SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM NAGAR, KATTANKULATHUR – 603 203

DEPARTMENT OF CHEMISTRY

QUESTION BANK

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II SEMESTER

CH3224-Chemistry For Agricultural Engineering

Regulations 2023

Academic Year 2024-25

UNIT I - FOOD CHEMISTRY & MICROBES

Food chemistry: definition, scope and importance of carbohydrate, protein, fat, amino acid, starch, gum & dietary fibres, vitamins in the food, enzymatic & non-enzymatic browning reaction. Contribution to texture, flavor and organoleptic properties of food, food additives - functions. FSSAI: role and function, Microbes: definition, food as a substrate for microorganisms, factors affecting the growth of microbes- pH and water activity.

S.No	PART-A (2 Marks)	BTL	Competence	CO
1.	What is food chemistry?	1	Remembering	CO1
2.	Name types of fat present in food.	1	Remembering	CO1
3.	Outline significance of studying food chemistry.	2	Understanding	CO1
4.	List out the types of vitamins.	1	Remembering	CO1
5.	List out the types and sources of dietary fibres.	1	Remembering	CO1
6.	Classify the types of carbohydrates.	1	Remembering	CO1
7.	Why starch is most unique among carbohydrates?	2	Understanding	CO1
8.	Define Gums in food chemistry.	1	Remembering	CO1
9.	Draw the chemical structure of table sugar or sucrose.	1	Remembering	CO1
10.	What is the difference between cellulose and starch?	2	Understanding	CO1
11.	What is the role of vitamins in food chemistry?	1	Remembering	CO1
12.	Write down the importance of FSSAI.	1	Remembering	CO1
13.	State the importance dietry fibres.	2	Understanding	CO1
14.	Demonstrate microorganisms in food spoilage.	2	Understanding	CO1
15.	How are dietry fibres essential in diet?	1	Remembering	CO1
16.	Organize the types of food protein.	2	Understanding	CO1
17.	What is Maillard reaction?	2	Understanding	CO1
18.	Differentiate enzymatic and non-enzymatic reactions.	1	Remembering	CO1
19.	Explain the term “food additives” and give examples.	2	Understanding	CO1
20.	Define flavor enhancer in food. Give an example.	1	Remembering	CO1
21.	What are organoleptic properties in food?	2	Understanding	CO1
22.	Write note on tastebuds and its role.	2	Understanding	CO1

S.No		Part-B	BTL	Competence	CO
1.	(i)	Write note on chemical reactions that can lead to alteration of food quality.	1	Remembering	CO1
	(ii)	Explain the types of food deterioration during handling, processing, or storage.	1	Remembering	CO1
2.		State the causes and effects during handling, storage and processing of food.	1	Remembering	CO1
3.		Examine the factors which affecting the growth of microbes.	4	Analyzing	CO1
4.		Compare nonenzymic browning and enzyme-catalyzed browning.	4	Analyzing	CO1
5.		Explore carbohydrates with respect to its types, structures and significance.	4	Analyzing	CO1
6.	(i)	Outline the properties, types and uses of starch.	2	Understanding	CO1
	(ii)	Interpret types and importance of vitamins.	2	Understanding	CO1
7.		Categorize the fats and its sources. Examine the role of trans fatty acids in human body.	4	Analyzing	CO1
8.		Elucidate behavior of the food during frying in fat (oil) and its control measures.	4	Analyzing	CO1
9.		Classify the functional and nutritional properties of proteins.	4	Analyzing	CO1
10.		Discuss the types and importance of dietary fibres.	2	Understanding	CO1
11.	(i)	Examine the types and properties of amino acids.	3	Analyzing	CO1
	(ii)	Illustrate the importance of food additives and food texture.	3	Applying	CO1
12.		Discover common flavors with sensory assessment and explain structural basis of the sweet modality.	3	Applying	CO1
13.		Analyze carbohydrates with respect to its types and significance.	4	Analyzing	CO1
14.		Construct the various functions of FSSAI.	3	Applying	CO1
15.	(i)	Sketch general causes of variation/losses of vitamins in food.	3	Applying	CO1
	(ii)	Analyze organoleptic properties of food.	4	Analyzing	CO1

UNIT II - FERTILIZERS AND COMPOST

Chemical fertilizers: classification, composition, manufacturing and properties of major nitrogenous, phosphatic, and potassic fertilizers - secondary and micronutrient fertilizers, complex fertilizers, nano fertilizers, biofertilizers - constraint in the application of biofertilizers. Manures: sources and production. Compost: different composting technologies-mechanical compost plants - vermicomposting.

