NAME: .....

SCHOOL: ..... RANDOM NO: .....

P525/3
CHEMISTRY
Paper 3
July/Aug. 2024
$3\frac{1}{4}$ hours

ASK INTEGRATED TEACHERS MOCK
EXAMINATIONS BURREAU

AITEL JOINT MOCK EXAMINATIONS 2024.

Uganda Advanced Certificate of Education

CHEMISTRY

PAPER III

PRACTICAL

3 HOURS 15 MINUTES

INSTRUCTIONS TO CANDIDATE.

All questions are compulsory
Answers to be written in the spaces provided
All your work must be in blue or black ink
Any work done on pencil will not be marked
You are not allowed to work worth the apparatus for the paper and check whether you have all the chemicals and apparatus
All working must be clearly shown
Mathematical tables and silent non-programmable scientific calculators may be used.

(O=16, Na =23, S =32, Mn =55)

You are provided with the following.

FA1: which contains 3.95g of an hydrous sodium thiosulphate, $Na_2S_2O_3$ in $500cm^3$ of solution.

FA2: which is hydrogen peroxide solution

Solid T: which is a salt containing manganate (VII) ion.

5% potassium iodide solution.

Starch solution

You are required to determine the,

(i) concentration of hydrogen peroxide in $moldm^3$ of FA2
(ii) Percentage of manganese in T.

Theory:

In acidic medium, hydrogen peroxide reacts with Manganese (VII) ions and iodide ions according to the following reactions.

$$2MnO_{4\,(aq)}^{-} + 5H_2O_2(aq) + 6H^+(aq) \longrightarrow 2Mn^{2+}(aq) + O_2\,(g) + 8H_2O_{(l)}$$

$$H_2O_2(aq) + 2I^-(aq) + 2H^+(aq) \longrightarrow I_2\,(aq) + 2H_2O_{(l)}$$

The Iodine liberated reacts with thiosulphate ions according to the following equations.

$$I_{2\,(aq)} + 2SO_3^{2-}(aq) \longrightarrow S_4O_6^{2-}(aq) + 2I_{(aq)}^-$$

PROCEDURES

PART A:

(a) Using a measuring cylinder, transfer exactly $5.0cm^3$ of FA2 into a $250cm^3$ volumetric flasks.

(b) Pipette $10.0cm^3$ of FA3 into a conical flask; add an equal volume of 1M sulphuric acid. Using a measuring cylinder followed by $10cm^3$ of 5% potassium iodide solution. Warm the mixture to 50°C and titrate with FA1 from the burette until the solution is pale yellow.

Add starch indicator and continue the titration until the end point. Repeat the titration until you obtain consistent results.

Record You're Results in the Table Below.

Volume of Pipette Used.....cm^3 $(1|2\ mks)$

Table 1

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

(4 1|2 *mks*)

Volume of FA1 used for calculating average volume
(1|2*mk*)

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Calculate the average volume of FA1 used **$(2\frac{1}{2}\ mk)$**

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Questions:

(a) Calculate the number of moles of iodine that reacted with FA1 **$(2^1/_2$ marks)**

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(b) Determine the concentration of FA2 in moledm^{-3} **(3 *mks*)**

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PROCEDURE

PART B:

(C) Weigh accurately about 0.8g of T and transfer it into a $250cm^3$ volumetric flask. Add about $100cm^3$ of 1M sulphuric acid followed by $15cm^3$ of FA2. Make the solution up to the mark with distilled water and allow to stand for about five minutes. Label the solutions FA4.

(d) Pipette $10.0cm^3$ of FA4 into a conical flask; add an equal volume of 1M sulphuric acid using a measuring cylinder, followed by $10cm^3$ of 5% potassium iodide solution. Warm the mixture to 50°C and titrate with FA1 from the burette until the solution is pale yellow. Add starch indicator and continue the titration until the end point.

Repeat the titration until you obtain consistent results. Record your results in table II below.

RESULTS:

Mass of weighing bottle + T.....g **(1|2 *mk*)**

Mass of empty weighing bottle.....g **(1|2 *mk*)**

Mass of T used.....g **(1|2*mk*)**

Volume if pipette used.....cm^3 **(1|2 *mk*)**

Table II

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

(4 1|2 *mks*)

Volume of FA1 used for calculating average volume

(1|2*mk*)

.....

Calculate the average volume of FA1 used **($2\frac{1}{2}$ *mk*)**

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Questions:

(c) Calculate the number of moles of

(i) Iodine that reacted with thiosulphate ions in FA1 **($1^1/_2$ mks)**

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(ii) Excess hydrogen peroxide obtained in $250cm^3$ **($1^1/_2$ mks)**

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(iii) Hydrogen peroxide that reacted with T. **($1^1/_2$ mks)**

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Determine the percentage of Manganese in I (3mks)

G contains two cations and anions.

Test	Observation	Deduction
(a) A spatula end-full of G is heated strongly until no further change takes place.		
(b) Two spatula end-full of G is shaken with about $8cm^3$ of water. The mixture was filtered and both the filtrate and residue kept.		

(c) The filtrate was divided into four parts. (i) To the first part is added dilute NaOH drop wise until in excess		
(ii) To the second part is added dilute aqueous ammonia drop wise in excess		
(iii) To the third part was about some lead (IV) oxide followed by about $0.5cm^3$ of conc. $HNO_3$and the mixture boiled.		
(iv) The last part was used for carrying out a test of one's choice to confirm the anion in the filtrate. Test:		

(d) The residue is washed and dilute HNO_3 added drop wise until no further change occurs. The resultant solution is then divided into 6 parts		
(i) To the first part is added dilute NaOH drop wise until in excess		
(ii) To the second part is added aqueous ammonia		
(iii) The third part was used to carry out a test of one's choice to confirm the cation present. Test:		

(iv)	To the fourth part is added about 1cm^3 of lead ethanoate solution and the mixture warmed.		
(v)	To the fifth part is added dilute ethanoic acid followed by a few drops of sodium nitrite and carbon tetrachloride.		
(vi)	To the sixth part is added conk HNO3 followed by potassium dichromate and heated		

The cations in G are .....and.....

The anions in G are .....and.....

You are provided with substance R which is an organic compound. You are requested to carry out the tests on R to determine the nature of R. Record your observation and deductions in the table below

TEST	OBSERVATIONS	DEDUCTION

(a) Burn a small amount of R on a spatula end or on a porcelain dish		

(e) To 1cm^3 of R, add about 3cm^3 of iodine solution followed by sodium hydroxide solution drop wise until the colour of Iodine is discharged.		

(f) Describe the nature of R

END