Centre No.				Surname	nitial(s)
Candidate No.				Signature	
	70	Reference(	02	on Examinations GC	Examiner's use only  Team Leader's use only

**Chemistry Ordinary Level** 

Paper 2

Thursday 17 May 2007 – Afternoon

Time: 2 hours

Materials required for examination	Items included with question papers
Nil	Nil

### **Instructions to Candidates**

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature. The paper is arranged in two sections, A and B.

In Section A, answer all the questions.

In Section B, answer TWO questions. Indicate which question you are answering by marking the box  $(\boxtimes)$ . If you change your mind, put a line through the box  $(\boxtimes)$  and then indicate your new question with a cross  $(\boxtimes)$ .

#### **Information for Candidates**

A Periodic Table is printed on the back cover of this question paper.

Calculators may be used.

The total mark for this paper is 100. Marks for parts of questions are shown in round brackets: e.g. (2). This paper has 9 questions. Any blank pages are indicated.

#### DATA

One mole of any gas occupies 24 000 cm<sup>3</sup> at room temperature and atmospheric pressure. One mole of electrons carries a charge of 96 500 coulombs or 1 faraday.

## **Advice to Candidates**

Write your answers neatly and in good English.

In Section B, organise your material and present your ideas in a clear and logical form. In calculations, show **all** the steps in your working.

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Total

1

2

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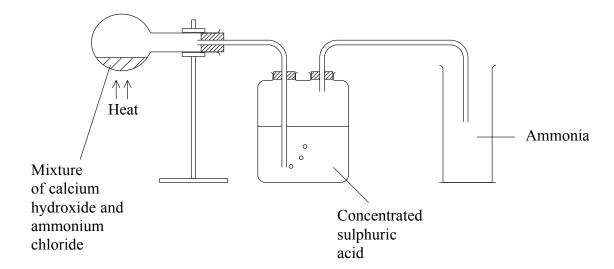
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#### **SECTION A**

Answer ALL the questions in this section. Write your answers in the spaces provided.

There is useful data on the front cover, and a Periodic Table is printed on the back of this booklet.

1. The following diagram shows the apparatus assembled to make a sample of dry ammonia gas in the laboratory.



(a) There are two reasons why this method would **not** work. State what they are and how the method should be modified.

2	 	

(b) Write an equation for the reaction between calcium hydroxide and ammonium chloride.

**(2)** 

	(1)
(d)	Describe what is seen when aqueous ammonia is added drop by drop to copper(II) sulphate solution until present in excess. Give the formula of the final product.
	(3)
	(Total 10 marks)

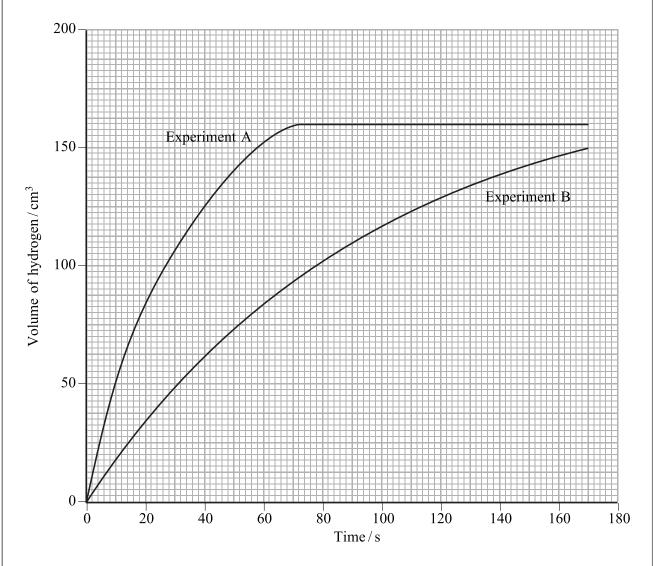
2. Two experiments were carried out in which magnesium was reacted with acid.

