SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM NAGAR, KATTANKULATHUR – 603 203

DEPARTMENT OF CHEMISTRY

QUESTION BANK

II SEMESTER

CH3225 - Chemistry for Information Science

(Common to CSE, IT, CYS, AI & DS branches)

Regulations 2023

Academic Year 2024-25

UNIT I - ENERGY SOURCES AND STORAGE DEVICES

Introduction - nuclear energy - light water nuclear power plant - breeder reactor, solar energy conversion - solar cells: principle, working and applications, types of batteries - primary battery (alkaline battery), secondary battery (lead acid battery, NICAD battery, lithium-ion battery), fuel cells (H_2-O_2 fuel cell). Super capacitors: storage principle, applications. Electric vehicles-working principles.

S.No	PART-A (2 Marks)	BTL	Competence	CO
1.	What are the non-conventional energy sources? Give example.	1	Remembering	CO1
2.	Define nuclear fission.	1	Remembering	CO1
3.	Compare nuclear fission from nuclear fusion.	2	Understanding	CO1
4.	Outline nuclear chain reaction.	1	Remembering	CO1
5.	Mention the components used in a nuclear reactor.	1	Remembering	CO1
6.	What is nuclear energy? Explain using a suitable example.	1	Remembering	CO1
7.	Examine coolants in nuclear reactor. Give an example.	2	Understanding	CO1
8.	Define breeder reactor.	1	Remembering	CO1
9.	What is solar energy? How is it obtained?	1	Remembering	CO1
10.	Narrate the merits of solar energy?	2	Understanding	CO1
11.	What is Battery? How does it differ from a cell?	2	Understanding	CO1
12.	Relate primary and secondary batteries? Give example.	1	Remembering	CO1
13.	Write the recharge reaction of lead acid battery.	1	Remembering	CO1
14.	Draw the diagram of lead acid battery.	2	Understanding	CO1
15.	Ni-Cd batteries are bad for the environment, why?	1	Remembering	CO1
16.	Construct cell representation on an alkaline battery.	2	Understanding	CO1
17.	Draw the diagram of H_2-O_2 fuel cells.	2	Remembering	CO1
18.	Summarize super capacitors.	1	Remembering	CO1
19.	Illustrate lithium-ion battery.	2	Remembering	CO1
20.	Write the advantages of lithium-ion battery.	1	Remembering	CO1
21.	What are the different types of Electric Vehicles?	2	Understanding	CO1
22.	List out few merits of electric vehicles.	2	Understanding	CO1

S.No		PART-B (16 Marks)	BTL	Competence	CO
1.	(i)	Distinguish between nuclear fission and fusion reactions	4	Analyzing	CO1
	(ii)	Define mass defect and binding energy. How are they related?	4	Analyzing	CO1
2.		Explain the functioning of light water nuclear power reactor with a neat diagram.	3	Applying	CO1
3.		Describe the Breeder reactor.	3	Applying	CO1
4.		What is a nuclear reactor? Describe the components of a light water nuclear power plant with a suitable diagram.	4	Analyzing	CO1
5.		What are solar cells? State the principle, harvesting and applications of solar energy.	3	Applying	CO1
6.	(i)	Describe the methods of harvesting the solar energy.	4	Analyzing	CO1
	(ii)	Write a note on Alkaline Battery.	1	Remembering	CO1
7.		What are lead accumulators? Explain the construction and functioning of a lead accumulator?	4	Analyzing	CO1
8.		Explain the construction and working of Lead acid battery with advantages and disadvantages.	3	Applying	CO1
9.		Explain the construction and working of Nickel-Cadmium battery with a neat sketch.	3	Applying	CO1
10.		Explain in detail about Lithium-ion battery with uses.	4	Analyzing	CO1
11.		What are fuel cells? Briefly describe about hydrogen-oxygen fuel cell.	3	Applying	CO1
12.	(i)	Write notes on super capacitors.	4	Analyzing	CO1
	(ii)	What are the different types of Electric Vehicles? Describe the applications.	1	Remembering	CO1
13.		Discuss the construction and applications of Lead acid battery.	4	Analyzing	CO1
14.		With a neat sketch, explain Nickel-Cadmium battery.	3	Applying	CO1
15.		How are super capacitors constructed? Explain the working and applications of super capacitors.	3	Applying	CO1

UNIT II PHOTOCHEMISTRY AND SPECTROSCOPY

Photochemistry: laws of photochemistry - Grotthuss-Draper law, Stark-Einstein law, and Lambert-Beer Law, quantum efficiency - determination - Jablonski diagram: internal conversion, intersystem crossing, fluorescence, phosphorescence, chemiluminescence, and photo-sensitization - applications. Spectroscopy: electromagnetic spectrum - absorption of radiation - electronic, vibrational, and rotational transitions, UV-visible and IR spectroscopy: principles, instrumentation (block diagram) - applications.

