CHEMISTRY



# **Program Code: UCH**

# 2021-2022 onwards



# MANNAR THIRUMALAI NAICKER COLLEGE

(AUTONOMOUS) Re-accredited with "A" Grade by NAAC PASUMALAI, MADURAI – 625 004

#### **Eligibility for Admission**

should have passed the Higher Secondary Examination conducted by the Candidate Board of Higher Secondary Education, Government of Tamil Nadu, CBSE Board with Science as one of the subjects in Higher Secondary Education.

#### Subjects of Study

Part I : Tamil / Company Secretarial Practice and Modern Office Management

Part II : English

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Part III

- 1. Core Subjects
- 2. Allied Subjects
- 3. Electives

Part IV

- 1. Non Major Electives (II Year)
- 2. Skill Based Subjects
- 3. Environmental Studies Mandatory Subject
- 4. Value Education Mandatory Subject

Part V

**Extension Activities** 

# Pattern of the question paper for the Continuous Internal Assessment Note: Duration – 1 hour

#### (For Part I, Part II & Part III)

The components for continuous internal assessment are	:
Part –A	
Four multiple choice questions (answer all)	4 x01= 04 Marks
Part –B	
Three short answers questions (answer all)	3 x02= 06 Marks
Part –C	
Two questions ('either or 'type)	2 x 05=10 Marks
Part –D	
Two questions out of three	1 x 10 =10 Marks
-	
Total	30 Marks

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#### The scheme of Examination for Part-I, II & III

 The components for continuous internal assessment are:

 (60 Marks of two continuous internal assessments will be converted to 15 marks)

 Two tests and their average
 --15 marks

 Seminar /Group discussion
 --5 marks

 Assignment
 --5 marks

 Total
 25 Marks

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Pattern of the question paper for the Summative Exa	minations:	
Note: Duration- 3 hours		
Part –A		
Ten multiple choice questions	10 x01	= 10 Marks
No Unit shall be omitted: not more than two questions fi	rom each unit	.)
Part –B		
Short answer questions (one question from each unit)	5 x02	= 10 Marks
Part –C		
Five Paragraph questions ('either or 'type)	5 x 05	= 25 Marks
(One question from each Unit)		
Part –D		
Three Essay questions out of five	3 x 10	=30 Marks
(One question from each Unit)		
Total		75 Marks

Part-IV- Skill Based Papers / NME:

The Scheme of Examination for Skill Based Papers: (Except Practical Lab Subjects) Pattern of the questions paper for the continuous Internal Assessment

**45 MCQs will be asked for each internal assessment tests** (45 x 1=45 Marks) **and converted for 15 marks** 

The components for continuous internal assessment are:

Two tests and their average	15 marks
Seminar /Group discussion	5 marks
Assignment	5 marks
Total	25 Marks

#### **Summative Examination Pattern**

Pattern of the Question Paper for Skill Based Papers (External)

**75 Multiple choice questions will be asked from five units** (75 x 1=75 Marks)

(15MCQ's from each unit)

#### Part-IV- Environmental Studies and Value Education

#### The Scheme of Examination (Environmental Studies and Value Education)

Two tests and their average	15 marks
Project Report	10 marks*
Total	25 marks

\* The students as Individual or Group must visit a local area to document environmental assets – river / forest / grassland / hill / mountain – visit a local polluted site – urban / rural / industrial / agricultural – study of common plants, insects, birds – study of simple ecosystem – pond, river, hill slopes, etc.

