

Name..... Index No:.....

233/3
CHEMISTRY
PRACTICAL
PAPER 3
PRACTICAL
2 ¼ Hours

Candidate's Signature
Date.....



SERIES 20 EXAMS

INSTRUCTIONS TO CANDIDATES

- Write your **name** and **index number** in the spaces provided.
- **Sign** and write the **date** of examination in the spaces provided.
- Answer **all** the questions in the spaces provided in the question paper.
- 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 you need.
- All working **must** be clearly shown where necessary.
- Mathematical tables and electronic calculators may be used.

For examiners use only

Question	Maximum Score	Candidate's Score
1	20	
2	10	
3	10	
TOTAL	40	

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

1. You are provided with
 Solution A, Hydrochloric acid
 Solution B, containing 8.8g per litre of sodium hydroxide
 0.5g of an impure carbonate solid C

Procedure

- (i) Fill the burette with sodium hydroxide, solution B
 (ii) Pipette 25cm³ of hydrochloric acid, solution A into a conical flask
 (iii) Add 2-3 drops of phenolphthalein indicator and titrate until a permanent pink colour appears
 (iv) Repeat the titration two more times and complete the table

Table 1

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

- (a) Find the average volume of solution B used? (4mks)
 (1mk)

(b) Determine the

- (i) Concentration of solution B in moles per litre (Na=23.0, O=16.0, H=1.0) (1mk)

- (ii) Concentration of solution A in moles per litre (½ mk)

Procedure III

- (i) Using a measuring cylinder, measure out 100cm³ of solution A into a 250cm³ beaker
 (ii) Add all of solid C into the beaker containing solution A
 (iii) Transfer all the solution into a 250ml volumetric flask and top up to the mark using distilled water. Label this as solution D
 (v) Fill the burette with sodium hydroxide solution, B
 (vi) Pipette 25.cm³ of solution D into a conical flask
 (vii) Add 2-3 drops of phenolphthalein indicator and titrate until a permanent pink colour appears
 (viii) Record your results in table II below
 (ix) Repeat the titration two more times and complete

Table II

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

- (a) Find the average volume of solution B used? (4mks)
 (1mk)

(b) Calculate the;

- (i) moles of hydrochloric acid in 25.0cm³ of solution D (1 ½ mks)

- (ii) Moles of hydrochloric acid in 250cm³ of solution D (1mk)

(iii) Moles of hydrochloric acid in 100cm³ of the original hydrochloric acid solution A (1mk)

(iv) Moles of hydrochloric acid that were used up in the reaction with solid C (1mk)

(v) Moles of the carbonate that reacted with hydrochloric acid (1mk)

(c) Given that the relative formula mass of the carbonate is 106, calculate the;
(i) mass of the carbonate that reacted (1mk)

(ii) percentage purity of the carbonate, solid C (1mk)

2. You are provided with 4.0g of oxalic acid labeled solid **Q**
You are required to determine the solubility of solid **Q** at different temperatures

Procedures

- (i) Place all solid **Q** in a boiling tube and add 5cm³ of distilled water using a burette
- (ii) Heat the mixture while stirring with thermometer to about 80°C until all the entire solid dissolves
- (iii) Allow the solution to cool while stirring with a thermometer and note the temperature at which crystals of solid **Q** starts to appear. Record the temperature in table below
- (iv) Using the burette, add 3cm³ of distilled water to the contents of the boiling tube. Heat the mixture while stirring with thermometer until the entire solid dissolves
- (v) Repeat the procedure and record the temperature in the table below
- (vi) Complete the table by calculating the solubility of solid **Q** in g/100g of water

Volume of distilled water in the boiling tube (cm ³)	Temperature in oC at which crystals first appear	Solubility of solid Q in g/100g of water
5		
8		
11		
14		
17		

(5mks)

(a) On the grid provided, plot a graph of solubility of solid **Q** against temperature (3mks)

(1mk)	(1mk)
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(iii) To 2cm³ of filtrate, add all the sodium hydrogen carbonate

Observations	Inferences
(1mk)	(1mk)

(b)(i) To the residue in a boiling tube add 3cm³ of 2M hydrochloric acid. Retain the mixture for b(ii)

Observations	Inferences
(1mk)	(1mk)

(ii) To 2cm³ of the mixture, add aqueous ammonia drop wise until in excess

Observations	Inferences
(1mk)	(1mk)