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P525/3

CHEMISTRY

Paper 3

June 2016

3 ½ hours

RESOURCEFUL MOCK EXAMINATIONS 2016

Uganda Advanced Certificate of Education

CHEMISTRY PRACTICAL

Paper 3

3hours 15minutes

INSTRUCTIONS TO CANDIDATES

Answer all questions.

Record your answers on this question paper in the spaces provided

Mathematical tables, slide rules 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 Examiners use only			
Q.1	Q.2	Q.3	Total

1. You are provided with the following:

HA1; which is a solution containing 20g l^{-1} of sodiumthiosulphate-5 water, $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$

HA2; which is potassium manganate (VII) solution of unknown concentration

0.5M potassium iodide solution

2M Sulphuric acid

Solid P, which is Ferrous ethane dioate crystals, $(\text{COO})_2\text{Fe} \cdot n\text{H}_2\text{O}$

You are required to standardize HA2 and then use it to determine the value of n in $(\text{COO})_2\text{Fe} \cdot n\text{H}_2\text{O}$

Theory:

Manganate (vii) ions react with thiosulphate ions, ethane dioate ions and iron (ii) ions in acidic medium according to the following equations



Procedure I

(a). Pipette 25cm^3 of HA2 into a clean conical flask, add 10cm^3 of 2M sulphuric acid followed by 10cm^3 of 0.5M potassium iodide solution and titrate with HA1 from the burette until the solution becomes pale yellow. Add 1cm^3 of starch indicator and continue the titration until the solution turns colourless. Repeat the titration 2-3 times until you obtain consistent results. Enter your results in the table I below.

Table I:

Volume of pipette used: cm^3

	1	2	3
Final burette reading(cm^3)			
Initial burette reading(cm^3)			
Volume of HA1 used(cm^3)			

Titre values for calculating average volumes of HA1

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Average volume of HA1.....cm³

Questions

Calculate the molar concentration of manganate (vii) ions in HA2

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Procedure II

(c) Weigh accurately about 1.2g of P and place it into a 250cm³ volumetric flask. Add to it 40cm³ of 2M sulphuric acid. Shake to dissolve and make up to the mark with water. Label the resultant solution HA3.

Pipette 25 cm³ of HA3 into a clean conical flask, add 10cm³ of 2M sulphuric acid and then heat the mixture to boiling temperature. Titrate the hot solution with solution HA2 from the burette. Repeat the titration 2-3 times until you obtain consistent results. Enter your results table II below.

Table II

Mass of empty container + P =g

Mass of empty container alone =g

Mass of P alone =g

Volume of pipette used:.....cm³

	1	2	3
Final burette reading(cm ³)			
Initial burette reading(cm ³)			
Volume of HA2 used(cm ³)			

Titre values for calculating average volumes of HA2

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Average volume of HA2.....cm³

Questions:

(d) Calculate the number of moles of

(i) manganate (VII) ions that reacted with 25cm^3 of HA_3

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(ii) iron (II) ions in 25cm^3 of HA_3 that reacted

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(e) Determine the

(i) mass of anhydrous $(COO)_2Fe$ in 250cm^3 of HA_3 (C=12, Fe=56, O=16, H=1)

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(ii) value of n in $(COO)_2Fe \cdot n H_2O$

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2. You are provided with substance T which contains three cations and one anion. You are required to identify the cations and anion in T. Carry out the following test on T and record your observations and deductions in the table below. Identify any gas (es) evolved.

Tests	Observations	Deductions
(a). Heat two spatula endfuls of T strongly in a dry test tube until there is no further change.		
(b). To two spatula endfuls of T in a test tube, add 5cm ³ of water and filter. Keep both the residue and filtrate.		
(c). Divide the filtrate into five portions. (i) To the first portion add sodium hydroxide solution drop wise until in excess. Then warm the mixture.		

Tests	Observations	Deductions
(ii). To the second portion add ammonia solution drop wise until in excess.		
(iii)To the third portion, add 3-4 drops of ammonium thiocyanate solution.		
(iv)To the fourth portion, add 3-4 drops of barium nitrate solution followed by about 1cm ³ of dilute nitric acid.		
(v)To the fifth portion add 3-4 drops of silver nitrate solution and divide the resultant mixture into two portions.		
· To the first portion add dilute ammonia solution drop wise until in excess.		
· To the second portion add dilute nitric acid drop wise until in excess		
(d)Wash the residue with water and then dissolve it in dilute hydrochloric acid. Divide the acidic solution into three portions.		

Tests	Observations	Deductions
(i) To the first portion of the acidic solution, add sodium hydroxide solution drop wise until in excess.		
(ii) To the second portion of the acidic add, ammonia solution drop wise until in excess.		
(iii) To the third portion of the acidic solution, add 3-4 drops of potassium hexa cyanoferrate (ii) solution		

(e)(i). Cations in T are:..... and.....

(ii). Anions in T are:..... and.....

3. You are provided with organic substance V. You are required to identify the nature of V. Carry out the following test on V and record your observations and deductions in the table below.

Tests	Observations	Deductions
(a) Burn a spatula endful of V on a porcelain dish or at the end of a spatula.		
(b) To about 1cm^3 of V, add 2cm^3 of water, shake and test the mixture with litmus paper.		
(c) To 3cm^3 of V in a test tube, add 1cm^3 of methanol and divide the resultant mixture into five portions.		
(i) To the first portion of the mixture, add a spatula endful of solid sodium hydrogen carbonate.		
(ii) To the second portion of the mixture, add 3-4 drops of neutral iron(III) chloride solution.		
(iii) To the third portion of the mixture, add 3cm^3 of Brady's reagent.		

Tests	Observations	Deductions
(iv) To the fourth portion of the mixture, add about 1cm ³ of Fehling's solution and boil.		
(v) To the fifth portion of the mixture, add about 1cm ³ of iodine solution followed by drop wise addition of sodium hydroxide solution until the brown colour of iodine is discharged. Warm the mixture gently and allow to stand		

Comment on the nature of V.

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END