Model Question Paper

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Course Code: 1BCHES102/202

First Semester B.E. Degree Examination, January 2025

Applied Chemistry for Smart Systems (CSE Stream)

TIME:3 hrs.   Max.Marks:100

Note: 1. Answer any FIVE full questions, choosing ONE question from each MODULE
2. VTU Formula Hand Books Permitted
3. M: Marks, L: Bloom's level,C: Course outcomes.

		Module-1	**M**	**L**	**C**
Q.1	**a**	What are organic semiconductors? Explain the types of organic semiconductors used in memory devices.	6	L1	CO1
	b	Write a note on Pentacene semiconductor chip.	7	L2	CO1
	c	Illustrate the construction and working of Quantum Light Emitting Diodes (QLEDs) and discuss their applications in modern display technology.	7	L2	CO1
		OR			
Q.2	**a**	What are liquid crystals (LCs)? Discuss their classifications.	6	L1	CO1
	b	Explain the synthesis of TiO_2-RAM nanomaterial by the sol–gel method and describe its properties and applications.	7	L2	CO1
	c	Illustrate the construction and working principle of Organic Light Emitting Diodes (OLEDs) and discuss their applications in modern electronic displays.	7	L2	CO1
		Module–2			
Q.3	**a**	Describe the wet chemical synthesis of Cd–Se quantum dots and list their important applications.	6	L2	CO2
	b	What is Nylon-6,6? Describe its synthesis, properties, and advantages in 3D printing applications.	7	L1	CO2
	c	Discuss construction, working principle and applications of quantum dot sensitized solar cells (QDSSCs).	7	L2	CO2
		OR			
Q.4	**a**	Explain the structure-property relationship in polymers.	6	L2	CO2
	b	Explain synthesis, properties and applications of polymethyl methacrylate (PMMA)	7	L2	CO2
	c	In a sample of a polymer, 150 molecules have the molecular mass 100 g/mol, 200 molecules have the molecular mass 1000 g/mol, 350 molecules have the molecular mass 10,000 g/mol. Calculate the number average and weight average molecular mass of a polymer and also, find the Polymer dispersity index.	7	L3	CO1

		Module–3			
Q.5	**a**	What are fuel cells? Explain construction and working of solid oxide fuel cell (SOFC).	6	L1	CO3
	b	A copper concentration cell is obtained by combining two copper electrodes of concentrations 0.1M and 0.5 M immersed in copper sulphate solution at 25 ˚C. Write the cell reactions and calculate EMF of the cell.	7	L3	CO3
	c	Explain the construction and working of a Li-ion battery.	7	L2	CO3
		OR			
Q.6	**a**	Explain the construction and working of a Lithium-ion battery.	6	L2	CO3
	b	Illustrate the construction, working and applications of solar photovoltaic cell (PV cell).	7	L2	CO3
	c	Discuss the production of green hydrogen using the TiO_2 photocatalytic method.	7	L2	CO3
		Module–4			
Q.7	**a**	Define the following terms (i) Transducer (ii) Actuators (iii) Sensors	6	L1	CO4
	b	Explain i). Water line corrosion ii). Pitting corrosion.	7	L2	CO4
	c	Apply the concept of galvanization to prevent corrosion in steel structures exposed to marine environments. Justify your choice with appropriate chemical reasoning.	7	L3	CO4
		OR			
Q.8	**a**	What is corrosion? Explain electrochemical theory of corrosion by taking iron as an example.	6	L1	CO4
	b	Explain the applications of Electrochemical gas sensors in sensing SO_X and NOx	7	L2	CO4
	c	What is CPR? A thick sheet of area 93 $inch^2$ is exposed to air near the ocean. After a 6 months it was found to experience a weight loss of 360 g due to corrosion, if the density of the steel is 7.9 g/cm^3. Calculate the corrosion penetration rate in mpy and mmpy (Given K = 534 in mpy and 87.6 mm/y).	7	L3	CO4
		Module–5			
Q.9	**a**	Describe the role of artificial intelligence in e-waste management.	6	L1	CO4
	b	Apply the concept of green synthesis for the production of ZnO nanoparticles.	7	L3	CO4
	c	Discuss the synthesis and properties of alginate hydrogel with reference to its applications in brain–computer interfaces (BCIs).	7	L2	CO4
		OR			
Q.10	**a**	Describe the sources and composition of e-waste.	6	L1	CO4
	b	Discuss the process of gold extraction from e-waste using the bioleaching method.	7	L2	CO4
	c	Explain the synthesis and properties of polylactic Acid (PLA) in touch screen applications.	7	L2	CO4

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