Name:

Enrolment No:

UPES

End Semester Examination, December 2025

Course: Instrumental Methods of Analysis **Semester: VII**

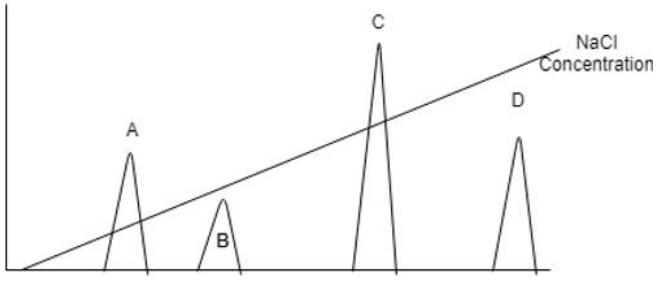
Program: B.Pharm **Time 03 hr**

Course Code: BP701T **Max. Marks: 75**

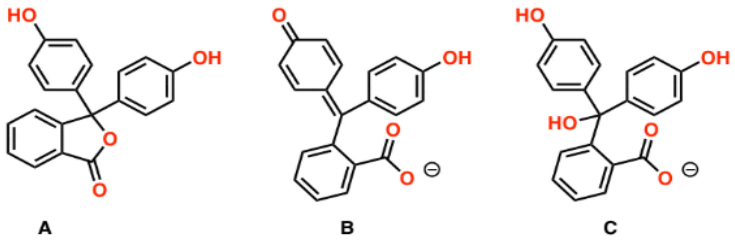
Instructions: Read the Question Paper Carefully.

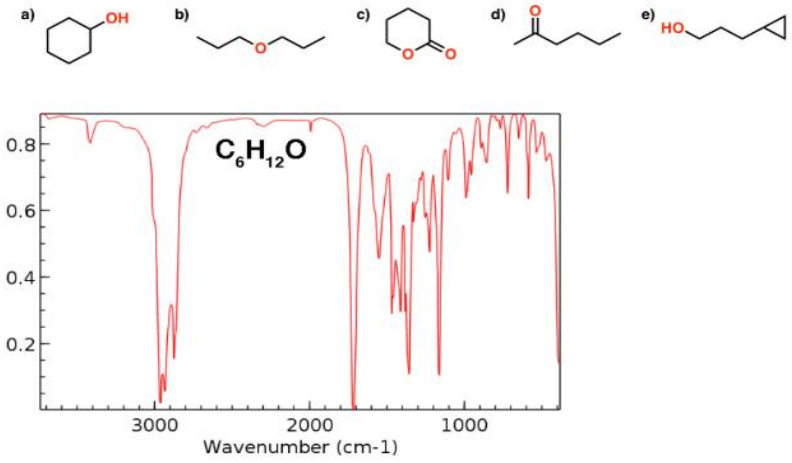
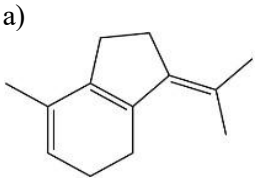
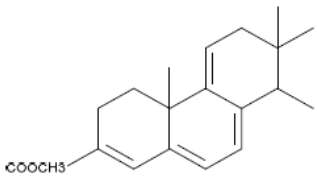
SECTION A

(20Qx1M=20 Marks)

S. No.		Marks	COs
Q1	Define Chromophore.	1	CO2
Q2	λmax of 1,3 butadiene is _____nm. a) 254 b) 214 c) 219 d) 254	1	CO1
Q3	Refractive index detector is not a preferred HPLC detector for gradient elusion. True/False.	1	CO4
Q4	Give the names of two polar and non-polar solvents used in normal phase chromatography.	1	CO4
Q5	What is the role of guard column in HPLC?	1	CO4
Q6	What is the range of Vacuum UV? a) 200-300nm b) 10-200nm c) 300-400nm d) 400-700nm	1	CO1
Q7	Gas chromatography can be used for ____. a) Volatile compounds b) Thermolabile compounds c) Compounds with high boiling points d) All	1	CO3
Q8	State the difference between normal phase and reverse phase chromatography.	1	CO2
Q9	Imagine 4 proteins A, B, C, D which have been eluted by ion exchange chromatography as described in the following picture. The X axis shows the fraction number. If, with the increase in unit time, concentration of NaCl is increased by 1M then what will be the correct increasing order of charge of protein?  a) Protein A < Protein B < Protein C < Protein D b) Protein B < Protein A < Protein C < Protein D c) Protein A < Protein C < Protein B < Protein D	1	CO5

	d) Protein A < Protein C < Protein D < Protein B		
Q10	Which of the following is a type of emission spectroscopy? a) UV spectroscopy b) Fluorimetry c) AAS d) All	**1**	CO5
Q11	Define Rm value.	**1**	CO5
Q12	Which of the following is an important condition for a compound to be IR active? a) Conjugation b) Dipole moment c) Unsaturation d) Volatility	**1**	CO1

Q13	At what frequency (cm^{-1}) ketones show a strong band in IR. a) 1550 b) 1660 c) 1720 d) 2200	**1**	CO1
Q14	Principle of separation in paper chromatography is _____.	**1**	CO3
Q15	Define SCOT and WCOT.	**1**	CO4
Q16	Name any one carrier gas used in Gas chromatography.	**1**	CO3
Q17	Write one limitation of Beers law.	**1**	CO1
Q18	If transmittance is 10%. What would be the reading of absorbance in UV spectroscopy.	**1**	CO1
Q19	Which stationary phase is used in ion exchange chromatography?	**1**	CO3
Q20	Name a derivatizing reagent for detection of amino acids in TLC.	**1**	CO3
SECTION B (20 Marks) **(2Qx10M=20 Marks)** **Attempt 2 Question out of 3**			
Q1	Discuss the principle and working procedure of ion exchange chromatography.	**4+6**	CO1
Q2	Draw the schematic diagram of HPLC and mention the role of each part of HPLC. Discuss the factors which may affect the elution rate in HPLC.	**6+4**	CO4
Q3	a) What are the factors affecting UV-Visible spectroscopy? b) These are the three forms of the pH indicator dye phenolphthalein. One of them is responsible for its characteristic pink color. Find out the correct one and give justification for that.  A B C	**4+3+3**	CO2

	c) Explain the different types of electronic transitions in UV spectroscopy.		
SECTION-C (35 Marks) **(7Qx5M=35 Marks)** **Attempt 7 Question out of 9**			
Q1	State the principle of HPLC? Why is mobile phase degassing important in HPLC analysis? Write down the advantages of PDA detectors in HPLC?	**2+2+1**	CO2
Q2	Define is Beer-lamber's law? How can it be derived?	**1+4**	CO2
Q3	Which of these molecules best corresponds to the IR spectrum below? Justify your answer. 	**5**	CO2
Q4	Discuss all different pharmaceutical applications of chromatography with examples.	**5**	CO4
Q5	Write about different types of molecular vibrations in IR spectroscopy.	**5**	CO3
Q6	Predict the λmax of a)  b) 	**2.5+2.5**	CO3
Q7	Briefly discuss the principle of gel electrophoresis.	**5**	CO4

Q8	A specific compound analyzed by HPLC has a retention time (tR) of 7.68 minutes and a peak width at the base (Wb) of 0.40 minutes. The column used is 2.0 meters long. Calculate the number of theoretical plates (N) and the height equivalent to a theoretical plate (H) to identify the efficiency of the column.	**5**	CO5
Q9	Explain different factors which may affect UV-Vis spectroscopy	**5**	CO4

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