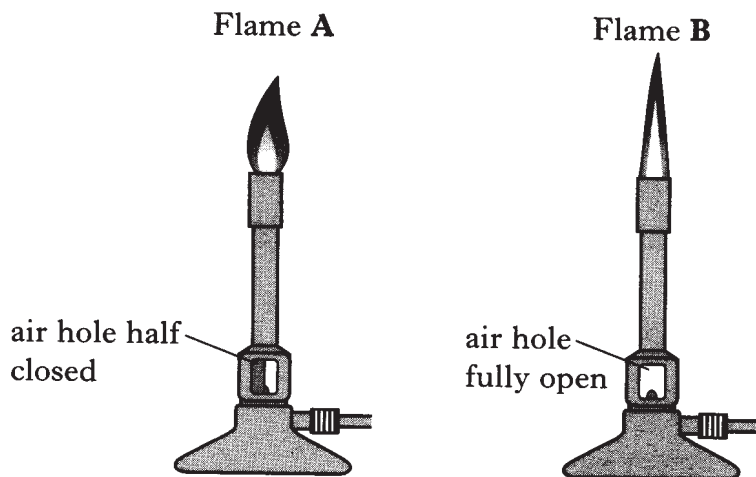
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## PART 2

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

10. The diagrams show how different flames can be produced in a Bunsen burner.



- (a) The fuel used in a Bunsen burner is methane,  $\text{CH}_4$ .  
What is meant by the term "fuel"?

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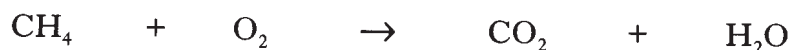


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1

- (b) Methane burns to form carbon dioxide and water.

- (i) Balance this equation.



1

- (ii) Name another product which could be formed in Flame A.

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1

- (c) Draw a diagram to show the **shape** of a methane molecule.

1

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*Marks*

11. There are two different types of chlorine atom:  $^{35}_{17}\text{Cl}$  and  $^{37}_{17}\text{Cl}$ .

(a) (i) What name is used to describe these different types of chlorine atom?

\_\_\_\_\_

1

(ii) A natural sample of chlorine has an average atomic mass of 35.5. What is the mass number of the more abundant type of chlorine atom in the sample?

\_\_\_\_\_

1

(b) The atoms in a chlorine molecule are held together by a covalent bond. A covalent bond is a shared pair of electrons. Explain how this holds the atoms together.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

1

(c) Complete the table to show the number of each type of particle in a  $^{35}_{17}\text{Cl}^-$  ion.

Particle	Number
proton	
neutron	
electron	

2

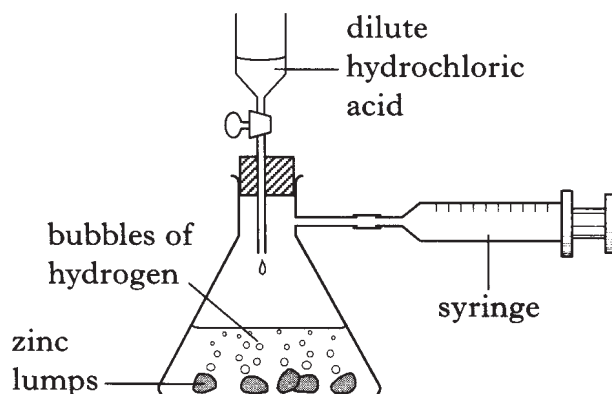
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Marks

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12. Hydrogen can be produced in the laboratory by adding excess hydrochloric acid to lumps of zinc. The reaction stops when all the zinc is used up.



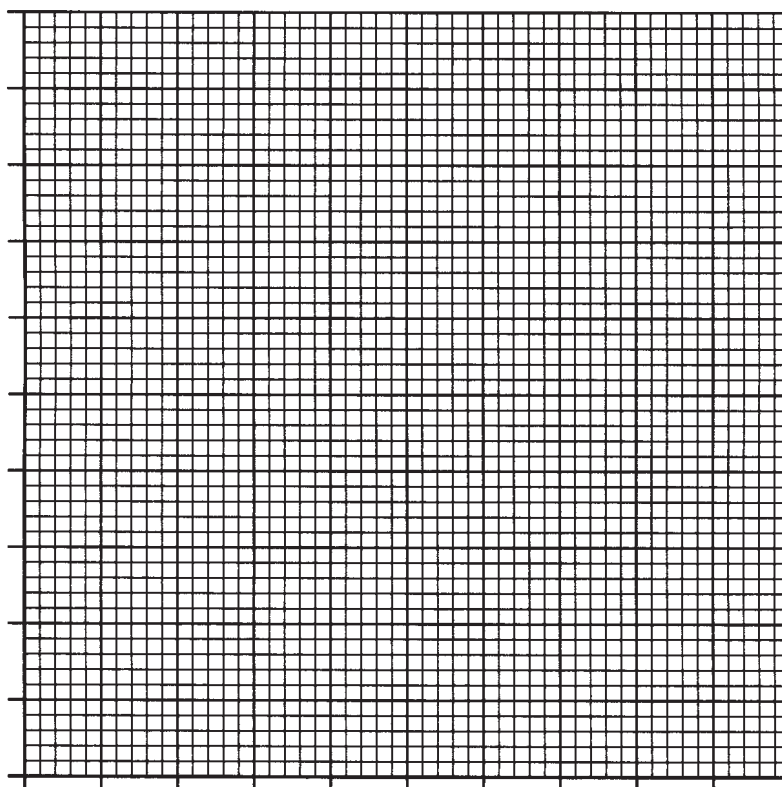
The volume of hydrogen gas produced over a period of time was measured and the results are shown in the table.

