Question Paper

Exam Date & Time: 09-Jan-2024 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST SEMESTER B.TECH. DEGREE EXAMINATIONS - JANUARY 2024
SUBJECT: CHM 1071 / CHM-1071 - ENGINEERING CHEMISTRY

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

Answer all the questions.

1A)	The EMF of the cell having Ni and Cu as the electrodes in contact with their respective electrolytes $NiCl_2$ (1 M) and $CuCl_2$ (10 M) is 0.6170 V at 273 K. Calculate its EMF, ΔG, ΔH for the reaction at 298 K. Write the cell representation. Why does the standardization of glass electrode need to be done frequently?	(4)
1B)	Explain the construction and working of alkaline fuel cell. Write any four basic requirements for a secondary battery.	(4)
1C)	Define decomposition potential. How is electroless plating of Cu superior to electroplating?	(2)
2A)	i) Explain the variation of conductometric titration of a weak acid with a strong base. ii) A chemist has a sample of Adenine with a concentration of 0.9 M. The molar absorption coefficient and path length for the medium is 0.0376 M^{-1} cm^{-1} and 1 cm respectively. Calculate how much light is transmitted through the sample? (2+2 = 4 marks)	(4)
2B)	Explain the following process: i) Phosphate conditioning ii) Reverse osmosis (2+2 = 4 marks)	(4)
2C)	Explain the procedure for the determination of hardness of water. Why does the solution appear blue at the endpoint of the reaction?	(2)
3A)	What are the characteristic features of pitting corrosion? Explain the type of corrosion that occurs when 18-8 stainless steel is welded at high temperature.	(4)
3B)	i) Define the term passivity. Draw and explain the potential vs corrosion current plot for the metals showing active-passive behaviour. ii) Discuss with suitable examples how the metal coating is useful in combating corrosion.	(4)
3C)	Discuss the type of factor that affects corrosion rate in the following examples: a) Peeling of tin coat on iron. b) Aluminum is exposed to an oxidising environment.	(2)
4A)	Differentiate between the following (Any two points each) - i) Thermoplastic and Thermosetting polymers. ii) Thermotropic and lyotropic liquid crystal. iii) Physical and chemical vapor deposition techniques. iv) Top down and bottom - up approach.	(4)
4B)	i) In a polymer sample, 30 % molecules have a molecular mass 20000, 40 % have molecular mass 30000 and remaining have molecular mass of 60000. Calculate the number average, weight average molecular weight of polymer and the polydispersity index of the polymer. ii) Polycatenar mesogens are considered as a hybrid class of thermotropic LCs. Give reason. (3+1 = 4 marks)	(4)

4C) i) Why polyvinyl chloride (PVC) has higher strength than Polyethylene? (2)
ii) Write any two factors on which properties of composite materials depend.

5A) i) For the cell Zn | Zn^{2+} (1 x 10^{-4}) || Mg^{2+} (1 x 10^{-3}) | Mg, the standard reduction potential of zinc and magnesium electrodes are -0.764 V and -2.364 V respectively. Find E^0_{cell}, ΔG and predict if the cell reaction is spontaneous or not. (4)
ii) Define over voltage?
(3+1 = 4 marks)

5B) i) Give reasons for the following: (4)
a) Ionic compounds are soluble in polar solvents.
b) HF has higher boiling point than HCl.

ii) Explain how the structure of a polymer influences;
a) crystallinity
b) Elasticity
(2+2 = 4 marks)

5C) Explain the function of anodic inhibitors with suitable example. (2)

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