SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM NAGAR, KATTANKULATHUR – 603 203

DEPARTMENT OF CHEMISTRY

QUESTION BANK

II SEMESTER

CH3223-Chemistry of Electronic Materials

(Common to ECE, EEE, EIE branches)

Regulations 2023

Academic Year 2024-25

UNIT I - CHEMISTRY OF CARBON

Catenation property of carbon-carbon based compounds - structure and bonding - hydrocarbons: fuels, carbon-based organic materials, activated carbon, and allotrope of carbon: properties - applications of diamond, graphite, graphene, fullerenes, and carbon nanotubes - types – preparation – properties - applications (electrical and electronic field) - future perspective in energy conversion and storage.

S.No	PART-A (2 Marks)	BTL	Competence	CO
1.	What is meant by catenation? Name two elements that exhibit the property of catenation.	1	Remembering	CO1
2.	List out the types of catenation.	1	Remembering	CO1
3.	Mention the factors that affect catenation.	1	Remembering	CO1
4.	Why does carbon form compounds mainly by covalent bonding?	3	Applying	CO1
5.	Categorize the carbon compounds.	2	Understanding	CO1
6.	Elaborate the chemical properties of carbon compounds.	3	Applying	CO1
7.	Mention the types of carbon compounds.	1	Remembering	CO1
8.	Correlate saturated and unsaturated hydrocarbons.	2	Understanding	CO1
9.	What are Hydrocarbons?	1	Remembering	CO1
10.	List out the types of Hydrocarbons.	2	Understanding	CO1
11.	List a few uses of hydrocarbons.	1	Remembering	CO1
12.	How do you synthesize activated carbon?	2	Understanding	CO1
13.	Classify the different types of activated carbon.	2	Understanding	CO1
14.	Summarize the bonding in graphite.	2	Understanding	CO1
15.	Name any two allotropes of carbon.	1	Remembering	CO1
16.	Give a reason why for diamond has a high melting point.	3	Applying	CO1
17.	What is a diamond?	1	Remembering	CO1
18.	Explain the term graphene.	2	Understanding	CO1
19.	Differentiate graphene from graphite.	2	Understanding	CO1
20.	Mention the types of carbon nanotubes.	1	Remembering	CO1
21.	What is fullerene?	1	Remembering	CO1
22.	Write the function of carbon in energy conversion.	2	Understanding	CO1

S.No	PART-B (16 Marks)		BTL	Competence	CO
1.	(i)	Define catenation. Compare the catenation behavior of carbon with silicon and sulfur.	3	Applying	CO1
	(ii)	Correlate sp, sp^2 and sp^3 hybridizations in carbon.	4	Analyzing	CO1
2.		Give a detailed note on bonds in carbon.	3	Applying	CO1
3.		State the term catenation. Explain in detail on catenation behavior of carbon with silicon and sulfur.	2	Understanding	CO1
4.		Explain in detail about electron dot structure of saturated and unsaturated carbon compounds.	1	Remembering	CO1
5.		Describe the different types of hydrocarbons.	2	Understanding	CO1
6.		Elucidate the properties and applications of hydrocarbons.	4	Analyzing	CO1
7.	(i)	Differentiate saturated and unsaturated carbon compounds with examples.	1	Remembering	CO1
	(ii)	Categorize the Lewis structure of saturated and unsaturated carbon compounds.	4	Analyzing	CO1
8.		Write notes on fullerenes.	2	Understanding	CO1
9.		How carbon-based compounds are employed in energy conversion and storage devices.	3	Applying	CO1
10.		Write a detailed account of the graphite and graphene.	3	Applying	CO1
11.		Enumerate the production, properties and uses of activated carbon.	4	Analyzing	CO1
12.	(i)	Compare graphene and fullerene.	4	Analyzing	CO1
	(ii)	Write the various applications of carbon nanotubes in energy storage devices.	3	Applying	CO1
13.		Explain in detail on, (i) Diamond, (ii) Graphite and (iii) Graphene.	3	Applying	CO1
14.		Clarify the synthesis and properties of CNTs.	4	Analyzing	CO1
15.	(i)	Write a detailed account of the graphene and fullerene.	3	Applying	CO1
	(ii)	Evaluate the applications of CNTs in the electrical and electronic fields.	4	Analyzing	CO1

UNIT II - ENGINEERING POLYMERS

Polymers: Classification - types of polymerization - plastic and its types – applications - Engineering polymers: ABS, PVC, Nylon-6, Nylon-6,6, Teflon, Kevlar and PEEK - preparation, properties and uses - fiber reinforced polymers - conducting polymers: types, and applications - applications of polymers in medicine and surgery.