S.No	PART-A (2 Marks)	BTL	Competence	CO
1.	What is Photochemistry?	1	Remembering	CO2
2.	Discuss Grotthuss-Draper law.	2	Understanding	CO2
3.	Define adsorption.	1	Remembering	CO2
4.	State Stark-Einstein law.	2	Understanding	CO2
5.	State Beer- Lambert Law.	2	Understanding	CO2
6.	Write the disadvantages of Beer- Lambert Law.	1	Applying	CO2
7.	Define quantum efficiency.	2	Understanding	CO2
8.	What is internal conversion.	1	Applying	CO2
9.	Outline intersystem crossing.	2	Understanding	CO2
10.	What is fluorescence?	1	Remembering	CO2
11.	Define phosphorescence.	2	Understanding	CO2
12.	Define chemiluminescence	1	Understanding	CO2
13.	Give brief notes on photo-sensitization.	2	Understanding	CO2
14.	Define adsorption spectra.	1	Remembering	CO2
15.	Draw the electronic transition diagram.	2	Applying	CO2
16.	What is finger print region?	2	Understanding	CO2
17.	List out the use of finger print region	2	Understanding	CO2
18.	Define chromophore.	2	Understanding	CO2
19.	Define auxochrome.	1	Applying	CO2
20.	Constract the principal of UV spectroscopy.	2	Understanding	CO2
21.	List out any two applications of UV spectroscopy	2	Understanding	CO2
22.	List out any two applications of IR spectroscopy.	2	Understanding	CO2

S.No		PART-B (16 Marks)	BTL	Competence	CO
1.		Explain the statement, derivation and the limitations of Beer-Lamberts law.	2	Understanding	CO2
2.		What is quantum efficiency? How is quantum efficiency determined experimentally?	2	Understanding	CO2
3.		Define and mention the reasons for high and low quantum yield.	1	Remembering	CO2
4.		Construct Jablonski diagram and explain the radiative and non-radiative pathways for an electronic transition.	4	Analyzing	CO2
5.		Explain the chemiluminescence and photosensitization with suitable diagram and examples.	4	Analyzing	CO2
6.		Distinguish between a) Fluorescence and phosphorescence. b) Thermal and photochemical reactions.	3	Applying	CO2
7.		What are electromagnetic spectrum and explain the characteristics of it.	4	Analyzing	CO2
8.		Illustrate in detail about the rotational, vibrational and electronic transitions.	3	Applying	CO2
9.		Evaluate the principle of IR spectroscopy and discuss the functions of various components in IR spectrophotometer.	5	Evaluating	CO2
10.		Construct the principle, instrumentation and working mechanism of UV-Visible spectroscopy.	3	Applying	CO2
11.		Explain the types of stretching and bending vibrations with suitable examples. Types of stretching and bending Vibrations.	4	Analyzing	CO2
12.		Discuss the applications of UV-Visible spectroscopy.	2	Understanding	CO2
13.		Discuss the applications of IR spectroscopy.	2	Understanding	CO2
14.		Analyze the applications of UV-Visible spectroscopy and IR spectroscopy	4	Analyzing	CO2
15.		Illustrate Jablonski diagram and explain all possible transitions.	3	Applying	CO2

UNIT III SMART MATERIALS

Introduction - organic functional materials: preparation, properties, and engineering applications of graphite, fullerenes, carbon nanotubes, smart materials: nanoporous zeolites, self-assembled nanoreactors, nanostructures for molecular recognition, the chemistry of nanoelectronics: data memory, lighting, and displays, thin films, OLEDs, sensors: electrochemical sensors, neuro-electronic interfaces.

