OCR
RECOGNISING ACHIEVEMENT

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
Advanced Subsidiary GCE

CHEMISTRY 2813/03TEST

Practical Test (Part B)

Friday **26 JANUARY 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 6 printed pages and 2 lined pages.

Registered Charity Number:1066969

1 Introduction

The purpose of this experiment is to find the relative molecular mass of dibasic acid H_2X by a titration.

Two chemicals are provided.

- Solution **B** is aqueous potassium hydroxide containing 8.50 g dm^{-3}.
- Solid **C** is the dibasic acid, H_2X.

You are also provided with phenolphthalein as an indicator.

Skill I (Implementing) [14 marks]

Part 1

Weigh the bottle provided containing **C**.
Tip **C** into the 250 cm^3 beaker and weigh the empty bottle.
Record the masses on page 3 of this booklet.

Dissolve your solid **C** in about 100 cm^3 of distilled (or deionised) water. The solid will dissolve more quickly if warmed *gently* for about a minute.

When all the solid has dissolved, add the solution to the 250 cm^3 volumetric flask. Rinse the beaker with a little distilled water and transfer the washings to the volumetric flask.

Make up the solution to 250 cm^3 with distilled water. Shake the solution thoroughly before using it for your titrations in **Part 2** of the practical task.

Part 2

Fill the burette with the solution of potassium hydroxide, **B**.

Pipette 25.0 cm^3 of your solution of **C** into a conical flask and add 4 or 5 drops of phenolphthalein indicator.

Record all your readings in a suitable table on page 3 of this booklet.
You should read the burette to the nearest 0.05 cm^3.

Titrate this solution with solution **B**. The end-point is when the indicator changes from colourless to pale pink.

Repeat the titration as many times as you think necessary to obtain accurate results.
Make certain that the recorded results show the accuracy of your practical work.

Results

Use the spaces below to write down your readings.

Weighings of C

Titrations of the solution of C with B

Summary

25.0 cm^3 of the solution of C required ..... cm^3 of B.

Show which readings you used to obtain this value of the volume of **B** by placing a tick (✓) under the readings used.

Safety

Outline **the** safety precautions that you have taken during your experiment. Give your reason(s) for each p**recaution** taken.

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

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

(a) Calculate the concentration, in mol dm^{-3}, of 8.50 g dm^{-3} KOH (solution **B**).
(A_r: K, 39.1; O, 16.0; H, 1.0)

(b) Calculate how many moles of KOH were used in the titration.

(c) The equation for the reaction taking place between the solutions of H_2X (solution **C**) and aqueous potassium hydroxide (solution **B**) in this titration is:

$$H_2X(aq) + 2KOH(aq) \longrightarrow 2KX(aq) + H_2O(l)$$

Calculate how many moles of H_2X reacted with the aqueous potassium hydroxide used in the titration.

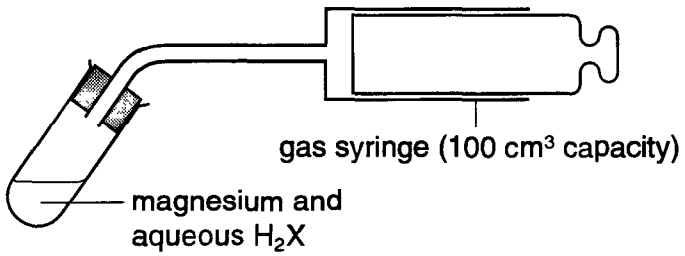
(d) Calculate how many moles of H_2X were in the 250 cm^3 solution in the volumetric flask.

(e) (i) Using your answer to **(d)** and the mass of H_2X that you used in **Part 1**, calculate the relative molecular mass of H_2X.

(ii) The empirical formula of H_2X is CH_3O_3. What is its molecular formula?

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

A student decided to determine the relative molecular mass of the dibasic acid H_2X, by another method using the apparatus shown below.



An excess of magnesium was added to an aqueous solution containing a known mass of H_2X. The volume of gas produced in the reaction was collected and measured. The equation for the reaction is as follows.

$$Mg(s) + H_2X(aq) \longrightarrow MgX(aq) + H_2(g)$$

The student obtained the following data by this method.

	experiment 1	experiment 2
mass of H_2X used /g	0.30	0.40
volume of gas collected measured at r.t.p. /cm^3	52	67

(a) Use the student's data to calculate another value for the relative molecular mass of H_2X. Explain clearly how you reached your answer.
(Under the conditions used, 1 mole of $H_2(g)$ occupies 24.0 dm^3)

(b) Identify sources of inaccuracy in the student's readings and procedure. Suggest how these errors might be reduced.

(c) Compare the student's experiment with your own titration. Explain which of the two experimental methods provides a more reliable determination of the relative molecular mass of H_2X.

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