S.No	PART-A (2 Marks)	BTL	Competence	CO
1.	Define Polymer. Give an example.	1	Remembering	CO2
2.	Define Monomer. Give an example.	1	Remembering	CO2
3.	What is meant by polymerization?	2	Understanding	CO2
4.	What is meant by the degree of polymerization?	1	Remembering	CO2
5.	State functionality of polymers.	2	Understanding	CO2
6.	What are Plastics? List out its advantages.	2	Understanding	CO2
7.	In what way is copolymerization different from addition polymerization?	3	Applying	CO2
8.	Thermosetting plastics cannot be remolded. Why?	3	Applying	CO2
9.	Differentiate thermoplastics and thermosetting plastics	1	Remembering	CO2
10.	Teflon is an addition polymer but it behaves like a thermosetting polymer, why?	3	Applying	CO2
11.	Define tacticity. Mention its types.	1	Remembering	CO2
12.	Differentiate addition and condensation polymerization.	2	Understanding	CO2
13.	List a few properties of Nylon-6.	1	Remembering	CO2
14.	Sketch the component's name in ABS polymer formation.	1	Remembering	CO2
15.	How do you manufacture ABS?	1	Remembering	CO2
16.	What is the repeating unit of Nylon 6,6?	2	Understanding	CO2
17.	Correlate the uses of Teflon and Kevlar.	2	Understanding	CO2
18.	How can we make fiber-reinforced polymers?	2	Understanding	CO2
19.	What is FRP?	1	Remembering	CO2
20.	Write notes briefly on conducting polymers.	2	Understanding	CO2
21.	What are conducting polymers?	1	Remembering	CO2
22.	Mention a few applications of polymers in surgery.	1	Remembering	CO2

S.No	PART-B (16 Marks)		BTL	Competence	CO
1.	(i)	Define polymer. Classify the polymers with examples.	1	Remembering	CO2
	(ii)	Summarize the difference between addition and condensation polymerization.	3	Applying	CO2
2.		What is a polymer? Explain the different types of polymers with examples.	1	Remembering	CO2
3.		Distinguish thermoplastics and thermosetting plastics with examples.	2	Understanding	CO2
4.		What are plastics? Discuss in detail about different types of plastics.	2	Understanding	CO2
5.		Outline the different types of polymers with examples.	4	Analyzing	CO2
6.	(i)	Discuss the following. (i) Addition polymerization, (ii) Condensation polymerization.	1	Remembering	CO2
	(ii)	Enumerate the following. (i) Homo polymers, (ii) Heteropolymer, (iii) Inorganic polymer, (iv) Organic polymer.	3	Applying	CO2
7.	(i)	Details out the preparation, properties and uses of PVC.	3	Applying	CO2
	(ii)	Correlate the preparation, properties and uses of Teflon and Nylon 6.	3	Applying	CO2
8.		Describe the preparation, properties and uses of Nylon-6,6 and PVC.	3	Applying	CO2
9.		Categorize the synthesis, properties and uses of (i) ABS, (ii) Nylon-6.6 and (iii) PEEK.	4	Analyzing	CO2
10.		Write in detail about the preparation, properties and uses of Kevlar, Teflon and PEEK.	3	Applying	CO2
11.		Evaluate any four engineering polymers in detail.	4	Analyzing	CO2
12.	(i)	Analyze the formation, properties and uses of Teflon, Kevlar and Nylon-6,6.	4	Analyzing	CO2
	(ii)	Classify the formation, properties and uses of ABS, PVC and Nylon-6.	4	Analyzing	CO2
13.		Explore various conducting polymers that act as engineering materials.	4	Analyzing	CO2
14.		Examine the properties and applications of fiber-reinforced polymers.	4	Analyzing	CO2
15.	(i)	Find the various applications of polymers in the field of medicine and surgery.	3	Applying	CO2
	(ii)	Explain the properties and uses of conducting polymers.	3	Applying	CO2