Experiment A	x g of magnesium ribbon was reacted with an excess of hydrochloric acid of concentration 1 mol dm <sup>-3</sup> at 25 °C
Experiment	x g of magnesium ribbon was reacted with an excess of
В	ethanoic acid of concentration 1 mol dm <sup>-3</sup> at 25 °C

(a) Write an ionic equation for the reaction that takes place in both experiments.

(1)

(b) The following graphs show the volume of hydrogen produced at 10 s intervals up to 170 s for both experiments.



	(1)
(ii) What was the final volume of gas produced in Experiment A?	
	 (1)
(iii) Predict the final volume of gas produced in Experiment B.	
	 (1)
(iv) How many seconds did it take for half the magnesium to react Experiment B?	in
	 (1)
Calculate the mass of magnesium, x, used in the experiment.	
	 (2)
Suggest why the graphs for the two experiments are different.	
	 (1)
On the grid opposite draw the graph you would expect to obtain if Experiment A wrepeated at a temperature of 40 °C, the volume of hydrogen produced being measurat the original temperature of 25 °C.	
	(2)
	ks)

•	ducts	5.	s the only
(a)	Ide	ntify compounds A, B and C.	
	(i)	Compound A is	(1)
	(ii)	Compound B is	(1)
	(iii)	Compound C is	. ,
(b)	(i)	What type of polymer is formed by alkene B?	( )
			(1)
	(ii)	Draw a diagram to show the structure of this polymer.	
			(1)
(c)	In a	n industrial process, alkene B reacts with steam to give ethanol.	
	(i)	Write an equation for this reaction.	
			(1)
	(ii)	State three conditions for this reaction.	
		1	
		2	
		3	

(1)
(Total 10 marks)

( )	:)	Calculate the amnirical formula of alueose. Working must be shown
	i)	Calculate the empirical formula of glucose. Working must be shown.
		(3)
<b>(</b> i		The relative molecular mass of glucose is 180. What is the molecular formula of
		glucose?
		(2)
1 \ F		
b) L	)es	cribe how ethanol can be made from glucose solution by fermentation.
•		

(c)	Glu a po	cose can be represented as HO-\(\subseteq\)-OH. Glucose molecules can combine to form olymer.	bla
		What type of polymer is formed?	
		(1)	
	(ii)	Draw a diagram to represent this polymer.	
		(1)	
		(Total 10 marks)	

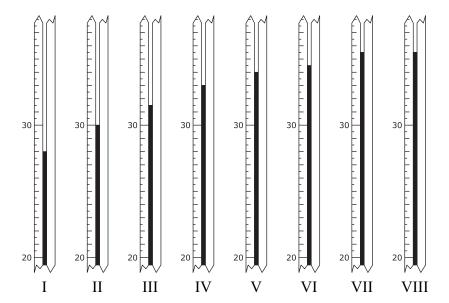


5. A series of experiments was carried out using hydrochloric acid of unknown concentration and sodium hydroxide solution of concentration 2 mol dm<sup>-3</sup>.

Different proportions of hydrochloric acid and water were added to 25 cm<sup>3</sup> of sodium hydroxide in a polystyrene beaker, all at the same temperature. The following table shows the proportions used each time.

Experiment	Volume of hydrochloric acid of unknown concentration	Volume of water
I	0	35
II	5	30
III	10	25
IV	15	20
V	20	15
VI	25	10
VII	30	5
VIII	35	0

After stirring, the maximum temperature of the mixture was recorded. The readings on the thermometer are shown in the following diagram.



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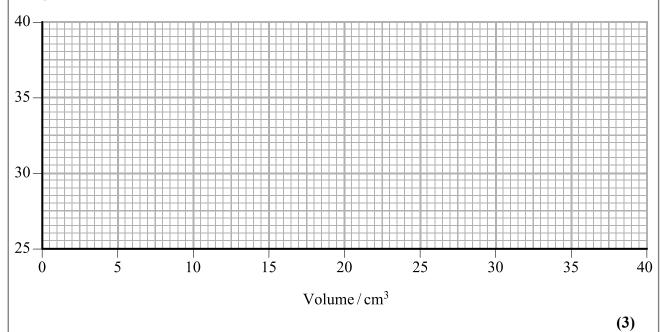
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(a) Draw a suitable table and record the thermometer readings with the corresponding volumes of hydrochloric acid.

