Name:\_\_\_\_\_ Reg No.:\_\_\_\_\_

# APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Second Semester B.Tech Degree (S, FE) Examination January 2024 (2019 Scheme)

## **Course Code: CYT 100**

Course Name: ENGINEERING CHEMISTRY (2019 -Scheme)				
Max. Marks: 100		Tarks: 100 Duration: 3	Duration: 3 Hours	
PART A  Answer all questions, each carries 3 marks  Marks				
1		Answer all questions, each carries 3 marks Calculate the EMF of the cell $Zn/Zn^{2+}_{(0.1M)}$ // $Cu^{2+}_{(0.1M)}$ /Cu. Write its half-cell	(3)	
		and net cell reaction. $E^0~_{Zn}^{2+}~_{/Zn}\!\!=~-0.76~V~~\&~~E^0{_{Cu}}^{2+}~_{/Cu}\!\!=~+0.34~V.$		
2		What is cell constant of a conductivity cell and how it is measured?	(3)	
3		Explain spin-spin splitting with an example.	(3)	
4		How to determine the unknown concentration of a sample using UV-visible	(3)	
		spectroscopy?		
5		What are the different types of detectors used in gas chromatography?	(3)	
6		Explain the two different regions observed in a thermogram.	(3)	
7		Define the following terms and give one example for each.	(3)	
		a) Enantiomers b) Metamers		
8		List any three advantages of OLED over conventional LCD.	(3)	
9		Mention any three advantages of break point chlorination.	(3)	
10		Temporary hardness can be removed by boiling, explain the chemistry behind	(3)	
		this.		
		PART B		
Answer one full question from each module, each question carries 14 marks.				
MODULE 1				
11	a)	What is electrochemical series? Describe any three applications of	(8)	
		electrochemical series.		
	b)	What are reference electrodes? Give examples for primary reference and	(6)	
		secondary reference electrodes and give their electrode reactions.		
12	a)	Explain the mechanism of electrochemical corrosion in different environmental	(10)	
		conditions.		
	b)	Explain the principle of electroless plating.	(4)	

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#### **MODULE 2**

- 13 a) Discuss the principle, instrumentation and applications of UV-visible (8) spectroscopy.
  - b) What are the criteria for a molecule to absorb IR radiation? Which of the (6) following molecules are IR active? Give reason. (i) HF, (ii) Cl<sub>2</sub>, (iii) CO, (iv) O<sub>2</sub>.
- 14 a) Write the principle of IR spectroscopy. Explain the different modes of vibrations (10) possible for CO<sub>2</sub> and H<sub>2</sub>O and identify IR active vibrations.
  - b) An organic compound with molecular formula C<sub>3</sub>H<sub>5</sub>Cl<sub>3</sub> gave the following <sup>1</sup>H (4) NMR data, a singlet with a chemical shift of 2.20 ppm and another singlet with a chemical shift of 4.02 ppm. Assign a structural formula.

#### **MODULE 3**

- 15 a) Discuss the following methods for nanoparticle synthesis (i) Hydrothermal, (ii) (10) sol-gel, (iii) chemical reduction and (iv) electro reduction.
  - b) Discuss the different types of detectors used in HPLC. (4)
- 16 a) Explain the principle, instrumentation and working of scanning electron (8) microscope.
  - b) Explain the three major steps in the working procedure of thin layer (6) chromatography technique.

#### **MODULE 4**

- 17 a) Explain the electrochemical and chemical methods for the synthesis of (8) polyaniline. List any two applications and properties.
  - b) Write the Fischer projection formula for lactic acid (CH<sub>3</sub>-CH(OH)-COOH). (6) Draw the mirror image and assign *R-S* notation for the compound as well as its mirror image. Give the rules for assigning *R-S* notation.
- 18 a) Draw and explain the conformational isomerism in (*cis*) and (*trans*) 1,4-dimethyl (8) cyclohexane. Which conformer is more stable in each case and why?
  - b) Explain copolymerization with one example. How copolymers are classified? (6)

#### MODULE 5

- 19 a) Describe the ion-exchange method for the demineralisation of water. (8)
  - b) A water sample found to contain 16.2 mg/L calcium bicarbonate, 29.2 mg/L (6) magnesium bicarbonate, 19.0 mg/L magnesium chloride and 27.2 mg/L calcium sulphate. Calculate the temporary and permanent hardness. What happens to the hardness of water sample if Na<sub>2</sub>CO<sub>3</sub> is added?

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- 20 a) What do you mean by dissolved oxygen? Mention the significance and explain (10) the Winkler's method for the estimation of dissolved oxygen.
  - b) Find the BOD if 250 mL sewage water was diluted to 2000 mL using dilution (4) water. The initial DO and DO level after 5 days were found to be 7.9 ppm and 4.4 ppm respectively.

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