21CHE1C4L

M.Sc. I Semester Degree Examination, April/May - 2024
CHEMISTRY
Analytical Methods and Treatment of Data
(NEP)

Time : 3 Hours   Maximum Marks : 70

Note : Answer **any five** of the following questions with Question No. **1 Compulsory**. Each question carries **equal** marks.

1. (a) What is sampling ? Explain the procedure involved in the sampling of solids and liquids.

   (b) Account on different types of errors. Explain the distribution of random errors in normal error curve.

   (c) What is the significance of Q-test ? A chemist analysed Vitamin C content in a given sample and obtained the following results : 50.2, 50.4, 50.0, 49.5 and 50.3 mg. Find whether the fourth data in the set of measurement is having any significant difference at 95% confidence level, (Given Q-value at 95% confidence level =0.710)   **5+5+4=14**

2. (a) Explain the criteria for the selection of indicator as well as mechanism of indicator action of redox indicators with a suitable example.

   (b) Discuss the procedure involved in the determination of manganese and zinc in a mixture by complexometric titration.

   (c) Derive the titration curve for the titration of 50 mL 0.1 N H_2SO_4 with 0.1 N NaOH.   **5+5+4=14**

3. (a) Enumerate the conditions for precipitation. Discuss the properties and applications of 8-hydroxy quinoline as precipitating agent with a suitable example.

   (b) With the help of chemical reactions, explain the Volhard's method in the determination of chloride.

   (c) Describe the conditions and advantages of precipitation from homogenous solution.   **5+5+4=14**

4. (a) State the Distribution Law. Derive the relationship between Distribution Ratio and Distribution Coefficient.

    (b) Enumerate the principle and different types of paper chromatographic techniques.

    (c) With the help of chemical reaction, explain the procedure for the synthesis of anion exchange resins.   **5+5+4=14**

5. (a) Discuss the principle of conductometry. Sketch the conductometric titration curve for :

    (i) H_2SO_4 vs NaOH   and   (ii) CH_3COOH vs NaOH

    (b) What is a reference electrode ? Sketch the calomel electrode and explain its working.

    (c) Discuss the principle and types of amperometric titration curves.   **5+5+4=14**

6. (a) A chemist analysed hematite ore for replicate measurement using a new method and the results are as follows : 24.5, 24.3, 24.6 and 24.6 mg. If the theoretical value is 25.4 mg, find whether the new method has significant difference from standard method at 95% confidence level. (Given t-value at 95% confidence level = 3.182)

    (b) With the help of chemical reactions, explain the procedure involved in the determination of ascorbic acid using I_3.

    (c) Discuss the factors influencing the sharpness of endpoints in precipitation titrations.   **5+5+4=14**

7. (a) Enumerate the methodology involved in Thin Layer Chromatography (TLC).

    (b) Write a note on Rapid Scan Polarography.

    (c) Briefly explain the principle and mechanism involved in ion exchange reactions.   **5+5+4=14**

8. (a) What are complexation reactions ? 1.0 g of limestone was dissolved and diluted to 100 mL. 10 mL of this solution required standardized 0.021 M 6.5 mL of EDTA for Eriochrome Black-T endpoint. Calculate the % of $CaCO_3$ present in the given limestone sample. (Given molecular weight of $CaCO_3$=100 amu)

    (b) With neat schematics, explain the principle and working of eletrogravimetry.

    (c) Explain the applications and advantages of voltametry with microelectrodes.   **5+5+4=14**

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