#### **Question Paper Pattern**

#### (Internal Assessment)

Pattern of the Question Paper for Environmental Studies & Value Education only) (Internal)

**45 MCQs will be asked for each internal assessment tests** (45 x 1=45 Marks) **and converted for 15 marks** 

	Total	25 Marks
Project		 10 marks
Two tests and their average		 15 marks

#### **Summative Examination Pattern**

Pattern of the Question Paper for Environmental Studies & Value Education only) (External)

**75 Multiple choice questions will be asked from five units** (75 x 1=75 Marks)

(15MCQ's from each unit)

#### Part V Extension Activities: (Maximum Marks: 100)

- 1. NCC
- 2. NSS
- 3. Physical Education
- 4. YRC
- 5. RRC
- 6. Health & Fitness Club
- 7. Eco Club
- 8. Human Rights Club

#### Pattern of the Question Paper for (Internal Examination & Summative Examination)

Internal Examinations- - 40 MarksSummative Examinations- - 60 Marks

100

#### **Minimum Marks for a Pass**

40% of the aggregate (Internal +Summative Examinations).No separate pass minimum for the Internal Examinations.27 marks out of 75 is the pass minimum for the Summative Examinations.

#### VISION

Department of Chemistry undertakes to aspires young adult to excel in Chemical Education, Research and Services to contribute to a chemically literate society through teaching, scholarship and service.

#### MISSION

To produce employable graduates in various areas and demonstrate science as a human endeavor and as a way to understand the natural world

#### The 12 Graduate Attributes\*:

- 1. (KB) A knowledge base for engineering: Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.
- 2. (PA) Problem analysis: An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions
- 3. (Inv.) Investigation: An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data and synthesis of information in order to reach valid conclusions.
- 4. (Des.) Design: An ability to design solutions for complex, open-ended engineering problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal considerations.
- 5. (Tools) Use of engineering tools: An ability to create, select, apply, adapt, and extend appropriate techniques, resources, and modern engineering tools to a range of engineering activities, from simple to complex, with an understanding of the associated limitations.
- 6. (Team) Individual and teamwork: An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.
- 7. (Comm.) Communication skills: An ability to communicate complex engineering concepts within the profession and with society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.
- 8. (Prof.) Professionalism: An understanding of the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and the public interest.
- 9. (Impacts) Impact of engineering on society and the environment: An ability to analyze social and environmental aspects of engineering activities. Such ability includes an understanding of the interactions that engineering has with the economic, social, health, safety, legal, and cultural aspects of society, the uncertainties in the prediction of such

interactions; and the concepts of sustainable design and development and environmental stewardship.

- 10. (Ethics) Ethics and equity: An ability to apply professional ethics, accountability, and equity.
- 11. (Econ.) Economics and project management: An ability to appropriately incorporate economics and business practices including project, risk, and change management into the practice of engineering and to understand their limitations.
- 12. (LL) Life-long learning: An ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge

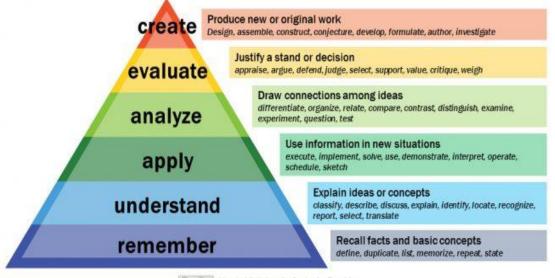
WA	Graduate Attributes	Caption as
1	A knowledge base for engineering: Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.	Disciplinary Knowledge
2	An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions.	Problem Analysis
3	An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data and synthesis of information in order to reach valid conclusions.	Investigation
7	An ability to communicate complex engineering concepts within the profession and with society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.	Communication skills
6,10	An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting. An ability to apply professional ethics, accountability, and equity.	Individual and Team Work & Ethics
5,12	An ability to create, select, apply, adapt, and extend appropriate techniques, resources, and modern engineering tools to a range of engineering activities, from simple to complex, with an understanding of the associated limitations. An ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge	Use of Engineering Tools & Life- Long Learning

	PROGRAM EDUCATIONAL OBJECTIVES (PEOs)
	On completion of the Programme, the Student will be able to
PEO1:	Enhance the students to nurture the requirements of industries/laboratories related to
	chemistry including pharmaceutical/analytical chemistry.
PEO2:	Enable the students to demonstrate information literacy skills for acquiring
1102.	knowledge of chemistry, as a chemist/researcher and also as a life-long learner.
	Develop the students to communicate effectively the scientific and research
<b>PEO3</b> :	information in both written and oral formats, to both professional scientists and to
	the public.
PEO4:	Collaborate with Industry and Alumni to explore the new avenues in respective
I E04.	domains and raise the employability ratio.
PEO5:	Adhere towards the ethical and environmental sustainability to create morally
LO2.	upright and empowered citizens to face industry/ institution.
PEO6:	Nurture environmental awareness and develop communal harmony in respective of
LEO0:	national integration.