UNIT III - ELECTROCHEMISTRY AND CORROSION

Electrode - electrode reaction - redox reaction - origin of electrode potential, oxidation potential - reduction potential - measurement and applications, electrochemical series and its significance - electrochemical cell - Nernst equation (derivation). Corrosion - causes - factors - types - chemical, electrochemical corrosion (galvanic, differential aeration), corrosion control - material selection and design aspects - electroplating of Au - electroless plating of Ni - paints - constituents and function.

S.No	PART-A (2 Marks)	BTL	Competence	CO
1.	Find out the factors affecting corrosion.	1	Remembering	CO3
2.	Define Electrochemical cell.	1	Remembering	CO3
3.	Describe Standard Electrode Potential.	2	Understanding	CO3
4.	What are the factors affecting the emf of the cell?	1	Remembering	CO3
5.	What is cell emf?	2	Understanding	CO3
6.	List out a few significances of electrochemical series.	2	Understanding	CO3
7.	What is the Nernst equation?	2	Understanding	CO3
8.	Explain why Zn displaces H_2 from HCl but Copper does not.	3	Applying	CO3
9.	Write the Nernst equation for an oxidation reaction.	3	Applying	CO3
10.	Differentiate oxidation potential and reduction potential.	1	Remembering	CO3
11.	Construct a method to predict electrode potential.	3	Applying	CO3
12.	Define corrosion	1	Remembering	CO3
13.	What are the types of corrosion?	1	Remembering	CO3
14.	Differentiate chemical and electrochemical corrosion.	1	Remembering	CO3
15.	Why do metals undergo corrosion?	2	Understanding	CO3
16.	How does the purity of a metal influence corrosion?	2	Understanding	CO3
17.	State Pilling bedworth ratio rule.	1	Remembering	CO3
18.	Define paint. Mention their constituents.	1	Remembering	CO3
19.	List out a few constituents of paint.	2	Understanding	CO3
20.	Explain the role of hydrazine and sodium sulfite in corrosion control.	2	Understanding	CO3
21.	What is the purpose of using Mg bars in ships?	3	Applying	CO3
22.	What is electroless plating?	2	Understanding	CO3

S.No	PART-B (16 Marks)		BTL	Competence	CO
1.	(i)	Differentiate electrolytic cells from electrochemical cells.	2	Understanding	CO3
	(ii)	Discuss the measurement of single electrode potential.	1	Remembering	CO3
2.		Derive the Nernst equation and give its significance (applications).	4	Analyzing	CO3
3.		Give notes on oxidation potential and reduction potential. Mention the applications of electrode potential.	3	Applying	CO3
4.		Define EMF Series. List out the significance.	2	Understanding	CO3
5.		How electrode potential can be obtained from the Nernst Equation.	3	Applying	CO3
6.		What are the consequences of corrosion? Discuss in detail about electrochemical or wet corrosion with examples.	1	Remembering	CO3
7.		Analyze dry (or) chemical corrosion with suitable examples and diagrams.	4	Analyzing	CO3
8.		What are the factors which influence the rate of corrosion?	2	Understanding	CO3
9.	(i)	Correlate the differences between electrochemical corrosion and chemical corrosion.	3	Applying	CO3
	(ii)	Describe cathodic protection by the sacrificial anode method.	3	Applying	CO3
10.		Explain the sacrificial anode and impressed current cathodic techniques for the prevention of corrosion.	3	Applying	CO3
11.		Discuss the principle, working, and applications of sacrificial anode and impressed current cathodic protection techniques in corrosion prevention.	3	Applying	CO3
12.		Discuss the importance of design and material selection in controlling corrosion.	3	Applying	CO3
13.		What are paints? Assess its constituents and functions with examples.	3	Applying	CO3
14.		Define paint. Analyse their constituents and functions with examples.	3	Applying	CO3
15.	(i)	Construct an electroplating of Copper.	4	Analyzing	CO3
	(ii)	Illustrate electroless plating and explain the plating of Ni by this process.	4	Analyzing	CO3

UNIT IV - 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). Supercapacitors: storage principle, applications. Electric vehicles-working principles.