S.No	Part-A	BTL	Competence	CO
1.	What are chemical fertilizers?	1	Remembering	CO2
2.	Name major nitrogeneous fertilizers.	1	Remembering	CO2
3.	Outline significance of potassic fertilizers.	2	Understanding	CO2
4.	Why phosphatic fertilizers are essential to plants?	2	Understanding	CO2
5.	List out the primary fertilizers.	1	Remembering	CO2
6.	Classify the types of secondary micronutrien fertilizers.	1	Remembering	CO2
7.	How nano particles encapsulated in fertilizers?	2	Understanding	CO2
8.	What are nano fertilizers? Give its types.	1	Remembering	CO2
9.	Sketch the synthesis of urea from ammonia.	1	Remembering	CO2
10.	Write the advantages and disadvantages of nano fertilizers.	3	Applying	CO2
11.	Relate constraint in the application of biofertilizers.	3	Applying	CO2
12.	Demonstrate the factors affecting the composting process.	2	Understanding	CO2
13.	What is biofertilizers give an example.	1	Remembering	CO2
14.	Difine manures and list out their types.	2	Understanding	CO2
15.	What is vermicomposting?	1	Remembering	CO2
16.	Construct the types of composting technologies.	3	Applying	CO2
17.	What is ordinary super phosphate?	2	Understanding	CO2
18.	Differentiate water soluble phosphate and insoluble phosphate.	1	Remembering	CO2
19.	Explain the term“Ammonia Volatilization”.	2	Understanding	CO2
20.	Define Enriched Farm Yard Manure (EFYM)/ Reinforced FYM.	1	Remembering	CO2
21.	What is Rhizobium?	2	Understanding	CO2
22.	Write note on Azotobacter.	2	Understanding	CO2

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S.No	Part-B		BTL	Competence	CO
1.	(i)	Classify various types of manure and fertilizers.	4	Analyzing	CO2
	(ii)	Explain the types of nitrogenous fertilizers with N content in percentage.	1	Remembering	CO2
2.		What is controlled release of fertilizers in soil? Explain nitrification inhibitors and its advantages.	1	Remembering	CO2
3.		Enumerate nano fertilizers and their potential in sustainable agriculture.	4	Analyzing	CO2
4.		Examine manufacturing of urea with neat flow chart.	4	Analyzing	CO2
5.		Discuss the manufacturing procedures and uses of ammonium sulphate, ammonium chloride and ammonium nitrate	4	Analyzing	CO2
6.	(i)	Outline the classification of phosphatic fertilizers.	2	Understanding	CO2
	(ii)	Interpret manufacturing of rock phosphate and bone meal.	2	Understanding	CO2
7.		Categorize the manufacturing of single, triple, super phosphates and thermophosphates.	4	Analyzing	CO2
8.		What are potassic fertilizers? Explain the manufacturing of KCl, K_2SO_4 and Schoenite.	4	Analyzing	CO2
9.		Construct different types of biofertilizers with their nature and functions.	2	Understanding	CO2
10.		Discuss the types and importance of complex fertilizers.	2	Understanding	CO2
11.	(i)	Give short note on secondary and micronutrient fertilizers.	4	Analyzing	CO2
	(ii)	Illustrate the reactions of potassic fertilizers in the soil.	3	Applying	CO2
12.		What are manures? Explain types, sources and characteristics of manures.	3	Applying	CO2
13.		Categorize various types of manure and synthetic fertilizers used in agriculture.	4	Analyzing	CO2
14.		Construct the various composting technologies of organic wastes.	3	Applying	CO2
15.	(i)	Sketch general applications of using fertilizers.	3	Applying	CO2
	(ii)	Analyze coated and Polymer-coated fertilizers.	4	Analyzing	CO2

UNIT III - ENERGY STORAGE SYSTEMS

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 principle.