PO NO	PROGRAMME OUTCOMES (POs)	
At the end	l of the programme, the students will be able to	
<b>PO</b> – 1	Demonstrate the knowledge and understanding of Science concepts and its relevant fields.	Disciplinary Knowledge
<b>PO</b> – 2	Identify, formulate, analyse complex problems and reach valid conclusions using the methodologies of Science.	Problem Solving
<b>PO</b> – 3	Employ critical and analytical thinking in understanding the concepts and apply them in various problems appearing in different branches of Science.	Analytical Reasoning & Critical Thinking
PO - 4	Communicate the known concepts effectively within the profession and with any forum	Communication Skills
PO - 5	Function successfully as a member/leader in any team and to apply ethics, accountability and equity in their life.	Team Work and Moral/Ethical Awareness
PO - 6	Use ICT tools in various learning situations, related information sources, suitable software to analyze data and furthermore participating in learning activities throughout life to meet the demands of work place through knowledge /up-skilling / re-skilling	Digital Literacy & Life-long Learning

S.No.	Graduate Attributes	PROGRAM SPECIFIC OUTCOME (PSOs)
PSO1:	Knowledge Base	Learn various concepts of organic, inorganic, physical chemistry, their biological aspects and their application in day-to-day life.
PSO2:	Problem Analysis & Investigation	Design towards executing experiments and confident handling of equipment's in Chemistry for industries.
PSO3:	Communication Skills & Design	Execute new ideas in the field of research and development using principles and techniques of science learned through activities such as expert lecturers, workshops, seminars and field projects.
PSO4:	Professionalism, Ethics and Equity	Aspire the knowledge of green environment learned through green chemistry and pollution free scenario
PSO5:	Individual & Team Work	Work effectively with a set of teams using modern technical skills and innovative research ideas in Chemistry areas
PSO6:	Lifelong learning	Develop employability and entrepreneurship skills learned through industry-based curriculum

# **Bloom's Taxonomy**



Vanderbilt University Center for Teaching

## MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS), MADURAI B.Sc., CHEMISTRY., CURRICULUM

<b>Course Code</b>	Title of the Course	Hrs	Credits	Maxi	mum M	larks
			Int	Ext	Total	
	FIRST SEMEST	ER				
Part – I	Tamil / Alternative Course					
21UTAG11	இக்காலக் கவிதையும் நாடகமும்	6	3	25	75	100
Part – II	English					
21UENG11	Communicative English - I	6	3	25	75	100
Part - III	Core Courses					
21UCHC11	Inorganic Chemistry -I	4	4	25	75	100
	Major Chemistry Practical – I					
21UCHCP1	(Inorganic Semi Micro-Qualitative	2	-	-	-	
	analysis)					
Part III	Allied Course					
	Allied Physics – I					
21UPHA11	(Mechanics, Properties of Matter,	4	4	25	75	100
	Heat and Sound)					
21UPHAP1	Allied Physics Practical – I	2	-	-	-	-
Part IV	Skill Based Course					
21UCHS11	Cosmetic Chemistry	2	2	25	75	100
21UCHS12	Green Chemistry	2	2	25	75	100
Part IV	Mandatory Course					
21UEVG11	Environmental Studies	2	2	25	75	100
	Total	30	20	175	525	700
	SECOND SEMES	TER		-		-
Part – I	Tamil / Alternative Course					
21UTAG21	இடைக்கால இலக்கியமும் சிறுகதையும்	6	3	25	75	100
Part – II	English					
21UENG21	Communicative English -II	6	3	25	75	100
Part - III	Core Courses					
21UCHC21	Organic Chemistry -I	4	4	25	75	100
	Major Chemistry Practical – I					
21UCHCP1	(Inorganic Semi Micro-Qualitative	2	2	40	60	100
	analysis)					
Part III	Allied Course					
	Allied Physics – II					
21UPHA21	(Electricity, Electronics, Optics and	4	3	25	75	100
	Modern Physics)					
21UPHAP1	Allied Physics Practical – I	2	1	40	60	100
Part IV	Skill Based Course					
21UCHS21	Dairy Chemistry	2	2	25	75	100
21UCHS22	Dye Chemistry	2	2	25	75	100
Part IV	Mandatory Course					
21UVLG21	Value Education	2	2	25	75	100
	Total	30	22	255	645	900