**(3)** 

(b) Plot a graph of temperature against volume of hydrochloric acid added.

Temperature / °C



(c)	Use the graph to estimate the volume of hydrochloric acid that reacted completely with 25 cm <sup>3</sup> of sodium hydroxide solution and the temperature at the end point of the	Leave blank
	reaction.	
	(i) Volume of hydrochloric acid(1)	
	(ii) Temperature	
	(1)	
(d)	Calculate the concentration of the hydrochloric acid in mol dm <sup>-3</sup> .	
	(2)	Q5
	(Total 10 marks)	
	TOTAL FOR SECTION A: 50 MARKS	

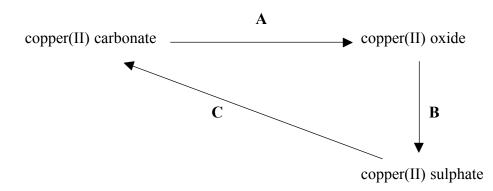
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#### **SECTION B**

Answer TWO questions in this section. Where appropriate, equations and diagrams should be given to clarify your answers.

If you answer Question 6, put a cross in this box (🖾).

**6.** The following diagram shows some reactions of copper(II) compounds.



- (a) For each of the reactions, A, B and C:
  - outline how you could carry out the reaction
  - state any observations you would expect to make
  - write a chemical equation.

eaction A	•••••
eaction B	

(12)
How could you obtain metallic copper from copper(II) oxide and from copper(II) sulphate solution using chemical reactions (not electrolysis)? For each starting material:
• give brief details of how you could carry out the reaction
<ul><li>state any observations you would expect to make</li><li>write a chemical equation.</li></ul>
Copper(II) oxide
Copper(II) sulphate

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	If you answer Question 7, put a cross in this box $(\square)$ .					
7.	Des read	using the				
	(a)	Statement: Reactant:	where a chemical reaction takes place.  Some chemical reactions are reversible.  Blue copper(II) sulphate crystals.			
	(b)	Statament	Increasing surface area increases the rate of a reaction	(5)		
	(0)	Statement: Reactants:	Increasing surface area increases the rate of a reaction. Calcium carbonate and dilute hydrochloric acid.			



**(5)** 

	Statement: Reactant:	Non-metals form acidic oxides. Sulphur.	
	•••••		
	•••••		•••••
	•••••		•••••
			(5)
			(-)
d)	Statement: Reactants:	Displacement reactions are exothermic.  Magnesium and iron(II) sulphate solution.	
	reactants.	wagnesium and non(m) surphate solution.	
			•••••
			(5)

(e)	Statement:	Different gases diffuse at different rates.	
(0)	Reactants:	Concentrated ammonia solution and concentrated hydrochloric acid.	
		(5)	
		(Total 25 marks)	ſ

Leave blank

# If you answer Question 8, put a cross in this box ( ).

(u)		tane has the molecular formula $C_5H_{12}$ , and the structural mula $CH_3CH_2CH_2CH_3$ .
	(i)	Calculate the percentage by mass of carbon in pentane.
		(3)
	(ii)	Draw and name two other structural isomers which have the molecular formula $C_5H_{12}$ .
		(4)
	(iii)	Name the homologous series to which pentane belongs. State the general formula for this series and give the molecular formula for the member which has 10 carbon atoms.

Leave blank

(b) Pent-1-ene has the structural formula  $CH_3CH_2CH$ = $CH_2$ . It can be converted to pentane by reaction with hydrogen.

$$CH_3CH_2CH \underline{=} CH_2 + H \underline{-} H \rightarrow CH_3CH_2CH_2CH_2CH_3$$

Use the information in the following table to calculate the net energy change for this reaction and state whether the reaction is exothermic or endothermic.

