CANDIDATE'S NAME……

CENTRE / INDEX NO: ……/……SIGNATURE: ……

545/3
CHEMISTRY
(PRACTICAL)
Paper 3
July- August 2023
2 ¼ hours

KAMSSA JOINT MOCK EXAMINATIONS

Uganda certificate of education

CHEMISTRY

PAPER 3

2 ¼ hours

- INSTRUCTIONS TO CANDIDATES:
- *Answer all questions*
- *Record your answers on this question paper in the spaces provided.*
- *Mathematical tables and silent non- programmable calculators may be used.*
- *Reference books (i.e. text books, books on qualitative analysis, etc) should not be used.*
- *Candidates are **not** allowed to start working with the apparatus for the first 15 minutes. This time is to enable candidates to read the question paper and make sure they have all the apparatus and chemicals that they may need.*

FOR EXAMINER'S USE ONLY			
Q.1			
Q.2			
Total			

Turn Over

1. You are provided with the following solutions.
   - ❖ **BA1** which is sodium hydroxide solution of unknown concentration.
   - ❖ **BA2** which is a ***2M*** sulphuric acid solution.

You are required to determine the molar concentration of sodium hydroxide solution.

Procedure:

i. Measure and record the initial temperature t_1 of **BA1** using a thermometer.
ii. Measure **30cm^3** of **BA1** using a measuring cylinder and transfer it into a clean plastic beaker.
iii. Measure and record the initial temperature t_2 of **BA2** and transfer it into a burette.
iv. Add **BA2** from the burette slowly to **BA1** in the plastic beaker while stirring the solution mixture using a thermometer until the volume added is **10cm^3**. Note and record the maximum temperature t_3 reached by the solution.
v. Without pouring the solution mixture, continue adding **BA2** from the burette and note the maximum temperature when the volume of **BA2** added are; 15.0, 20.0, 25.0, 30.0, 35.0, 40.0, and 45.0cm^3.
vi. Record your results in the table below.

Table 1 of results

Initial temperature t_1 of **BA1**. .....^{0}C ***(0½ mark)***

Initial temperature t_2 of **BA2**.....^{0}C ***(0½ mark)***

Average initial temperature t_0 .....^{0}C ***(0½ mark)***

Volume of **BA2** added (cm^3)	0.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0
Temperature of solution mixture t_3 (^{0}C)									
Temperature change (^{0}C)									

(05 mark)

Questions

a) Plot a graph of temperature change against volume of **BA2** added ***(05½ marks)***
b) Use your graph to determine the;
   i. The maximum temperature change ***(01 marks)***

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ii. Volume of **BA2** that completely neutralized $30cm^3$ of **BA1.** (*01 mark*)

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c) Calculate;

i. The heat evolved at the end point. (Specific heat capacity of solution= $4.2Jg^{-1}{}^0C^{-1}$, density of solution = $1.0g/cm^3$). (*02 marks*)

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ii. The number of moles of **BA2** that reacted (*01½ marks*)

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iii. The enthalpy of neutralization of sodium hydroxide by sulphuric acid. (*03½ marks*)

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d) Determine the molarity of sodium hydroxide in **BA1.** (*04 marks*)

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2. You are provided with substance **R**, which contains **two** cations and **one** anion. Carry out the following tests to identify the two cations and anion in **R**. Identify any gases that may be evolved.
   Record your observation and deductions in the table below.

Table 2 ***(25 marks)***

TESTS	OBSERVATIONS	DEDUCTIONS
a) Heat a spatula endful of **R** strongly in a hard-dry test tube until there is no further change.		
b) To **two** spatula end-ful of **R** in a test tube, add about $10cm^3$ of water and shake vigorously to dissolve. Then add dilute ammonia solution dropwise until in excess to the resultant solution. Filter and keep both the filtrate and the residue.		

c) To the filtrate in (b), add dilute hydrochloric acid dropwise until the solution is just acidic. Divide the acidic solution into **five** equal parts and test them as follows.		
i) To the **first** part of the acidic solution, add dilute sodium hydroxide solution dropwise until in excess.		
ii) To the **second** part of the acidic solution, add dilute ammonia solution dropwise until in excess.		
iii) To the **third** part of the acidic solution, add **3-4** drops of potassium iodide solution.		
iv) To the **fourth** part of the acidic solution, add **2-3** drops of lead (II) nitrate solution and warm		
v) To the **fifth** part of the acidic solution, carry out a test of your own choice in order to confirm the anion present in **R.**		

d) wash the residue with dilute ammonia solution and dissolve it in **4cm^3** of dilute hydrochloric acid. Divide the resultant solution into **three** parts and test as follows		
i) To the **first** part of the solution, add dilute sodium hydroxide solution dropwise until in excess.		
ii) To the **second** part of the solution, add dilute ammonia solution dropwise until in excess		
iii) To the **third** part of the solution, add a few drops of potassium hexacyanoferrate(III) solution.		

e) Identify the: -

i) Cations in **R**: ..... **And**.....

ii) Anion in **R**: .....

END