NAME:…… Adm. No. …… INDEX NO……

CANDIDATE'S SIGNATURE:……DATE……

SCHOOL: …… STREAM……

233/3

CHEMISTRY PAPER 3

AUGUST 11, 2021

$2\frac{1}{4}$HOURS

BURAMU EXAM TERM ONE 2021

CHEMISTRY PAPER 3

INSTRUCTIONS TO THE CANDIDATE

a] Write your name and index number in the space provided.
b] Sign and write the date of the exam in the spaces provided.
c] Answer all questions in the spaces provided in these question paper.
d] All working must be shown clearly where necessary.
e] You are not allowed to start working with the apparatus for the first 15 minutes of the 2 1/4 hours. This time is to enable you to read the question paper and make sure you have all chemicals and apparatus that you may need.
f] K.N.E.C Mathematical tables and silent electronic calculators may be used
g] Candidates should check the question paper to ascertain that all pages are printed as indicated and no questions are missing.
FOR EXAMINER'S USE ONLY

QUESTION	MAXIMUM SCORE	CANDIDATE SCORE
1	21	
2	*13*	
3	06	
TOTAL SCORE	40	

1 A) You are provided with :

i) 5g of solid W which is dibasic acid, $C_xH_2O_4.\ 2H_2O$

ii) 0.2M sodium hydroxide solution.

You are required to determine:

i) The solubility of solid W at different temperatures.

ii) The value of x in the formula of the acid.

PROCEDURE I

-Place all the solid W provided into a boiling tube.

-Fill the burette with distilled water. Run $10cm^3$ of distilled water into the boiling tube containing solid W.

-Put the boiling tube into a beaker containing water (water bath) and insert a thermometer into the boiling tube. Continue heating and stirring until the solid dissolves. Remove the boiling tube and its contents from the water bath and allow it cool until crystals start to appear. Note the temperature when the crystals start to form and record in the table below.

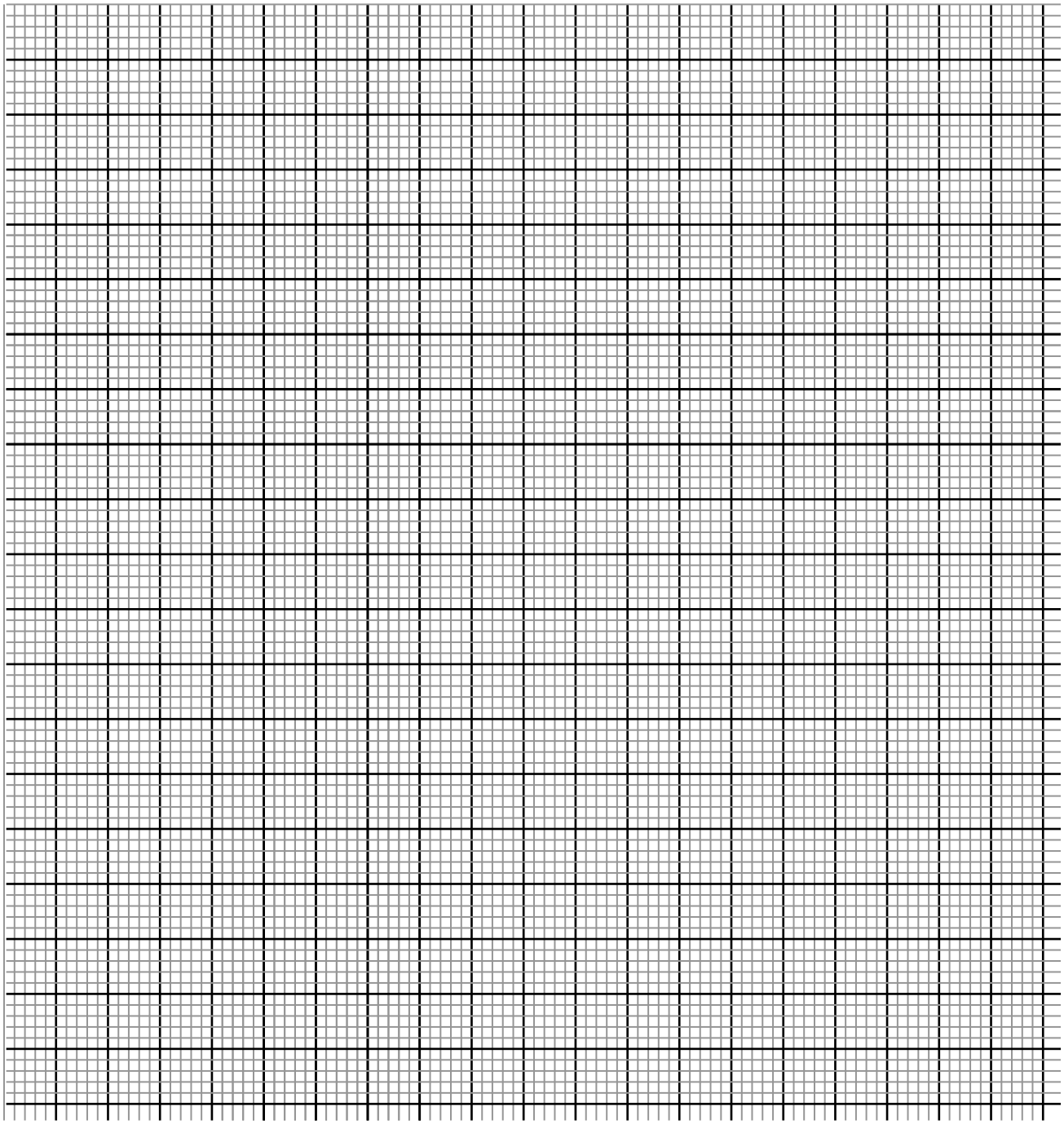
NB: cooling can be done using cold water from the tap where necessary.

