

Total No. of printed pages = 4

MPC 201 T ✓

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2022

M.Pharm. 2nd Semester End-Term Examination

Pharmacy

ADVANCED SPECTRAL ANALYSIS

Full Marks – 75

Time – Three hours

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

1. Multiple Choice Questions (MCQ) :

(20 × 1 = 20)

- (i) Woodward-Fieser rules consider which electronic excitation of the following for calculation of λ_{\max} of dienes?
- (a) $\pi \rightarrow \pi^*$ (b) $\sigma \rightarrow \sigma^*$
(c) $n \rightarrow \pi^*$ (d) $n \rightarrow \sigma^*$
- (ii) What are enones?
- (a) Conjugated dienes (b) Conjugated polyenes
(c) Cyclic dienes (d) α, β -unsaturated ketones
- (iii) Which one of the following is used as the material in ATR crystal of IR spectrometers?
- (a) Potassium chloride (b) Zinc selenide
(c) Sodium chloride (d) Polystyrene
- (iv) The presence of a carbonyl band in IR spectrum at around 1725 cm^{-1} and two other bands at around 2850 cm^{-1} and 2750 cm^{-1} Indicates which chemical class of the following?
- (a) Carboxylic acid (b) Amide
(c) Aldehyde (d) Ester

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- (v) Which of the following is correct with respect to the position of C-H absorption band in the high frequency region of IR spectra?
- Alkyne C-H > Alkene C-H > Alkane C-H
 - Alkane C-H > Alkene C-H > Alkyne C-H
 - Alkene C-H > Alkyne C-H > Alkane C-H
 - Alkyne C-H = Alkene C-H = Alkane C-H
- (vi) Which one of the following statements is correct regarding 1-D NMR spectra?
- Plot of chemical shift along Y-axis against intensity along X-axis
 - Plot of intensity along Y-axis against chemical shift along X-axis
 - Plot of magnetic field strength along Y-axis against chemical shift - along X-axis
 - Plot of chemical shift along Y-axis against coupling constant along X-axis
- (vii) Which one of the following is a technique of Homonuclear Through Bond 2-D NMR spectroscopy?
- NOESY
 - HETCOR
 - COSY
 - HSQC
- (viii) Select the technique of Homonuclear Through Space 2-D NMR spectroscopy from the following:
- NOESY
 - HETCOR
 - INADEQUATE
 - HMQC
- (ix) Which one of the following is not a technique of ionization in mass spectrometer?
- ESI
 - FAB
 - MALDI
 - ToF
- (x) Which statement of the following is correct with respect to the presence of structural features in a molecule to undergo McLafferty Rearrangement?
- An appropriately located heteroatom (e.g O)
 - A π system, usually a double bond
 - An abstractable H atom γ to the C=O system
 - All of the above
- (xi) Thermobalance is an instrumental component of which technique of the following?
- DSC
 - DTA
 - TGA
 - Thermometric analysis

- (xii) Which technique of the following measures the changes in enthalpy against the increase of temperature of a sample?
- (a) DSC (b) LC-FTIR
(c) CE-MS (d) HPTLC
- (xiii) Select the technique from the following which involves the recording of differential temperature between sample and reference as a function of temperature:
- (a) LC-NMR (b) DTA
(c) I-EC (d) TGA
- (xiv) What is the function of the AAS component in the GC-AAS hyphenated technique?
- (a) Separation of components of the sample
(b) Element specific detection
(c) Injection of sample
(d) Temperature control
- (xv) Which one of the following is a technique of Planner Chromatography?
- (a) Super critical Fluid Chromatography
(b) High performance Thin Layer Chromatography
(c) Flash Chromatography
(d) Gas Chromatography
- (xvi) Select the correct statement from the following to indicate the Flash Chromatography technique:
- (a) It is a liquid chromatography technique
(b) It uses compressed gas (Nitrogen or air) or a pump to push mobile phase through the column
(c) It is a technique of medium pressure and shorter column chromatography
(d) All of the above
- (xvii) In the Super Critical Fluid Chromatography, a specific gas is used as the mobile phase at what condition with respect to temperature and pressure of the following?
- (a) Above the ethical point (b) Below the critical point
(c) At the critical point (d) At any temperature and pressure
- (xviii) Which ionic group of the following is not present in cation exchangers?
- (a) Quaternary amino groups (b) Phenolic group
(c) Sulphonic acid group (d) Phosphoric acid group

(xix) Radiolabeled antigen is used in which immunochemical technique of the following?

- (a) EMIT (b) ELISA
(c) RIA (d) None of the above

(xx) In which statement of the following, Raman Spectroscopy is dissimilar from the IR Spectroscopy?

- (a) Raman Spectroscopy is used for fingerprinting of molecules
(b) Raman spectra result due to changes in vibrational modes of molecules
(c) Roman spectra result from scattering of light by vibrating bonds
(d) Raman spectroscopy can be used for both qualitative and quantitative analysis

2. Questions for short answer: Answer any *seven* questions (7 × 5 = 35)

- (a) Explain the general principle of calculating λ_{\max} of compounds by Woodward Fieser Rules citing an example.
- (b) Describe the salient features of IR spectra giving a representative diagram.
- (c) Explain the working principle of ATR-IR technique and enumerate the advantages of attaching an ATR assembly to IR equipment.
- (d) Explain COSY spectra giving a schematic diagram and describe the utility of COSY spectra.
- (e) Discuss the fragmentation of alkanes in Mass Spectrometric technique citing example.
- (f) Explain the working principle and briefly describe the instrumentation of the Flash Chromatography technique.
- (g) Explain the principle and describe the important applications of Raman Spectroscopy.
- (h) Enumerate the advantages, disadvantages and applications of RIA technique.
- (i) Explain the salient features of a DTA thermogram giving a labeled diagram.

3. Questions for long answer; Answer any *two* questions (2 × 10 = 20)

- (a) Explain the distinctive differences between 1D NMR spectra and 2D NMR spectra giving representative schematic diagrams. Describe the characteristic features and utility of the following 2-D NMR spectra:
(i) NOESY (ii) HETCOR
- (b) What are hyphenated techniques? Describe the instrumentation and applications of the following hyphenated techniques;
(i) LC-MS (ii) LC-FTTR
- (c) Explain the working principle of ELISA and describe the various types of this technique. Write a brief note on the applications of ELISA.