

Unique Paper Code	:	32177904
Name of the Paper	:	DSE: Analytical Methods in Chemistry
Name of the Course	:	B.Sc. Program
Semester	:	V
Duration	:	3 Hours
Maximum Marks	:	75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **Four** questions in all. All questions carry **18.75** marks each.

Q1.

- I. What is sampling? Why is it considered the most difficult part of chemical analysis? Give a block diagram showing stages in chemical analysis. How will you do sampling of Ganga river water?
- II. Differentiate between determinate and indeterminate errors with the help of examples. Explain "F" test in detail.
- III. Explain Precision with the help of an example. List the number of significant figures in the following numbers:
(a) 900.000, (b) 0.412, (c) 70.4 (d) 0.000210

Calculate the mean and the standard deviation of the following set of analytical results: 25.47, 23.69, and 26.03 g.

(6.75, 6, 6)

Q2.

- I. 400-700nm wavelength region of electromagnetic spectrum is called_____.
- II. How does the polychromatic nature of radiation affect the absorption value in a UV-Visible spectrometer? How can we use UV-Visible spectrometer to differentiate between geometrical isomers?
- III. A substance when dissolved in water at 10^{-3} M concentration absorbs 20% of an incident radiation in a path of 1cm length. What should be the concentration of the solution in order to absorb 80% of the same radiation. Can we use cuvette made up of plastic in UV-Visible spectrometer? Why or why not?
- IV. Explain the working of single beam UV-Visible spectrometer with the help of labelled diagram. Explain the working of barrier layer cell type detector.

(0.75, 6, 6, 6)

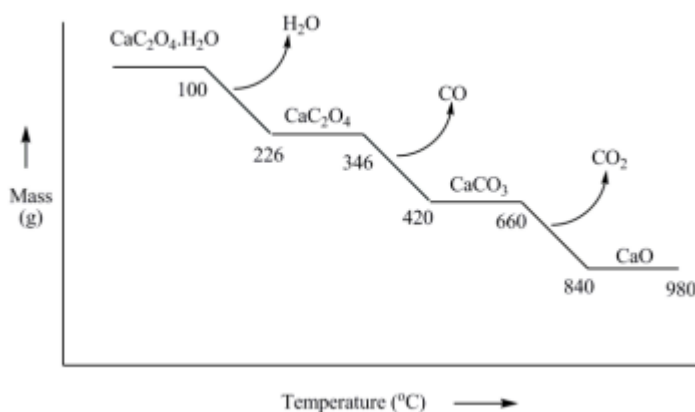
Q3.

- I. Colour of flame observed for potassium is _____.
- II. Explain the working of flame atomic emission spectrometer with the help of labelled diagram. Give its applications.
- III. Differentiate between total consumption burner and premixed type burner. What are gratings and how they work as monochromators.
- IV. Explain the working of Hollow Cathode Lamp (HCL) with the help of diagram. Give its one advantage and one disadvantage. What is chemical interference?

(0.75, 6, 6, 6)

Q4.

- I. Full form of TGA is _____.
- II. What information can we get from TGA? Explain the sources of errors in TGA analysis. Differentiate between qualitative analysis and quantitative analysis. Give examples.
- III. Analyze the following TGA spectra of calcium oxalate monohydrate ($\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$) in terms of:
 1. Reactions involve at each step
 2. Percentage weight loss at each step
 (atomic masses: Ca(40.078 u), O(15.999 u), H(1.00784 u), C(12.0107 u)):



- IV. Discuss any one technique for the determination of equivalence points in detail. Write down some applications of potentiometric titrations.

(0.75, 6, 6, 6)

Q5.

- I. Draw and explain the conductometric curve for the following titrations:
 - a) HCl versus NaOH
 - b) CH_3COOH versus NaOH
- II. Explain the working of glass electrode along with its cell notation. Write down its advantages and limitations. Why is it necessary to keep glass electrode hydrated?
- III. Explain classification of electroanalytical methods. What should be the appropriate pH of a fertile soil? How will check the soil quality using pH meter?

(6, 6.75, 6)

Q6.

- I. State the Nernst distribution law and derive following expression:

$$w_n = W \left(\frac{K_D V}{K_D V + v} \right)^n$$

Where W = mass of solute to be repeatedly extracted, w_n = mass of solute left unextracted after n^{th} operation, v = volume of another solvent which is immiscible with first, K_D = distribution coefficient, V = Total volume of solution

What can be concluded from above expression?

- II. What is the basis of chromatographic separation? Name the different sorption mechanisms in the chromatographic technique. Describe any one mechanism in detail.
- III. Discuss the process of extraction of metal ions from the aqueous solution by solvent extraction process. Explain frontal analysis mode of chromatographic separation.

(6.75, 6, 6)