Paper Reference (complete below)

| | | | | / | |

Surname

Initial(s)

Signature

Paper Reference(s)

6243B.02

Edexcel GCE

Chemistry

Advanced Subsidiary

Unit Test C3B

Tuesday 21st January 2003 – Afternoon

Time: 1 hour

Question Number	Leave Blank
1	
2	
3	
4	
Total	

Materials required for examination
Nil

Items included with question papers
Nil

Instructions to Candidates

In the boxes above, write your centre number and candidate number, your surname, initial(s), signature and the paper reference.
The paper reference is shown above.
Answer ALL the questions in the spaces provided in this question paper.
You must show all the steps in any calculations and state the units. You may use a calculator.
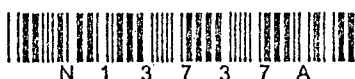
Information for Candidates

The total mark for this paper is 50. The marks for the various parts of questions are shown in round brackets: e.g. (2).
A Periodic Table is printed on the back cover of this booklet.

Advice to Candidates

You are reminded of the importance of clear English and careful presentation in your answers.

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Edexcel

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1. Two compounds **Q** and **R** react together to give a solid and three gases.

(a) (i) **Q** is a white solid. Complete the table below to show the ions present in **Q**.

Test	Observation	Inference
Flame test	Lilac flame	
Dissolved in water and acidified and then tested with aqueous silver nitrate solution.	Pale cream precipitate	

(2)

(ii) What further test would you perform on the pale cream precipitate to confirm its identity? State what you would do and what you would see.

....

....

....

(2)

(b) **R** is a colourless, corrosive, viscous liquid that mixes with water in all proportions in a very exothermic process. Complete the interference statements in the table below.

Test	Observation	Inference
Solution of **R** added to zinc metal.	Bubbles of gas evolved. A squeaky pop is heard when the gas is tested with a lighted splint.	The gas is .... ∴ **R** contains .... ions
Aqueous barium chloride added to a solution of **R**. Dilute aqueous hydrochloric acid then added.	White precipitate formed which does not dissolve in dilute aqueous hydrochloric acid.	The precipitate is .... ∴ **R** is ....

(4)

42

(c) Addition of R to Q at room temperature gives three gases.

- an orange/brown gas U that can be condensed to a brown volatile liquid;
- a steamy, acidic, very water-soluble gas T that reacts with silver nitrate in the same way that Q itself does;
- sulphur dioxide.

(i) Identify U.

....

(1)

(ii) Identify T.

....

(1)

(iii) How would you show the presence of sulphur dioxide?

....

....

....

(2)

(iv) State two safety precautions you would take when mixing R and Q. Give a reason in each case.

Precaution 1 ....

Reason ....

Precaution 2 ....

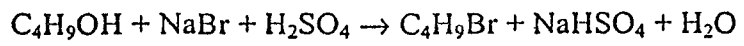Reason ....

(2)

(Total 14 marks)

Q1

2. 1-bromobutane (boiling temperature 102 °C) may be prepared from butan-1-ol (boiling temperature 117 °C).

$$C_4H_9OH + NaBr + H_2SO_4 \rightarrow C_4H_9Br + NaHSO_4 + H_2O$$

(a) The reagents are heated under reflux at 100 °C for about 45 minutes. Draw a diagram of the apparatus that you would use for this procedure.

(4)

(b) Impure 1-bromobutane containing unreacted butan-1-ol can be extracted from the reaction mixture from (a).

(i) Give the name of the practical technique that you would use to obtain a pure sample of 1-bromobutane from the mixture with butan-1-ol.

....

(1)

(ii) Explain the relevance of the boiling temperatures of 1-bromobutane and butan-1-ol to the success of this technique.

....

....

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....

(2)

(c) In a preparation of 1-bromobutane, 11.1 g of butan-1-ol gave 12.4 g of 1-bromobutane.

(i) Calculate the amount (number of moles) of butan-1-ol used in this preparation.

(2)

(ii) Calculate the mass of 1-bromobutane that would be formed if all the butan-1-ol was converted into 1-bromobutane.

(2)

(iii) Calculate the % yield in this preparation to an appropriate number of significant figures.

(1)

(iv) Suggest a reason why the yields in organic preparations seldom approach 100%.

....

....

....

(1)

(Total 13 marks)

Q2

Turn over

3. (a) This question is about finding the formula of copper hydroxide. The method is as follows:
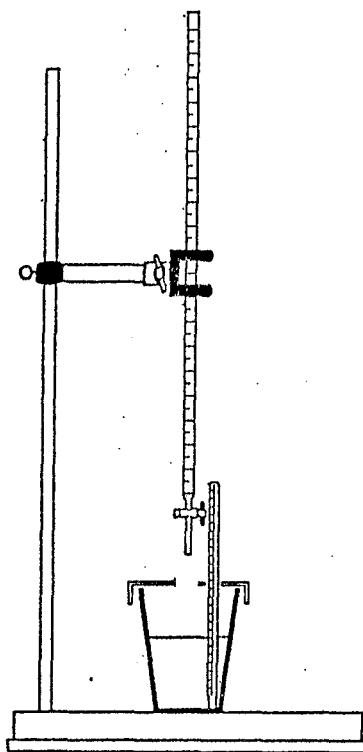
20.0 cm³ of an aqueous solution of a copper salt of concentration 1.00 mol dm⁻³ was placed in a polystyrene cup and its temperature measured using a thermometer graduated in 0.1 °C intervals.

