

27/11/14 ASTU/M.Pharm 1st Sem.

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PY 134101

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M. Pharm 1st Semester End-Term Examination

MODERN ANALYTICAL TECHNIQUE

Full Marks – 100 Pass Marks – 35 Time – Three hours

The figures in the margin indicate full marks for the questions.

SECTION – A

1. Answer any five questions : 1×5=5
- (a) What is the absorbance corresponding to transmittance of 99% ?
  - (b) What is the wave number in  $\text{cm}^{-1}$  of an IR radiation of wavelength  $2.5 \mu\text{m}$  ?
  - (c) How many fundamental vibrational modes exist in water molecule ?
  - (d) How many orientations are possible in a nucleus of spin  $\frac{1}{2}$  ?

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- (e) How many signals you would get for isopropyl alcohol in  $^1\text{H}$  NMR spectrum ?
- (f) Write the equation based on which Bragg's X-ray spectrometer works.

2. Answer any *five* questions :  $2 \times 5 = 10$

- (a) Define molar absorptivity. How can you calculate molar absorptivity value ?
- (b) Enumerate the advantages of FTIR equipment over that of dispersive equipment.
- (c) Name the important components of a Mass Spectrometer.
- (d) What is ion-exchange chromatography ? Give one example each of cation exchange resins and anion exchange resins.
- (e) Briefly explain the principle of super critical fluid chromatographic technique.
- (f) Define the terms : 'Red shift' and 'Blue shift'.

3. Answer any *five* questions :  $3 \times 5 = 15$

- (a) Explain the electronic excitation associated with the UV-Vis spectroscopic technique.

- (b) Describe the important features of an IR spectrum giving a schematic representation.
- (c) Discuss the distinctive features between  $^1\text{H}$  NMR spectrum and  $^{13}\text{C}$  NMR spectrum.
- (d) Describe the characteristic points for interpretation of a Mass Spectrum giving schematic representation and using suitable example.
- (e) Explain the X-ray diffraction method used in the study of crystalline structure.
- (f) Discuss briefly the advantages and applications of GC-MS technique.

4. Answer any *three* questions : 4×3=12

- (a) Explain the applications of DTA technique in the study of compatibilities of drugs and excipients in the development of formulation.
- (b) Explain the principle of ELISA and describe its applications.
- (c) Write a note on Woodward-Fieser rules for calculation of  $\lambda_{\text{max}}$  citing examples.
- (d) What is DEPT technique ? Discuss its analytical significance.

5. Answer any *two* questions :  $5 \times 2 = 10$

- (a) Describe at least two methods used for analysis of multicomponent samples by UV-Vis spectroscopic technique.
- (b) Discuss the analytical applications of IR spectrophotometric technique in Pharmacopoeial monographs giving examples.
- (c) Discuss the advantages of HPTLC technique over that of conventional TLC technique. Enumerate the applications of HPTLC technique in the analysis of Pharmaceuticals.

#### SECTION - B

6. Define any *five* of the following terms :  $1 \times 5 = 5$

- (i) Chromophores
- (ii) Coupling constant
- (iii) Base peak
- (iv) Chemical shift
- (v) Molecular ion
- (vi) Planar chromatography.

7. Answer any *five* questions :  $2 \times 5 = 10$

- (a) Enumerate the advantages with tetramethyl silane as the reference substance in NMR spectroscopy.

- (b) What are the characteristics of IR absorption band positions for identification of a carboxylic acid ?
- (c) Why paraffinic compounds are transparent to UV radiation ?
- (d) What does the splitting of signals in an  $^1\text{H}$  NMR spectra mean? Mention the splitting pattern in case of ethyl bromide.
- (e) What are the different methods adopted for ionization of molecules in Mass Spectrometry ?
- (f) Define the terms : 'Spin-Spin relaxation' and 'Spin-Lattice relaxation'.

8. Answer any *five* questions : 3×5=15

- (a) Explain the operational principle of HPLC technique giving a block diagram of the equipment.
- (b) Discuss the applications of Differential Scanning Calorimetry (DSC) technique citing examples.

- (c) Enumerate the factors to be considered for selection of mobile phase and detectors for analytical work by HPLC technique.
- (d) Explain briefly the principles of electrophoresis and mention its important applications.
- (e) Write an account on the application of thermal analysis technique on purity assessment of a compound.
- (f) Write a note on solvents used in NMR Spectroscopic technique.

9. Answer any *two* questions :- 4×2=8

- (a) What are bioanalytical methods ? Write an explanatory note on bioanalytical method validation.
- (b) What are the information and how can you get such information from an  $^1\text{H}$  NMR spectrum ? Explain giving example.
- (c) What is Isothermal titration calorimetry ? Explain its principle and indicate applications.

10. Answer any *two* questions :

5×2=10

- (a) Describe a method for quantitative analysis of sample by IR spectrophotometric technique.
- (b) Discuss the salient points in the interpretation of IR spectrum taking example.
- (c) Discuss the factors that affect the C-13 chemical shifts citing examples.