Repeat the above procedure with further addition of $10cm^3$ of distilled water up to $50cm^3$ as shown in the table.

Volume of water added	Mass of solid W in 100g of water.	Crystallization temperature
$10cm^3$		
$20cm^3$		
$30cm^3$		
$40cm^3$		
$50cm^3$		

a) Complete the table I above by recording the temperature at which crystals form to the nearest $0.5^{o}C$ and calculate the mass of solid W in grams per 100g of water. (5mks)

b) On the grid provided, plot a graph of solubility of solid W against crystallization temperature. (3mks)



c) From the graph, determine the solubility of solid W at:

i) 55^oC (1mk)

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ii) 65^oC (1mk)

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d) Determine the mass of solid W deposited when the saturated solution is cooled from65^oC to 55^oC (1mk)

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PROCEDURE II

Transfer all the contents of the boiling tube used in procedure I into a clean 250ml beaker and add 100 $cm^3$of distilled water. Stir the mixture till all the solid dissolves.

Transfer the solution into a clean 250 cm^3volumetric flask. Rinse the beaker with distilled water and pour the contents into the volumetric flask and top up to the mark using distilled water, label the solution as W.

Fill the burette with solution W.

Transfer 25cm^3 of sodium hydroxide solution using a pipette into a clean conical flask and add 2 to 3 drops of phenolphthalein indicator and shake. Titrate with solution W from the burette and record your results in the table below.

Repeat the procedure to complete the table.

Titration	I	II	III
Final burette reading			
Initial burette reading			
Volume of solution W used.			

(4mks)

a) Determine the average volume of solution W used. (1mk)

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b) Calculate the number of moles of sodium hydroxide that reacted with the solution W. (1mk)

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c) Given that the reacting mole ratio for the acid to sodium hydroxide is 1: 2, determine the number of moles of the acid in the volume used. (1mk)

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……

d) Determine the number of moles of the acid in the $250cm^3$ of solution W prepared. (1mk)

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……

e) Work out the relative formula mass of the acid hence the value of x in the formula. (2mks)

2. You are provided with **solid M**; use it to carry out the tests below.

a) Put all the solid in a boiling tube and add about $10cm^3$ of distilled water. Shake the mixture and filter**. Keep the residue for procedure (b).** Divide the filtrate into three portion.

Observation	Inference
(1mk)	(1mk)

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

Observation	Inference
(1mk)	(1mk)

ii) To the second portion add ammonium hydroxide drop wise till in excess.

Observation	Inference
(1mk)	($\frac{1}{2}$mk)

iii) To the third portion add lead (II) nitrate solution and warm the mixture.

Observation	Inference
(1mk)	($\frac{1}{2}$mk)

b) Put the residue in a test tube and add dilute nitric (v) acid until all the residue dissolves.

Observation	Inference
(1mk)	(1mk)

i) To a portion of the solution in (b) above, add sodium hydroxide drop wise till in excess.

Observation	Inference
(1mk)	(1mk)

ii) To a portion of the solution in **(**b) above, add ammonium hydroxide till in excess.

Observation	Inference
(1mk)	(1mk)

iii) To a portion of the solution in (b) above, add 3 drops of potassium iodide solution.

Observation	Inference
($\frac{1}{2}$mk)	($\frac{1}{2}$mk)

3. You are provided with **liquid N**, use it to carry out the tests below.

a) Put $2cm^3$ of liquid N on a glass watch glass,use a burning splint to ignite the liquid on the watch glass.

Observation	Inference
(1mk)	($\frac{1}{2}$mk)

b) Put about $6cm^3$ of distilled water in a test tube and add all the remaining liquid N.

Observation	Inference
(1mk)	(1mk)

c) To a portion of the mixture obtained in (b) above, add 3 drops of bromine water.

Observation	Inference
(1mk)	($\frac{1}{2}$mk)

d) To a portion of the mixture from (b), add a spatula end full of sodium hydrogen carbonate.

Observation	Inference
($\frac{1}{2}$mk)	($\frac{1}{2}$mk)