

Register No.: ..... Name: .....

## SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

**SECOND SEMESTER B.TECH DEGREE EXAMINATION (Supplementary), December 2021**

**Course Code: 20CYT100**

**Course Name: Engineering Chemistry**

**Max. Marks: 100**

**Duration: 3 Hours**

### PART A

*(Answer all questions. Each question carries 3 marks)*

- |                                                                                                                                                                                                                     | <b>CO</b> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 1. What is cathodic protection and suggest two methods by which it can be done.                                                                                                                                     | [1]       |
| 2. Write any three differences between galvanic series and electrochemical series.                                                                                                                                  | [1]       |
| 3. Explain the principle of IR spectroscopy.                                                                                                                                                                        | [2]       |
| 4. Calculate the wavenumber of stretching vibration of C=C bond, given that force constant $k=11 \times 10^5 \text{ gs}^{-2}$ , atomic mass of carbon=12 amu and $1 \text{ amu} = 1.67 \times 10^{-24} \text{ g}$ . | [2]       |
| 5. Define retention factor. What is its significance?                                                                                                                                                               | [3]       |
| 6. What are nanomaterials? Write any two applications of nanomaterials.                                                                                                                                             | [3]       |
| 7. Draw the enantiomers of 2-hydroxypropanoic acid using Fischer projection formulae.                                                                                                                               | [4]       |
| 8. How are copolymers classified?                                                                                                                                                                                   | [4]       |
| 9. Differentiate between temporary hardness and permanent hardness.                                                                                                                                                 | [5]       |
| 10. How ultraviolet light is helpful for cleaning swimming pools?                                                                                                                                                   | [5]       |

### PART B

*(Answer one full question from each module, each question carries 14 marks)*

#### MODULE I

- |                                                                                                                                                | <b>CO</b> | <b>Marks</b> |
|------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------|
| 11. a) Define single electrode potential. Derive Nernst equation for single electrode potential. What are the applications of Nernst equation? | [1]       | (10)         |
| b) Explain the construction of glass electrode with the help of a labelled diagram.                                                            | [1]       | (4)          |

OR

		<b>CO</b>	<b>Marks</b>
12.	a) Explain the construction, working and applications of Lithium-ion battery.	[1]	(10)
	b) Write any four types of electrodes along with their electrode representations.	[1]	(4)

**MODULE II**

		<b>CO</b>	<b>Marks</b>
13.	a) State and explain Beer-Lambert's Law. Explain the various types of electronic transitions possible during UV-Visible spectroscopy. Give examples of compounds in which these electronic transitions are found.	[2]	(9)
	b) Explain the instrumentation of UV-Vis spectrometer. List any two applications of UV-Vis spectroscopy.	[2]	(5)

OR

		<b>CO</b>	<b>Marks</b>
14.	a) Define spin-spin splitting. Compare the $^1\text{H}$ NMR spectra of 1-chloropropane [ $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$ ] and 2-chloropropane [ $(\text{CH}_3)_2\text{CHCl}$ ].	[2]	(9)
	b) Define chemical shift. Explain the factors affecting chemical shift.	[2]	(5)

**MODULE III**

		<b>CO</b>	<b>Marks</b>
15.	a) Explain the principle, instrumentation and applications of TGA.	[3]	(8)
	b) Briefly explain the procedure for identification of components of a mixture by thin layer chromatography.	[3]	(6)

OR

		<b>CO</b>	<b>Marks</b>
16.	a) Suggest and explain the principle and instrumentation of a fast chromatographic technique that can be used for the separation of non-volatile organic compounds from a mixture.	[3]	(10)
	b) Explain any one method for the preparation of nanomaterials.	[3]	(4)

**MODULE IV**

		<b>CO</b>	<b>Marks</b>
17.	a) Define isomerism. Explain structural isomers with suitable examples.	[4]	(10)
	b) Explain the conformational analysis of ethane molecule with the help of energy level diagram?	[4]	(4)

OR

		CO	Marks
18.	a) Explain the preparation, properties and applications of Kevlar and ABS polymer.	[4]	(10)
	b) Detail the working of OLED. Give any two advantages of OLED.	[4]	(4)

MODULE V

		CO	Marks
19.	a) Detail the principle and procedure for the estimation of hardness of water using EDTA method.	[5]	(10)
	b) Why $\text{CaCO}_3$ is taken as a standard to express degree of hardness? Calculate the $\text{CaCO}_3$ equivalent hardness of a hard water sample containing 272 mg of $\text{CaSO}_4$ per litre.	[5]	(4)

OR

		CO	Marks
20.	a) Describe the aerobic and anaerobic processes involved in secondary sewage treatment with the help of labeled diagrams.	[5]	(10)
	b) Explain disinfection by chlorination. Define breakpoint chlorination.	[5]	(4)

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