MOBILE PHONES PROHIBITED

Siddaganga Institute of Technology, Tumakuru-572 103

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

Bachelor of Engineering Supplementary Examinations Aug – Sept. 2024

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.

Unit - I

			M	BL	CO	PO	PSO
1	a)	Outline the origin of single electrode potential.	5	2	1	1	
	b)	Derive a mathematical expression of Nernst equation for single electrode potential.	5	3	1	1	
	c)	With a neat diagram, explain the construction and working of Calomel electrode.	5	2	1	1	
	d)	Define concentration cell. Give an example. Evaluate EMF of a cell when two copper rods are placed in 1M of copper sulphate solution, assuming one of the solutions is diluted to $1/5^{th}$ of its original value.	5	5	1	1	

OR

			M	BL	CO	PO	PSO
2	a)	What is an electrochemical cell? Distinguish between galvanic cell and electrolytic cell.	5	4	1	1	
	b)	Describe the construction and working of concentration cell.	5	2	1	1	
	c)	Derive the mathematical equation for the determination of pH of a solution using glass electrode.	5	3	1	1	
	d)	What voltage will be generated by a cell that consists of an iron rod immersed in 0.01 M solution of $FeSO_4$ and a silver wire immersed in 0.1 M solution of $AgNO_3$ at 298K? Given $E°_{Fe^{2+}/Fe}$ and $E°_{Ag^+/Ag}$ are -0.44 V and 0.8 V respectively.	5	1	1	1	

Unit - II

			M	BL	CO	PO	PSO
3	a)	State and derive Beer-Lambert's law.	5	3	2	2	
	b)	Explain the application of potentiometeric titration of Mohr's salt against potassium dichromate. Justify the sleep increases in EMF at the equivalence point.	5	5	2	2	
	c)	What is a reserve battery? Give an example. What are the advantages of reverse battery?	5	1	2	2	
	d)	Write the anodic and cathodic reactions for the following batteries (i)Li-ion (ii) Ni-cd battery.	5	1	2	2	

OR

			M	BL	CO	PO	PSO
4	a)	A printed circuit board solution containing 2.75×10^{-4} M of copper sulphate displayed the transmittance of 36.6% when measured in a 1.5 cm cell at wavelength of 620nm. Solve and calculate (a) the absorbance of the solution (b) the molar absorptivity of $CuSO_4$.	5	3	2	2	
	b)	Define specific conductance. Explain the variation in conductance for the mixture of strong acid and weak acid against strong base.	5	2	2	2	
	c)	Explain the operation of a battery during discharging and charging process.	5	2	2	2	
	d)	Discuss the construction and working of Zn-air battery.	5	2	2	2	

Unit - III

			M	BL	CO	PO	PSO
5	a)	Describe the synthesis of zinc oxide nanoparticles by solution combustion method.	5	2	3	2	
	b)	What are carbon nanotubes? Explain the preparation of carbon nanotubes by arc discharge method.	5	2	3	2	
	c)	How is bio-ethanol produced? Mention its uses.	5	1	3	2	
	d)	What is a fuel cell? How does a fuel cell differ from a battery? Write the half-cell reactions taking place at anode and cathode of $MeOH-O_2$ fuel cell.	5	1	3	2	

OR

6 a) Classify nanoparticles based on materials. Give examples. | 5 | 2 | 3 | 2

b) Elaborate the synthesis of nano TiO_2 by hydrothermal method. | 5 | 6 | 3 | 2

c) Define % atom economy. Justify the feasible synthetic route for the synthesis of phenol by calculation % atom economy.
[Given atomic mass C=12, H=1,)=16, S=32, N=14, CI=35 and Na=23]
Route 1: $C_6H_6 + H_2SO_4 + NaOH \rightarrow C_6H_5OH + NaHSO_3$
Route 2: $C_6H_5N_2Cl + H_2O_2 \rightarrow C_6H_5OH + HCl + N_2$ | 5 | 5 | 3 | 2

d) With suitable reaction, explain the synthesis of bio-diesel and give its applications. | 5 | 2 | 3 | 2

Unit - IV

7 a) An iron metal lost 1.4×10^{-2} g of weight when it is immersed in deareated acidic solution for 3 hrs. Calculate the corrosion penetration rate (CPR) for the exposed area of 2 cm^2. Given k =534 and the density of metal =5.37 g cm^{-3}. Express the CPR in terms of meter per second. | 5 | 3 | 4 | 1

b) Explain the different types of corrosion in the following cases:
(i) A part of iron block is covered by sand.   (ii) An iron pipe is subjected to bending. | 5 | 2 | 4 | 1

c) Explain the process of anodization of aluminium articles. | 5 | 2 | 4 | 1

d) What are the sources of e-waste? Explain the impact of e-waste on environment. | 5 | 2 | 4 | 1

OR

8 a) Explain the formation of brown coloured product of rust on iron metal surface by electrochemical theory. | 5 | 2 | 4 | 1

b) Iron corrodes faster when in contact with copper, but not in contact with zinc. Justify the statement. | 5 | 5 | 4 | 1

c) What is cathodic protection? Explain the cathodic protection by impressed voltage method. | 5 | 2 | 4 | 1

d) Explain the extraction of gold from a e-waste by hydrometallurgy. | 5 | 2 | 4 | 1

Unit - V

9 a) Explain the mechanism of conduction in polyacetylene by oxidative doping. | 5 | 2 | 5 | 2

b) Calculate the number average and weight average molecular masses of polymer with the following compostion.
(Given: Atomic weight of H =1, C=12 and Cl=35).

$$[-CH_2-CH-]_{250} \text{ is } 50\% ; [-CH_2-CH-]_{450} \text{ is } 30\% ; [-CH_2-CH-]_{500} \text{ is } 20\%$$
(with Cl substituents) | 5 | 3 | 5 | 2

c) With an example each, distinguish between thermotropic liquid crystals and lyotropic liquid crystals. | 5 | 4 | 5 | 2

d) Discuss the effect of light on liquid crystals. | 5 | 2 | 5 | 2

OR

10 a) Classify polymer based on occurrence and effect of heat. Give examples. | 5 | 2 | 5 | 2

b) Construct the synthetic route for the following polymers and give its applications.
(i) Teflon (ii) PMMA. | 5 | 3 | 5 | 2

c) Explain the molecular ordering in the following liquid crystal phases (i) Chiral nematic phase (ii) Smectic phase. | 5 | 2 | 5 | 2

d) What are LEDs? Describe the working principle of light emitting diodes. | 5 | 2 | 5 | 2

_____