(For the student admitted during the academic year 2021-2022 onwards)

	THIRD SEMEST	ER				
Part – I	Tamil / Alternative Course					
21UTAG31	காப்பிய இலக்கியமும் உரைநடையும்	6	3	25	75	100
Part – II	English					
21UENG31	Communicative English-III	6	3	25	75	100
Part - III	Core Courses					
21UCHC31	Physical Chemistry – I	4	4	25	75	100
21UCHC32	Inorganic Chemistry – II	4	4	25	75	100
21UCHCP2	Major Chemistry Practical – II (Volumetric Analysis)	2	-	-	-	-
Part III	Allied Course					
21UMCA32 / 21UMBA32	Allied Mathematics – I / Allied Microbiology – I: Fundamentals of Microbiology	6	4	25	75	100
Part IV	Non-Major Elective Course					
21UCHN31	Basic Concepts in Chemistry	2	2	25	75	100
	Total	30	20	150	450	600
	FOURTH SEMES	TER				
Part – I	Tamil / Alternative Course					
21UTAG41	பண்டைய இலக்கியமும் புதினமும்	6	3	25	75	100
Part – II	English					
21UENG41	Communicative English -IV	6	3	25	75	100
Part - III	Core Courses					
21UCHC41	Organic Chemistry – II	4	4	25	75	100
21UCHC42	Physical Chemistry – II	4	4	25	75	100
21UCHCP2	Major Chemistry Practical – II (Volumetric Analysis)	2	2	40	60	100
Part III	Allied Course					
21UMCA43 / 21UMBA42	Allied Mathematics – II / Allied Microbiology – II: Applied Microbiology	6	4	25	75	100
Part IV	Non-Major Elective Course					
21UCHN41	Water Treatment	2	2	25	75	100
Part V	Extension Activities					
21UEAG40-	NSS, NCC, YRC		1	40	(0)	100
21UEAG49		-	1	40	60	100
	Total	30	23	230	570	800

	FIFTH SEMEST	ER				
Part - III	Core Courses					
21UCHC51	Organic Chemistry – III	6	6	25	75	100
21UCHCP3	Major Chemistry Practical – III (Physical Chemistry experiments)	6	5	40	60	100
21UCHCP4	Major Chemistry Practical – IV (Gravimetric Analysis and Organic Preparation)	3	-	-	-	-
21UCHCP5	Major Chemistry Practical – V (Organic Analysis and Estimation)	3	-	-	-	_
Part III	Core Elective					
21UCHE51	Analytical Chemistry					
21UCHE52	Nuclear, Industrial Chemistry & Metallic State	5	~	25	75	100
21UCHE53	Supramolecular Chemistry	5	5	25	75	100
21UCHE54	Bioinorganic Chemistry					
21UCHE55	Chemistry in crime investigation	5	5	25	75	100
21UCHE56	Food Processing Chemistry					
Part IV	Skill Based Course					
21UCHS51	Drug Chemistry	2	2	25	75	100
	Total	30	23	140	360	500
	SIXTH SEMEST	ER				
Part - III	Core Courses					
21UCHC61	Physical Chemistry – III	6	6	25	75	100
21UCHCP4	Major Chemistry Practical – IV (Gravimetric Analysis and Organic Preparation)	3	5	40	60	100
21UCHCP5	Major Chemistry Practical – V (Organic Analysis and Estimation)	3	5	40	60	100
21UCHPR1	Project and viva voce	6	4	40	60	100
Part III	Core Elective Courses					
21UCHE61	Applied Chemistry					
21UCHE62	Soil and Agriculture Chemistry	F	F	25	75	100
21UCHE63	Fuel Chemistry	5	5	25	75	100
21UCHE64	Nano Chemistry					
21UCHE65	Clinical and Medicinal Chemistry	_	F	25	75	100
21UCHE66	Applied Electrochemistry	5	5	25	75	100
Part IV	Skill Based Course					
21UCHS61	Polymer Chemistry	2	2	25	75	100
	Total	30	32	220	480	700
	Grand Total	180	140	1170	3030	4200





## MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name INORGANIC CHEMISTRY – I										
Course Code	21UCHC11	L	Р	С						
Category	Core	4	-	4						
Nature of cours	se: EMPLOYABILITY ✓ SKILL ORIENTED ENTREPRENI	EURS	HIP	<ul> <li>Image: A set of the set of the</li></ul>						
Course Objectives:										
• To Recall the structure of atom and also know the various model of an atom for the structure of										
the atoms.										
	ber the basics of periodic table and atomic properties to relate their pri	nciple	S							
-	e the types of bonds to relate their relations between them.	1.41								
• To Perform of molecule	the chemical bonding and VSEPR theory and their applications to fin	a the	geome	etry						
	ne the various concepts on Acids and Bases and also know the positio	ns of 1	vdro	ren						
and its prop	-	115 01 1	iyuro	gen						
<b>^ _</b> _	RUCTURE OF ATOM		12							
	onstituents of atom (elementary idea) - Rutherford model of an atom -	Mosl	ey's							
determination of	of atomic number – mass number. Quantum theory: Black body radiati	on – p	hoto							
electric effect -	Compton effect - Bohr model of atom: postulate and hydrogen spectr	um –	de							
0 1	ions – Heisenberg's uncertainty principle – Quantum numbers – Pauli	's exc	lusion	l						
· · ·	bau principle – Hund's rule – electronic configuration of atoms.									
Unit: IIPERIODIC TABLE AND ATOMIC PROPERTIES12										
	of periodic table- periodic law and electronic configuration of eleme									
	lationship. Atomic properties- Size of atom- Atomic Volumes - Ior									
	ty- Electronegativity- Different scales- Diagonal relationship- C			n of						
	basis of their electronic configuration- (further extension of periodic <b>IEMICAL BONDING</b>	table).	12							
	ical bonding – octet rule – ionic bond – covalent bond – valence bor	nd anr		- its						
	ajan's rule – VSEPR theory and its limitations – application of VSEP									
	olecules (NH <sub>3</sub> and H <sub>2</sub> O) – hybridization – sp, sp <sup>2</sup> , sp <sup>3</sup> , sp <sup>3</sup> d <sup>2</sup> and (Be									
	blecular Orbital theory – LCAO method – MO diagram for homo nuc									
	ic molecules $-$ H <sub>2</sub> , He <sub>2</sub> , Li <sub>2</sub> , Be <sub>2</sub> , C <sub>2</sub> , N <sub>2</sub> , O <sub>2</sub> , F <sub>2</sub> , CO and HF $-$ d									
magnetic prope	rty and bond order									
Unit: IV AC										
Arrhenius concept-Lowry Bronsted -Lewis concepts-Lux Flood solvent system concepts -										
Usonowich concept. Factors influencing the acidic and basis properties (steric effect, +I and -I										
effect, resonance effect and electronegativity effect). Oxo acids and strength of oxo acids.										
Unit: V     HYDROGEN, OZONE AND HYDROGEN PEROXIDE     12										
<b>Hydrogen:</b> Position of hydrogen in periodic table – resemblance of hydrogen with alkali metals –										
	resemblance with halogens – special position of hydrogen – resemblance with carbon – preparation – manufacture – pure hydrogen – ortho and para hydrogen – occluded hydrogen – uses – Isotopes of									
	topic effect – hydrides – classification – examples. <b>Ozone</b> : Commerce									
	s, structure. <b>Hydrogen peroxide</b> : Manufacture – properties – struct									
	ermanganometric and iodimetric method – strength of hydrogen perox									
	<u> </u>			_						

