BP Code: 10023192

03/04/2023

Time: 3 Hrs **Marks : 75**

Note:

1. **Draw neat labeled diagrams wherever necessary**
2. **Figures to the right indicate full marks**

I. Multiple choice questions 20

1. The following quantitation methods in UV - Visible spectroscopy need a reference standard except

a. Standard curve method

b. Single point standardization

c. Double point standardization

d. Use of standard absorptivity

2. Michelson's interferometer is a component of

a. Atomic absorption spectrophotometer

b. X-ray diffractometer

c. GC

d. FTIR spectrophotometer

3. In flame photometry, as the energy gap between excited and unexcited metal atoms increases, the proportion of atoms in the ground state

a. Increases

b. Decreases

c. Remains unaffected

d. Increases or decreases

4. Fluorescence involves conversion from

a. Singlet excited state to ground state

b. Triplet excited state to ground state

c. Ground state to triplet excited state

d. Ground state to singlet excited state

5. The signal for the methyl protons of n-butane is split into a

a. Quartet

b. Triplet

c. Singlet

d. Doublet

6. Coupling constant in proton NMR spectroscopy is:

a. Ratio of chemical shifts

b. Difference in Hz between adjacent peaks in a multiplet

c. Difference of chemical shifts

d. Ratio of absorption frequencies

7. Which of the following is used as an internal standard in ^{1}HNMR?

a. DMSO

b. $CDCl_3$

c. DMF

d. TMS

8. Nuclei having either the number of protons or neutrons as odd number have _____ spin

a. Integral

b. Half integral

c. One third

d. Zero

9. In mass spectrometry, the most intense peak is called the

a. Base peak

b. Fragment ion peak

c. Molecular ion peak

d. Metastable ion peak

10. Which of the following is used as a matrix in MALDI?

a. Acetic acid

b. Lactic acid

c. Benzoic acid

d. Citric acid

11. A mass spectrometer bombards molecules with a high energy electron beam in

a. Colloidal phase

b. Vapour phase

c. Solid state

d. Liquid phase

12. Which of the following is associated with mass spectrometry

a. Excitation of electron

b. Electron bombardment

c. Molecular vibration

d. Splitting of electrons magnetic energy

13. Gradient elution in HPLC involves_____

a. Changing the mobile phase composition with time

b. Successive injection of the sample

c. Changing the length of the column

d. Using constant mobile phase composition throughout the run time

14. Wall coated open tubular columns are used in_____.

a. GC

b. TLC

c. HPLC

d. Electrophoresis

15. Which of the following can be calculated using peak width at half peak height?

a. Asymmetry factor

b. Number of plates

c. Tailing factor

d. Resolution

16. The mechanism of separation in TLC is usually

a. Partition

b. Ion exchange

c. Adsorption

d. Size exclusion

17. Which of the following is associated with X-ray diffractometry

a. Miller's Indices

b. Retention indices

c. Magnetogyric ratio

d. Attenuated total reflectance

18. According to Bragg's Law constructive interference occurs at path difference of _____ between two waves.

a. $2dSin\Theta$

b. $Sin\Theta$

c. $2\Theta Sin\Theta$

d. $2\Theta Sind$

19. In capillary electrophoresis _____ flow causes the movement of electrolytes through the tube.

a. Micro-osmotic

b. Macro-osmotic

c. Electro-osmotic

d. Reverse osmotic

20. In electrophoresis, as the particle size of analyte is increased,

a. rate of migration decreases

b. No change in the migration rate

c. rate of migration increases

d. Particle becomes immobile

II. Long answer questions (Answer any two out of three) **20**

1. a. Give any two fragmentation pathways for 2-pentanone

b. What is meant by spin-spin coupling? Relate and apply the concept to depict the splitting pattern for ^1H NMR spectrum of ethyl bromide.

2. a. A chromatogram shows an unretained solute eluting out at a dead time of 0.6 minutes. There are two more analyte peaks observed. Peak A starts at 4.4 minutes and ends at 4.7 minutes while peak B starts at 5.6 minutes and ends at 5.9 minutes. Assuming that peaks A and B are symmetric, calculate-

i) - Adjusted retention time for peak A

ii) - Capacity factor for peak B

iii) - Selectivity factor

iv) - Number of plates for peak B

v) - Resolution between peaks A and B

b. Explain the following terms with suitable examples:
I. Shielding ii. Deshielding iii. Precessional frequency

3. a. Draw a typical mass spectrum showing different peaks seen in the same. Explain the following terms with suitable examples:
i. Isotope peak ii. Metastable ion peak

b. Enlist the methods for multicomponent analysis in UV - Visible spectroscopy.
If a 12µg/ml solution of molecule $C_8H_9NO_2$ gives an absorbance of 0.86 at its λ_{max} in a 1cm cell, what is its molar absorptivity?

III. Short answer questions (Answer any seven out of nine)

1. Explain the terms -Gradient elution, Number of theoretical plates, Tailing factor
2. Enlist the reflectance methods used in IR spectroscopy. Explain any one in detail.
3. Enlist the detectors used in HPLC and explain the working of any one detector.
4. Write two points of distinction between AAS and AES. Explain principle of AAS.
5. Enlist the different ionization techniques used in mass spectrometry. Write a detailed note on MALDI or Chemical ionization.
6. Explain the term FT-NMR. Give three points of distinction between ^{1}H NMR & ^{13}C NMR.
7. Discuss principle involved in X-ray diffraction technique. State Bragg's law and its equation. Describe rotating crystal technique used in X ray Crystallography.
8. Explain the principle of paper electrophoresis. Comment on effect of factors affecting separation in the same.
9. Enlist quantitation methods used in HPLC. Discuss any one in detail.

****