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## First Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026 Applied Chemistry for Smart Systems

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.  
4. Missing data, if any, may be suitably assumed.*

Module – 1			M	L	C
Q.1	a.	Explain p type and n type semiconductors with an example.	6	L2	CO1
	b.	Explain the synthesis of TiO <sub>2</sub> -RAM nano material by the sol-gel method and mention its properties and applications.	7	L2	CO1
	c.	Describe the construction, working principle and applications of Active-Matrix Organic Light Emitting Diodes (AMOLEDs).	7	L2	CO1
<b>OR</b>					
Q.2	a.	Explain the construction, working and advantages of pentacene semiconductor chip.	6	L2	CO1
	b.	What are liquid crystals (LCs)? Explain their classifications.	7	L2	CO1
	c.	Explain the construction and working principle of Organic Light Emitting Diodes (OLEDs) and mention its applications in electronic displays.	7	L2	CO1
<b>Module – 2</b>					
Q.3	a.	Explain the construction, working and the applications of Quantum dot sensitized solar cells (QDSSCs).	6	L2	CO2
	b.	What is a Polymer? Explain the synthesis, properties of Nylon 6,6 and mention its applications.	7	L2	CO2
	c.	A polymer sample containing 50, 100 and 150 molecules having molar mass 1000, 2000 and 3000 respectively. Calculate the number and weight average molecular weights of polymer.	7	L3	CO2
<b>OR</b>					
Q.4	a.	Describe the following structure property relationship of the polymer. a) Crystallinity    b) Strength    c) Chemical resistivity.	6	L2	CO2
	b.	Explain the wet chemical synthesis of Cd-Se quantum dots and mention its application.	7	L2	CO2
	c.	Polymers are generally known for their insulating nature. Applying the knowledge of conduction mechanism, highlight and explain the conduction mechanism in Polyaniline polymer. Mention its engineering applications.	7	L3	CO2

**Module – 3**

<b>Q.5</b>	<b>a.</b>	Describe the construction and working of Lithium-ion Battery.	<b>6</b>	<b>L2</b>	<b>CO3</b>
	<b>b.</b>	Explain the production of green hydrogen using TiO <sub>2</sub> photocatalytic water splitting method.	<b>7</b>	<b>L2</b>	<b>CO3</b>
	<b>c.</b>	The emf of a cell Ag(s) / AgNO <sub>3</sub> (0.02M) // AgNO <sub>3</sub> (XM) / Ag(s) is found to be 0.084V at 298 K. Find the value of X and write the cell reactions.	<b>7</b>	<b>L3</b>	<b>CO3</b>

**OR**

<b>Q.6</b>	<b>a.</b>	A fuel cell is considered as an efficient energy conversion device to convert fuel energy into electricity operating at wide temperature range. Apply the concept of energy conversion and outline the characteristics, construction and working of solid oxide fuel cell.	<b>6</b>	<b>L3</b>	<b>CO3</b>
	<b>b.</b>	Explain the construction and working of Sodium ion Battery and mention its applications.	<b>7</b>	<b>L2</b>	<b>CO3</b>
	<b>c.</b>	What is a battery? Outline the classification of battery with suitable examples.	<b>7</b>	<b>L2</b>	<b>CO3</b>

**Module – 4**

<b>Q.7</b>	<b>a.</b>	Explain the mechanism of Pitting corrosion and Waterline corrosion with suitable examples.	<b>6</b>	<b>L2</b>	<b>CO4</b>
	<b>b.</b>	Explain the principle, construction and application of Electrochemical sensors in the detection of NO <sub>x</sub> and Sox.	<b>7</b>	<b>L2</b>	<b>CO4</b>
	<b>c.</b>	What is CPR? A thick sheet of area 93 inch <sup>2</sup> is exposed to air near the ocean. After 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 <sup>3</sup> . Calculate the corrosion penetration rate in mpy and mmpy (Given K = 534 in mpy and 87.6 mm/y).	<b>7</b>	<b>L3</b>	<b>CO4</b>

**OR**

<b>Q.8</b>	<b>a.</b>	What is corrosion? Explain electrochemical theory of corrosion by taking iron as an example.	<b>7</b>	<b>L2</b>	<b>CO4</b>
	<b>b.</b>	Explain the application of Conductometric sensors in the estimation of acid mixture.	<b>7</b>	<b>L2</b>	<b>CO4</b>
	<b>c.</b>	Define the terms a) Transducer b) Actuators c) Sensors.	<b>6</b>	<b>L2</b>	<b>CO4</b>

**Module – 5**

<b>Q.9</b>	<b>a.</b>	Explain the role of artificial intelligence in e-waste management.	<b>6</b>	<b>L2</b>	<b>CO4</b>
	<b>b.</b>	Explain the synthesis and properties of alginate hydrogel with reference to its applications in brain-computer interfaces (BCIs).	<b>7</b>	<b>L2</b>	<b>CO4</b>
	<b>c.</b>	Explain the extraction of gold from e-waste by bioleaching method.	<b>7</b>	<b>L2</b>	<b>CO4</b>

OR

Q.10	a.	Explain the effects of e-waste on the Environment and Human Health.	6	L2	CO4
	b.	Explain the green synthesis of ZnO nano particles and mention its uses in magnetic Radio Frequency Identification. (RFID).	7	L2	CO4
	c.	Explain the synthesis and properties of polylactic Acid (PLA). Mention its uses in touch screen applications.	7	L2	CO4

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