

Name :.....

Index No.....

Candidate's sign.....

Date

233/3

CHEMISTRY

Paper 3 (Practical)

Time: 2 ¼ Hours

INSTRUCTIONS TO CANDIDATES

- Write **your name** and **index number** in the spaces provided above
- **Sign** and **write** the date of examination in the spaces provided.
- Answer **all** questions in the spaces provided .
- You are not allowed to start working with the apparatus for the first **15 minutes** of the 2 ¼ hours allowed for this paper. This time is to enable you to **read** the questions paper and **make sure** you have all the chemicals and apparatus that you may need.
- All working **must** be clearly shown where necessary.

FOR EXAMINER'S USE ONLY

Question	Maximum Score	Candidate's Score
1.	14	
2.	10	
3.	16	
TOTAL	40	

This paper consists of 6 printed pages . Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing

1. You are provided with sodium hydroxide solution **L** 1.8g of solid **T**, Solid **T** is a dibasic acid 0.36M Solution of the dibasic acid **H₂X** labelled solution **Q**.

You are required to determine

- i) The molar heat of solution of solid **T**
- ii) The heat of reaction of one mole of dibasic acid with sodium hydroxide.
- II. Calculate the heat of reaction of solid **H₂X** with aqueous sodium hydroxide.

Procedure I

Place 40cm³ of distilled water into a 100cm³ beaker. Measure the initial temperature of the water and record it in table **I** below. Add all the Solid **T** at once. Stir the mixture carefully with the thermometer until all the solid dissolves. Measure the final temperature reached, record it in table I and complete table I. (2mks)

Table I

Final temperature (°C)	
Initial temperature (°C)	
Temperature change ΔT	

(b) Calculate the;

- (i) Heat change when **H₂X** dissolve in water (Assume the specific heat capacity of the solution is 4.2J g⁻¹ °C⁻¹ and density is 1g / cm³) (2mks)

(ii)The number of moles of the acid that dissolved.

(Relative formula mass of **H₂X** is 126)

(1mk)

iii) Molar heat of solution, ΔH_1 , solution of the acid **H₂X**

(1mk)

Procedure II

Place 40cm³ of solution Q into a 100cm³ beaker. Measure the initial temperature and record it in table II below. Measure 40cm³ of sodium hydroxide, solution L. Add all the 40cm³ of solution L at once to solution Q in the beaker. Stir the mixture with the thermometer. Measure the final temperature reached, record it in table II and complete the table (2mks)

a) Table II

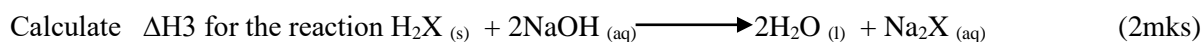
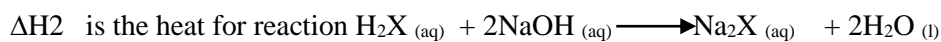
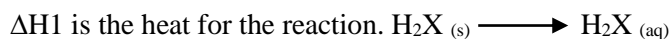
Final temperature	
Initial temperature	
Temperature ΔT	

(b) (i) Calculate the heat change for the reaction (Assume the specific heat capacity of the solution is 4.2J g⁻¹ °C⁻¹ density is 1g / cm³) (2mks)

(ii) Calculate the number of moles of H₂X used (1mk)

(iii) Calculate the heat of reaction ΔH_2 of one mole of the acid H₂X with sodium hydroxide (1mk)

(c) Given that :



2. **You are provided with:**

- 2.3g of solid **N** in a boiling tube.
- Solution, 0.03M acidified potassium manganate (VII).

You are required to determine the number of moles of water of Crystallization in solid **N**.

Procedure (III)

(a) Add 10cm³ of distilled water into the boiling tube containing solid **N** shake it to dissolve the solid. Transfer the contents of the boiling tube into a 250cm³ volumetric flask. Rinse the boiling tube with the distilled water and add it to the volumetric flask. Add more distilled water to make it to the mark label this **solution N**.

Fill the burette with **solution R**. using a pipette and a pipette filler place. 25.0cm³ of **solution N** into a conical flask. Warm the mixture to about 60°C. Titrate the hot **solution N** with **solution R** until a permanent pink colour persists.

Record your readings in table III below . Repeat the titration two more times and complete table III. (Retain solution **R** for use in question 3 II f (i) (4mks)

Table III

	I	II	III
Final burette readings (cm ³)			
Initial burette reading (cm ³)			
Volume of solution R (cm ³)			

b) Calculate the :

i) Average volume of solution **R** used (1mk)

ii) Number of moles of potassium manganate (VII) that reacted (1mk)

iii) Number of moles of **N** in 25cm³ of solution **N**, given that 5moles of **N** reacts completely with 2 moles of potassium manganate (VII) Solution **R** (1mk)

iv) Relative formula mass of **N** (1mk)

b) The formula of **N** has the form **P** · **X** H₂O. Determine the value of **x** in the formula given that the relative formula mass of **P** is 90.0 and atomic masses of hydrogen and oxygen are 1.0 and 16.0 respectively.

(2mks)

2. You are provided with Solid **M** carry out the tests below. Write your observations and inferences in the spaces provided.

Place all the solid **M** in a boiling tube. Add about 10cm³ of distilled water. Shake until all the solid dissolves. Divide the solutions into five portions.

i) To the first portion add 2M sodium hydroxide drop wise till in excess.

OBSERVATIONS	INFERENCE
(1mk)	(1½mk)

(b) To the second portion add ammonia solution drop wise until in excess.

OBSERVATIONS	INFERENCE
(1mk)	(½mk)

(c) To the third portion add four drops of hydrochloric acid.

OBSERVATIONS	INFERENCE
(½mk)	(½mk)

d) To the fourth portion add 3 drops of lead (ii) Nitrate solution

OBSERVATIONS	INFERENCE
(½mk)	(2mk)

e) Warm the mixture obtained in (d) above

OBSERVATIONS	INFERENCE
(½mk)	(½mk)

II. You are provided with solid **W**. Carry out the tests. Write your observations and inferences in the spaces provided.

(f) Place $\frac{3}{4}$ of the solid **W** provided in a boiling tube. Add about 10cm^3 of distilled water and shake until all the solid dissolves. Divide the solution into portion.

(i) To portion one add 3 drops of solution **R**

OBSERVATIONS	INFERENCE
(½mk)	(1mk)

(ii) To the portion two, add 5 drops of acidified potassium dichromate (vi)

OBSERVATIONS	INFERENCE
(1mk)	(2mks)

(iii) To portion 3, add all the sodium hydrogen carbonate

OBSERVATIONS	INFERENCE
(½mk)	(½mk)

(iv) To portion 4 add 3 drops of universal indicator and determine the pH

OBSERVATIONS	INFERENCE
(½mk)	(½mk)

v) Scoop the remaining Solid **W** using a metallic spatula. Ignite it in a bunsen burner flame.

OBSERVATIONS	INFERENCE
(½ mk)	(½ mk)