

**M. SC. (ANALYTICAL CHEMISTRY) SEM-IV (CHOICE BASED
CREDIT & GRADE SYSTEM) : SUMMER - 2018
SUBJECT : ADVANCED ANALYTICAL TECHNIQUES**

Day : **Saturday** Time : **03.00 PM TO 06.00 PM**
Date : **21/04/2018** **S-2018-0886** Max. Marks : 60

N. B. :

- 1) All questions are **COMPULSORY**.
 - 2) Figures to the right indicate **FULL** marks.
 - 3) Answers to both the sections should be written in **SEPARATE** answer books.
 - 4) Draw neat and labelled diagram **WHEREVER** necessary.
 - 5) Use of log table/non programmable scientific calculator is **ALLOWED**.
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SECTION - I

- Q. 1** Attempt **ANY THREE** of the following: **(15)**
- a) Explain the use of FAR IR and near IR spectroscopy in various industries.
 - b) Describe fluorimetry instrument and write down applications of it.
 - c) Give various detectors used in IR spectroscopy and explain any two detectors in detail.
 - d) Describe MID IR reflection spectroscopy and explain application of it in industries.
 - e) Describe turbidimetry apparatus and its components.
- Q. 2** **A)** Attempt **ANY TWO** of the following: **(10)**
- i) State Raman effect and explain Raman spectrophotometer in brief.
 - ii) Distinguish between fluorescence and phosphorescence.
 - iii) State various sources for IR radiation and explain any two of them.
- B)** Solve **ANY ONE** of the following: **(05)**
- i) Calculate the absorptivity of a compound with molecular weight - 144, if 1.5×10^{-5} g/ml solution exhibits an absorbance of 0.4 when the optical path is 2.5 cm.
 - ii) Express the following absorbances in terms of percent transmittance :
a) 0.049 b) 0.902 c) 0.037 d) 0.065 e) 0.458

SECTION - II

- Q. 3** Attempt **ANY THREE** of the following: **(15)**
- a) Explain the origin of the chemical shifts in ESCA lines. Describe the use of chemical shifts in analysis.
 - b) State applications of NMR chemical shifts including qualitative and quantitative analysis.
 - c) Give various application of electron microscopy, scanning electron microscopy and transmission electron microscopy.
 - d) Explain FT-NMR spectrometer with suitable diagram and its applications in industries.
 - e) Describe the construction and working of X-ray diffraction spectrometer.
- Q. 4** Attempt **ANY TWO** of the following: **(10)**
- i) Write an explanatory note on Auger electron spectroscopy.
 - ii) Explain the interaction of X-rays with matter.
 - iii) Describe the mechanism of the production of MNN Auger electron.
- B)** Solve **ANY ONE** of the following: **(05)**
- i) In ESCA, electron was found to have a KE of 1037.5 eV when MgK_{α} source was employed ($\lambda = 9.89 \text{ \AA}$). The electron spectrometer had a work function of 14.71 eV. Calculate the binding energy of electron.
Given: $h = 6.63 \times 10^{-34} \text{ J.s}$
 $C = 3 \times 10^{10} \text{ cm.s}^{-1}$ and $eV = 1.602 \times 10^{-19} \text{ J}$.
 - ii) A powder diffraction pattern of lead (Pb) was obtained with CuK_{α} radiation ($\lambda = 1.539 \text{ \AA}$). Calculate the 'd' spacing value of the first order at $\sin \theta = 0.9210$.

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