P525/3

CHEMISTRY

(PRACTICAL)

PAPER 3

Jul/Aug 2022

3 ¼ HOURS

BUSOGA REGION JOINT EXAMINATION BOARD

UGANDA ADVANCED CERTIFICATE OF EDUCATION

CHEMISTRY

(PRACTICAL)

Paper 3

3 HOURS 15 MINUTES

INSTRUCTIONS TO CANDIDATES

*Answer **all** questions. Use blue or black ink*

*Any work done in pencil will **not** be marked except drawings*

Record you answers on this question paper in the spaces provided

Mathematical tables and silent non – programable scientific calculators may be used

*Reference books (i.e textbooks, booklets on qualitative analysis etc) should **not** be used*

*Candidates are **Not** allowed to start working with the apparatus for the first 5 minutes.*

This time is to enable candidates read the question paper and make sure they have all the apparatus and chemicals they may need

FOR EXAMINER'S USE ONLY			
Q.1	**Q.2**	**Q.3**	**TOTAL**

1. You are provided with the following
   FA₁ which is a solution containing $3.0gl^{-1}$ of potassium iodate
   FA₂ which is a solution containing $3.5gl^{-1}$ of a salt, $\boldsymbol{MCr_2O_7}$
   Solid, **S** which is sodium thiosulphate crystals, $\boldsymbol{Na_2S_2O_3.5H_2O}$
   You are required to;
   (i) prepare and standardize a solution of sodium thiosulphate
   (ii) determine the atomic mass of **M** in $\boldsymbol{MCr_2O_7}$

   Iodate ions and dichromate(VI) ions oxidize iodide ions to liberate iodine according to the following equations

$$IO_3^-(aq) + 6H^+(aq) + 5I^-(aq) \longrightarrow 3I_2(aq) + 3H_2O(l)$$

$$Cr_2O_7^{2-}(aq) + 14H^+(aq) + 6I^-(aq) \longrightarrow 3I_2(aq) + 2Cr^{3+}(aq) + 7H_2O(l)$$

   (a) **preparing a standardizing sodium thiosulphate solution.**
   Weigh accurately about **5.0g** of **S** and dissolve it in about **100cm³** of distilled water.
   Transfer the solution into a **250cm³** volumetric flask and fill to the mark with distilled water.
   Label the resultant solution **FA₃**
   Pipette **20** or **25cm³** of **FA₁** into a clean conical flask, add **20cm³** of **1M** sulphiric acid followed by **10cm³** of **10%** potassium iodide solution
   Titrate the mixture with **FA₃** using starch as indicator
   Repeat the titration until you obtain consistent values
   Record your results in table 1 below
   Results
   (i) Mass of **S** used ……g (0½mark)

   (ii) Volume of pipette used ……..cm^3 (0½mark)

Table 1

Final Burette reading (cm^3)			
Initial Burette reading (cm^3)			
Volume of FA_3 used (cm_3^3)			

(04½marks)

   (iii) Average volume of **FA₃** used (02½marks)

……

……

……..

Questions

(a) Calculate the;

(i) molarity of **FA_1** (K = 39, I = 127, O = 16) (03marks)

……

……

……

……

……

……

……..……

(ii) molarity of **FA_3** (05marks)

……

……

……

……

……

……

……

……

……

……

……

……

……

……..……

(b) Determining the atomic mass of **M** in MCr_2O_7

Pipette **20** 0r **25cm^3** of **FA_2** into a clean conical flask, add **20cm^3** of **1M** sulphiric acid followed by **10cm^3** of **10%** potassium iodide solution.

Titrate the mixture with **FA_3** until the solution is pale yellow.

Add 5 drops of starch indicator and continue to titrate until the blue colour turns green

Repeat the titration until you obtain consistent values

Record your results in table 2 below

(i) Volume of pipette used ……cm^3 (0½mark)

Table 2

Final Burette reading (cm^3)			
Initial Burette reading (cm^3)			
Volume of FA_3 used (cm_3^3)			

(04½marks)

(ii) Average volume of **FA_3** used (02½marks)

……

……

……

……

Questions

(a) Calculate the number of moles of

(i) **FA_3** that reacted (02marks)

……

……

……

……

……

……

……

(ii) iodine liberated by 20 or 25cm^3 of **FA_2** (02marks)

……

……

……

……

……

……

(b) Determine the;

(i) molarity of **FA_2** (02marks)

……

……

……

……

……

……

(ii) value of **M** in **MCr_2O_7** (03marks)

……

……

……

……

……

……

……

……

2. You are provided with substance **T**, which contains two cations and two anions. Carry the tests in table 3 below to identify the cations and anions in **T**. Identify any gas(es) evolved. Record your observations and deductions in the table.

Table 3

TEST	OBSERVATION	DEDUCTION
(a) Heat two spatula endfuls of **T** strongly in a dry test tube. Keep the residue for part (d)		
(b) To one spatula endful of **T** in a test tube, add copper turnings followed by 5 drops of concentrated sulphiric acid and heat the mixture		
(c) Dissolve two spatula endfuls of **T** in about $6cm^3$ of water and divide the resultant solution into four portions		
(i) To the first portion of the solution, add equal amount of ethanol followed by 2 – 3 drops of concentrated sulphiric acid and heat. Pour the mixture into a beaker of water		
(ii) To the second portion of the solution, add sodium hydroxide solution dropwise until in excess		

(iii) To the third portion of the solution, add 3 – 4 drops of dilute hydrochloric acid. Boil the mixture and cool		
(iv) Use the fourth portion to carry out a test of your own to test for one of the cations in **T** **…….....** **……** **……**		
(d) To the residue from (a), add about 5cm^3 of dilute sulphiric acid and warm. Filter and divide the filtrate into two parts		
(i) To the first part of the filtrate, add sodium hydroxide solution dropwise until in excess		
(ii) To the second part of the filtrate, add solid ammonium chloride and shake to dissolve. Add 2 - 3 drops of disodium hydrogen phosphate solution followed by ammonia solution dropwise until in excess		

(e) Identify the;

(i) Cations in **T**

……

……

(ii) Anions in **T**

……

……..

3. You are provided with an organic compound **V**. you are required to carry out tests in table 4 below on **V** and describe the nature of **V**. Record your observations and deductions in table. (17marks)

TESTS	OBSERVATIONS	DEDUCTIONS
(a) Burn a small amount of **V** on a spatula end or in a dry porcelain dish		
(b) To about $1cm^3$ of **V**, add water, shake and test the mixture with litmus paper		
(c) To about $1cm^3$ of **V**, add 2 – 3 drops of neutral Iron(III) chloride solution		
(d) To about $1cm^3$ of **V**, add 3 – 4 drops of 2,4 – dinitro – phenylhydrazine		
(e) To about $2cm^3$ of **V**, add 3 – 4 drops of acidified potassium dichromate(VI) solution and heat		
(f) To about $2cm^3$ of **V**, add 2 – 3 drops of Luca's reagent		

(g) Describe the nature of **V**

……

……

……

……

END