Question 1. **[7]**

You are provided with two solutions as follows:

(a) **C-10** is a solution containing 1.6 g of pure potassium manganate (VII) ($KMnO_4$) per litre of the solution.

(b) **C-11** is a solution containing 18.0 g of impure sample of hydrated ammonium iron (II) sulphate crystals [$(NH_4)_2SO_4FeSO_4.6H_2O$] per litre of the solution.

PROCEDURE

Rinse and fill the burette with the given solution C-10. Pipette out 20 cm^3/25 cm^3 of solution C-11 into a clean conical flask. To it add about 20 cm^3 of C-12 (dilute H_2SO_4).

Run the solution C-10 from the burette slowly into the flask dropwise till it gives a light pink color to the solution in the flask. The pink color should not disappear on shaking the contents in the flask. This gives the end point.

Show it to the Visiting Examiner.

Repeat the titration to get at least two concordant readings.

Tabulate at least three readings.

State the:

(i) capacity of the pipette used.

……

(ii) titre value you intend to use in your calculation.

……

The equations for the reactions are as follows:

$2KMnO_4 + 3H_2SO_4 \rightarrow K_2SO_4 + 2MnSO_4 + 3H_2O + 5[O]$

$10(NH_4)_2SO_4.FeSO_4.6H_2O + 5H_2SO_4 + 5[O] \rightarrow 10(NH_4)_2SO_4 + 5Fe_2(SO_4)_3 + 65H_2O$

Ionic Equation for the reaction is as follows:

$2MnO_4^- + 16H^+ + 10Fe^{2+} \rightarrow 2Mn^{2+} + 10Fe^{3+} + 8H_2O$

Relative atomic masses:

K=39, Fe=56, S=32, N=14, H=1, Mn = 55, O=16

Calculate the following.

(i) The molarity of the solution of potassium manganate (VII), C-10.

(ii) The molarity of hydrated ammonium iron (II) sulphate, C-11.

(iii) The strength of hydrated ammonium iron (II) sulphate, C-11.

(iv) The purity percentage of hydrated ammonium iron (II) sulphate, C-11.

Question 2 **[5]**

Substances C-13 and C-14 are organic compounds. Carry out the following experiments and note down all the changes taking place at each step of experiment.

Note the smell of the substances formed, color of the solution obtained and precipitate formed. Identify the compound on the basis of your observations and deductions.

(a) **Substance C-13**

Qn. No.	**Procedures**	**Observation/s**	**Deduction/s**
(i)	Take $1cm^3$ of C-13 in a clean test-tube and add about 2 drops of blue litmus solution.		
(ii)	Take $1cm^3$ of C-13 in a test-tube and add a pinch of $NaHCO_3$.		

(iii)	To 1cm^3 of C-13, add 2cm^3 of ethanol and few drops of conc. H_2SO_4 slowly and heat the content in a boiling water bath. Then pour the contents in a beaker containing cold water.		
(iv)	Shake 1cm^3 of C-13 with 3cm^3 of distilled water in a clean test-tube and add NH_4OH solution drop wise till a clear solution is obtained. Heat the content to remove the smell of ammonia. Then add a few drops of neutral $FeCl_3$ solution.		

(b) **Substance C-14**

Qn. No.	**Procedures**	**Observation/s**	**Deduction/s**
(i)	Take 1cm^3 of aqueous solution of C-14 in a clean test-tube and add a few drops of blue litmus solution.		
(ii)	To a few crystals (about 0.5g) of C-14 add about 5cm^3 of H_2O and shake well. Then add a few drops of neutral ferric chloride ($FeCl_3$) solution.		

(iii)	Mix a few crystals of C-14 and a few crystals of $NaNO_2$ (sodium nitrite) in a test-tube. To it add 4-5 drops of conc. H_2SO_4 and shake gently. Then heat the contents in a hot water bath. Cool and dilute with cold water.		
(iv)	Take a few crystals of C-14 in a clean dry test-tube and add a few crystals of phthalic anhydride. Now add a few drops of conc. H_2SO_4 and shake gently until it becomes red brown. Cool it and add $5cm^3$ of H_2O. Then slowly add NaOH solution by shaking until the solution becomes alkaline.		

Question 3 **[8]**

Analyse qualitatively the substance **C-15** which contains two cations and two anions. Identify these ions. *The Visiting Examiner will check one observation of an anion or a cation during the salt analysis.*

(a) While testing for anions you must mention:

(i) How the water extract / soda extract was prepared?

(ii) How the gases were identified?

(iii) One confirmatory test for each anion.

(b) While testing for cations you must mention:

(i) How the original solution for group analysis was prepared?

(ii) The formal group with pertinent group reagents.

(iii) One confirmatory test for each cation.

Note:

1. Use of qualitative analysis booklets / tables are not allowed.
2. Dry test are not accepted as confirmatory.
3. Tabulate the experiment, observation and inference as per the example given below.
1. If the *experiment* is incorrect, no marks will be awarded for the *observation* and *inference*.

Sl. No.	**Experiment**	**Observation**	**Inference**
1.			
2.			