Name……**Adm No**……

Class…… **Date**……

233/3

CHEMISTRY

Paper 3

(PRACTICAL)

Time - 2 ¼ hours

INSTRUCTIONS

(a) Write your name and other details required in the cover page.

(b) Answer all questions in the spaces provided in the question paper.

(c) You are not allowed to start working with the apparatus for the first 15 minutes of the 2 hours and 15 minutes. This time is to enable you to read the question paper and make sure you have all chemicals and apparatus that you may need.

(d) All workings must be clearly shown where necessary.

(e) Electronic calculators may be used.

(f) This paper consists of printed pages.

(g) Check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

For Examiner's Use Only

Question	Maximum Score	Candidate's score
1	17	
2	11	
3	12	
Total Score	40	

1. **You are provided with**:

- Acidified aqueous potassium manganate(VII), $KMnO_4$, solution A,.
- Solution B containing 11.75g of ammoniumiron(II)sulphate, $(NH_4)_2Fe(SO_4)_2.6H_2O$ dissolved in 500 $cm^3$of solution.
- Solution C containing 1.25g of a dibasic acid, $H_2X.\ 2H_2O$ dissolved in 250cm^3 of solution.

You are required to:

- Standardize solution A using solution B.
- Use the standardized solution A to determine the concentration of solution C.
- Determine the molecular mass of X.

Procedure I:

Fill the burette with solution A.Using a pipette and pipette filler, place 25 $cm^3$of solution B into a 250 ml conical flask. Titrate solution A with B until a permanent pink colour just appears.Record your results in table 1 below. Repeat this procedure two more times and complete table 1.

TABLE 1

Titration	I	II	III
Final burette reading, cm^3			
Initial burette reading, cm^3			
Volume of solution A used, cm^3			

(4 marks)

(a) Calculate the average volume of solution A used. (1 mark)

(b) Calculate the concentration of B in moles per litre. (RFM of B is 392)
(1 mark)

(c) Calculate the number of moles of iron (II)ions in the 25 cm^3 of solution B. (1 mk)

(d) Calculate the concentration of manganate(VII)ions in solution A in moles per litre given: (1 mk)

$$MnO_4^-(aq) + 5Fe^{2+}(aq) + 8H^+(aq) \longrightarrow Mn^{2+}(aq) + 5Fe^{3+}(aq) + 4H_2O(l)$$

Procedure II:

Pipette 25 cm^3 of solution C into a conical flask. Heat this solution to about 70 ^0C and titrate the hot solution C with solution A in the burette until a permanent pink colour just appears. Shake thoroughly during titration. Record your results in table II. Repeat this procedure to complete table II.

TABLE 1I

Titration	I	II	III
Final burette reading, cm^3			

Initial burette reading, cm^3			
Volume of solution A used, cm^3			

(4 mks)

(e) Calculate the average volume of solution A used in table II.. (1 mark)

(f) Calculate the number of moles of manganate (VII) ions in table II above. (1 mk)

(g) Given that 2 moles of of manganate (VII) ions react with 5 moles of the dibasic acid C, calculate the number of moles of the dibasic acid used in moles per litre. (1 mk)

(h) Calculate the:

(I) Formula mass of the dibasic acid, solution C.(H = 1.0, O = 16.0) (1 mk)

(II) Formula mass of X in the dibasic acid C.(1 mk)

2. You are provided with solid M. Carry out the tests and write your observations and inferences in the spaces provided.

(a) Describe the appearance of solid P. (1 mark)

Appearance

(b) Place the solid M in a boiling tube. Add about 12cm^{3}of distilled water and Shake well.Divide the solution into five portions and carry out the tests below.

(I) To the first portion, dip both red and blue litmus paper.

Observations	Inferences
(1 mark)	(1 mark)

(II) To the second portion, add sodium hydroxide solution dropwise until in excess.

Observations	Inferences
(1 mark)	(1 mark)

(III) To the third portion, add aqueous ammonia dropwise until in excess.

Observations	Inferences
(1 mark)	(1 mark)

(IV) To the fourth portion, add three drops of sodium chloride solution.

Observations	Inferences
(1 mark)	(1 mark)

(V) To the fifth portion, add two drops of barium nitrate followed by five drops of nitric(V) acid.

Observations	Inferences
(1 mark)	(1 mark)

3. You are provided with solid P. Carry out the following tests and record your observations and inferences in the spaces provided.

(a) Place about one third of the solid P on a clean metallic spatula and ignite using a Bunsen burner.

Observations	Inferences
(1 mark)	(1 mark)

(b) Place the remaining solid P in a boiling tube. Add about $10cm^3$ of distilled water and Shake well.

Observations	Inferences
(1/2mark)	(1/2 mark)

(c) Divide the mixture into three portions.

i. To the first portion add two drops of acidified potassiummanganate(VII).

Observations	Inferences
(1 mark)	(1 mark)

ii. To the second portion, add two drops of bromine water.

Observations	Inferences
(1 mark)	(1 mark)

iii. To the third portion, describe the procedure you can use to determine the PH using the reagents given.

Procedure:
(1 mark)

iv. Carry out your procedure in (iii) to determine the PH.

Observations	**Inferences**
(1 mark)	(1 mark)

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