S.No	PART-A (2 Marks)	BTL	Competence	CO
1.	What are smart materials?	1	Remembering	CO3
2.	How can you prepare graphite.	2	Understanding	CO3
3.	Write any two properties of graphite.	1	Remembering	CO3
4.	Summarize any two engineering applications of graphite.	5	Evaluating	CO3
5.	Define fullerenes.	2	Understanding	CO3
6.	How are the fullerenes prepared?	4	Analyzing	CO3
7.	Outline the applications of fullerenes.	2	Understanding	CO3
8.	What are the types of carbon nanotubes?	2	Understanding	CO3
9.	Narrate any two methods of preparation of carbon nanotubes.	3	Applying	CO3
10.	Discuss any two applications of carbon nanotubes.	2	Understanding	CO3
11.	Write chemical formula for Zeolite.	1	Remembering	CO3
12.	List out few uses of Zeolite.	2	Understanding	CO3
13.	What is nanoporous zeolites.	1	Remembering	CO3
14.	Defend nanoreactors.	1	Remembering	CO3
15.	Write note on self-assembled nanoreactors.	1	Remembering	CO3
16.	What is smart materials.	1	Remembering	CO3
17.	Summarize the role of smart materials in chemical industry.	3	Applying	CO3
18.	Assess the molecular recognition by nanochemistry.	4	Analyzing	CO3
19.	What is OLEDs?	1	Remembering	CO3
20.	Write note on electrochemical sensors.	2	Understanding	CO3
21	List out few applications of electrochemical sensors.	2	Understanding	CO3
22.	What are neuro-electronic interfaces?	1	Remembering	CO3

S.No	PART-B (13 Marks)		BTL	Competence	CO
1.		Explain preparation, properties, and engineering applications of graphite.	4	Analyzing	CO3
2.		Construct preparation, properties, and engineering applications of fullerenes.	4	Analyzing	CO3
3.		Examine properties, and engineering applications of carbon nanotubes.	4	Analyzing	CO3
4.		Illustrate the classification and properties of smart materials.	2	Understanding	CO3
5.		List out the applications of smart materials in chemical industry.	4	Analyzing	CO3
6.		Criticize the synthesis of nanoporous zeolites.	2	Understanding	CO3
7.		List out the application of nanoporous zeolites.	2	Understanding	CO3
8.		What are nanoreactors and describe the self-assembling of nanoreactors in industry?	4	Analyzing	CO3
9.		Compile the pathway of nanostructures for molecular recognition.	3	Applying	CO3
10.		Summarize the role of chemistry in data memory and lighting.	3	Applying	CO3
11.		Interpret the applications of chemistry in displays and thin films.	4	Analyzing	CO3
12.		How the graphite can be prepared? Write its properties and applications.	5	Evaluating	CO3
13.		Investigate electrochemical sensors with its applications.	6	Creating	CO3
14		Construct self-assembling of nanoreactors and its applications	4	Analyzing	CO3
15.		Interpret neuro-electronic interfaces and its applications.	4	Analyzing	CO3

UNIT IV NANOCOMPOSITES & MEMORY DEVICES

Introduction-definition-need, constitution: matrix materials (polymer matrix, metal matrix) and reinforcement (fiber), properties and applications of metal matrix composites (MMC), and polymer matrix composites-micro and nanoelectromechanical systems, applications of nanomaterials in memory devices.

S.No	PART-A (2 Marks)	BTL	Competence	CO
1.	Define nanomaterials.	1	Remembering	CO4
2.	Defend nanocomposites.	2	Understanding	CO4
3.	What are matrix materials?	2	Understanding	CO4
4.	State polymer matrix.	2	Understanding	CO4
5.	Give two examples of polymer matrix materials.	2	Understanding	CO4
6.	Define metal matrix.	1	Remembering	CO4
7.	Give two examples of metal matrix materials.	2	Understanding	CO4
8.	Write a note on fiber reinforcement.	2	Understanding	CO4
9.	What are the constitutions of polymer matrix?	1	Remembering	CO4
10.	Outline the need of polymer matrix.	1	Remembering	CO4
11.	What are the constitution of metal matrix.	2	Understanding	CO4
12.	Illustrate the need of metal matrix.	3	Applying	CO4
13.	Write any two advantages of fiber reinforcement material.	1	Remembering	CO4
14.	Narrate any two properties of metal matrix composites.	2	Understanding	CO4
15.	List out any two applications of metal matrix composites.	3	Applying	CO4
16.	What are polymer matrix composites?	1	Remembering	CO4
17.	Outline any two properties of polymer matrix composites.	2	Understanding	CO4
18.	Write any two applications polymer matrix composites.	2	Understanding	CO4
19.	What is MEMS?	1	Remembering	CO4
20.	Defend NOMFET.	2	Understanding	CO4
21.	Narrate MOSFED.	2	Understanding	CO4
22.	Write any two applications of nanomaterials in memory devices.	1	Remembering	CO4

