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## RV COLLEGE OF ENGINEERING®

(An Autonomous Institution affiliated to VTU)

II Semester B. E. Regular / Supplementary Examinations Aug-2024 COMMON TO ECE / EEE / EI / ETE

## CHEMISTRY OF FUNCTIONAL MATERIALS

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 FIVE full questions from Part B. In Part B question number 2 & 11 are compulsory. Answer any one full question from 3 and 4, 5 and 6, 7 and 8, 9 and 10, and 11 lab components (compulsory).

PART-A M BT CO

1	1.1	How shelf life of a battery is related to self-discharge?	01	1	1
	1.2	In the hydrogen oxygen fuel cell complete the following reaction			
		$H_2(g) + 4)H^- \rightarrow$	01	3	2
	1.3	In carbon nanotubes, mention the change in hybridization of the			
		Carbon atom after functionalized with $-NH_2$ group.	01	2	3
	1.4	What is the role of $KMnO_4$ in the synthesis of graphene oxide?	01	1	3
	1.5	Pentacene play a pivotal role in organic semiconductors, draw its			
		structure.	01	1	1
	1.6	Mention any one difference between human skin and e-skin.	01	2	2
	1.7	What is the main role of transparent conducting electrode in			
		electrochromic devices?	01	1	1
	1.8	Improper disposal of e-waste is hazardous to human health.			
		Justify.	01	3	2
	1.9	Give any one application of electrochemical sensors in the field of			
		medicine.	01	1	1
	1.10	In the potentiometric estimation of iron using potassium			
		dichromate, sudden raise in the potential after equivalence point			
		occurs. Given reasons.	01	4	3

## PART B

2	a	Outline the construction, working, charging and discharging mechanism of lithium cobalt oxide battery with neat labeled			
		diagram.	07	1	1
	b	Quantum dots-sensitized solar cell (QDSSC) has great potential to meet global demand for clean energy. Discuss the construction			
		and working of above solar cell with neat labeled diagram.	07	2	2
3	a	Explain the <i>PECVD</i> technique for the preparation of inorganic films along with advantages and applications.	07	2	2
	b	Explain the synthesis of metal oxide nanoparticles using solution combustion method by taking suitable example. Mention its			_
		advantages.	07	2	2
		OR			

a Explain the principle, procedure involved in chemical vapour deposition technique with neat labeled diagram.  b Discuss the complete process with schematic representation of the different stages and routes of the sol-gel method for the synthesis of nano materials by taking suitable example.  7 a With a neat labeled diagram, explain the complete process involved in the preparation of crystalline silicon ingots by Czochralski method.  8 b What are conducting polymers? Discuss the synthesis of polyaniline with the chemical reaction involved along with its applications.  8						
Synthesis of nano materials by taking suitable example.	4	a b	, · · · · · · · · · · · · · · · · · · ·	07	2	2
involved in the preparation of crystalline silicon ingots by Czochralski method.  What are conducting polymers? Discuss the synthesis of polyaniline with the chemical reaction involved along with its applications.  OR  6 a The floating zone (FZ) technique is crucible-free crystal growth methods, with a neat labeled diagram, explain the complete process involved in the preparation of electronic grade silicon by FZ method.  Discuss the importance of Gallium-Arsenide (GaAs) and Silicon-Germanium (SiGe) in the field of electronics.  What are electrochromic and photochromic materials? Discuss the materials and mechanism of working along with their applications.  Write the importance of magneto- and electro-strictive materials in the field of material science.  OR  8 a What is e-nose? What are the basic requirements of design e-nose? With the necessary diagram, explain the principle of materials used for e-nose.  Discuss the environmental threats involved in handling of e-waste and discuss the suitable measures to control.  9 a What are optoelectronic sensors? Discuss the mechanism of working along with its applications.  Explain the principle, procedure and instrumentation involved in the estimation of copper using colorimetry.  OR  What are piezoelectric sensors? Discuss the materials and mechanism of working along with its applications.  Explain the principle, procedure and instrumentation of flame photometer along with its applications.  LAB COMPONENT  11 a Suggest a suitable volumetric procedure for the estimation of copper from e-waste using lodometric principle and discuss its detailed procedure with all the necessary reactions and calculations.  b How will you determine the concentration of analyte using conductometric titration in the mixture of i) CH <sub>3</sub> COOH & HCI vs NaOH ii) HCI vs NaOH iii) HCI vs NaOH iii) HCI vs NaOH iii) HCI vs Na				07	1	1
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