

RV COLLEGE OF ENGINEERING*
(An Autonomous Institution affiliated to VTU)
I Semester B. E. Examinations May-2023
Common to AI / BT / CSE / CY / CD / IS

SP

CHEMISTRY OF SMART MATERIALS AND DEVICES

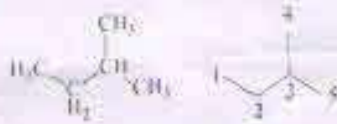
Time: 03 Hours

Maximum Marks: 100

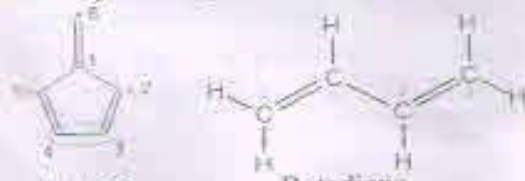
Instructions to candidates:

1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer SIX full questions from Part B. In Part B question number 2 and 11 are compulsory. Answer any one full question from 3 and 4, 5 and 6, 7 and 8 & 9 and 10.
3. Handbook of chemistry is permitted.

PART-A

1	1.1	Write the structure of polymer; <i>Poly (3 - hydroxybutyrate - co - 3 - hydroxyvalerate) or-PHBV.</i>	01
	1.2	What is the SI unit of capacity of a battery?	01
	1.3	List the various applications of bio-compatible polymeric materials.	01
	1.4	Predict the edge adjacency matrix for the following molecule. Δ	01
	1.5	Compile the vertex-adjacency matrix for isopentane molecule.	
		 <p>Molecular structure Graph</p>	01
	1.6	At the functionalization site of CNT, mention the hybridization of carbon atom before and after functionalization.	01
	1.7	Write the structure of ascorbic acid.	01
	1.8	Give one example of natural biomaterial used in bio-composite based memory device.	01
	1.9	List any two organic molecules used in electrical memory devices.	01
	1.10	What is the role of tri-iodide electrolyte in QDSSC?	01

PART-B

2	a	Illustrate any three green chemistry principles with appropriate examples.	07
	b	What useful byproduct is produced when lead-acid batteries are recycled? Explain the key steps involved in the lead-acid battery recycling using pyro metallurgical process.	07
3	a	Categorize and compare the different non-covalent interactions present in protein structures.	07
	b	Construct the vertex adjacency matrix for fulvene and butadiene.	
		 <p>fulvene Butadiene</p>	07

OR		
4	a	Define molecular topology. Explain the applications of molecular topological descriptors in <i>QSAR</i> and drug design. 07
	b	What are topological indices? Explain with examples of Zagreb indices and Wiener topological indices. 07
5	a	What are memory devices? Discuss the classification of electronic memory device with example. 07
	b	Distinguish between organic light emitting diode (<i>OLED</i>) and light emitting electrochemical cells (<i>LEC</i>). With the schematic diagram, explain the construction of <i>OLED</i> . 07
OR		
6	a	Provide a comprehensive explanation of the semiconductor chip manufacturing process. 07
	b	What are liquid crystals? Explain the fabrication and working of liquid crystal display. 07
7	a	Describe the working principle of Piezoelectric and Electrochemical sensors with schematic diagram. 07
	b	Cylindrical molecules that consist of rolled-up sheets of single-layer carbon atoms are used in <i>RFID</i> devices. Construct the experimental setup and design the procedure for the synthesis. How one can introduce carboxylic or hydroxyl groups ($-COOH, -OH$) on these material? 07
OR		
8	a	Write the conducting structure of polyaniline and explain its synthesis with applications. 07
	b	Explain the working principle of glucose sensor using electrochemical principle. 07
9	a	Explain the working and steps involved in the current generation of organic solar cells (<i>OPVs</i>). Mention any two limitations of organic photovoltaics. 07
	b	Explain the construction and working of $LiCoO_2$ battery with neat labeled diagram. 07
OR		
10	a	Discuss the materials used in different types of super capacitors. Explain the construction and working of electrostatic double-layer capacitors (<i>EDLCs</i>) with neat labeled diagram. 07
	b	With a neatly labeled diagram, explain the construction and working principle of the quantum dot sensitized solar cell (<i>QDSSC's</i>). 07
11	a	Explain the principle, procedure and calculation involved in the determination of sodium using flame photometry. 10
	b	Discuss the conductometric principle and procedure used for the estimation of <i>HCl</i> in the given solution using <i>NaOH</i> solution. Plot the typical graphs and explain the chemistry behind variation of conductance. 10