NAME...INDEX NO ....

Signature:...School..

P525/3
CHEMISTRY
(PRACTICAL)
Paper 3
Jul. Aug.2023
$3\frac{1}{4}$ Hours

UGANDA TEACHERS' EDUCATION CONSULT (UTEC)

Uganda Advanced Certificate of Education

CHEMISTRY PRACTICAL

Paper 3

3 Hours 15 Minutes

INSTRUCTIONS TO CANDIDATES

Answer all questions. Use blue or black ball point pen. Any work done in pencil will not be marked except drawings.

Record your answers on this question paper on the spaces provided.

Mathematical tables and silent non-programmable calculator may be allowed

Reference books (i.e. text books, booklets and 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 read the question paper and make sure they have all the apparatus and chemicals that they may need.

Q.1	Q.2	Q.3	Total

1. You are provided with the following

    FA1; which is dilute sulphuric acid solution

    FA2; which is a mixture of sodium hydroxide and sodium carbonate

    Solid **Q** which is a metal carbonate

    You are required to standardize FA1 using metal carbonate and use FA1 to determine the percentage composition of FA2

    THEORY

    Metal carbonate reacts with sulphuric acid in a ratio of 1:1

    Procedure I

    Weigh accurately, **1.4g** of solid **J** into a clean beaker. Add about $100 \ cm^3$ of distilled water using a measuring cylinder and stir well to dissolve. Transfer the solution into a $250 \ cm^3$ volumetric flask and make up to the mark with distilled water. Label the solution **FA3**.

    Pipette 20.0 or $25.0 \ cm^3$ of **FA3** into a conical flask. Add 2-3 drops of methyl orange indicator and titrate with **FA1** from the burette. Repeat the titration until you obtain consistent results. Record your results in **Table 1**.

    Mass of weighing bottle + **J** ....g   (½ mark)

    Mass of weighing bottle alone ....g   (½ mark)

    Mass of **J** alone ....g   (½ mark)

    Table I

    Volume of pipette used ....cm^3 (½ mark)

Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of FA1 used cm^3			

                                                                                    (4 ½ marks)

Titre values used to calculate the average volume of FA1.........................cm^3. (½ mark)

Average volume of FA1used...cm^3.   (2 ½ marks)

Questions

(a)   Calculate;

(i)   The moles of metal carbonate in 250 cm^3 of FA3   (2 marks)

(1 mole of metal carbonate weighs 106 g)

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(ii)   The concentration sulphuric acid in FA1 in moldm^{-3} (3 marks)

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Procedure II

Pipette 20.0 or 25.0cm^3 of **FA2** into a clean conical flask. Add 2-3drops of phenolphthalein indicator and titrate with **FA1** from the burette until the end point is reached. Record your results in **Table I** below and then add 2-3 drops of methyl orange indicator to the resultant solution and continue the titration with **FA1** until the end point is reached. Record your results in **Table II below.** Repeat the titration until you obtain consistent results.

Volume of pipette used ....cm³.   (½ mark)

Burette readings	Table I (with phenolphthalein indicator)			Table II (with methyl orange indicator)		
Final burette reading (cm³)						
Initial burette reading (cm³)						
Volume of **FA1** used (cm³)						

(6 marks)

Average volume of **FA1** used for **Table I** ....cm³ (½ mark)

Average volume of **FA1** used for **Table II**............................cm³ (2½ marks)

Questions

(a) Determine the volume of sulphuric acid in **FA1** required for complete neutralization of ;   (1 mark)

(i) Sodium carbonate

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(ii) Sodium hydroxide   (1 mark)

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(b) Calculate the;

(i) The concentration of sodium hydroxide in FA2 in grams per liter (Na=23, C=12, O=16, H = 1).   (4 marks)

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(ii) The concentration of sodium hydroxide in FA2 in grams per liter. (4 marks)

(c) Determine the percentage of sodium hydroxide in the FA2 mixture. (02 marks)

2. You are provided with substance **H**, which contains **two** cations and **two** anions. You are required to carry-out tests below on **H** and identify the cations and anions in **H**. Identify any gas(es) evolved. Record your observations and deductions in the table below.

Table 2   *(30 marks)*

TESTS	OBSERVATIONS	DEDUCTIONS
(a) Heat two spatula endfuls of **H** strongly in a dry test tube until here is no further change.		
(b) To 2 spatula endfuls of **H**, add about 4 cm³ of distilled water and shake well. Filter the mixture and divide the filtrate into three portions		
(i) To the first portion, add lead (ii) nitrate solution followed by dilute nitric acid		
(ii) To the second portion add silver nitrate solution followed by excess ammonia solution		
(iii) To the third portion add barium nitrate solution followed by dilute nitric acid		
(c) Wash the residue with distilled water and add dilute nitric acid. Warm to dissolve. To the resultant solution add aqueous ammonia drop wise until in excess. Filter the mixture and keep both the filtrate and residue.		

(d)	To the filtrate, add dilute nitric acid dropwise until the solution is just acidic. Divide the acidic solution into three portions.		
(i)	To the first portion, add sodium hydroxide solution drop wise until in excess		
(ii)	To the second portion, add ammonia solution drop wise until in excess.		
(iii)	Use the third portion to carry out a test of your own choice to confirm the cation in **H**		
(e)	Dissolve the residue from (c) with minimum volume of dilute nitric acid of dilute nitric acid. Divide the resultant solution into four portions.		
(i)	To the first part add sodium hydroxide solution dropwise until in excess.		
(ii)	To the third part, add dilute ammonia solution drop-wise until in excess.		
(iii)	To the fourth part add potassium chromate(VI) solution followed by sodium hydroxide solution		

(f). (i) Cations in **H**:......................... and ....

(ii) Anions in **H**.........................and...........................

3. You are provided with organic substance **D**. You are required to determine the nature of **D**. Carry out the following tests on **D** and record your observations and deductions in Table 4 below. **(14 marks)**

TESTS	OBSERVATIONS	DEDUCTIONS
(a) Burn a small amount of **P** on a spatula end or on crucible lid.		
(b) To 0.5 cm^3 of **D** add 1 cm^3 of water and shake. Test the resultant solution with litmus paper.		
(c) To 0.5 cm^3 of **D** add 2-3 drops of sodium carbonate solution.		
(d) To 0.5 cm^3 of **D** add iodine solution followed by sodium hydroxide solution drop wise until the solution turns pale yellow. Warm gently and then cool under running tap water.		
(e) To 0.5cm^3 of **D** add 2-3 drops of 2-4 dinitrophenylhydrazine solution		
(f) To 1 cm^3 of **D**, add 2 cm^3 of acidified potassium dichromate (Vi) solution and heat.		
(g) To the 0.5 cm^3 of **D** add equal volume of ammoniacal silver nitrate solution and warm; then allow standing.		
(h) To 1cm^3 of **D**, add 2 cm^3 of Fehling's solution and boil.		

(i) Comment on the nature **D**.

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END