A burette was filled with aqueous sodium hydroxide of concentration 2.00 mol dm⁻³.

2.00 cm³ of sodium hydroxide solution was run into the solution of the copper salt and the temperature was measured immediately.

As soon as possible a further 2.00 cm³ of sodium hydroxide solution was run in and the temperature measured again.

This process of adding 2.00 cm³ portions of sodium hydroxide solution and measuring the temperature was continued until a total of 36.0 cm³ of the sodium hydroxide solution had been added.

The temperature readings are shown in the graph opposite.

Temperature / °C

Volume of NaOH(aq) / cm^{-3}
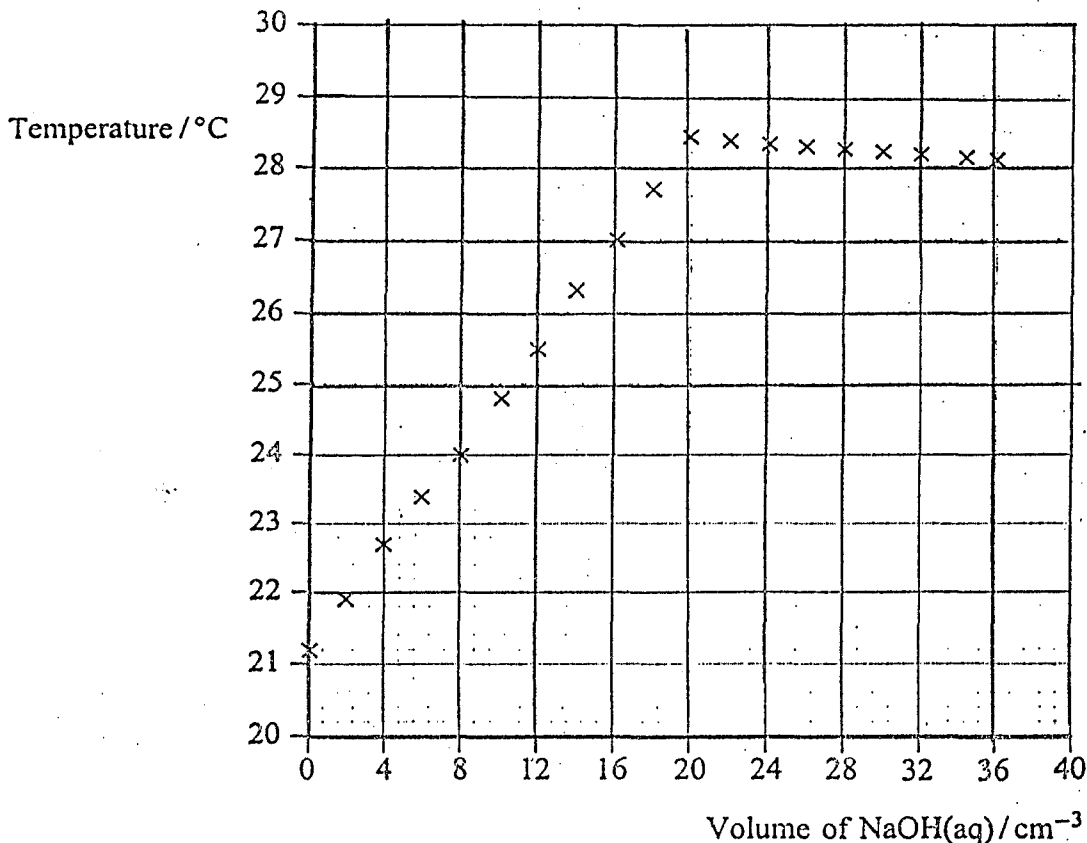
(i) Explain why the temperature reaches a maximum and then falls slightly on addition of further sodium hydroxide solution.

....

....

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(2)

(ii) From the graph, what volume of the aqueous sodium hydroxide was required for complete reaction?

....

(1)

(iii) Calculate the amount (number of moles) of sodium hydroxide in this volume of solution.

(1)

(iv) Calculate the amount (number of moles) of copper ions that have reacted.

(1)

(v) Write the ratio of moles of copper ions to hydroxide ions reacting.

(1)

(vi) Write the formula of the copper hydroxide that is produced.

(1)

(b) The data can be used to find the enthalpy change for the reaction between sodium hydroxide and the copper salt.

(i) Use the graph to find the temperature rise that occurs for complete reaction.

....
(1)

(ii) Find the heat change, q, that occurs in the polystyrene cup for complete reaction. Use the formula

$$q = 168 \times \Delta T \text{ joules}$$

(1)

(iii) Use your results from (a)(iv) and (b)(ii) above, to find the molar enthalpy change, ΔH, for the reaction. Give the correct sign and units to the answer.

(3)

(c) Identify one potential source of error in this experiment, and say what you would do to reduce its effect.

....

....

....

....

....

(2)

Q3

(Total 14 marks)

49

Turn over

4. Imagine that you are given four colourless, organic liquids in unlabelled test tubes. They are known to be

- an alkane
- an alkene
- an alcohol
- a chloroalkane

but not necessarily in this order.

You are required to plan a series of chemical tests to identify the nature of each liquid. This should include:

- what you would do;
- the test reagents you would use;
- the observations you would make that would enable you to identify the four compounds.

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(9)

Q4

(Total 9 marks)

TOTAL FOR PAPER: 50 MARKS

END