

Hall Ticket Number:

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Code No. : 12222 N/O

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD

Accredited by NAAC with A++ Grade

B.E. II-Semester Main & Backlog Examinations, August-2023

Material Chemistry

(Common to CSE, AIML & IT)

Time: 3 hours

Max. Marks: 60

Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B**

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Explain the possible electrochemistry when CuCl_2 solution is stored in a Zn container under standard conditions. (SRP values of Zn and Cu electrodes are -0.77 and 0.34 volts respectively.)	2	3	1	1,2,12
2.	0.01N KCl solution shows a resistance of 225 ohms in a conductivity cell. The specific conductance of 0.01N KCl at the temperature of experiment is 0.00141 mho/cm. If 0.01N solution of an electrolyte shows a resistance of 60 ohms in the same cell, find its equivalent conductance.	2	3	1	1,2,12
3.	What are batteries? Classify them with appropriate examples.	2	2	2	1,2,7,12
4.	A battery weighing 25 g produces 3 amperes current per hour under a potential gradient of 1.5V. Compute its energy density and power density.	2	3	2	1,2,7,12
5.	Outline the reaction for the preparation of kevalar. Mention its properties and applications.	2	2	3	1,2,7,12
6.	Define glass transition temperature. What is its significance?	2	1	3	1,2,7,12
7.	Differentiate between thermotropic and lyotropic liquid crystals.	2	3	4	1,2,7,12
8.	List the applications of composite materials.	2	1	4	1,2,7,12
9.	What are the approaches for synthesis of nanomaterials? Mention two examples each.	2	2	5	1,2,7,12
10.	Properties of nano materials are different from their bulk materials – reason.	2	2	5	1,2,7,12
Part-B (5 × 8 = 40 Marks)					
11. a)	Sketch neatly labeled graphs and explain the principle of determination of the equivalence point of a) CH_3COOH Vs NaOH b) Mixture of acids ($\text{HCl} + \text{CH}_3\text{COOH}$) Vs strong base titration by conductometry.	4	2	1	1,2,7,12
b)	Construct a galvanic cell using Mg and Zn electrodes, write the cell reaction and calculate E.M.F and change in Gibb's free energy of the cell at 25°C when the concentrations of Mg^{+2} and Zn^{2+} are 10^{-3} and 10^{-2} M respectively. (SRP values of Mg and Zn electrodes are -2.36 and -0.76 volts respectively.)	4	3	1	1,2,7,12

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12. a)	Demonstrate the construction and electrochemistry of Leclanche cell. Write its merits and uses.	4	3	2	1,2,7,12
b)	Illustrate the construction and working of molten carbonate fuel cell and write its limitations and applications.	4	2	2	1,2,7,12
13. a)	Classify conducting polymers and discuss the mechanism of conduction in n-doped polyacetylene.	4	2	3	1,2,7,12
b)	Calculate the number average, weight average molecular weight and PDI of a PVC (molecular weight of monomer is 62.5) sample having 24, 30,46 and 24 molecules with degree of polymerization 180,200,240 and 270 respectively.	4	3	3	1,2,7,12
14. a)	Explain the manufacturing of composite materials by pultrusion method with a neatly labeled diagram. Mention its advantages.	4	1	4	1,2,7,12
b)	Discuss the molecular ordering in smectic and cholesteric liquid crystals.	4	2	4	1,2,7,12
15. a)	How do you synthesize nanomaterials by sol-gel method? Explain with appropriate reactions.	4	2	5	1,2,7,12
b)	Explain the working principle of atomic force microscope with block diagram.	4	2	5	1,2,7,12
16. a)	Discuss the construction and working of quinhydrone electrode. How do you determine pH of a solution using quinhydrone and saturated calomel electrodes?	4	3	1	1,2,7,12
b)	How do you construct a Lithium-ion cell? Explain its functioning and applications.	4	3	2	1,2,7,12
17.	Answer any <i>two</i> of the following:				
a)	Discuss the structural requirements of a polymer for bio degradation. How do you synthesize poly lactic acid? What are its advantages?	4	3	3	1,2,7,12
b)	Define composite materials and discuss their constituents. Explain glass fiber reinforced composites.	4	1	4	1,2,7,12
c)	Enlist the applications of carbon nanotubes and illustrate their synthesis by Arc-Discharge method with a neat diagram.	4	1	5	1,2,7,12

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level - 1	20%
ii)	Blooms Taxonomy Level - 2	40%
iii)	Blooms Taxonomy Level - 3 & 4	40%
