Q. Code: 577063

Reg. No. | | | | | | | | | | | | | |

B.E./ B.TECH. DEGREE EXAMINATIONS, MAY 2024

Fourth Semester

CH22404 – INSTRUMENTAL METHODS OF ANALYSIS

(Chemical Engineering)

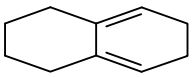
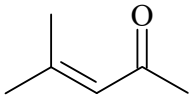
(Regulation 2022)

TIME: 3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Acquire knowledge on the fundamental concepts and various terms in electromagnetic radiations and absorption spectroscopy.	**2**
CO 2	Arrive at the knowledge in the various analytical instruments which are based on electrical property of compounds.	**2**
CO 3	Obtain familiarity on various properties of liquid materials and the instruments used to measure these properties.	**3**
CO 4	Investigate the applications of spectroscopic techniques in Chemical Industry.	**1**
CO 5	Obtain the awareness in the modern techniques which are used in nanoscience.	**3**

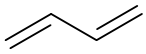
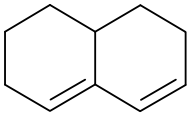
PART- A (20 x 2 = 40 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Which of the following will exhibit λ_{max} at longer wavelength? a) $CH_3CH_2CH_2CH=CH_2$; b) $CH_2=CH-CH=CH_2$;	**1**	**3**
2.	Which compound shows the higher wavelength maximum? Justify your answer.  	**1**	**3**
3.	Propose the reason for the symmetrical stretching vibration in linear triatomic CO_2 molecule is inactive in infrared.	**1**	**3**
4.	Describe the term bathochromic shift.	**1**	**2**
5.	Provide the principal advantage of conductometric titrations.	**2**	**2**
6.	Explain the term specific conductance.	**2**	**2**
7.	Draw the graph which represents a titration in which the reagent reacts at the electrode while the analyte does not.	**2**	**3**
8.	Mention the benefits of ISEs.	**2**	**2**
9.	Compare AAS and FES.	**3**	**3**
10.	List out the factors that change the value of angle of rotation in polarimetry.	**3**	**2**
11.	Bring out the effect of polarizable groups on refractive groups.	**3**	**2**
12.	Distinguish between Nephelometry and Turbidimetry.	**3**	**3**
13.	Explain the splitting pattern in the NMR spectrum of CH_3CH_2OH.	**4**	**3**
14.	Why ^{12}C, ^{16}O and ^{32}S do not show NMR spectra?	**4**	**3**

15.	Compare NMR and ESR.	**4**		**3**
16.	Water and alcohol are not suitable solvents for ESR studies. Justify.	**4**		**2**
17.	Mention the two different ways for the detection and determination of X-radiation.	**5**		**2**
18.	Give the equation of Mosley's law.	**5**		**2**
19.	Compare STM and AFM.	**5**		**3**
20.	Suggest any two methods to obtain X-ray.	**5**		**2**

PART- B (5 x 10 = 50 Marks)

		Marks	CO	RBT LEVEL
21. (a)	Classify the Instrumental Methods of Analysis based on the physical properties of analyte.	**(10)**	**1**	**4**
	(OR)			
(b)	Calculate the absorption maximum for the following compounds.  	**(10)**	**1**	**4**
22. (a)	Draw weak acid – strong base and strong acid – weak base conductometric titration curves and explain them.	**(10)**	**2**	**3**
	(OR)			
(b)	Elaborate any two ion selective electrodes.	**(10)**	**2**	**3**
23. (a)	Illustrate the principle and instrumentation of FES.	**(10)**	**3**	**2**
	(OR)			
(b)	**(i)** Briefly elucidate the polarimetry.	**(5)**	**3**	**2**
	(ii) Mention the applications of refractometry.	**(5)**	**3**	**2**
24. (a)	Discuss the principle and instrumentation of NMR spectroscopy with a neat diagram.	**(10)**	**4**	**3**
	(OR)			
(b)	**(i)** Enumerate the instrumentation of Mass spectrometry.	**(5)**	**4**	**3**
	(ii) Configure the various applications of ESR spectroscopy.	**(5)**	**4**	**3**
25. (a)	Write a brief note on X-ray spectroscopy.	**(10)**	**5**	**3**
	(OR)			
(b)	Demonstrate the principle and instrumentation of Scanning Tunneling Microscope.	**(10)**	**5**	**3**

PART- C (1 x 10 = 10 Marks)

(Q.No.26 is compulsory)

		Marks	CO	RBT LEVEL
26.	Elucidate the configuration of an IR spectroscopy apparatus accompanied by a well-defined diagram.	**(10)**	**1**	**4**