S.No	Part-A	BTL	Competence	CO
1.	What is nuclear energy?	1	Remembering	CO3
2.	Define light water nuclear power plant.	1	Remembering	CO3
3.	Outline significance of H_2-O_2 fuel cell.	2	Understanding	CO3
4.	Why breeder reactor is essential to nuclear power plant?	2	Understanding	CO3
5.	List out the parts nuclear power plant.	1	Remembering	CO3
6.	Classify the types of batteries.	1	Remembering	CO3
7.	Why lithium batteries are superior among batteries?	2	Understanding	CO3
8.	What is Breeder reactor?	1	Remembering	CO3
9.	Define photogalvanic cell (or) Solar cell?	1	Remembering	CO3
10.	Relate fissile nuclides from fertile nuclides.	3	Applying	CO3
11.	Explain Super critical mass and Sub critical mass.	1	Remembering	CO3
12.	Demonstrate moderator? Give some examples.	2	Understanding	CO3
13.	How is H_2-O_2 fuel cell working?	1	Remembering	CO3
14.	Construct chemical reactions involved in lead acid battery.	3	Applying	CO3
15.	What is the main advantage of secondary battery over primary battery?	1	Remembering	CO3
16.	Compare lead acid battery and lithium-ion battery employed in electric vehicles.	3	Applying	CO3
17.	Explain the storage principle of Supercapacitors.	2	Understanding	CO3
18.	List out the important applications of solar cell.	1	Remembering	CO3
19.	What are the limitations of H_2-O_2 fuel cell?	1	Remembering	CO3
20.	List out applications of lithium-ion battery.	1	Remembering	CO3
21.	Outline significance of NICAD battery.	2	Understanding	CO3
22.	Write note on Supercapacitors.	2	Understanding	CO3

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S.No		Part-B	BTL	Competence	CO
1.	(i)	Classify various types of batteries.	3	Analyzing	CO3
	(ii)	Explain breeder reactor with illustration.	1	Remembering	CO3
2.		Explain with a neat diagram with parts and functions of light water nuclear reactor.	1	Remembering	CO3
3.		How are batteries classified? Describe the construction and functioning of an alkaline battery**.**	4	Analyzing	CO3
4.		What are fuel cells? Describe the construction and working of hydrogen-oxygen fuel cell.	4	Analyzing	CO3
5.		How is NICAD battery constructed? Explain the cell reaction involved.	4	Analyzing	CO3
6.	(i)	Write a note on photovoltaic cell.	2	Understanding	CO3
	(ii)	Explain advantages and the limitations of the solar energy.	1	Remembering	CO3
7.		Describe lithium-ion battery with cell reaction and diagram.	4	Analyzing	CO3
8.		Discuss lead-acid battery with the charging and discharging reaction.	4	Analyzing	CO3
9.		With a neat sketch explain the working of light water nuclear power plant.	2	Understanding	CO3
10.		Construct the charging and discharging reaction with applications of lead-acid storage cell.	2	Understanding	CO3
11.	(i)	Give short note on solar cells.	4	Analyzing	CO3
	(ii)	Bring out the difference between primary and secondary battery.	3	Applying	CO3
12.		What is Supercapacitors? Explain its storage principle and applications.	3	Applying	CO3
13.		Construct the working of H_2-O_2 fuel cell. Explain their applications.	3	Applying	CO3
14.		Construct the working of Li-ion secondary battery. Explain their applications.	3	Applying	CO3
15.	(i)	Compare various batteries used in Electric vehicles.	3	Applying	CO3
	(ii)	Analyze working principle of Electric vehicles.	4	Analyzing	CO3

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UNIT IV - ELEMENTS IN SOIL

Chemistry of soil (nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients) - source, form, and their behaviour - agricultural significance - biotic factors in soil development, microbial toxins in the soil- factors affecting their availability in soil.

