CM221IB

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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 $PECVD$ 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			

4	a	Explain the principle, procedure involved in chemical vapour deposition technique with neat labeled diagram.	07	2	2
	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.	07	1	1
5	a	With a neat labeled diagram, explain the complete process involved in the preparation of crystalline silicon ingots by Czochralski method.	07	2	3
	b	What are conducting polymers? Discuss the synthesis of polyaniline with the chemical reaction involved along with its applications.	07	1	1
		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.	07	2	3
	b	Discuss the importance of Gallium-Arsenide ($GaAs$) and Silicon-Germanium ($SiGe$) in the field of electronics.	07	1	1
7	a	What are electrochromic and photochromic materials? Discuss the materials and mechanism of working along with their applications.	07	2	1
	b	Write the importance of magneto- and electro-strictive materials in the field of material science.	07	1	2
		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.	07	2	1
	b	Discuss the environmental threats involved in handling of e-waste and discuss the suitable measures to control.	07	2	2
9	a	What are optoelectronic sensors? Discuss the mechanism of working along with its applications.	07	2	1
	b	Explain the principle, procedure and instrumentation involved in the estimation of copper using colorimetry.	07	2	2
		OR			
10	a	What are piezoelectric sensors? Discuss the materials and mechanism of working along with its applications.	07	1	3
	b	Explain the principle, procedure and instrumentation of flame photometer along with its applications.	07	2	3
		LAB COMPONENT			
11	a	Suggest a suitable volumetric procedure for the estimation of copper from e-waste using Iodometric principle and discuss its detailed procedure with all the necessary reactions and calculations.	10	1	3
	b	How will you determine the concentration of analyte using conductometric titration in the mixture of i) CH_3COOH & HCI vs $NaOH$ ii) HCI vs NaOH Discuss the procedure with calculations and draw the nature of graph for both the experiments.	10	2	3