OCR

RECOGNISING ACHIEVEMENT

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
Advanced Subsidiary GCE

CHEMISTRY   **2813/03/TEST**

Practical Test (Part B)

Tuesday   **26 JUNE 2001**   ·   Morning   1 hour 30 minutes

Additional materials:
    Electronic calculator
    Data Sheet for Chemistry
    Candidate's Plan (Part A of Practical Test)
Candidates answer on the question paper.

Candidate Name	Centre Number	Candidate Number

TIME   1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

* Write your name in the spaces above.

* Write your Centre number and Candidate number in the boxes above.

* Answer **all** questions.

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

INFORMATION FOR CANDIDATES

* In this part of the Practical Test, you will be assessed on the Experimental and Investigative Skills:
  Skill I   Implementing
  Skill A   Analysing evidence and drawing conclusions
  Skill E   Evaluating evidence and procedures

* You may use an electronic calculator.

* You are advised to show all the steps in any calculations.

* Use of the *Data Sheet for Chemistry* is allowed.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
Planning	16	
1	14	
2	16	
3	14	
TOTAL	60	

This question paper consists of 7 printed pages and 1 lined page.

1 Introduction

The purpose of this experiment is to find

- the concentration of aqueous sodium hydroxide in the solution provided;
- the enthalpy change for the neutralisation of 1 mol H_2SO_4 by aqueous sodium hydroxide.

Two chemicals are provided.
- Solution **W** is aqueous sodium hydroxide.
- Solution **X** is aqueous sulphuric acid, of concentration $2.0\,mol\,dm^{-3}$.

Both solutions, particularly W, are very corrosive at the concentrations you are using.

Skill I (Implementing) [14 marks]

(a) Fill the burette with **X**.

(b) Measure $10.0\,cm^3$ of **X** into the plastic cup provided.

Use the measuring cylinder to measure $10\,cm^3$ of **W**.
Measure the initial temperature of **W** and record your result in a table on page 3 of this booklet.
Add **W** to **X** in the plastic cup.

Use the thermometer to stir the mixture, and record the **maximum** temperature reached.
Work out the temperature rise.
Record all your results on page 3 of this booklet.
Rinse out the plastic cup and use it for the next experiment.

(c) Repeat the procedure described in **(b)** four more times. Use $10.0\,cm^3$ of **X** for each experiment. Add $20\,cm^3$, $30\,cm^3$, then $40\,cm^3$ and $50\,cm^3$ volumes of **W**.

For each experiment record the initial temperature, the maximum temperature reached and the temperature rise.

(d) Carry out **two** further experiments of your choice.

Choose these two extra experiments to investigate what volume of **W** causes the highest temperature rise.
Add these extra results to your table.

(e) On page 3, state and explain the safety precautions you used.

Results

Use the space below to write down your readings.

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Safety
Outline the safety precautions that you have taken during your experiment. Give your reason(s) for each precaution taken.

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2   Skill A (Analysing evidence and drawing conclusions) [16 marks]

You are advised to show full working in all parts of your calculations.

(a) Plot a graph of temperature against the volume of **W** used.