Time/s	0	20	40	60	80	100	120	140
Volume of hydrogen/cm <sup>3</sup>	0	30	51	65	74	78	80	80

- (a) Draw a line graph of the results.

Use appropriate scales to fill most of the graph paper.

(Additional graph paper, if required, will be found on page 24.)



2

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MARGIN**12. (continued)**

- (b) Use your graph to estimate the time, in seconds, for 40 cm<sup>3</sup> of hydrogen to be produced.

\_\_\_\_\_

- (c) The equation for the reaction of zinc with hydrochloric acid is



Calculate the mass of zinc required to produce 0.5 mole of hydrogen.

Answer: \_\_\_\_\_ g

1  
(4)

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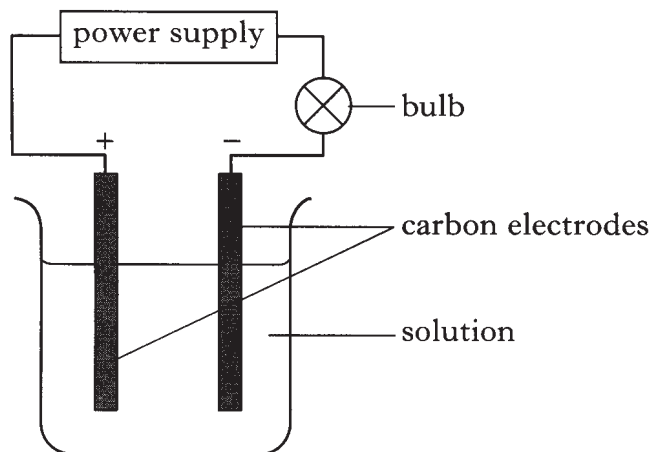
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13. Mrs Smith gave her class three chemicals labelled **P**, **Q** and **R**.

The chemicals were ethanol ( $C_2H_5OH$ ) solution, silver nitrate solution and dilute sulphuric acid.

The class used the following apparatus to identify each solution.



The results are shown in the table.

Solution	Bulb lights	Observation at electrodes
<b>P</b>	Yes	grey solid formed at negative electrode
<b>Q</b>	No	no reaction
<b>R</b>	Yes	a gas formed at both electrodes

(a) Identify **P**.

\_\_\_\_\_

1

(b) What type of bonding is present in **Q**?

\_\_\_\_\_

1

(c) Name the gas formed at the negative electrode when solution **R** is used.

\_\_\_\_\_

1

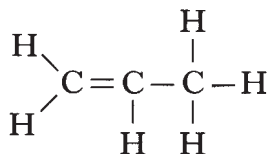
(d) What process would be used to obtain a sample of ethanol from the ethanol solution?

\_\_\_\_\_

1

(4)

14. Propene has the structural formula shown below.



Propene quickly decolourises bromine water, Br<sub>2</sub>(aq).

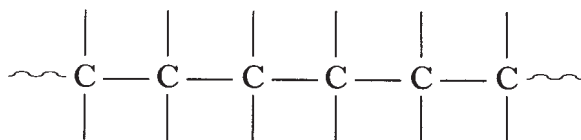
(a) (i) Name the type of chemical reaction which takes place when propene reacts with bromine water.

\_\_\_\_\_

(ii) Draw the **full** structural formula for the product of the reaction.

(b) Propene can be converted into the polymer, poly(propene).

Complete the diagram to show how **three** propene molecules join to form part of the polymer chain.