S.No	PART-A (2 Marks)	BTL	Competence	CO
1.	What are non-conventional energy sources? Give an example.	1	Remembering	CO4
2.	Define nuclear fission.	1	Remembering	CO4
3.	Differentiate nuclear fission from nuclear fusion.	2	Understanding	CO4
4.	Outline nuclear chain reaction.	1	Remembering	CO4
5.	Mention the components used in a nuclear reactor.	2	Understanding	CO4
6.	What is nuclear energy? Explain using a suitable example.	1	Remembering	CO4
7.	Examine coolants in nuclear reactors. Give an example.	3	Applying	CO4
8.	Describe the breeder reactor.	2	Understanding	CO4
9.	What is solar energy. How it is obtained?	1	Remembering	CO4
10.	Narrate the merits of solar energy.	1	Remembering	CO4
11.	What is a Battery? How does it differ from a cell?	2	Understanding	CO4
12.	Relate primary and secondary batteries. Give example.	1	Remembering	CO4
13.	Illustrate Lead acid battery.	2	Understanding	CO4
14.	Ni-Cd batteries are bad for the environment, why?	3	Applying	CO4
15.	Construct cell representation on an alkaline battery.	3	Applying	CO4
16.	What are the electrodes used in the H_2-O_2 fuel cells?	1	Remembering	CO4
17.	Sketch the diagram for H_2-O_2 fuel cells.	3	Applying	CO4
18.	Summarize supercapacitors.	1	Remembering	CO4
19.	Sketch the cell representation of the lead acid battery.	3	Applying	CO4
20.	Give brief notes on lithium-ion batteries.	2	Understanding	CO4
21.	What are the different types of Electric Vehicles?	2	Understanding	CO4
22.	List out a few merits of electric vehicles.	1	Remembering	CO4

S.No	PART-B (16 Marks)		BTL	Competence	CO
1.	(i)	Distinguish between nuclear fission and fusion reactions	1	Remembering	CO4
	(ii)	Define mass defect and binding energy. How are they related?	2	Understanding	CO4
2.		Explain the components and their work functioning of a light-water nuclear power reactor (LWR) with the help of a neat diagram.	3	Applying	CO4
3.		Describe the conversion and working of a Breeder reactor.	4	Analyzing	CO4
4.		What is a nuclear reactor? Describe the components of a light-water nuclear power plant with a suitable diagram.	4	Analyzing	CO4
5.		What are solar cells? State the principle, harvesting and applications of solar energy.	3	Applying	CO4
6.		Define solar energy. Elaborate on principle, working and applications of solar energy.	2	Understanding	CO4
7.	(i)	Describe the methods of harvesting the solar energy.	4	Analyzing	CO4
	(ii)	Write a note on the Alkaline Battery.	1	Remembering	CO4
8.		What are lead accumulators? Explain the construction and functioning of a lead accumulator.	4	Analyzing	CO4
9.		Explain the construction and working of the Nickel-Cadmium battery with a neat sketch.	4	Analyzing	CO4
10.		Explain in detail about Lithium-ion batteries and their uses.	4	Analyzing	CO4
11.		What are fuel cells? Briefly describe about hydrogen-oxygen fuel cell.	3	Applying	CO4
12.	(i)	Write notes on supercapacitors.	2	Understanding	CO4
	(ii)	What are the different types of Electric Vehicles? Describe the applications.	3	Applying	CO4
13.		Discuss the construction and applications of Lead acid batteries.	4	Analyzing	CO4
14.		With a neat sketch, explain the Nickel-Cadmium battery.	3	Applying	CO4
15.	(i)	How are supercapacitors constructed? Explain the working and applications of supercapacitors.	3	Applying	CO4
	(ii)	Compile the advantages and main components function of electric vehicles in detail.	4	Analyzing	CO4

UNIT V - INSTRUMENTAL METHODS AND ANALYSIS

Introduction, absorption of radiation, types of spectra, UV-Visible and IR Spectrophotometer: Instrumentation and applications, cyclic voltammetry for redox system. Thermal methods of analysis TGA, DTA, DSC. Sensors: oxygen, pulse oximeter, biometrics, and glucose sensor.