	Total Lecture Hou	rs 60 Hrs
Books	for Study:	
1. B.F	R. Puri, L.R.Sharma & K.C. Kalia, Principles of Inorganic Chemistry Miles	tone Publisher
	t edition, New Delhi 2013	
Books	for References:	
1. Pt	ri, Sharma & Kalia, Principles of Inorganic Chemistry Milestone publisher	& distributor,
	ew Delhi 2009.	
2. R.	D Madan S.Chand, Modern Inorganic Chemistry band Co.Ltd, New Delhi 20	12.
	D.Lee, Wiley India, Concise Inorganic Chemistry 5th Edition, New Delhi 2009	
Web R	Resources:	
1. https	:://bit.ly/3tu7P32	
	:://bit.ly/2Qev0Ac	
	:://bit.ly/3bRnjs6	
	:://bit.ly/30R8dww	
	e Outcomes	K Level
On th	e completion of the course the student will be able to	
<b>CO1:</b>	Recall the general characteristics of sub atomic particles of an atom and	[Up to K2]
	periodicity	
<b>CO2:</b>	Discuss the long form periodic table, types of chemical bonds and concept of	[Up to K3]
	Acids and Bases.	
CO3:	Prepare the hydrogen, ozone and hydrogen peroxide and compute the	[Up to K3]
	properties with alkali metals	
<b>CO4:</b>	Examine the Quantum model of an atom and VSEPR theory to find the	[Up to K4]
	geometry of molecules	
CO5:	Apply various types of bonds and quantum model of atom for the geometry	[Up to K4]
	of molecules	-

### CO & PO Mapping:

Course Outcomes	Programme Outcomes (POs)								
(COs)	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	PO 4	<b>PO 5</b>	<b>PO 6</b>			
CO 1	3	1	2	3	1	2			
CO 2	1	3	1	1	2	3			
CO 3	2	2	3	2	3	3			
CO 4	3	1	2	2	1	2			
CO5	1	3	2	3	2	1			
Weightage	10	10	10	11	9	11			

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

#### LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	<b>STRUCTURE OF ATOM</b> An outline of constituents of atom (elementary idea) – Rutherford model of an atom – Mosley's determination of atomic number – mass number. Quantum theory: Black body radiation – photo electric effect – Compton effect – Bohr model of atom: postulate and hydrogen spectrum – de Broglie's equations – Heizenberg's uncertainty principle – Quantum numbers – Pauli's exclusion principle – Aufbau principle – Hund's rule – electronic configuration of atoms.	12	Chalk, Talk & Power point
II	<b>PERIODIC TABLE AND ATOMIC PROPERTIES</b> The long form of periodic table- periodic law and electronic configuration of elements- Horizontal and vertical relationship. Atomic properties- Size of atom- Atomic Volumes - Ionisation energy- electron affinity- Electronegativity- Different scales- Diagonal relationship-Classification of elements on the basis of their electronic configuration - (further extension of periodic table).	12	Chalk, Talk & Power point
III	CHEMICAL BONDING Cause of chemical bonding – octet rule – ionic bond – covalent bond – valence bond approach- its limitations – Fajan's rule – VSEPR theory and its limitations – application of VSEPR theory to find geometry of molecules (NH <sub>3</sub> and H <sub>2</sub> O) – hybridization – sp, sp <sup>2</sup> , sp <sup>3</sup> , sp <sup>3</sup> d <sup>2</sup> and (BeF <sub>2</sub> , BCl <sub>3</sub> , CH <sub>4</sub> , SF <sub>6</sub> , H <sub>2</sub> O)- Molecular Orbital theory – LCAO method – MO diagram for homo nuclear and hetero nuclear diatomic molecules – H <sub>2</sub> , He <sub>2</sub> , Li <sub>2</sub> , Be <sub>2</sub> , C <sub>2</sub> , N <sub>2</sub> , O <sub>2</sub> , F <sub>2</sub> , CO and HF – determination of magnetic property and bond order	12	Chalk, Talk & Power point
IV	ACIDS AND BASES Arrhenius concept-Lowry Bronsted –Lewis concepts-Lux Flood solvent system concepts -Usonowich concept. Factors influencing the acidic and basis properties (steric effect, +I and –I effect, resonance effect and electronegativity effect). Oxo acids and strength of oxo acids.	12	Chalk, Talk & Power point
V	HYDROGEN, OZONE AND HYDROGEN PEROXIDE Hydrogen: Position of hydrogen in periodic table – resemblance of hydrogen with alkali metals – resemblance with halogens – special position of hydrogen – resemblance with carbon – preparation – manufacture – pure hydrogen – ortho and para hydrogen – occluded hydrogen – uses – Isotopes of hydrogen – Isotopic effect – hydrides – classification – examples. Ozone: Commercial preparation, properties, uses, structure. Hydrogen peroxide: Manufacture – properties – structure and uses – estimation by permanganometric and iodimetric method – strength of hydrogen peroxide.	12	Chalk, Talk & Power point

