U.S.N.										

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

Autonomous Institute Affiliated to VTU

September / October 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

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

UNIT - I

1	a)	What are reference electrodes? Describe the construction and working of calomel electrode.	**06**
	b)	What are all concentration cells? EMF of concentration cell: $Zn\|ZnSO_4$ (X) $\|\|$ $ZnSO_4$ (0.02M) $\|$ Zn, at 29^{o}C is 0.03 V. Find the concentration of $ZnSO_4$ at anode.	**05**
	c)	Justify the following statements: i) Iron corrodes faster in contact with silver than with copper. (ii) Phosphating is a surface conversion coating	**05**
	d)	Appraise the process of Galvanization of Iron.	**04**

OR

2	a)	Define corrosion. Explain electrochemical theory of corrosion taking iron as an example.	**06**
	b)	Predict the effect of following factors on the rate of corrosion: i) nature of corrosion product ii) pH of medium	**04**
	c)	Justify the following statements: (i) EMF of a galvanic cell has to be always positive. (ii) The potential of calomel electrode increases with decrease in KCl concentration	**04**
	d)	What is electroless plating? Explain the electroless plating of copper with relevant reactions and mention its advantages over electroplating.	**06**

UNIT - II

3	a)	Define GCV. When 0.76 g of chemical fuel is subjected to complete combustion in a bomb calorimeter, the temperature of the surrounding water increased from 25^{o}C to 28^{o}C. The weight of water taken and water equivalent of bomb calorimeter are 2.5 Kg and 0.485 Kg respectively. Calculate GCV and NCV. (Given: Specific heat of water=4.186 KJ/Kg/^{o} C, Latent heat of steam is 2457 KJ/Kg and percentage of hydrogen in the fuel is 4.9).	**05**
	b)	Explain the construction and working of solar cell.	**05**
	c)	Lithium is preferred as anode material in battery technology: justify the statement. Explain the construction and working of Li-CoO_2 battery.	**06**

	d)	Justify the following statements: (i) Fuel cells do not store chemical energy. (ii) Why acidic electrolyte is preferred in Methanol-O_2 fuel cell?	**04**

UNIT - III

4	a)	In a polymer sample, 20 molecules have molecular mass 15000g/mol, 35 molecules have molecular mass 25000g/mol and remaining 45 molecules have molecular mass 20000 g/mol. Calculate the number average, weight average molecular mass and PDI of the polymer.	**05**
	b)	Write the synthesis and uses of: (i) UF resin and (ii) Nitrile rubber. Mention their applications	**06**
	c)	Describe the synthesis and applications of poly glycolic acid	**05**
	d)	Justify the following statements: i) Kevlar is less flexible than nylons ii) Not all simple organic molecules are monomers.	**04**

UNIT - IV

5	a)	Describe the synthesis of ethylene oxide and methyl methacrylate from green route.	**06**
	b)	Define hardness of water. In an experiment 25 cm^3 of hard water sample required 12.3 cm^3 0.025 M EDTA solution for titration using EBT as indicator. Under similar conditions another 25$cm^3$of same sample water after boiling and cooling required 9.5 cm^3 of EDTA solution. Calculate temporary, permanent and total hardness of water sample.	**05**
	c)	Explain with a neat diagram desalination of sea water by reverse osmosis method.	**05**
	d)	Justify the roles of Ag_2SO_4 and $HgSO_4$ in experimental determination of COD of waste water. What happens to estimation of COD in their absence?	**04**

OR

6	a)	Describe the process of removal of hardness by ion exchange method.	**06**
	b)	What is atom economy? Describe its significance in green chemistry.	**04**
	c)	Aerobic conditions are necessary in secondary treatment of sewage water, justify the statement. Elaborate the Trickling filter process of sewage treatment.	**06**
	d)	List any four principles of green chemistry.	**04**

UNIT - V

7	a)	Draw and explain the phase diagram for water system. Explain the significance of area, curves and triple point.	**06**
	b)	Justify the following statements: i) Nano gold is catalytically more active than bulk gold ii) Graphene has superior mechanical and electrical properties	**04**
	c)	State Lambert – Beer Law. Elaborate the principle involved in colorimetric estimation of copper.	**06**
	d)	Differentiate top-down approach from bottom up approach of nanomaterial synthesis.	**04**

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