S.No	Part-A	BTL	Competence	CO
1.	What are the biotic elements present in soil?	1	Remembering	CO4
2.	Differentiate nitrogen exchange and nitrate leaching.	1	Remembering	CO4
3.	Outline functions of soil nitrogen.	2	Understanding	CO4
4.	Why nitrogen fixation is essential in soil?	2	Understanding	CO4
5.	List out factors affecting nitrification.	1	Remembering	CO4
6.	Classify various forms of nitrogen in soil.	1	Remembering	CO4
7.	Why phosphorus is important in soil?	2	Understanding	CO4
8.	Indicate forms of phosphorus in soil.	3	Applying	CO4
9.	Draw the forms of potassium in soil.	1	Remembering	CO4
10.	What are the benefits of adequate soil potassium?	2	Understanding	CO4
11.	What is the agricultural significance of soil sulphur.	1	Remembering	CO4
12.	Write the importance of magnesium in soil.	2	Understanding	CO4
13.	Relate if calcium is high in soil.	3	Applying	CO4
14.	Write factors determining availability of magnesium in soil.	2	Understanding	CO4
15.	How micronutrients are essential in soil?	1	Remembering	CO4
16.	Illustrate a list of micronutrients in soil.	3	Applying	CO4
17.	What are the deficiency symptoms of magnesium?	2	Understanding	CO4
18.	Discuss values of soil analysis.	1	Remembering	CO4
19.	Explain the term “Elemental Toxicity” and give examples.	2	Understanding	CO4
20.	List out biotic factors in soil development.	1	Remembering	CO4
21.	What are microbial toxins in the soil?	2	Understanding	CO4
22.	Write note on factors affecting microbial toxins in soil.	2	Understanding	CO4

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S.No	Part-B		BTL	Competence	CO
1.	(i)	Classify various sources and functions of nitrogen in soil.	4	Analyzing	CO4
	(ii)	Explain the types of functions of the base cations.	1	Remembering	CO4
2.		Write in detail potassium cycle in soil? Explain factors affecting potassium availability**.**	1	Remembering	CO4
3.		Enumerate calcium cycle and factors determining calcium availability.	4	Analyzing	CO4
4.		Examine the Phosphorus cycle with neat chart.	4	Analyzing	CO4
5.		Discuss the nitrogen cycle and nitrogen fixation in soil.	4	Analyzing	CO4
6.	(i)	Outline forms and functions of micronutrients in soil.	2	Understanding	CO4
	(ii)	Interpret nitrogen mineralization and conditions affecting nitrogen mineralization in soils.	2	Understanding	CO4
7.		Categorize the factors that affect phosphorus-sorption.	4	Analyzing	CO4
8.		What are forms and functions of Phosphorus in soil?	4	Analyzing	CO4
9.		Construct factors that affecting microbial availability in soil.	2	Understanding	CO4
10.		Discuss factors affecting micronutrient availability in soil.	2	Understanding	CO4
11.	(i)	Give short note on biotic factors in soil development.	4	Analyzing	CO4
	(ii)	Illustrate the reactions of potassium in the soil.	3	Applying	CO4
12.		Analyze deficiency symptoms of nitrogen, phosphorus, potassium, and calcium in soil.	3	Applying	CO4
13.		Categorize various forms and functions of micronutrients in soil.	4	Analyzing	CO4
14.		Construct various source, form, and behavior of nitrogen, phosphorus, potassium and calcium in soil.	3	Applying	CO4
15.	(i)	Sketch types of micronutrient toxicity in soil.	3	Applying	CO4
	(ii)	Analyze various forms and applications of nitrogen, phosphorus, potassium and calcium in soil.	4	Analyzing	CO4

UNIT V - ANALYTICAL TECHNIQUES

Introduction, absorption of radiation, types of spectra, UV-Visible, IR spectrophotometer and atomic absorption spectrophotometer (AAS): Instrumentation (block diagram) and applications. Thin layer chromatography (TLC), gas chromatography, high-performance liquid chromatography (HPLC): working principle and applications, C,H,N,O analyser.

