	Utech
Name:	
Roll No.:	A Special Of Exemple 2 and Explained
Invigilator's Signature :	

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES

Time Allotted: 3 Hours Full Marks: 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A (Multiple Choice Type Questions)

 $1. \quad \hbox{Choose the correct alternatives for any $\it ten$ of the following:}$

 $10 \times 1 = 10$

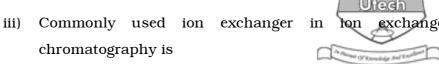
- i) In NMR spectroscopy the Boltzmann factor for distribution of nuclei in the lower spin state is
 - a) 0.1%

b) 0.001%

c) 1.0%

- d) 0.01%.
- ii) Hydrogen bond in alcohol and phenol is responsible for
 - a) lowering of stretching frequency
 - b) increasing of stretching frequency
 - c) lowering of bending frequency
 - d) increasing of bending frequency.

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a) zeolite

- b) amberlite IR-120
- c) silica gel
- d) agar 120 F.
- iv) In mass spectrophotometer the second field free region lies between
 - a) ion source and electrostatic analyzer
 - b) electrostatic and magnetic analyzer
 - c) magnetic analyzer and collector
 - d) none of these.
- v) For a non-linear molecule of n atoms the number of possible vibration in IR is
 - a) 3n 2

b) 2n - 7

c) 3n - 6

- d) 3n 5.
- vi) In gel permeation chromatography the separation takes place according to the phenomenon of
 - a) adsorption
 - b) partition
 - c) ion exchange
 - d) shape and size of the molecule.

- vii) Bathochromic shift takes place in UV-Vis spectroscopy on increasing the solvent polarity for which type of transition?
 - a) $\sigma \sigma^*$

b) $n - \sigma^*$

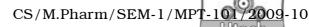
c) $\pi - \pi^*$

- d) $\eta \pi^*$.
- viii) What class of compounds is most likely to give a fragment ion at m/z = M-18?
 - a) Alkenes
 - b) Cycloalkanes
 - c) Alcohols
 - d) Alkyl iodies
 - e) Benzene derivatives.
- ix) Which of the following compounds is most likely to have its base peak at m/z = 43?
 - a) $CH_3 (CH_2)_4 CH_3$
 - b) $(CH_3)_3 CCH_2 CH_3$
 - c) cyclohexane
 - d) (CH $_3$) $_2$ CHCH (CH $_3$) $_2$.

- x) FT-IR records a signal in the
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- a) time domain
- b) frequency domain
- c) both time and frequency domains
- d) none of these.
- xi) Chemical shift for the protons of halomethane is to the electronegativity of halogen atom.
 - a) directly related
 - b) inversely related
 - c) unrelated.
- xii) In the I-R spectroscopy, the absorbed energy brings about predominant changes in the vibrational energy which depend upon
 - a) mass of the atom present in the molecule
 - b) strength of the bond
 - c) the arrangement of atoms within the molecule
 - d) all of these.

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GROUP - B

(Short Answer Type Questions)

Answer any three of the following.



 $5 \propto 1$

- 2. Write notes on various types of bioassay.
- 3. Discuss in brief about spin-spin splitting and Pascal triangle. $2\frac{1}{2} + 2\frac{1}{2}$
- 4. Describe the following terms :

Stomatal number, stomatal index, palisade ratio, vein islet number and vein termination number.

- 5. How will you detect the presence of aromatic ring in an IR spectrum? How will you differentiate 1° , 2° , 3° alcohols by looking at their IR spectrum?
- 6. Bring out the similarities and differences of the principle of the microbiological assay of antibiotics and vitamins.

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. Explain the term "Finger Print Region". Why is it called so? Discuss in brief about the mechanism of measurement in FTIR. What are the factors affecting the position of absorption of carbonyl group in FTIR. 2+2+5+6

8. Write down the basic principle of mass spectroscopy. Explain the main ionization techniques applied in mass spectrometry. Discuss in detail about metastable ion.

3 + 7 + 5

9. a) An organic compound, C $_6$ H $_8$ O shows the following spectral data :

UV : λ_{max} 225 nm (ϵ = 10,000) , 318 nm (ϵ = 40)

MS: molecular ion at m/z = 96, base peak at m/z = 68

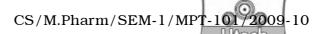
IR: a strong band at 1690 cm $^{-1}$

 $^1\,$ H NMR : A $^1\,$ H doublet at $\delta\,5.9$ and a $^1\,$ H multiplet at $\delta\,7.0\,$ Propose a structure for this compound.

- b) How can you distinguish among the three isomeric amines of the formula C $_3$ H $_9$ N from their (a) IR spectra and (b) Mass spectra ? 8+3+4
- 10. a) Define and derive Beer's Law. Write notes on electronic spectroscopy. Explain why bathochromic shifts occur in $\pi-\pi^* \text{ transition in polar solvent}.$
 - b) Explain Woodward-Fieser rules for calculation of λ_{max} in conjugated dienes and trienes. Write different qualitative and quantitative applications of UV-Vis spectroscopy. 5+10

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- 11. a) On which parameters does the volumetric flow rate (F_c) depend on ?
 - b) Write short notes on the following:
 - i) Partition coefficient and partition ratio
 - ii) Band assymetry
 - iii) Resolution
 - iv) Eddy diffusion.

 $3 + (4 \otimes 3)$