Bond	Bond energy/kJ per mole of bonds
С—С	+346
C=C	+610
С—Н	+413
Н—Н	+432

	(7)

# If you answer Question 9, put a cross in this box ( ).

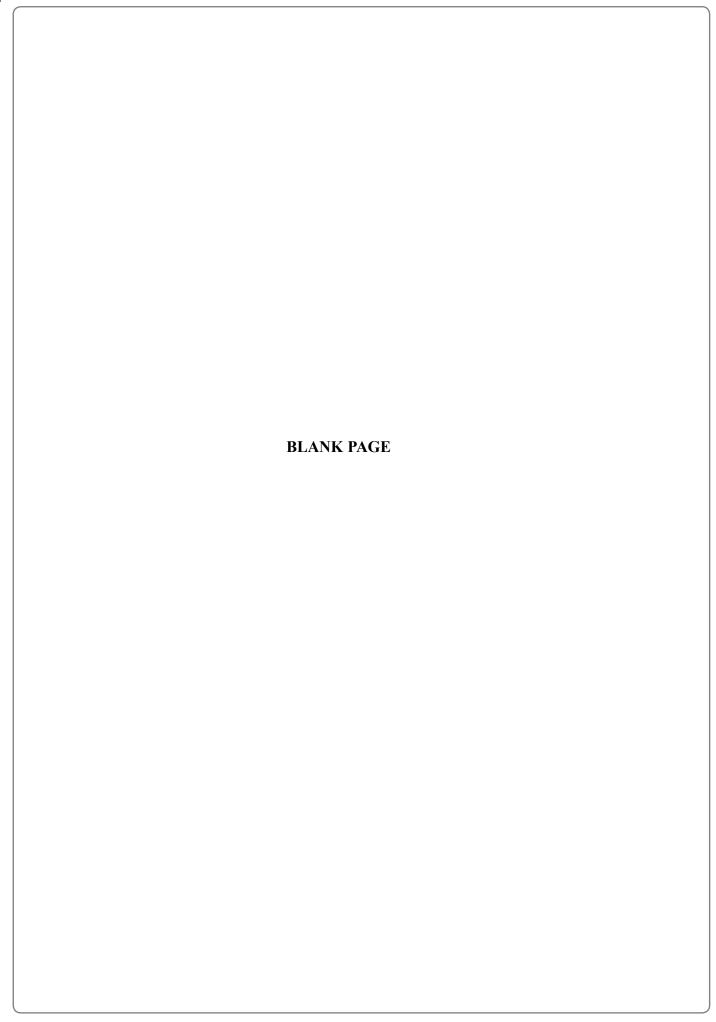
Draw a labelled diagram to show the extraction of aluminium from the purified Give equations for the reactions that take place at the electrodes.

