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Siddaganga Institute of Technology, Tumakuru-572 103

(An Autonomous Institution affiliated to VTU, Belagavi, Approved by AICTE, New Delhi)

Even Semester Bachelor of Engineering Examinations Sept. 2023

Chemistry for Electrical and Electronics Engineering Stream

Time: 3 Hours **Max. Marks: 100**

Note : 1. Revealing of Identity in any form in the answer book will be treated as malpractice.
2. Answer any five questions choosing one full question from each unit.

			M	BL	CO	PO	PSO
		Unit - I					
1	a)	What is standard electrode potential? Explain the origin of single electrode potential when the concentration of the metal ion solution is less.	5	2	1	1	
	b)	Explain the construction and working of calomel electrode.	5	2	1	1	
	c)	What is a concentration cell? Given an example. Derive an expression to calculate the EMF of a concentration cell.	5	2	1	1	
	d)	Evaluate the cell potential of Ag^+ | Ag couple with Cu | Cu^{++} couple if the concentration of Ag^+ and Cu^{++} are 4.2 x 10^{-6} M and 1.3 x 10^{-3}M respectively. Write the half cell and net cell reactions at STP. Given $E^{\circ}_{cell} = 0.9\,V$.	5	5	1	1	
		OR					
2	a)	Derive Nernst equation for single electrode potential.	5	2	1	1	
	b)	Derive an expression to calculate the pH of a solution using glass electrode.	5	2	1	1	
	c)	Explain the classification of electrochemical cells with suitable examples.	5	2	1	1	
	d)	Write the half-cell and net cell reactions for the following cell, Zn | $ZnSO_4$(aq) || $CuSO_4$(aq) | Cu. Calculate the emf of the cell. Given, $E^{\circ}_{Zn^{++}/Zn}$ = -0.76 V and $E^{\circ}_{Cu^{++}/Cu}$ = 0.34 V at STP.	5	3	1	1	
		Unit - II					
3	a)	State and derive Beer-Lamberts law.	5	2	2	2	
	b)	Elaborate the concept of potentiometric red-ox titration for $K_2Cr_2O_7$ versus FAS solution.	5	2	2	2	
	c)	Explain the construction and working of lead acid battery.	5	2	2	2	
	d)	Discuss the construction and working of zinc – air battery.	5	2	2	2	
		OR					
4	a)	The molar absorptivity of a solution is 2.1 x 10^4 $Lmol^{-1}cm^{-1}$. Calculate the transmittance through a cuvette with a 5.00 cm light path for 2.00 x 10^{-6} M solutions.	5	3	2	2	
	b)	Explain the variation of conductivity for the titration of the following: i) Strong acid versus strong base and ii) strong acid versus weak base	5	2	2	2	
	c)	With a schematic diagram, explain the operation of a battery during discharging.	5	2	2	2	
	d)	Predict the possible anodic and cathodic reactions occurs for the following battery: i) Lithium ion battery ii) Ni-Cd battery	5	6	2	2	
		Unit - III					
5	a)	What are nanomaterials? Explain the classification of nanomaterials based on composition with suitable example.	5	2	3	2	
	b)	Describe the experimental procedure for the preparation of nano TiO_2 by hydrothermal method.	5	6	3	2	
	c)	Explain the preparation of bio-ethanol from molasses.	5	2	3	2	

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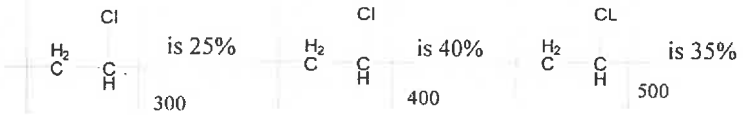
	d)	What are fuel cells? Explain the construction and working of MeOH-O_2 fuel cell.	5	2	3	2
		OR				
6	a)	Explain the preparation of nano ZnO by combustion method.	5	2	3	2
	b)	Discuss the preparation of carbon nanotubes by arc discharge method.	5	2	3	2
	c)	With a suitable reaction, explain the preparation of biodiesel.	5	2	3	2
	d)	Calculate the percent atom economy for the preparation of acetone from the following two different experimental procedures. Given atomic mass : c = 12; H = 1, O = 16 i) By oxidation of 2-propanol $CH_3CH(OH)CH_3 \xrightarrow{\Delta} CH_3COCH_3 + H_2$ ii) By reductive oxidation of 2-propene $CH_3CH = CH_2 + 1/2\ O_2 \rightarrow CH_3COCH_3$	5	3	3	2
		Unit - IV				
7	a)	Explain the electrochemical theory of corrosion by taking iron as an example.	5	2	4	1
	b)	What is anodization? Explain the anodization process for aluminium.	5	2	4	1
	c)	What is differential aeration corrosion? Explain this concept to pitting corrosion.	5	1	4	1
	d)	Describe the experimental procedure for the extraction of gold from e-waste.	5	3	4	1
		OR				
8	a)	Iron corrodes faster when in contact with copper but slowly when in contact with tin. Justify the statement.	5	5	4	1
	b)	An iron metal lost 2.12 x 10^{-3} g of weight when it is immersed in deaerated acidic solution for 2 hours. Calculate the corrosion penetration rate for the exposed area of 3 cm^2. Given K = 534 and the density of metal if 5.3 g/cm^3.	5	3	4	1
	c)	What is cathodic protection? With a neat diagram, explain the corrosion control by sacrificial anode method.	5	2	4	1
	d)	What are the sources of E-waste? Explain the problems of E-waste on environment and human health.	5	1	4	1
		Unit - V				
9	a)	Explain the preparation of following polymers: i) Teflon and ii) PMMA	5	2	5	2
	b)	Distinguish between thermoplastic and thermosetting polymers.	5	2	5	2
	c)	What are thermotropic and lyotropic liquid crystals? Give an example for each one.	5	1	5	2
	d)	What are LEDs? Describe the working principle of LEDs.	5	2	5	2
		OR				
10	a)	What are conducting polymers? Explain the mechanism of conduction in polyacetylene by oxidative doping.	5	1	5	2
	b)	Calculate number average and weight average molecular masses of polyvinyl chloride with the following composition  [H = 1, C = 12, Cl = 35]	5	3	5	2
	c)	Explain (i) chiral nematic liquid crystals and (ii) smectic liquid crystals	5	2	5	2
	d)	Point out the difference between LED and LCD.	5	4	5	2