S.No	PART-B (13 Marks)		BTL	Competence	CO
1.		Explain with definition, need, constitution of polymer matrix.	4	Analyzing	CO4
2.		Evaluate with definition, need, constitution of metal	5	Evaluating	CO4
		matrix.			
3.		Construct the fiber reinforcement materials with its advantages.	4	Analyzing	CO4
4.		Formulate the fiber reinforcement polymer composite.	6	Creating	CO4
5.		Investigate the properties and applications of metal matrix composites.	6	Creating	CO4
6.		Compile the properties and applications of polymer matrix composites.	6	Creating	CO4
7.		Compare the properties of metal matrix composites and metal matrix composites.	3	Applying	CO4
8.		Interpret the applications of metal matrix composites along with metal matrix composites.	4	Analyzing	CO4
9.		Summarize micro and nanoelectromechanical systems.	5	Evaluating	CO4
10.		Describe the advantages and applications of MEMS.	2	Understanding	CO4
11.		Summarize the role of chemistry in data memory.	5	Evaluating	CO4
12.		List out the applications of nanomaterials in memory devices.	3	Applying	CO4
13.		Compare the constitutions, properties and uses of polymer matrix, metal matrix.	5	Evaluating	CO4
14		Categorize nanomaterials and write its applications	4	Analyzing	CO4
15.		Explain with definition, need, constitution of polymer matrix.	2	Understanding	CO4

UNIT V CHEMINFORMATICS

Introduction - coordinate-bond, bond length, bond angles, torsional angles - chemical structure - confirmation - representation of structural information - sources - formats - graph theory - molecular numerology - storage of structural data - databases - types - fingerprint - similarity search - applications of cheminformatics in drug designing.

S.No	PART-A (2 Marks)	BTL	Competence	CO
1.	What is cheminformatics?	1	Remembering	CO5
2.	Write the important tools used in cheminformatics	1	Remembering	CO5
3.	Write the significance of coordinates in chemistry	2	Understanding	CO5
4.	How many coordinates are used to model a computer?	2	Understanding	CO5
5.	Define conformational analysis	1	Remembering	CO5
6.	Label the conformational search	1	Remembering	CO5
7.	What is conformation?	1	Remembering	CO5
8.	Illustrate bond length	2	Understanding	CO5
9.	Outline bond angle	1	Remembering	CO5
10.	Mention the importance of connection table	4	Analyzing	CO5
11.	How does a linear format represent a molecule?	4	Analyzing	CO5
12.	List out some importance of line notation	1	Remembering	CO5
13.	What is MOL format	1	Remembering	CO5
14.	Write the important use of MOL format	1	Remembering	
15.	What is PDB format?	2	Understanding	CO5
16.	Write the important use of PDB	1	Remembering	CO5
17.	List out some important databases to store the chemical information.	1	Remembering	CO5
18.	Write some important database searching.	1	Remembering	CO5
19.	Define torsional angle and write its conditions.	2	Understanding	CO5
20.	Define finger print region.	2	Understanding	CO5
21.	List out applications of finger print region.	2	Understanding	CO5
22.	Narrate the similarity search.	3	Applying	CO5

S.No	PART-B (13 Marks)		BTL	Competence	CO
1.		Explain the types of coordinates, generally used to represent the position of atoms.	4	Analyzing	CO5
2.		Describe the following with example a**)** bond length b**)** bond angle c**)** torsional angle	2	Understanding	CO5
3.		Evaluate any two types of structural representations involved.	5	Evaluating	CO5
4.		What is conformation? Describe conformation analysis and methods.	4	Analyzing	CO5
5.		Evaluate the structures represented by SMILES notation.	5	Evaluating	CO5
6.		Construct the importance of PDB format and using PDB format, explain classification of proteins.	4	Analyzing	CO5
7.		Compare MOL format and PDB format	5	Evaluating	CO5
8.		Summarize graph theory and molecular numerology	5	Evaluating	CO5
9.		How are structural data stored in a data base? Explain the important data storage organization available now.	3	Applying	CO5
10.		Interpret the storage of structural data done in data base.	4	Analyzing	CO5
11.		Formulate finger print region, method to generate and merits and demerits of finger print.	6	Creating	CO5
12.		Interpret the various factors affecting torsional angle.	4	Analyzing	CO5
13.		Construct the role of cheminformatics in drug designing	6	Creating	CO5
14.		Describe similarity search.	4	Analyzing	CO5
15.		Assess the applications of cheminformatics in drug designing	3	Applying	CO5