S.No	Part-A	BTL	Competence	CO
1.	What is absorption spectroscopy?	1	Remembering	CO5
2.	Name various types of electronic transitions.	1	Remembering	CO5
3.	Outline significance of UV-Visible spectroscopy.	2	Understanding	CO5
4.	Why changes of dipole movement of molecule are essential in IR spectroscopy?	2	Understanding	CO5
5.	List out the applications of IR spectroscopy.	1	Remembering	CO5
6.	Differentiate chromophores from auxochromes.	1	Remembering	CO5
7.	Explain the principle of UV-Visible spectroscopy.	2	Understanding	CO5
8.	Indicate Solvent effect on IR and UV spectra?	3	Applying	CO5
9.	What is finger print region? Mention its important uses?	1	Remembering	CO5
10.	What is IR spectroscopy and how does it work?	2	Understanding	CO5
11.	What the light source of IR spectroscopy? Give an example.	1	Remembering	CO5
12.	Compare Bathochromic shift from Hypochromic shift	2	Understanding	CO5
13.	Demonstrate CHNO analyzer and give its application.	2	Understanding	CO5
14.	How is high performance liquid chromatography working?	1	Remembering	CO5
15.	List out applications of Thin layer chromatography (TLC)	1	Remembering	CO5
16.	Construct the types of chromatography.	3	Applying	CO5
17.	What is chromatography?	1	Remembering	CO5
18.	Differentiate Eluent and Eluate in chromatography.	1	Remembering	CO5
19.	Explain the term "R_f value".	2	Understanding	CO5
20.	Define thin layer chromatography.	1	Remembering	CO5
21.	Mention a few advantages of chromatography?	2	Understanding	CO5
22.	Write note on gas chromatography.	2	Understanding	CO5

S.No	Part-B		BTL	Competence	CO
1.	(i)	Classify various types of spectra.	4	Analyzing	CO5
	(ii)	Explain the types of stretching and bending vibrations with suitable examples.	1	Remembering	CO5
2.		Explain the principle of IR spectroscopy and discuss the functions of various components in IR spectrophotometer.	1	Remembering	CO5
3.		Examine the principle, instrumentation and working mechanism of UV-Visible spectroscopy.	4	Analyzing	CO5
4.		Discuss the applications of IR spectroscopy.	4	Analyzing	CO5
5.		Discuss the applications of UV-Visible spectroscopy.	4	Analyzing	CO5
6.	(i)	How do atomic spectra differ from molecular spectra?	2	Understanding	CO5
	(ii)	Differentiate emission spectra from absorption spectra?	2	Understanding	CO5
7.		Categorize in detail about the rotational, vibrational and electronic transitions.	4	Analyzing	CO5
8.		What are electromagnetic spectrum and explain the characteristics of it.	4	Analyzing	CO5
9.		State the following (a) Hypsochromic shift, (b) Hyper chromic shift, (c) Hypochromic shift, (d) Bathochromic shift.	2	Understanding	CO5
10.		Differentiate chromophore from auxochrome with examples.	2	Understanding	CO5
11.	(i)	Discuss atomic absorption spectrophotometer and give their applications.	4	Analyzing	CO5
	(ii)	Illustrate the working of high-performance liquid chromatography and applications.	3	Applying	CO5
12.		What are chromatographies? Explain types, and applications.	3	Applying	CO5
13.		Classify the various applications of ultraviolet-visible spectroscopy.	3	Applying	CO5
14.		With the help of block diagram discuss the functions of various components in IR spectrophotometer.	3	Applying	CO5
15.	(i)	With the help of block diagram discuss functions of UV-Visible spectrophotometer with applications.	3	Applying	CO5
	(ii)	Analyze Thin layer chromatography and its role.	4	Analyzing	CO5

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