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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

May 2023 Semester End Main Examinations

Programme: B.E

Semester: I / II

Branch: Common to all Branches

Duration: 3 hrs.

Course Code: 21CY1BSECT / 21CY2BSECT

Max Marks: 100

Course: Engineering Chemistry

Date: 18.05.2023

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1	<p>a) Explain the construction and working of glass electrode. Derive an expression for potential of glass electrode. 5</p> <p>b) What are concentration cells? Calculate the cell potential of the following cell at 290 K : $\text{Ag} \text{Ag}^+(0.024\text{M}) \text{Ag}^+(0.056\text{M}) \text{Ag}$ 5</p> <p>c) Justify : i. EMF of the calomel electrode is dependent on the concentration of KCl at STP. ii. Chromium anodes are not used in electroplating of chromium. 4</p> <p>d) With appropriate reactions, explain pitting corrosion with suitable example. Justify that in pitting corrosion, rate of corrosion is progressively increasing. 6</p>
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OR

2	<p>a) Describe the construction and working of calomel electrode. 5</p> <p>b) Write cell reactions and calculate the emf of the cell at 298 K, consisting of Zn metal in contact with ZnSO_4 solution (0.001M) and Ag metal in contact with AgNO_3 solution (0.1 M). The SRP values of Ag^+/Ag half-cell is +0.80 V and Zn^{+2}/Zn is -0.76 V 5</p> <p>c) Explain electroless plating of copper for the manufacturing of PCB in electronic industry. 4</p> <p>d) How the following factors affect the rate of corrosion? i) Ratio of anodic to cathodic area, (ii) Polarization 6</p>
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UNIT - II

3	<p>a) In a bomb calorimeter experiment, 1.05 g of a solid fuel was subjected to complete combustion. The temperature of surrounding water (1.3 kg) is increased by 3.1 °C, if the water equivalent of calorimeter is 0.5 kg, find out GCV and NCV of the fuel. (Given: Molecular formula of fuel: $\text{C}_7\text{H}_6\text{O}_2$, Specific heat of water: 4.187 KJ/Kg/ °C, Latent heat of steam: 587×4.187 KJ/Kg) 5</p> <p>b) Explain the construction and working of a silicon based solar cell. 5</p> <p>c) What is petroleum cracking? Justify the need for cracking. 4</p> <p>d) What are secondary batteries? Explain the construction and charge-discharge reactions of $\text{Li}-\text{CoO}_2$ battery. 6</p>
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Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

UNIT - III

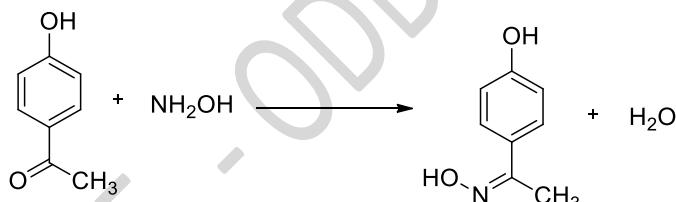
4	a)	Describe the synthesis of PMMA. Mention its applications.	5
	b)	Define glass transition temperature (Tg). Elaborate on any two factors affecting Tg.	6
	c)	Discuss the structure, properties, and applications of Kevlar fibre.	5
	d)	A polymer sample has following composition: 100 molecules with molecular weight 25000, 200 molecules with molecular weight 27000, and another 100 molecules with molecular weight 30000. Calculate number and weight average molecular weights.	4

UNIT - IV

5	a)	Elaborate on any five principles of green chemistry.	5
	b)	Discuss the synthesis of methyl methacrylate by green route.	4
	c)	With a neat sketch, discuss the ion exchange process of water purification. Why regeneration of spent resin is required in ion exchange process?	6
	d)	Define COD. In a COD experiment, 10 mL of waste water sample required 12 mL and 8.5 mL of 0.025 N FAS solution for blank and back titrations, respectively. Calculate the COD of the given sample.	5

OR

6	a)	Elaborate on synthesis of adipic acid by conventional and green route. What are the advantages in green route?	7
	b)	The synthesis of key intermediate required for the synthesis of paracetamol is given below	4



Calculate atom economy for the same.

(Given: Atomic weights of H : 1, C : 12, N : 14, O : 16)

c)	Justify the need of aerobic condition in secondary treatment of sewage water.	3
d)	Explain the estimation of total hardness of water by EDTA titration.	6

UNIT - V

7	a)	What are carbon nanotubes? How are they classified? Elaborate their properties and applications.	6
	b)	Explain the principles behind estimation of copper by colorimetry.	5
	c)	State and explain the Gibbs phase rule.	3
	d)	What is eutectic point? Sketch labelled lead-silver phase diagram.	6
