

**RAMAKRISHNA MISSION VIDYAMANDIRA**  
(Residential Autonomous College affiliated to University of Calcutta)

**B.A./B.Sc. SIXTH SEMESTER EXAMINATION, MAY 2025**

**THIRD YEAR [BATCH 2022-25]**

**CHEMISTRY (HONOURS)**

Date : 07/05/2025

Time : 11 am – 1 pm

**Paper : CC 14**

Full Marks : 50

[Use one Answer book for **Unit I & II** and another Answer book for **Unit III & IV**]

[Attempt **one question** from **each unit**]

**Unit –I**

[13 Marks]

1. a) What are the common error in Iodometry and iodimetry? How can you minimize the error?  
b) For a sample (0.2801 gm) containing chromium, 75 ml of 0.1 (M) ferrous sulphate was added and the excess of iron solution was titrated with 0.02507 (M), of dichromate to give 16.85 ml titre value. What is the percentage of chromium in the sample?  
c) Name the common indicator used in Iodometric/iodimetric titration. Why the indicator is used near the end point and in cold condition?  
d) Why back-titration is not possible by  $\text{KMnO}_4$  solution?  
e) How can you estimate  $\text{Ca}^{2+}$  using EBT indicator. [(2+2)+3+3+1+2]
  
2. a) What is argentometry? Using absorption indicator how can you estimate chloride ion, give mechanisms. What are the advantage and disadvantages of use absorption indicator?  
b) Depict the principle of complexometric titration with a suitable example.  
c) Potassium bi-iodate is a primary standard substance, justify. Determine its Oxidimetric and Acidimetric equivalent weight. [(1+1+3+2)+2+(2+2)]

**Unit –II**

[12 Marks]

3. a) What is the composition of brass? How can you dissolve brass? Give all the reaction with balance equation. Give the procedure for the estimation of Zn in brass.  
b) Give outlines of the analytical procedure for the estimation of calcium and magnesium in dolomite. [(1+2+2+3)+4]
  
4. a) What is Co-precipitate and post-precipitate? Give example of each, what are the basic differences between them? How can you minimize Co-precipitate and Post-precipitate?  
b) 0.20 gm of an ore containing  $\text{MnO}_2$  was treated with excess hydrochloric acid. The  $\text{Cl}_2$  formed was distilled off and absorbed in KI solution. Titration of the liberated iodine consumed 42.5 ml of 0.052 N sodium thiosulphate solution. Calculate the percentage of  $\text{MnO}_2$  in the ore. [(2+2+2+2)+4]

**Unit –III**

[13 Marks]

5. a) Define accuracy and precision. Explain their significance in chemical analysis.  
b) Differentiate between cation and anion exchange resins. Give one example of each.  
c) The refractive index of water is found to have the values 1.29, 1.33, 1.34, 1.35, 1.32, 1.36, 1.30 and 1.33. Calculate the mean value, absolute error, the relative error and the percentage error.  
d) What is the basis of chromatographic separation process? What are the moving and stationary phase used in thin layer chromatography? [3+3+4+3]

6. a) A chemist performs five titrations and obtains the following values of volume in mL: 25.10, 25.15, 25.00, 25.05, and 25.10. Calculate the mean and standard deviation.
- b) Define systematic errors and give two examples of how they can be eliminated.
- c) Discuss the principle of estimation of BOD in water.
- d) Mention one advantage and one disadvantages of TLC over paper chromatography.
- e) What is exchange capacity in ion exchange resins? How is it measured? [2+3+3+2+3]

### Unit –IV

[12 Marks]

7. a) Explain the Turkevich method for synthesizing gold nanoparticles. What factors influence the size of nanoparticles in this method?
- b) What factors influence the shape of a micelle?
- c) What are the key features of optical property of quantum dots? How does the size of a quantum dot affect this property?
- d) What is the role of a hollow cathode lamp in AAS? Why is a specific lamp required for each element being analyzed?
- e) Bulk gold is yellow but nano-gold is never yellow - why?
- f) Discuss on the one dimensional control of nanostructure. [2+2+2+2+2+2]
8. a) Explain the seed-mediated growth method used for synthesizing gold nanorods?
- b) Why do gold nanorods exhibit two plasmon bands in their absorption spectra? How is it influenced by their size and shape?
- c) What do you mean by armchair, chiral and zig-zag CNT? Discuss their metallic and semiconducting properties.
- d) How will you prepare the sample for analysis of lead in soil samples?
- e) What is spectral interferences in AAS and how it can be reduced?
- f) Write a short note on carbon nanotubes. [2+2+3+2+1.5+1.5]

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