No. of Printed Pages : **2**

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M.Sc. I Semester Degree Examination, April/May - 2023

CHEMISTRY

Analytical Methods and Treatment of data

(New syllabus)

Time : 3 Hours | Maximum Marks : 70

Note : *Answer* ***any five*** *of the following questions with Question* ***No. 1 (Q.1) compulsory****, each question carries* ***equal*** *marks.*

1. (a) Mention the limitations of analytical methods. How the errors can be minimized in the laboratory ? Explain. **5+5+4=14**

(b) What is stratified sampling ? Mention its advantages over Random sampling. Explain the procedure involved with sampling of solids.

(c) A chemist analysed calcium in dolomite sample using a newly developed method and obtained the following results : 50.6; 50.0; 51.0; 50.0 mg. If the standard method showed a standard deviation of 0.45. Find whether the newly developed method is having any significant difference from the standard method at 95% confidence level. (Given F value = 9.22).

2. (a) Explain the role of solvent and concentration in acid-base titrations. **4+5+5=14**

(b) Write the properties of I_3^-. With the help of chemical reactions, describe the procedure for the determination of ascorbic acid using I_3^-.

(c) (i) What are demasking agents ? Explain with an example.

(ii) A 5.0 g of food sample was decomposed and diluted to 25 mL which consumed 3.4 mL 0.022 M EDTA for Patton and Reeder's endpoint in presence of 8M KOH. Calculate the % of CaO present in the sample. (Molecular weight of CaO = 56 amu).

3. (a) (i) Differentiate between coprecipitation and postprecipitation with suitable example. **5+5+4=14**

(ii) What are organic precipitants ? List their properties.

(b) To 10.0 mL of water sample 25 mL of 0.021 M $AgNO_3$ solution was added and excess of $AgNO_3$ consumed 16.2 mL 0.022 M NH_4SCN for ferric chloride endpoint. In blank titration, if 25 mL of 0.021 M $AgNO_3$ consumed 22.4 mL 0.022 M NH_4SCN for ferric chloride end point. Calculate the amount of chloride present in the given water sample. (atomic weight of chloride = 35.5 amu).

(c) What is solubility product ? Explain its influence on precipitation reaction.

P.T.O.

4. (a) What is the principle of solvent extraction ? Discuss the criteria for the selection of solvent for solvent extraction. **5+5+4=14**

(b) Enumerate the principle and mechanism of paper chromatography. Mention its applications.

(c) What is ion exchange capacity of a resin ? How it is determined ?

5. (a) Discuss the principle and applications of conductometry. **5+4+5=14**

(b) What are Ion selective electrodes ? How they are different from indicator electrodes ? Explain with an example.

(c) What is the principle of voltametry ? Sketch a quasi-reversible cyclic voltammogram and how it is different from reversible cyclic voltammogram ?

6. (a) (i) Why mixed indicators are employed in the determination of carbonates and bicarbonates while phenolphthalein is employed in the determination of strong acids and bases ? Explain. **4+5+5=14**

(ii) Distinguish between equivalence point and endpoint in a titration.

(b) Why the analyte's oxidation state is adjusted in redox titrations ? How it is done ? Explain with an example.

(c) Briefly explain various steps involved in the gravimetric analysis.

7. (a) What are strong and weak anion exchange resins ? With the help of chemical reactions, explain the procedure for the synthesis of strong anionic exchange resins. **5+4+5=14**

(b) What is R_F value ? A sample containing three components were separated using TLC and showed solute front values of 2.8, 3.2 and 3.5cm. If the solvent front value is 4.6cm and the desired component has a R_F value of 0.7608, identify the solute front value in the TLC for the desired component in the sample.

(c) Describe the principle and applications of amperometric titrations.

8. (a) Discuss the various methods employed in the detection of endpoints in redox titrations. Mention their advantages and limitations. **5+4+5=14**

(b) Neatly sketch and explain the working of dropping mercury electrode.

(c) Write the structure and properties of 8-hydroxy quinoline. Explain its applications in inorganic analysis.

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