OCR
RECOGNISING ACHIEVEMENT

ADVANCED SUBSIDIARY GCE

2813/03/TEST

CHEMISTRY

Practical Examination 1 (Part B – Practical Test)

MONDAY 12 MAY 2008

Afternoon

Time: 1 hour 30 minutes

Candidates answer on the question paper.
Additional materials:
Candidate's Plan (Part A of the Practical Examination)
Scientific Calculator
Data Sheet for Chemistry (Inserted)

CUP/T36379

Candidate Name

Centre Number

Candidate Number

INSTRUCTIONS TO CANDIDATES

- Write your name in the space above.
- Write your Centre number and Candidate number in the boxes above.
- Answer **all** the questions.
- Write your answers in the spaces provided on the question paper.
- Read the instructions and questions carefully.
- Do not write in the bar code. Do not write in the grey area between the pages.

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 a scientific calculator.
- You are advised to show all the steps in any calculations.
- You may refer to your Plan produced for Part A.
- You will be awarded marks for the quality of written communication where this is indicated.
- A copy of the *Data Sheet for Chemistry* is provided as an insert with this question paper.

FOR EXAMINER'S USE		
Qu.	**Max.**	**Mark**
Planning	**16**	
Implementing & Analysing	**30**	
Evaluating	**14**	
TOTAL	**60**	

This document consists of **10** printed pages, **2** blank pages and a *Data Sheet for Chemistry*.

[Turn over

Answer **all** the parts.

Introduction

In this examination, you will investigate the reaction between sulphamic acid, H_3NSO_3, and potassium hydroxide by carrying out a titration.

Three chemicals are provided.

- Solution **Y** is aqueous potassium hydroxide, KOH. **Irritant** 
- Solid **Z** is sulphamic acid, H_3NSO_3. **Irritant** 
- Phenolphthalein solution is the indicator. **Flammable** 

Part 1 Titration of aqueous KOH with aqueous H_3NSO_3
Skill I (Implementing)

[16 marks]

Record all your readings in the spaces on page 3.

Weigh the bottle containing **Z**, with the lid.
Tip all of **Z** into a 250 cm^3 beaker.
Weigh the empty bottle and lid.
Calculate the mass of **Z** used.

In the beaker, dissolve **Z** in about 100 cm^3 of distilled (or de-ionised) water.
When the solid has dissolved, transfer the solution into a 250 cm^3 volumetric flask.
Use distilled water to rinse any remaining solution from the beaker into the flask.
Make the solution up to 250 cm^3 using distilled water.
Invert the volumetric flask several times before use, to mix the solution thoroughly.

Using a pipette and filler, transfer 25.0 cm^3 of this solution of **Z** into a conical flask.
Add five drops of phenolphthalein indicator.

Fill the burette with solution **Y**.
Record all burette readings to 0.05 cm^3.
The end-point of the titration is when the indicator changes from colourless to pale pink.

Carry out a trial titration.

Repeat the titration until you obtain **two** consistent accurate results.
In each case, use 25.0 cm^3 of your solution of **Z**.

Calculate your mean titre.

Readings and calculations

Use the spaces below to record **all** your readings.

Weighings

mass of **Z** used = ... g

Titration data (tabulated)

Summary

25.0 cm^3 of the solution of **Z** required a mean titre of ..... cm^3 of **Y**.

Show the readings you used to obtain this value of the volume of **Y** by putting a tick (✓) under these readings.

Safety

A bottle of **solid** potassium hydroxide is labelled as **Corrosive**.

Suggest why the bottle containing **Y**, aqueous potassium hydroxide, is labelled **Irritant**.

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Part 2 Deducing the equation for the reaction of KOH with H_3NSO_3 **[14 marks]**
Skill A (Analysing)

Use the *Data Sheet for Chemistry* supplied for any data you require.
Your working must be shown clearly.
Give your answers to **three** significant figures for parts **(a) – (e)**.

(a) Solution **Y** contains 5.50 g dm^{-3} of **impure** KOH.
The KOH used to make up solution **Y** was 86.0% pure by mass.