S.No	PART-A (2 Marks)	BTL	Competence	CO
1.	What is spectroscopy?	1	Remembering	CO5
2.	Define transmittance and absorbance.	1	Remembering	CO5
3.	State Beer's law.	1	Remembering	CO5
4.	Define the term spectroscopy.	1	Remembering	CO5
5.	Mention the different types of spectrophotometers.	2	Understanding	CO5
6.	Name the types of detectors used for IR spectrometry.	2	Understanding	CO5
7.	Categorize different IR regions of the spectrum.	3	Applying	CO5
8.	Name a few IR radiation sources.	1	Remembering	CO5
9.	What are the main components of a UV-visible spectrophotometer?	2	Understanding	CO5
10.	What is Beer Lambert's law?	1	Remembering	CO5
11.	What are the applications of UV visible spectroscopy?	1	Remembering	CO5
12.	Compare Beer and Lambert's law.	2	Understanding	CO5
13.	What is the use of cyclic voltammetry?	1	Remembering	CO5
14.	Mention the principle for cyclic voltammetry.	2	Understanding	CO5
15.	What are the factors affecting the cyclic voltammetry measurements?	2	Understanding	CO5
16.	List out the applications of TGA.	1	Remembering	CO5
17.	Compare DSC and DTA.	2	Understanding	CO5
18.	What is thermogravimetric analysis?	2	Understanding	CO5
19.	Enumerate the uses of pulse oximeter.	3	Applying	CO5
20.	What are the sensors used in biometrics?	2	Understanding	CO5
21.	Classify chemical sensors.	2	Understanding	CO5
22.	Examine the electrochemical sensor.	3	Applying	CO5

S.No	PART-B (16 Marks)		BTL	Competence	CO
1.	(i)	Derive Beer-Lambert Law and what are its application and limitations?	1	Remembering	CO5

	(ii)	Differentiate between UV-visible and IR spectroscopy.	2	Understanding	CO5
2.		Discuss the principle, instrumentation and working of UV-visible spectrophotometer.	1	Remembering	CO5
3.		Discuss the instrumentation of a UV-visible spectrophotometer. Draw a labeled diagram.	2	Understanding	CO5
4.		Write a detailed note on IR spectroscopy with its advantages and disadvantages.	3	Applying	CO5
5.		Discuss the selection rule, principle and instrumentation of IR spectroscopy.	3	Applying	CO5
6.	(i)	Explain various detectors used in IR Spectroscopy.	3	Applying	CO5
	(ii)	Explain various applications of IR spectroscopy.	4	Analyzing	CO5
7.		Enumerate the principle, working and uses of cyclic voltammetry.	4	Analyzing	CO5
8.		Explain the principle and working mechanism of cyclic voltammetry (CV). Mention their uses.	3	Applying	CO5
9.		Explain how TGA is used in qualitative and quantitative measurements.	3	Applying	CO5
10.		Explain the principle, instrumentation and applications with a schematic diagram of (i) TGA and (ii) DTA.	3	Applying	CO5
11.		Classify the instrumentation and applications of (i) TGA and (ii) DSC.	3	Applying	CO5
12.	(i)	Categorize oxygen sensor and glucose sensor.	4	Analyzing	CO5
	(ii)	Summerize on sensors and their types.	4	Analyzing	CO5
13.		Illustrate the principle, working and uses of pulse oximeter sensor.	4	Analyzing	CO5
14.		Describe the instrumentation and applications of glucose sensors.	4	Analyzing	CO5
15.	(i)	Derive the uses of biometrics and glucose sensors.	3	Applying	CO5
	(ii)	Compare the oxygen sensor and glucose sensor.	4	Analyzing	CO5