Question 1 **[10]**

Determine the percentage purity of potassium manganate (VII) using the solutions provided to you by permanganometry titration.

a) **C-10** is a solution containing 0.4 g of potassium manganate (VII) per 250 mL.

b) **C-11** is a solution containing 20.3 g of hydrated ammonium iron (II) sulphate per 500 mL.

c) **C-12** is a 1.0 M dilute sulphuric acid.

[Relative atomic mass: K=39, Mn = 55, Fe = 56, S = 32, O = 16, N = 14, H = 1]

Based on the above experiment, answer the following questions:

i. Write the chemical equations for the given redox titration.

ii. Identify the oxidizing agent and reducing agent from the equation.

iii. Calculate the molarity of C-11 solution using the strength provided in the question. This solution should be used as a stock solution for the preparation of required subsequent solution.

Read the given procedure carefully and prepare $\frac{1}{20}$ M **C-11** solution.

Step1: Rinse and fill the burette with water.

Step 2: Deliver 50 mL of water in a clean 250 cc beaker. Discard the remaining water in the burette.

Step 3: Rinse and fill the burette with the given **C-11** stock solution.

Step 4: To the beaker containing 50 mL water, add another 50 mL of **C-11** stock solution from the burette.

Step 5: Stir the solution with a glass rod to make it uniform throughout.

Step 6: Label it as $\frac{1}{20}$ M **C-11** solution.

iv. Carry out the volumetric titration using the given C-10 and $\frac{1}{20}$ M C-11 solutions. Write the complete procedure of this titration stating the capacity of pipetted used.

v. Tabulate your readings *(Show your final titre value and titrant to the Visiting Examiner).*

vi. Calculate the molarity of C-10 solution. (Round off your answer to **TWO** decimal places)

vii. Determine the strength of **C-10** solution in gram per litre.

viii. Express the purity of **C-10** solution in percentage.

ix. Give **ONE** reason why purity of **C-10** is determined in the above titration.

x. Why dilute Sulphuric acid used in permanganometry titration is measured with a measuring cylinder instead of a pipette?

Question 2 **[10]**

You are provided with a salt mixture **S-1** which contains two cations. (**S-1** is a 1:1 mixture of substances **C-5** and **C-7**). Qualitatively analyze the given salt mixture and identify the cations present. While testing for cations you must mention:

a. how the original solution for group analysis was prepared?

b. the formal group analysis with pertinent group reagents.

c. one confirmatory test for each cation.

Show the confirmatory observation of each cation to the Visiting Examiner.

Analysis of a salt mixture, S-1

Report your analysis in the given table of observation.

Sl/No	Experiment	Observation	Inference	

Based on the above salt mixture analysis, answer the following questions:

i. Explain why original solution is prepared for the detection of cations?

ii. Write a balanced chemical equation representing the confirmatory observation of a cation present in the mixture, **S-1**.

iii. Why is it necessary to boil off H_2S from the filtrate of group II before proceeding for the analysis of group III?

iv. Design a simple chemical test to confirm that H_2S is completely removed from the filtrate of group II?

v. Devise an alternative way to avoid boiling off H_2S gas in group III analysis?

Rough Work