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B.Sc. Course (CBCS) Ordinance (Sem-VI)

EXAMINATION MAY-2023

CHEMISTRY - SELECTED INSTRUMENTATION IN CHEMISTRY

[Time: 2 Hours]

[Max. Marks: 80]

- Instructions:**
1. All questions are compulsory
  2. Answers to the two should be written in answer books
  3. Non-programmable calculators are allowed.

**SECTION: A****Q.1** 1) Answer any four of the followings:**4x4=16**

- i) Give any four applications of HPLC technique.
- ii) Draw a neat labelled diagram of Single Focussing MS and explain its working.
- iii) Why pressure is required in HPLC? Discuss the types of pumps used.
- iv) Name the detectors used in GC. Explain any one in detail.
- v) Describe electron impact method of ionisation in Mass Spectroscopy.
- vi) Write a note any one method for detection of X-rays.

**Q.2 A)** i) With the help of a neat labelled diagram, explain instrumentation of GC chromatography. **04**

ii) Give any two characteristics of target material used in generation of X-rays. **02**

**OR**

iii) Explain the various factors responsible for band broadening in GC **04**

iv) Explain the difference between  $K_{\alpha}$  and  $K_{\beta}$  emissions in X-rays. **02**

**B)** i) Give a labelled block diagram of Basic components of Instrument of analysis. Discuss the function signal processor. **04**

ii) Describe the injection system used in HPLC technique. **02**

**Q.3 A)** i) Explain the sample size and spectrum resolution with respect to MS. **04**

ii) Write two advantages of Instruments interfaced with computers. **02**

**OR**

**A)** iii) Discuss application and structure elucidation by peak matching by MS. **04**

iv) Write a note on overview of instruments used in chemical analysis. **02**

**B)** i) Deduce Bragg's law from the diffraction of X-rays from crystal planes. **04**

ii) A GC peak had a retention time of 75 seconds. The base width obtained from the intersection of the base line was 6.5 seconds. If the column was 3.5 feet in length, what was the HETP in cm per plate? (Given: 1Foot=12 inches, 1 inch = 2.54 cm) **02**



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## SECTION : B

Q.4 Answer any four of the followings

4x4=16

- With a diagram, explain the Photoemissive cell.
- Describe the applications of UV-Visible in an identification of structural groups in a molecule and study of coordination complexes.
- Represent the single beam filter fluorimeter. Give the significance of primary and secondary filters used in filter fluorimeter.
- Explain the limitations of Atomic Absorption Spectroscopy.
- With a neat labelled diagram, explain the total Consumption burner.
- Briefly explain the factors affecting the DTA results.

Q.5 A) i) What are the different events occurring when a sample is introduced into the flame? 03

ii) Discuss the principles of the DTA. 03

OR

iii) With a diagram describe the Hollow Cathode lamp. 03

iv) Discuss the apparatus of DTA. 03

B) i) Explain the terms: Singlet state, Triplet state, fluorescence and delayed fluorescence. 04

ii) Explain the diffracting grating monochromator. 02

Q.6 A) i) With the help of a diagram explain the working of double beam photoelectric colorimeter. 03

ii) The fluorescence calibration curve for uranium metal has a slope of 7 intensity units per milligram per litre. Find the uranium content in the sample which gives a reading of 32 intensity units. 03

OR

iii)  $1.1 \times 10^{-3}$  M solution of a nickel salt has a transmittance of 48% when measured at a wavelength of 510 nm in a cell of length 2 cm. calculate the absorbance of the salt solution if its concentration is reduced to half its original concentration. 03

iv) Differentiate between Atomic Absorption Spectroscopy and flame photometry. 03

B) i) Discuss the different types of photometric titration curves. 04

ii) With a suitable example represent the DTA thermogram for an interpretation of DTA results. 02