Day : Tuesday

Date : 27-12-2022

W-20179-2022

Time : 10:00 AM-01:00 PM

Max. Marks : 60

N.B.
1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Both the sections should be written in **SEPARATE** answer books.
4) Draw neat labelled diagrams **WHEREVER** necessary.
5) Use of log table / nonprogrammable scientific calculator is **ALLOWED**.

SECTION – I

Q.1   Attempt any **THREE** of the following: (15)

a) Explain the factors affecting measurements of nephelometric analysis and turbidometric analysis.

b) Describe Raman instrument in detail.

c) Draw a block diagram of Nephelometer and describe each and every component in detail.

d) Write a note on Hyperfine splitting in ESR (Electron spin resonance) spectroscopy.

e) Explain any two detectors used in MID IR spectroscopy.

Q.2 A) Attempt any **TWO** of the following: (10)

i) Draw energy level diagram showing absorption processes and relaxation processes and their rates in Fluorimeter. Explain each term in detail.

ii) Explain principle and working of ESR (Electron spin resonance) spectroscopy.

iii) Distinguish between fluorescence and phosphorescence.

B) Solve any **ONE** of the following: (05)

i) In the turbidimetric analysis of Calcium using a Beckmann DU spectrophotometer at a wavelength of 455 nm, a certain sample of concentration 5.9×10^{-5} mole / Lit. in a 1.5 cm cell is found to have a transmittance T of 0.181. What is the turbidity coefficient of Calcium ion at 455 nm in the given concentration region?

ii) The excitation wavelength is 784 nm and the Raman Spectrum wavelength is 755 nm, then calculate Raman shift in nm units.

P.T.O.

SECTION - II

Q.3 Attempt any **THREE** of the following: (15)

a) Draw a sketch of NMR apparatus and explain each part of it.

b) Draw schematic diagram of scanning electron microscopy and describe its components in detail.

c) Describe the construction and working of X – ray diffraction spectrometer.

d) Write down reasons for ESCA satellite peaks and chemical shift observed in some spectra.

e) Write an explanatory note on Auger electron spectroscopy.

Q.4 A) Attempt any **TWO** of the following: (10)

i) State applications of NMR chemical shifts including qualitative and quantitative analysis.

ii) Draw a neat labelled diagram of X – ray tubes. Describe its construction and working in detail.

iii) Define: UPS, XPS, AES, PESIS and PESOS.

B) Solve any **ONE** of the following: (05)

i) Calculate the mass absorptive coefficient of an alloy at 0.436 nm consisting of 85.0 % Fe, 5% Ni, 9.0% Cu and remaining Zn, the mass absorptive coefficient for the pure elements are 610, 715, 760, and 910 cm^2 g^{-1} respectively

ii) Predict the number ESR lines for following systems.

    i) CH_3 radical

    ii) C_6H_6 radical

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