temperature
/°C
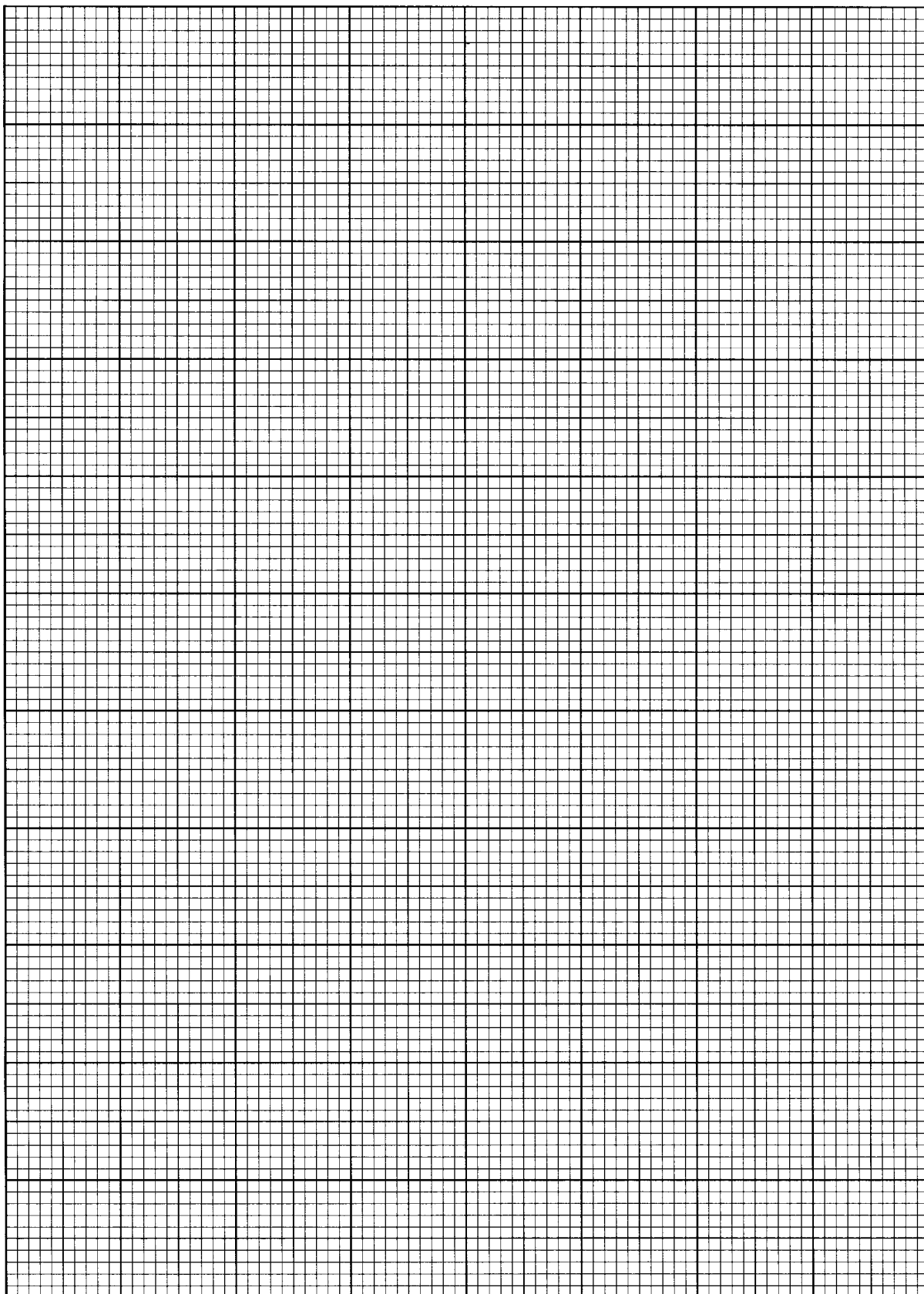
(b) Balance the equation below for the reaction of sodium hydroxide, **W**, with sulphuric acid, **X**.

_____ NaOH (aq) + _____ H_2SO_4 (aq) $\longrightarrow$ _____ Na_2SO_4 (aq) + _____ H_2O (l)
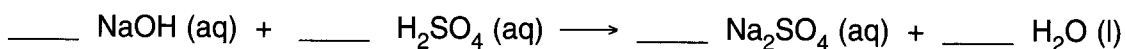
(c) Calculate how many moles of H_2SO_4 are present in the $10\,cm^3$ volume of **X** used in each experiment. Remember that the concentration of H_2SO_4 in **X** is $2.00\,mol\,dm^{-3}$.

(d) Calculate how many moles of NaOH were required to neutralise this amount of H_2SO_4.

(e) The maximum temperature rise on your graph corresponds to the volume of sodium hydroxide, **W**, needed to neutralise $10.0\,cm^3$ of sulphuric acid, **X**.

Estimate this temperature from your graph and the volume of aqueous sodium hydroxide **W**.

Estimated maximum temperature rise   = ... °C

Volume of NaOH   = ... cm^3

Using this volume and your answer to **(d)**, calculate the concentration in $mol\,dm^{-3}$, of NaOH in solution **W**.

(f) Calculate the enthalpy change for the neutralisation of 1 mol of H_2SO_4 by NaOH. Assume that
  • the density of all solutions used is $1.0\,g\,cm^{-3}$.
  • the specific heat capacity of the solutions is $4.2\,J\,g^{-1}\,K^{-1}$.

3   Skill E (Evaluating evidence and procedures) [14 marks]

(a) Identify unusual readings, if any, and suggest likely reasons for them.

(b) Identify sources of error in the apparatus and experimental procedure used. Suggest how these errors could be reduced.

(c) How could the concentration of the aqueous sodium hydroxide, **W**, be determined more accurately?

(d) Under the conditions of this experiment, the enthalpy change for neutralisation of 1 mol of sulphuric acid with aqueous sodium hydroxide was found to be $-133\,kJ$.
Suggest reasons for any difference between your result and this value.

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