

P525/3

Chemistry

Paper 3

3 ¼ hours

INTERNAL MOCK EXAMINATIONS 2011

P525/3 CHEMISTRY

PAPER 3

3 ¼ hours

Instructions to Candidates

Answer all questions

Record your answers in the spaces provided only

*Candidates are not allowed to start work with the apparatus for the first **15 minutes***

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

1. You are provided with the following:
FA1; which is Oxalic acid solution.

Solid Q; which is a sample of pyrolusite,

Impure manganese (IV) oxide , MnO₂.

1M sulphuric acid

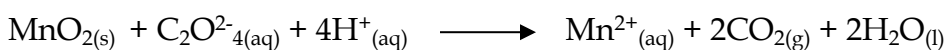
You are required to determine the ;

(a) Molar concentration of FA1

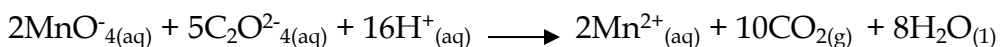
(b) Percentage of Manganese (IV) oxide, MnO₂ in the pyrolusite.

Theory:

Pyrolusite is an Impure form of Manganese (IV) oxide. The Manganese (IV) oxide reacts with acidified oxalate as follows:



Oxalate ions react with acidified potassium permanganate as follows;



Procedure

PART A

- a) By means of a measuring Cylinder , measure 100cm³ of FA1 and transfer it into a 250cm³ volumetric flask. Then add distilled water and make up to the mark. Label resultant solution FA3 .
- b) Pipette 25cm³ of FA3 into a clean conical flask followed by 20cm³ of 1M sulphuric acid and heat the mixture to about 70⁰C. Titrate the hot solution immediately with FA2 from the burette. Repeat the procedure 2 -3 times to obtain consistent readings. Record your results in the table below.

Results

Volume of pipette used(cm³)

Final burette reading (cm ³)			
Initial burette reading (cm ³)			
Volume of FA2 used (cm ³)			

Volumes of FA2 used to calculate average

Volume;(cm³)

Questions

a) Calculate the;

i) Moles of MnO_4^- in FA2 that reacted

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ii) Moles of $\text{C}_2\text{O}_4^{2-}$ in FA3 that reacted.

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iii) Molar concentration of $\text{C}_2\text{O}_4^{2-}$ in FA1

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PART B

d) Weigh accurately 1.2g of Q and transfer it into a conical flask. Add to it about 100cm³ of FA1 followed by about 20cm³ of 1M sulphuric acid. Boil the mixture gently for about 4 -5 minutes (with a glass funnel in the neck of the flask) until the remaining solid particles become white. Cool the mixture and transfer it into a 250cm³ volumetric flask and then make up to the mark with distilled water. Label the resultant solution FA4.

e) Pipette 25cm³ of FA4 into a clean conical flask, then add 20cm³ of 1M sulphuric acid and heat the mixture to about 70°C. Titrate the hot solution

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 immediately with FA2 from the burette. Repeat the procedure 2 -3 times to
 obtain consistent readings . Record your results in the table below.

Mass of weighing vessel + Q.....g

Mass of weighing vessel aloneg

Mass of Q aloneg

Volume of pipette.....(cm³)

Final burette reading (cm ³)			
Initial burette reading (cm ³)			
Volume of FA2 used (cm ³)			

Volumes of FA2 used for calculating

average.....
(cm³)

Average of FA2(cm³)

QUESTIONS

f) Calculate the number of moles of ;

i) FA2 that reacted.

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ii) C₂O₄²⁻ that reacted with FA2.

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iii) C₂O₄²⁻ that reacted with MnO₂.

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iv) MnO_2 that reacted with $\text{C}_2\text{O}_4^{2-}$ ions.

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g) Determine the percentage of MnO_2 in the pyrolusite.

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2. You are provided with substance T which contains two cations and two anions. You are required to identify the cations and anions in T. Carry out

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 the tests below and record your observations and deductions in the table
 below. Where a gas is evolved, it should be identified.

TESTS	OBSERVATIONS	DEDUCTIONS
a) Heat a spatula endful of T in a hand glass test tube first gently and then more strongly until there is no further change.		
b) Put three spatula endfuls of T in a testtube . Add about 3cm ³ of water and shake vigorously . Then add dilute sodium hydroxide solution dropwise until in excess and filter. Keep both filtrate and residue.		
c) To the filtrate , add dilute nitric acid dropwise until the solution just becomes acidic. Then divide the resultant solution into seven parts.		
(i) To the first part of the solution , add dilute sodium hydroxide solution drop-wise until in excess.		
ii) To the second part of the solution. Add dilute		

ammonia dropwise until in excess.		
iii) Use the third part of solution , to carry out a test of your own choice to confirm one of the cations in T.		
iv) To the fourth part of the solution , add about 3 -4 drops of lead (II) nitrate solution and warm.		
v) To the fifth part of the solution, carry out a test of your own choice to confirm one of the anions in T.		
vi) To the sixth part of the solution , add 5 drops of neutral Iron (III) chloride solution and heat gently to boiling.		
vii) To the seventh part of the solution , carry out a test of your own to confirm the second anion in T.		
d) To the residue , add dilute hydrochloric acid until there is no further change. Divide the solution into four portions.		
i) To the first portion of the solution , add dilute sodium		

hydroxide drop-wise until in excess.		
ii) To the second portion of the solution , add dilute ammonia solution dropwise until in excess.		
iii) To the third part of the solution , add 2-3 drops of dilute sulphuric acid.		
iv) To the fourth part of the solution , add 2 -3 drops of potassium chromate (VI) and then add dilute sodium hydroxide solution drop wise until in excess and allow mixture to stand.		

d) Identify the ;

(i) Cations in Tand.....

(ii) Anions in Tand.....

3. You are provided with an organic substance W. You are required to determine the nature of the substance. Record your observations and deductions in the table below.

TESTS	OBSERVATIONS	DEDUCTIONS
a) Burn a spatula endful of W on a porcelain dish.		
b) To about 0.5cm ³ of W, add 3 -4 drops of neutral Iron (III) Chloride solution and heat.		
c) To about 0.5cm ³ of W, add 3 -4 drops of Brady's reagent.		
d) To about 3cm ³ of W, add 3cm ³ of distilled water and shake. Then test with litmus paper. Divide the resultant mixture into three parts.		
i) To the first part, add 1cm ³ of propan-1-ol followed by 2 -3 drops of concentrated sulphuric acid and heat . Cool and pour the contents on Petri dish.		
ii) To the second part, add 3 -5 drops of acidified potassium dichromate and heat.		
iii) To 2cm ³ of silver nitrate solution, add 2 drops of dilute sodium hydroxide . Then add ammonia solution dropwise until the precipitate just dissolves .Add 2cm ³ of the third part and warm.		

From your results above, deduce the nature of compound W.

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