Time: 3 Hours   **Max. Marks: 75**

Note:
1. **Draw net labeled diagrams wherever applicable**

I.   **Multiple choice questions**   **20M**

1. A molecule X (molecular weight 200) shows an absorbance of 0.5 in a 1cm pathlength cell when its concentration is 10ppm. What is its molar absorptivity?   **1M**

a. $10000 \ Lmol^{-1} \ cm^{-1}$

b. $1000 \ Lmol^{-1} \ cm^{-1}$

c. $100000 \ Lmol^{-1} \ cm^{-1}$

d. $5000 \ Lmol^{-1} \ cm^{-1}$

2. Which of the following is used as a light source for visible spectroscopy?   **1M**

a. Hydrogen lamp

b. Tungsten lamp

c. Nernst glower

d. Xenon arc lamp

3. Beer's law states that absorbance is directly proportional to _____   **1M**

a. Sample concentration

b. Sample volume

c. Pathlength

d. Absorptivity

4. Which of the following is a single component analysis method?

a. Difference spectroscopy

b. Simultaneous equation method

c. Use of standard absorptivity value

d. Absorption ratio method

5. Generally, in fluorescence, the emitted wavelengths are: **1M**

a. Equal to or longer than absorbed wavelengths

b. Shorter or longer than absorbed wavelength

c. Shorter or equal to absorbed wavelengths

d. Equal to absorbed wavelengths

6. Fermi resonance is exhibited in IR absorption spectra of **1M**

a. Ketones

b. Aldehydes

c. Ethers

d. Alkanes

7. Which of the following is an example of detector used in IR spectroscopy? **1M**

a. Evaporative light scattering detector

b. Flame ionization detector

c. Golay detector

d. Photomultiplier tube

8. Sodium ions can be analyzed by? **1M**

a. UV-visible spectroscopy

b. GC

c. HPLC

d. Flame photometry

9. Following is the commonly used light source for atomic absorption spectroscopy **1M**

a. Globar source

b. Coolidge tube

c. Hollow cathode lamp

d. Incandescent wire source

10. Turbidimetry is based on? **1M**

a. Light emission

b. Light transmission

c. Light reflection

d. Light scattering

11. Ability of the stationary phase to hold the sample component of a mixture is given **1M** by the following factor

a. Resolution

b. Capacity factor

c. Selectivity factor

d. Tailing factor

12. A mixture of compounds M , N, O and P were separated on a Silica gel TLC plate. If **1M** their polarity order is M > N > O >P,_____will have lowest Rf value

a. M

b. N

c. O

d. P

13. Rate of migration of ions in Paper electrophoresis is based on **1M**

a. Only mass of the ion

b. Only magnitude of the charge on the ion

c. Magnitude of the charge , shape and mass of the ion

d. Magnitude of the charge , and mass of the ion

14. Analysis of residual solvents in the sample can be performed using **1M**

a. HPLC

b. Gas chromatography

c. Paper chromatography

d. Thin layer chromatography

15. During the process of separation by gas liquid chromatography, sometimes derivatizing reagents are used in order to   **1M**

a. increase the solubility of sample

b. develop the colour in the sample

c. to convert the non-volatile sample to volatile ones

d. to reduce the retention time

16. Pumps used in HPLC which are suitable for gradient type of elution   **1M**

a. Displacement pumps

b. Reciprocating pumps

c. Pneumatic pumps

d. Syringe pumps

17. Isocratic elution in column chromatography means_____   **1M**

a. Use of mobile phase having a fixed composition of its content

b. Use of a single solvent as a mobile phase

c. Use of two solvents taken in the 1:1 ratio

d. Use of mobile phase whose composition varies systematically during the course of development.

18. Which one of the following can be used as an anion exchanger   **1M**

a. polystyrene sulphonated resin

b. polystyrene phenolated resin

c. polystyrene amine resin

d. polystyrene polymethacrylate resin

19. Gel chromatography is also known as: **1M**

a. Affinity chromatography

b. Soap chromatography

c. Molecular sieve chromatography

d. Ion pair chromatography

20. Affinity chromatography is a separation technique based on? **1M**

a. Specific binding

b. Molecular size

c. Ionic charges

d. Polarity

II. **Long answer questions (Attempt <u>any two</u> out of three)** **20M**

1. a. Using Jablonski diagram, explain the process of fluorescence **5M**

b. Enlist the various factors affecting vibrational frequency in IR spectroscopy. Explain any three in detail **5M**

2. a. Give the principle involved in the separation by paper chromatography. Discuss various developmental techniques used in paper chromatography **5M**

b. Write a note on principle and applications of ion exchange chromatography **5M**

3. a. Mixture of compounds X and Y was separated on a 20 cm Normal phase Silica Gel Column Chromatogram obtained provided the following data **5M**

	Retention time (mins)	Peak width at base (min)
Unretained	0.9	
Retained X	11.1	0.3
Retained Y	19.0	0.2

Answer the following
1. Calculate the selectivity factor for this separation
2. Calculate the number of plates for Y
3. Amongst X and Y, which compound is more polar?

b. With the help of a suitable diagram explain the construction and working of thermal conductivity detector used in gas chromatography. Give one limitation of gas chromatography **5M**

III. **Short answer questions (Attempt <u>any seven</u> out of nine)** **35M**

1. A 10 microgram/ml solution of drug X gives an absorbance of 0.6 at 270 nm in a 1cm pathlength cell. If the molecular weight of X is 204, calculate its molar absorptivity. **5M**

2. Draw a neat labelled block diagram of a flame photometer. Explain the role of each component involved in it. **5M**

3. Write a detailed note on wavelength selectors used in uv-visible spectroscopy **5M**

4. Explain the principle and instrumentation for a nephelometer **5M**

5. Explain the principle involved in separation by gel electrophoresis. Discuss any two factors affecting separation in electrophoresis **5M**

6. Discuss various columns used in gas chromatography. **5M**

7. Discuss steps involved in the separation of components by thin layer chromatography. Give one application of thin layer chromatography **5M**

8. What is the difference between bulk property and solute property detector in HPLC? Give two examples each of bulk property and solute property detector in HPLC. Draw neat labelled diagram of any one detector **5M**

9. Explain the principle and applications of affinity chromatography **5M**

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