Question Paper

Exam Date & Time: 01-Jun-2023 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

SECOND SEMESTER B.TECH. EXAMINATIONS - MAY/JUNE 2023
SUBJECT: CHM 1071-CHM/CHM 1071-B/CHM 1051-B - ENGINEERING CHEMISTRY

Marks: 50 **Duration: 180 mins.**

Answer all the questions.

1A)	Explain the working of Daniel cell. Calculate ΔG for a cell Fe /$FeSO_{4(0.1\ M)}$ ‖ $CdSO_{4(0.05\ M)}$ / Cd at 273K. Write the cell reactions and predict the spontaneity of the reaction.	(4)
1B)	Explain the working of Lithium-ion cell.	(2)
i)		
ii)	Why oxygen should be free from CO2 impurities in an alkaline fuel cell?	(1)
iii)	Write any two disadvantages of the glass electrode.	(1)
1C)	What is the effect of temperature and current density on the nature of the electrodeposit?	(2)
2A)	Justify the following: i) Conductance value decreases initially during conductometric titration of weak acid with strong base. ii) Concentration of the titrant must be 10 times as the solution being titrated in conductometric titration. (2+2 = 4 marks)	(4)
2B)	Explain any two methods of softening of water.	(4)
2C)	Discuss the disadvantages of scale formation in boilers.	(2)
3A)	Explain any two types of dry corrosion with an example for each.	(2)
i)		
ii)	Name and explain the type of corrosion that occurs during welding of stainless steel.	(2)
3B)	Explain the mechanism of rusting of iron. Discuss any one primary and secondary factor that affect the rate of corrosion.	(4)
3C)	Give reasons for the following: i) Galvanized containers are not used to store acidic food. ii) Fe_2O_3 promotes corrosion, whereas Al_2O_3 retards corrosion.	(2)
4A)	Differentiate between the following (Any two points each) - i) Nematic and smectic phases ii) Thermotropic and lyotropic liquid crystal. iii) Physical and chemical vapor deposition techniques. iv) Top down method and bottom - up approach.	(4)
4B)	The polymer sample has the following composition.	(3)

i)

Degree of polymerization	400	300	200	100
% of composition	10	20	30	40

		If the number average molecular weight of the sample is 20000. Calculate the molecular weight of the monomer, weight average molecular weight and PDI of the polymer sample.	
	ii)	What is the effect of plasticizer on glass transition temperature of polymer?	(1)
4C)		i) Why polyvinyl chloride (PVC) has higher strength than Polyethylene? ii) Write any two factors on which properties of composite materials depend.	(2)
5A)		Explain the methods of cleaning the metal surface (Any two)	(2)
	i)		
	ii)	Discuss electroless plating of copper.	(2)
5B)		Explain the preparation of nanomaterials by sol-gel method.	(3)
	i)		
	ii)	How is agglomeration of zirconia prevented in the production of nanocrystalline Zirconia (ZrO_2)?	(1)
5C)		Explain the role of addition of Hydrazine (N_2H_4) and $ZnSO_4$ in corrosion inhibition.	(2)

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