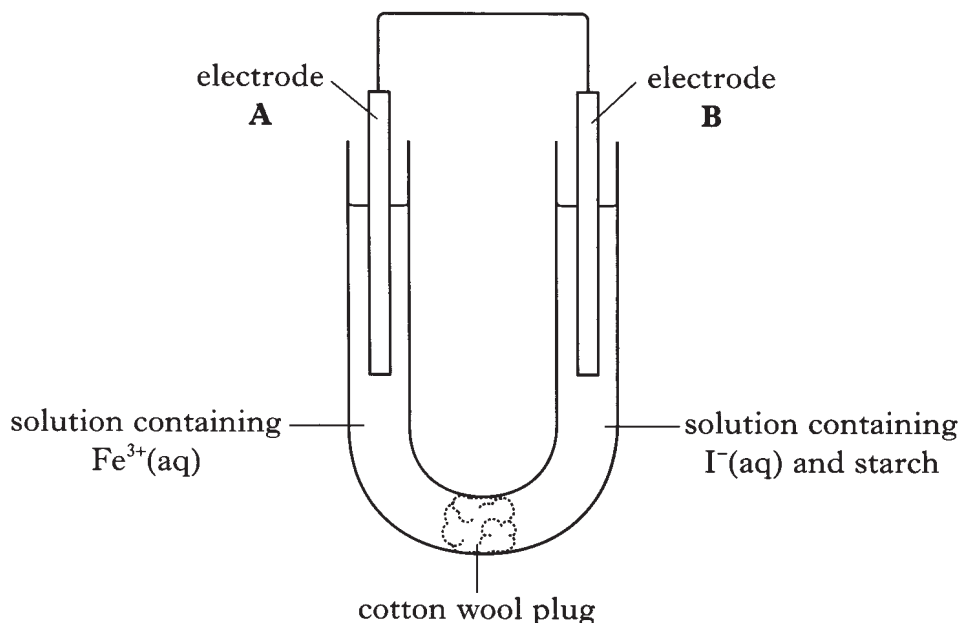
Marks	DO NOT WRITE IN THIS MARGIN	
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1		
1		
1		
(3)		

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16. Helen set up the cell shown below.



The reaction taking place at electrode **A** is



(a) (i) **On the diagram**, clearly mark the path and the direction of electron flow.

\_\_\_\_\_

1

(ii) What term is used to describe the type of chemical reaction taking place at electrode **A**?

\_\_\_\_\_

1

(b) Iodine forms at electrode **B**.

(i) What would you **see** happening around electrode **B**?

\_\_\_\_\_

\_\_\_\_\_

1

(ii) Write an ion-electron equation for the chemical reaction taking place at electrode **B**.

You may wish to use the data booklet to help you.

\_\_\_\_\_

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(4)

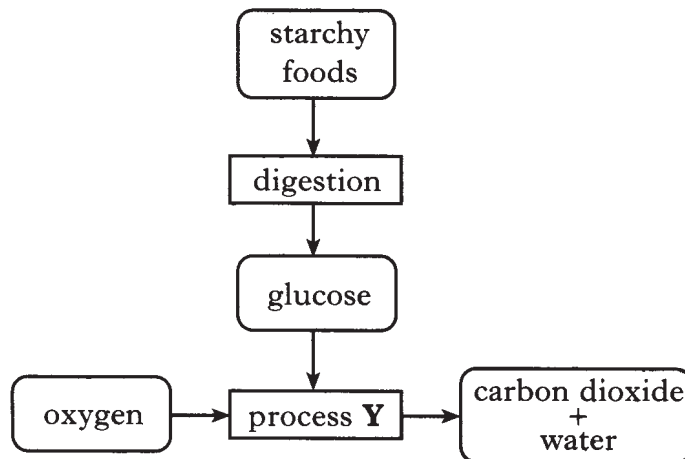
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1	
1	
1	
1	
<b>(4)</b>	

17. The flow diagram shows what happens to starchy foods after they have been eaten.



(a) What **type** of substance, present in the digestive system, speeds up the breakdown of starchy foods?

\_\_\_\_\_

(b) What **type** of chemical reaction takes place when starch is broken down into glucose during digestion?

\_\_\_\_\_

(c) Process **Y** provides the body with energy.  
Name this process.

\_\_\_\_\_

(d) Name an isomer of glucose.

\_\_\_\_\_

Marks

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18. The energy required to remove an outer electron from an atom is called the ionisation energy.

