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1BCHEE102

First Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

Applied Chemistry for Emerging Electronics and Futuristic Devices (EEE, ECE)

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
 2. M : Marks, L: Bloom's level, C: Course outcomes.
 3. VTU formula handbook is permitted.*

Module – 1						
Q.1	a.	Distinguish between organic and inorganic semiconductors.	6	L3	CO1	
	b.	Discuss construction and working principle of Poly (3-hexylthiophene) (P3HT) as a donor and Phenyl-C61-butyric acid methyl ester (PCBM) as an acceptor.	7	L2	CO1	
	c.	Explain working principle and applications of Micro-electromechanical systems (MEMS)-based energy harvesters.	7	L2	CO1	
OR						
Q.2	a.	What is battery? Explain the battery characteristics: capacity, power density, shelf life & cycle life.	6	L2	CO1	
	b.	Explain construction and working of ultra-small asymmetric super capacitor and its applications in IoT/wearable devices.	7	L2	CO1	
	c.	Discuss construction, working principle and advantages of solar photovoltaic cell (PV cell).	7	L2	CO1	
Module – 2						
Q.3	a.	Explain the size dependent properties: catalytic, optical properties and electrical conductivity.	6	L2	CO2	
	b.	Explain synthesis of silicon based Quantum Dots by sol gel method and Cd-Se Quantum Dots by hot injection method.	7	L2	CO2	
	c.	Discuss synthesis and properties of chitosan-carbon quantum dots hydrogel and its applications in next-generation flexible and wearable electronics.	7	L2	CO2	
OR						
Q.4	a.	What are Quantum dots (QDs)? Explain optical and electronic properties of quantum dots (QDs).	6	L2	CO2	
	b.	Explain synthesis of TiO ₂ nano particles by sol-gel method and its uses in sensor applications.	7	L2	CO2	
	c.	Discuss synthesis and properties of Graphene Quantum Dots using citric acid method and its applications in emerging electronics.	7	L2	CO2	

Module – 3					
Q.5	a.	Explain synthesis and conduction mechanism of polyaniline.	6	L2	CO3
	b.	A sample of polymer contains 20 molecules of molecular mass 3000, 30 molecules of molecular mass 5000 and the remaining molecules of molecular mass 7000. Calculate number average, weight average molecular mass and poly dispersity index.	7	L3	CO3
	c.	Discuss working principle of lithography for micro-patterned copper deposition.	7	L2	CO3
OR					
Q.6	a.	What are polymer composite? Explain synthesis and properties of epoxy resin magnetite (Fe_3O_4) composite from ultra-sonication method.	6	L2	CO3
	b.	Discuss the synthesis and properties of Kevlar Fiber Reinforced Polymer (KFRP) for smart electronic devices applications.	7	L2	CO3
	c.	Explain the synthesis, properties of PDMS (Polydimethylsiloxane) and its uses in e-skin (electronic skin).	7	L2	CO3
Module – 4					
Q.7	a.	Discuss types of electrodes with examples.	6	L2	CO4
	b.	Discuss instrumentation and application of potentiometric sensor for the estimation of iron in steel.	7	L2	CO4
	c.	What is concentration cell? A zinc concentration cell is obtained by combining two zinc electrodes of concentrations 0.2M and 0.4 M immersed in zinc sulphate solution at 298K. Write the cell reactions and calculate EMF of the cell.	7	L3	CO4
OR					
Q.8	a.	Discuss construction and working of glass electrode.	6	L2	CO4
	b.	Describe instrumentation and application of colorimetric sensor in the estimation of copper in PCBs with diagram.	7	L2	CO4
	c.	Explain the principle and instrumentation of conductometric sensor and its application in the estimation of acid mixture.	7	L2	CO4
Module – 5					
Q.9	a.	What is e-waste? explain the need for e-waste management.	6	L2	CO4
	b.	Apply the principles of electroplating to explain the process of chromium plating used for hard and decorative coatings.	7	L2	CO4
	c.	What is CPR? A thick steel sheet of area 80 inch ² is exposed to moist air. After 6 months it was found to experience a weight loss of 340 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 mmpy).	7	L3	CO4

OR

Q.10	a.	What is metal finishing? Explain technological importance of metal finishing.	6	L2	CO4
	b.	Discuss electrochemical theory of corrosion taking iron as an example.	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