Calculate the mass of pure KOH in 1.00 dm^3 of solution **Y**.

mass of pure KOH = ... g

(b) Calculate the concentration, in mol dm^{-3}, of pure KOH in solution **Y**.

concentration = ... mol dm^{-3}

(c) Calculate the number of moles of KOH in the mean titre.

answer = ... mol

(d) Calculate the number of moles of sulphamic acid, H_3NSO_3, **Z**, that you weighed out.

answer = ... mol

(e) Calculate the number of moles of H_3NSO_3, **Z**, used in each titration.

answer = ... mol

(f) Use your answers to **(c)** and **(e)** to calculate how many moles of KOH react with 1 mol of H_3NSO_3.

Show your working and give your answer to the nearest whole number.

answer = ... mol KOH

(g) Three possible reactions of KOH with H_3NSO_3, are represented by the equations below.

(i) Complete and balance the second and third equations.

State symbols are **not** required.

$$KOH + H_3NSO_3 \rightarrow KH_2NSO_3 + H_2O$$

$$2\,KOH + H_3NSO_3 \rightarrow K_2HNSO_3 + \text{……}$$

$$3\,KOH + H_3NSO_3 \rightarrow K_3NSO_3 + \text{……}$$

(ii) Write a tick (✓) next to the equation which matches most closely to your answer to **(f)**.

Explain your choice.

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(h) Sulphamic acid is a strong acid.

Deduce the number of moles of hydrogen ions, H^+, present in an aqueous solution containing 1 mole of H_3NSO_3.

answer = ... mol

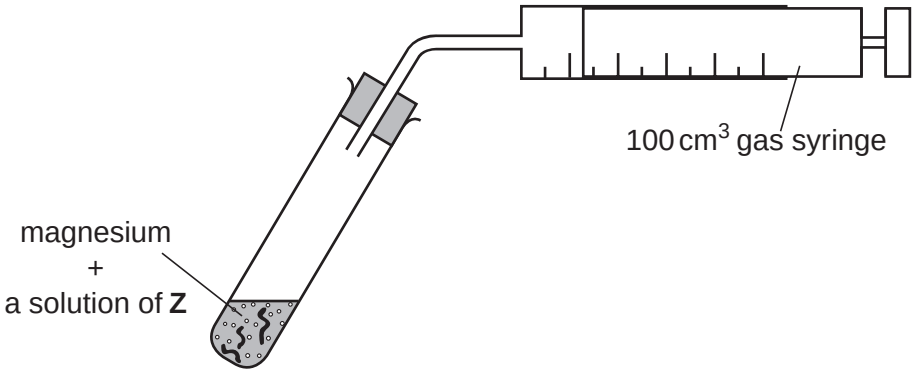
Part 3 Skill E (Evaluating) **[14 marks]**

Information

A student carried out a different experiment to determine the number of moles of H^+ ions in an aqueous solution containing 1 mole of aqueous sulphamic acid, **Z**.

He added excess magnesium to a solution of **Z**, and measured the volume of hydrogen produced in a 100 cm^3 gas syringe.

The apparatus used is shown below.



(a) The equations below represent three possible reactions of magnesium with aqueous sulphamic acid, **Z**.

$$Mg + 2H_3NSO_3 \rightarrow Mg(H_2NSO_3)_2 + H_2$$

$$Mg + H_3NSO_3 \rightarrow MgHNSO_3 + H_2$$

$$3Mg + 2H_3NSO_3 \rightarrow Mg_3(NSO_3)_2 + 3H_2$$

In a preliminary experiment, which was carried out at room temperature and pressure (r.t.p.), the student used 0.97 g of **Z**, dissolved in water.

Carry out a calculation to find out whether this was a suitable mass of **Z** to use with a 100 cm^3 gas syringe. The volume of 1 mole of any gas at r.t.p. = 24 000 cm^3.

Explain your working.

[3]

(b) State why it is important that an **excess** of magnesium is used during the reaction.

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(c) Suggest **three** sources of error in the student's experiment.

Explain how **each** source of error could be reduced or minimised.

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(d) The student carried out the experiment twice.

His readings are shown in the table below.

mass of sulphamic acid, **Z**, used / g	0.64	0.45
volume of gas collected / cm^3	80	50

(i) Carry out a calculation(s) to find out whether the student should repeat the experiment again.

[2]

(ii) Which experiment gives more **reliable** results, your own (involving the titration) or the student's?

Justify your answer.

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END OF QUESTION PAPER

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