Question Paper

Exam Date & Time: 23-Nov-2024 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST SEMESTER B.TECH. (CSE STREAM) EXAMINATIONS - NOVEMBER 2024
SUBJECT: CHM 1072 - APPLIED CHEMISTRY FOR ENGINEERS

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

Answer all the questions.

1A)	Explain the construction and working of lead-acid battery with necessary reactions. Write any two limitations of lead-acid battery.	(4)
1B)	Describe the construction and working of methanol fuel cell with the necessary diagram and chemical reactions. Write two advantages of fuel cells.	(4)
1C)	Give reasons for the following; i) Gas vents are not provided in maintenance-free lead acid batteries. ii) Proper water management is crucial for the efficient functioning of proton exchange membrane fuel cell	(2)
2A)	i) Explain how crystallinity affects the tensile strength of polymers. ii) Briefly explain the sol-gel method for the preparation of nanomaterials.	(4)
2B)	i) Give any two applications of biodegradable polymers. ii) A polymer sample contains molecules with degrees of polymerization of 500, 750, 950, and 1500 in a ratio of 1:2:3:4. Calculate the number average and weight average molecular weight of the polymer, given that the molecular mass of ethylene (monomer) is 28.	(4)
2C)	Describe any two types of viscosities in polymer solutions, providing the relevant equations and explaining key terms.	(2)
3A)	Give a reason for the following; i) Ordinarily pure materials do not display the luminescence phenomenon. ii) Core and cladding in optical fibers are important for propagating light. iii) Paramagnetic substances lose their magnetism when the external magnetic field is removed iv) Ferromagnetic substances become paramagnetic when they are heated above the curie point.	(4)
3B)	Explain the working of chemical sensors. List the limitations of sensors.	(4)
3C)	Outline the role of chemical sensors in environmental monitoring and medical diagnostics.	(2)
4A)	Give sources and health risks associated with the following toxic substances in e-waste: i) brominated flame retardants (BFRs) ii) Lead	(4)
4B)	i) How do recycling and material recovery contribute to a circular economy in e-waste management? ii) Summarize the case study of e-waste pollution in Guiyu, China.	(4)
4C)	i) What is sulphation of lead -acid battery? ii) Sodium-ion batteries are more cost-effective than lithium-ion batteries. Justify the statement	(2)
5A)	Explain the basic structure and working of Twisted Nematic liquid crystal display	(4)
5B)	i) What potential do glucose-responsive polymers have for managing diabetes, and how do they function? ii) Explain the steps involved in gel permeation chromatography.	(4)

5C) What is the significance of λ_{max} in colorimetric estimation of copper? The preparation of 250 mL standard solution of $CuSO_4$ require 1.2354 g of $CuSO_4$ crystals. Calculate the concentration Cu in 1 mL of this solution. (Given atomic weight of Cu - 63.54 g and Molecular weight of $CuSO_4$ = 249.7 g) (2)

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