(a) The equation for the ionisation of a magnesium atom is

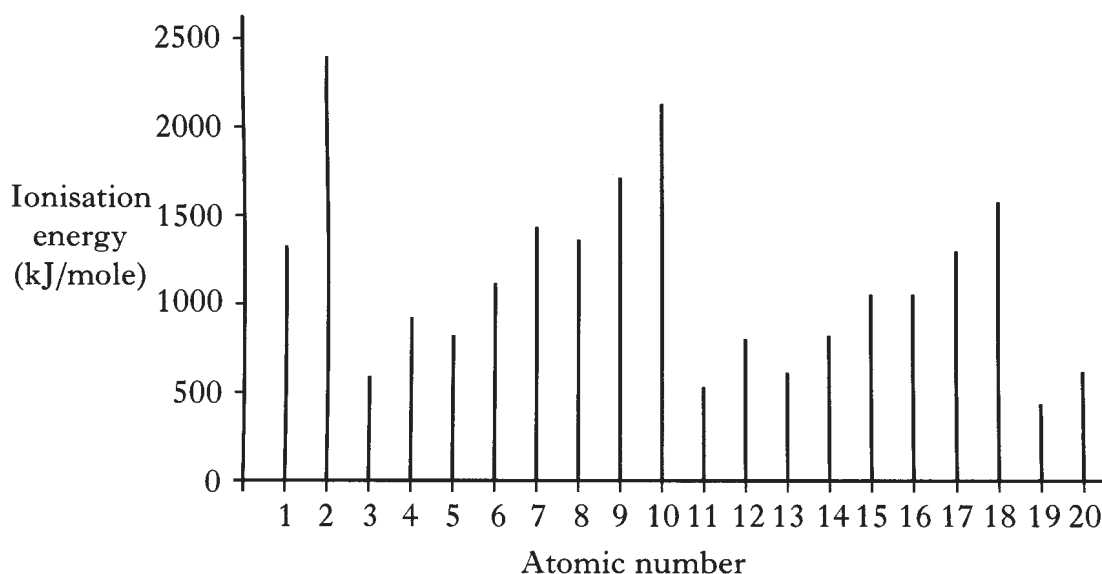


Write the electron arrangement for  $\text{Mg}^{\text{+}}(\text{g})$ .

\_\_\_\_\_

1

(b) The graph shows the ionisation energy values for the first 20 elements.



(i) Describe the general trend in ionisation energy going from lithium to neon.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

1

(ii) Describe the trend in ionisation energy going down a group.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

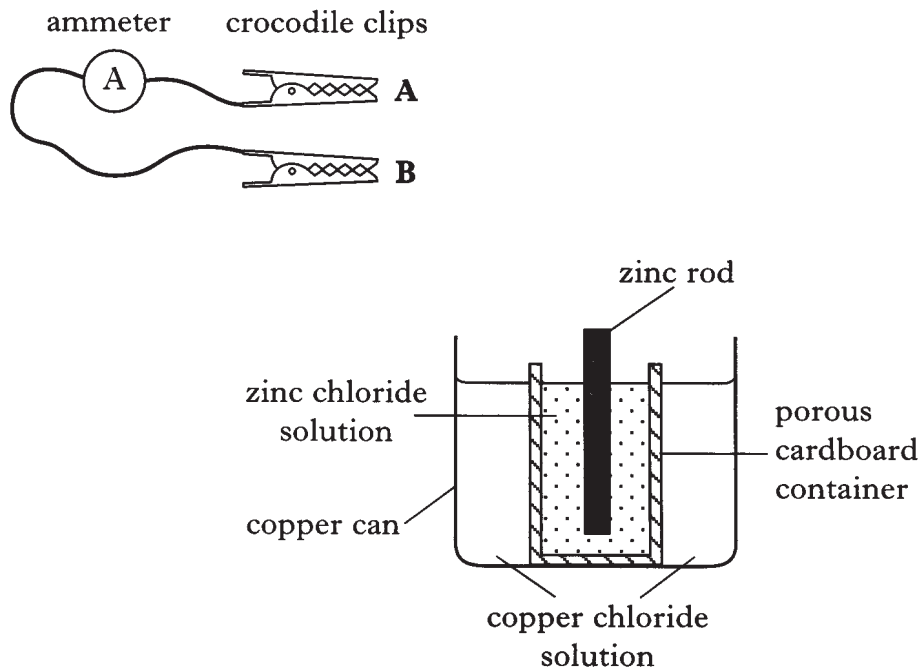
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(3)

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19. Roy wanted to show that chemicals can be used to produce an electric current.



When the crocodile clips (labelled **A** and **B**) were attached to certain parts of the apparatus, the ammeter gave a reading.

- (a) (i) Show clearly **on the diagram**, using labels **A** and **B**, where the crocodile clips could have been attached.

1

- (ii) Why was no current produced when the porous cardboard container was replaced by a glass beaker?

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1

- (iii) What would happen to the reading on the ammeter if the zinc rod was replaced with a tin rod in a tin chloride solution?

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1

Marks

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**19. (continued)**

(b) Roy was instructed to make 50 cm<sup>3</sup> of a 1 mol/litre solution of copper chloride, CuCl<sub>2</sub>.

Calculate the mass, in grams, of copper chloride needed.

**Show your working clearly**

Answer: \_\_\_\_\_ g

2  
(5)

[END OF QUESTION PAPER]