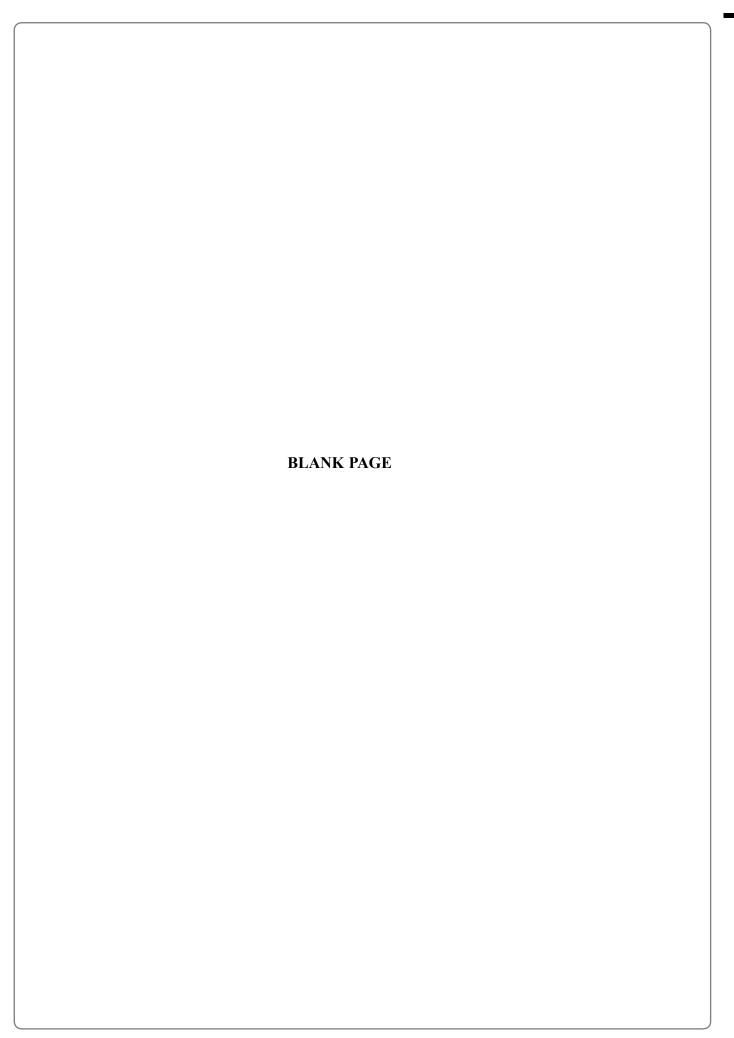


	obtain a named metal from its ore. Describe any observations you would expe make and write an equation for the reaction.					
(c)	Aluminium reacts with oxygen to form aluminium oxide. State the ele					
(c)	Aluminium reacts with oxygen to form aluminium oxide. State the ele configurations of the atoms and ions involved in this reaction. Give the formuthe two types of ions present in the oxide, and state the ratio in which these ion formed.					
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is able to conduct an electric curre	lic lattice of aluminium and explain how aluminium ent.
	(5)
	(5) (Total 25 marks)
	TOTAL FOR SECTION B: 50 MARKS
	TOTAL FOR PAPER: 100 MARKS
	END









				,		
	0	2 Helium 4	Neon Neon 20 20 Argon 40	36 Krypton 84 84 54 Xenon	Rn Radon 222	
	7		Fluorine 19 17 Cl Chlorine 35.5	35 Bromine 80 83 53 127 127 127 127	Astatine 210	
	9		Oxygen 16 16 S Sulphur 32	Selenium 79 79 52 Tellurium 78	Polonium 210	
	Ŋ		Nitrogen 14 15 Phosphorus 31	AS Arsenic 75 51 Sb Antimony	Bismuth 209	
	4			Germanium 73 S0 Sn Tin Tin Tin Tin Tin Tin Tin Tin Tin Ti		
	က			Gallium 70 70 49 Highlium Indium 115 115		
		Ĺ	L	2nc Znc Sinc 65 48 Cadmium	Hg Mercury 201	
THE PERIODIC TABLE				Copper 63.5 47 Ag	Au Good	
NODIC				Nickel Signature Palladium	78 78 Platinum 195	
E PER				Cobalt 59 45 Rhodium Rhodium	77   17   192	
<b>†</b>				Fe Fe Fe For	Osmium 190	اة اعاد
	Group	Hydrogen		24 25 Cr Mn Chromium Manganese 52 55 42 43 Mo TC Molybdenum Technetium 96	Renium 186	Key Atomic number Symbol Name Relative atomic mass
		<u></u>		Chromium Chromium 52 52 42 WO Molybdenum 96	74 W Tungsten 184	
				Vanadium 51 A1 Niobium N	73 Ta Tantalum 181	
				Titanium 48 48 40 Zirconium 91	Hafnium 179	
				Scandium 45 99 45 45 45 45 45 45 45 45 45 45 45 45 45		
	0		Be Beryllium 9 12 Mg Magnesium 24	Calcium 40 38 Strontium 88 Strontium	Barium 1 137 188 Radium 226	
	-		Lithium 11 Na Sodium Na 23		Caesium 133 87 Francium 223	
		Period	α σ	4 το	9 1	