

M. SC. (Analytical Chemistry) Sem-IV (Choice Based Credit & Grade System) : WINTER - 2018

SUBJECT: ADVANCED ANALYTICAL TECHNIQUES

Day: Saturday
Date: 20/10/2018

W-2018-0999

Time: 03.00 PM TO 06.00 PM
Max. Marks: 60

N.B:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Draw neat and labeled diagram **WHEREVER** necessary.
- 4) Use of log table/non programmable scientific calculator is **ALLOWED**.

SECTION-I

- Q.1** Attempt **ANY THREE** of the following: (15)
- a) Describe fully Michelson interferometer and its use in MID-FTIR.
 - b) Explain the applications of phosphorimetry in industries.
 - c) Explain the theory of RAMAN spectroscopy. Describe its uses in medical laboratory.
 - d) Explain apparatus used for turbidimetry with suitable sketch.
 - e) Explain the stretching and bending vibrations of a polyatomic molecule.
- Q.2** A) Attempt **ANY TWO** of the following: (10)
- i) Explain the use of FAR and Near IR in various industries.
 - ii) Describe the use of IR spectroscopy with suitable example.
 - iii) Discuss the applications of luminescence techniques.
- B) Attempt **ANY ONE** of the following: (05)
- i) Calculate the force constant of the PO bond in POCl_3 having IR absorption frequency at 2105 cm^{-1} .
Given : P = 31.2, O = 15.99, $c = 3 \times 10^{10} \text{ cm/s}$
 - ii) In the turbidimetric analysis of sulphate using a spectrometer at a wave length 354 nm, a certain sample in a 2.0 cm cell found to have a turbidance S = 9.412. If the turbidimetry coefficient of sulphate is $1.67 \times 10^3 \text{ mol}^{-1} \text{ cm}^{-1}$ at this wave length. What is the concentration of the sulphate?

SECTION-II

- Q.3** Attempt **ANY THREE** of the following: (15)
- a) Explain the working of electron microscopy with suitable diagram.
 - b) Write down theory of NMR spectroscopy.
 - c) Describe Auger electron microscopy and explain its uses in analysis.
 - d) Explain the use of X-ray absorptions techniques in chemical analysis.
 - e) Explain the use of MRI in medical science.
- Q.4** A) Attempt **ANY TWO** of the following: (10)
- i) What are satellite peaks? Explain the mechanism that leads to satellite peaks.
 - ii) Explain any two detectors used in X-ray absorption techniques.
 - iii) How can you use NMR spectroscopy in kinetics?
- B) Attempt **ANY ONE** of the following: (05)
- i) Calculate the absorption frequency in a magnetic field of strength 7.2 T for ^{31}P nucleus. Given $\lambda = 1.054 \times 10^8 \text{ rad T}^{-1} \text{ s}^{-1}$.
 - ii) A certain X-ray tube apparatus at 50kV, calculate the short wave length limit for X-rays which are emitted and estimate the wave length of maximum intensity.

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