B.Sc. 5th Semester (Honours) Examination, 2021(CBCS)
Subject: Analytical Methods in Chemistry
Paper: DSE-2

Time: 2 h   **Full Marks: 40**

Candidates are required to give their answers in their own words as far as practicable

Answer any eight questions from the following: **8 x 5 = 40**

1. "Sampling is more important for analysis of a new chemical product." – Justify the statement. Distinguish between *determinate* error and *indeterminate* error with suitable example.

2. Write down the significance and application of molar extinction coefficient? Illustrate the F-test and Q-test for chemical data analysis statistically.

3. How will you determine the composition of Ni-ethylenediamine complex using Job's method? Describe briefly.

4. Name two each of stationary phases and mobile phases used in column chromatography. What is R_f value in chromatographic? Write its importance?

5. Note down the advantages of flame atomic emission spectrophotometer instruments for quantitative metal estimation. What do you mean by the atomization and back-ground correction for flame atomic absorption spectrophotometer instrument?

6. Write down a proper electroanalytical method for determination of pk_a value of benzoic acid. Mention two important limitations of electroanalytical methods.

7. Write down the basic principle of *thermogravimetry method of analysis* with suitable diagram. What are the disadvantages of thermo-gravimetric process?

8. Describe the principle and efficiency of chromatographic separation technique. Distinguish between the frontal development and elution development method of chromatogram with proper diagram.

9. Pictorially describe the detector section of the modern infrared spectrophotometer instrument. Cite the characteristic infrared frequencies of p-nitrophenol observed in its infrared spectrum?

10. Prove that multiple extraction is more efficient than a single extraction provided total volume of organic and aqueous phases are same in both the cases. Mention some important limitation of spectrophotometric determination of an analyte.

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Instrumental methods of chemical analysis (Theo)

Time: 2 Hours   **Full Marks: 40**

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Answer any *eight* questions from the following: **8 × 5 = 40**

1. Discuss the difference between accuracy and precision with example. Analysis of a soda-ash sample shows the Na_2CO_3 content 90.50, 90.58 and 90.43%. Find the confidence limit within the 95% range.

2. What is monochromator? Explain the difference between bathochromic and hypsochromic shift.

3. Explain the factors that affect 'chemical shift' in NMR spectroscopy.

4. How can you distinguish between phenyl acetate and methyl benzoate by IR spectroscopy? What types of cells are used for liquid samples in IR spectrometer?

5. Explain the sample preparation of IR spectroscopy? What types of detectors are used for this spectroscopy?

6. Draw a block diagram of double beam UV spectrophotometer.

7. Mass spectrum of 3-butyn-2-ol shows base peak at m/z = 55. Explain why the fragment giving rise to this peak would be very stable.

8. Discuss the instrumentation of a mass spectrometer.

9. What is hollow cathode lamp? What is meant by resonance line sources in AAS?

10. What is the function of using TMS in NMR? How would you distinguish *p*-dichlorobenzene and *o*-dichlorobenzene by comparison of their ^1H NMR spectra?