

NAME:

233/3

CHEMISTRY

PAPER 3

(PRACTICAL)

TERM 1, FORM FOUR

2 ¼ HOURS

INDEX NO.:

CANDIDATE'S SIGNATURE:

DATE:

Instructions to candidates

- a) Answer all the questions in the spaces provided in the question paper.
- b) 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 question paper and make sure you have all the chemicals and apparatus that you may need.
- c) All working must be clearly shown where necessary.

FOR EXAMINER'S USE ONLY

QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORE
1	16	
2	10	
3	14	
TOTAL SCORE	40	

You are provided with:

- Solution Q 0.125M Hydrochloric acid solution
- N grammes of anhydrous sodium carbonate.
- Methylorange indicator

You are required to prepare a solution of sodium carbonate and then standardize it with hydrochloric acid solution Q.

Procedure

Transfer all the N grams of sodium carbonate into a 250 ml volumetric flask.

Add 100cm³ of distilled water and shake till all the solid dissolves. Add more distilled water upto the 250 ml mark and label it solution P. using a measuring cylinder, transfer 50cm³ of solution P into a clean 250 ml beaker and add 50cm³ of distilled water. Stir well with a glass rod and label it solution T. pipette 25.0cm³ of solution T and place it into a conical flask, add 2 drops of methyl orange indicator and titrate with solution Q from the burette. Record your results in the table 1 below and repeat the titration part to complete the table below.

Table 1: (3 mks)

	I	II	III
Final burette reading (cm ³)			
Initial burette reading (cm ³)			
Volume of Q used (cm ³)			

- a) Calculate the average volume of solution Q used. (1 mk)
- b) (i) Calculate the number of moles of solution Q used. (2 mks)
- (ii) Write an equation for the reaction between solution T and Q. (1 mk)
- Calculate:
- (iii) Number of moles of sodium carbonate solution in 25cm³ of solution T. (2 mks)
- (iv) Number of moles of sodium carbonate in 100cm³ of solution T. (2 mks)
- (v) Number of moles of sodium carbonate in 50cm³ of the original solution P. (2 mks)
- c) Given that Na=23.0, C=12.0, O=16.0;
 - (i) The mass of sodium carbonate N grammes that were dissolved to make solution P. (1 mk)
 - (ii) The concentration of sodium carbonate solution P in moles per litre. (2 mks)

2. You are provided with:

1 M Sulphuric (vi) acid solution D.

2 M Sodium hydroxide solution C.

You are required to determine the heat of neutralization of Sulphuric (vi) acid solution D.

Procedure

Measure 50cm³ of solution C and transfer into a 250cm³ plastic beaker provided. record the initial temperature of solution C. measure 10cm³ of sulphuric(vi)acid solution D and add it to solution C in the beaker. Stir gently with the thermometer to mix and record the highest temperature in the table below.

Continue adding 10cm³ portions of solution D recording the temperature after each addition until 80cm³ of solution D has been added. (3 mks)

Total volume of solution D added (cm ³)	0	10	20	30	40	50	60	70	80
Temperature of the mixture (°C)									

- a. Plot a graph of temperature against volume of sulphuric(vi)acid solution D added. (3 mks)
- b. From your graph determine the maximum temperature change ΔT . (¹/₂ mk)
- c. From your graph determine the volume of sulphuric(vi)acid solution required for neutralization. (¹/₂ mk)
- d. Calculate the molar heat of neutralization of 1M sulphuric(vi)acid solution D. (Assume density of water = 1g/cm³, specific heat capacity = 4.2 Jg⁻¹K⁻¹) (3 mks)

3. (I) You are provided with solid A. carry out the following tests, record the observations and inferences.

(a) Place solid A in a boiling tube and add about 10cm³ of distilled water while shaking. Filter the solution and divide the filtrate into three portions. Keep the residue for part (b).

Observations	Inferences
(1 mk)	(1 mk)

(i) To the first portion, add sodium hydroxide dropwise till in excess.

Observations	Inferences
(1/2 mk)	(1/2 mk)

(ii) To the second portion add 3 drops of barium nitrate solution.

Observations	Inferences
(1 mk)	(1 mk)

(iii) To the third portion add 3 drops of lead(ii) Nitrate solution

Observations	Inferences
(1/2 mk)	(1/2 mk)

(b) Place the residue in(a) above in a boiling tube. Add dilute nitric(v)acid while shaking till the solid just dissolves.

Divide the solution into two portions.

Observations	Inferences
(1/2 mk)	(1/2 mk)

(i) To the first portion add sodium hydroxide solution dropwise till in excess.

Observations	Inferences
(1 mk)	(1 mk)

(ii) To the second portion, add a few drops of ammonia solution then in excess.

Observations	Inferences
(1 mk)	(1 mk)

(II) You are provided with solid Z. carry out the tests below and record your observations and inferences.

Place all of solid Z into a boiling tube. Add 10cm³ of distilled water and shake well. Divide the solution into three portions.

a. Test the first portion with both blue and red litmus paper.

Observations	Inferences
(1/2 mk)	(1/2 mk)

b. To the second portion add 2 drops of acidified potassium manganate(vii) and shake well.

Observations	Inferences
(1/2 mk)	(1/2 mk)

c. To the third portion add a little sodium hydrogen carbonate.

Observations	Inferences
(1/2 mk)	(1/2 mk)