

Model Question Paper

First/Second Semester B.E Degree Examination

Engineering Chemistry

Time: 3 Hours

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M: Marks, L: RBT (Revised Bloom's Taxonomy) level, C: Course outcomes.

Module -1			M	L	C
Q1	a.	Illustrate the application of lithium battery technology in the construction and working of Li- Polymer battery.	07	L3	CO3
	b.	The emf of the cell $\text{Fe}/\text{FeCl}_2 (x \text{ M})// \text{FeCl}_2 (1.2\text{M})/\text{Fe}$ is 0.08922 V at 25°C. Write the electrode reactions and find the value of x.	07	L3	CO3
	c.	Classify the fuel cells based on the components present.	06	L2	CO1
OR					
Q2	a.	Interpret how chemical energy of fuel and oxidant is converted to electrical energy without combustion by using construction and working of Proton exchange membrane fuel cells.	07	L3	CO3
	b.	Two copper rods are immersed in CuSO_4 solution of concentration 0.02 M & 0.06M. Write the cell representation, cell reactions and calculate EMF at 298 K.	07	L3	CO3
	c.	Explain any six differences between classical batteries with fuel cells.	06	L2	CO1
Module- 2					
Q3	a.	In a COD experiment, 25.3 cm ³ and 16.6 cm ³ of 0.01 N FAS solution were required for blank and back titration respectively. Calculate chemical oxygen demand of waste water sample, given volume of waste water sample used is 25 cm ³ .	07	L3	CO3
	b.	Describe the principle, construction and working of softening of water by ion exchange mechanism with the neat diagram.	07	L2	CO2
	c.	Explain the process of copper metal extraction from printed circuit board with a suitable reaction.	06	L2	CO1
OR					
Q4	a.	Calculate the COD of 20 cm ³ of an effluent sample which requires 8.3 cm ³ of 0.001N $\text{K}_2\text{Cr}_2\text{O}_7$ for its complete oxidation.	07	L3	CO3
	b.	Explain the principle and working of reverse osmosis technique with a neat diagram.	07	L2	CO2
	c.	Outline the role of stakeholders in environmental management of e-waste.	06	L2	CO1
Module – 3					
Q5	a.	Explain the application of potentiometry in the quantitative measurement of iron extracted from TMT bar.	07	L2	CO2
	b.	Describe the principle, working, and properties of OLED and identify the applications.	07	L2	CO2
	c.	Interpret the temperature dependent and concentration dependent liquid crystals.	06	L2	CO1
OR					
Q6	a.	Discuss the application of conductometry in the quantitative measurement of acid content present in vinegar.	07	L2	CO2
	b.	Outline the components, principle and working of electrochemical sensors.	07	L2	CO2

	c.	Outline the properties and application of liquid crystals.	06	L2	CO1
Module – 4					
Q7	a.	Illustrate the application of photoelectric effect in the construction and working of solar cells (PV cells).	07	L3	CO3
	b.	Describe the synthesis of biodiesel with a suitable reaction.	07	L2	CO2
	c.	Liquid fuel weighing 0.98 g and contains 90.1% C, 8% H with the following results in bomb calorimeter experiment: Amount of water taken in calorimeter = 1450 g; Water equivalent of calorimeter = 450 g Rise in temperature of water = 1.8 °C. If the specific heat of water is 4.187 kJ/kg/°C and the latent heat of steam is 2457 kJ/kg, calculate the gross and net calorific value.	06	L3	CO3
OR					
Q8	a.	Interpret how the hybrid organic-inorganic metal halides influence the conversion of solar radiation into electrical energy in thin film solar cells.	07	L3	CO3
	b.	Explain the mechanism of knocking with relevant reactions.	07	L2	CO2
	c.	A coal sample with 93% C, 5% hydrogen & 2% ash is subjected to combustion in a bomb calorimeter. Calculate GCV & NCV if the mass of fuel is 0.95 g, mass of water is 2000 g & the water eq. of the calorimeter is 700 g. Rise in temp is 2.8°C. Given, latent heat of water is 587 Cal/g, specific heat of water is 4.187 KJ/Kg/°C.	06	L3	CO3
Module – 5					
Q9	a.	A metal iron plate was found in a vessel containing acidic media, it was estimated that the original area was 30 inch ² that approximately 1.2 kg had corroded. Assuming a CPR of 400mpy for this iron in acidic, calculate time in years, density of iron is 7.87 g/cm ³ .	07	L3	CO3
	b.	Outline the properties and applications of graphene.	07	L2	CO2
	c.	Describe the suitable designs and selection of materials for corrosion control.	06	L2	CO1
OR					
Q10	a.	A thick steel sheet of area 400 cm ² is exposed to air near the ocean. After one-year period it was found to experience a weight loss 375 g due to corrosion. If the density of the steel is 7.9 g/cm ³ calculate the corrosion penetrating rate in mpy and mmpy (given K= 534 in mpy, 87.6 in mmpy & 1 cm ² = 0.155 inch ²).	07	L3	CO3
	b.	Summarize the synthesis of nanomaterials from co-precipitation method.	07	L2	CO2
	c.	Explain the differential metal corrosion by taking iron as an example with suitable reactions.	06	L2	CO1
