Question Paper

Exam Date & Time: 04-Dec-2023 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST SEMESTER B.TECH. DEGREE EXAMINATIONS - NOVEMBER/DECEMBER 2023
SUBJECT: CHM 1071 / CHM-1071 - ENGINEERING CHEMISTRY

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

Answer all the questions.

1A)	Explain the construction and working of glass electrode. Derive the expression for potential of glass electrode.	(4)
1B)	i) Write the cell reaction and calculate the pH of the solution when the cell Pt | $\dot{H}_2$| $H^+_{(x)}$|| $KCl_{(0.1\ M)}$ | Hg_2Cl_2|Hg is set up at 298 K, which provides an EMF of 0.65 V*(EMF of normal calomel electrode is 0.2810 V)*. ii) Give reason: Weston cadmium cell is used for emf measurements. (3+1 = 4 marks)	(4)
1C)	Give reasons for the following: i) Salt bridge is used in the construction of an electrochemical cell. ii) Pure chromium is not used as anode during chromium plating.	(2)
2A)	i) The concentration of yeast t-RNA in an aqueous solution is 20 M. The absorbance is found to be 0.418 when this solution is placed in a 2.00 cm cuvette and 516 nm radiations are passed through it. a) Calculate the specific absorptivity. b) What will be the absorbance if the solution is 10 M? ii) Explain the conductometric titration of strong acid vs weak base with illustration. (2+2 = 4 marks)	(4)
2B)	i) Differentiate between Temporary and Permanent Hardness. Write any two advantages of lime soda process. ii) Explain any two disadvantages of scale formation in boilers. (2+2 = 4 marks)	(4)
2C)	Briefly explain Phosphate and Calgon Conditioning.	(2)
3A)	Explain how the following factors affect the rate of corrosion: i) relative electrode potential ii) pH iii) hydrogen overvoltage iv) temperature	(4)
3B)	Explain the mechanism of electrochemical theory of corrosion with an example. Why should anodic inhibitors be used in the sufficient concentration to prevent corrosion?	(4)
3C)	Explain the sacrificial anode method of corrosion protection.	(2)
4A)	a) Explain how the structure of a polymer influences the following properties: i) Tensile strength ii) Chemical resistance b) Polymers molecule with different degree of polymerization such as 500, 750, 950 and 1500 are mixed in molecule ratio 1:2:3:4 in a sample of high polymer of ethylene. (Mol. Mass= 28). Calculate	(4)

Number average and Weight average molecular weight of the polymer.
(2+2 = 4 marks)

4B) i) Explain the principle and working of liquid crystals display unit.
ii) Differentiate between particle and fiber reinforced composites. (4)

4C) With a neat diagram, describe the physical vapor deposition process. (2)

5A) i) Explain the construction and working of Li ion battery.
ii) Discuss the origin of single electrode potential. (4)

5B) i) Define glass transition temperature of a polymer. Mention any four factors affecting it.
ii) Discuss the types of hydrogen bonding with suitable example in each case. (4)

5C) What is liquid metal corrosion? How it is different from wet corrosion? (2)

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