Course Designed by: Dr. V. Ramasamy Raja & Dr. J.E. Sangeetha

	Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)										
			Sectio	on A	Sectio			~			
Inte rnal Cos		K Level	MC No. of. Questions	Qs K – Level	Short Aı No. of. Questio ns	nswers K - Level	Section C Either or Choice	Section D Open Choice			
CI	CO1	Up to K2	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)			
AI CO2		Up to K3	2	K1 & K2	2	K2	2 (K3&K3)	2(K2 & K3)			
CI CO3 AII CO4 Question Pattern CIA I & II		Up to K2	2	K1 & K2	1	K2	2 (K2&K2)	1(K2)			
		Up to K4	2	K1 & K2	2	K2	2 (K3&K3)	2(K3 &K4)			
		No. of Questions to be asked	4		3		4	3			
		No. of Questions to be answered	4		3		2	2			
		Marks for each question	1		2		5	10			
		Total Marks for each section	4		6		10	20			

			Distribution (	of Marks with	K Level CL	A I & CIA	II	
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
	K1	2	2	-	-	4	6.67	
	K2	2	4	10	20	36	60	67
CIA	K3	-	-	10	10	20	33.33	33
I	K4	-	-	-	-	-	-	-
-	Marks	4	6	20	30	60	100	100
	K1	2	2	-	-	4	6.67	
	K2	2	4	10	10	26	43.33	50
CIA	K3	-	-	10	10	20	33.33	33
II	K4	-	-	-	10	10	16.67	17
	Marks	4	6	20	30	60	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

S	Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)										
			MC		Short An	swers	Section C	Section D			
S.No Cos K - Level			No. of Question s	K – Level	No. of Question	K – Level	(Either / or Choice)	Section D (Open Choice)			
1	CO1	Up to K 2	2	K1,K2	1	K1	2 (K2&K2)	1(K2)			
2	CO2	Upto K 3	2	K1&K2	1	K1	2 (K3&K3)	1(K3)			
3	CO3	Up to K 3	2	K1&K2	1	K2	2 (K3&K3)	1(K3)			
4	CO4	Up to K 4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)			
5	CO5	Up to K 4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)			
No. of	Questions	s to be Asked	10		5		10	5			
No	o.of Questi answe		10		5		5	3			
Maı	rks for eac	h question	1		2		5	10			
Total Marks for each section			10		10		25	30			
	(Figures	in parenthesi	is denotes, q	uestions s	hould be as	ked with	the given K	level)			

	Distribution of Marks with K Level										
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D ( Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %				
K1	5	4	-	-	9	7.5	33				
K2	5	6	10	10	31	25.83	55				
K3	-	-	40	20	60	50	50				
K4	-	_	-	20	20	16.67	17				
Marks	10	10	50	50	120	100	100				

 NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.

Q.No         CO         K Level         Questions           1         CO1         K1	Section	A (Mu	iltiple Cho	ice Questions)
1         CO1         K1           2         CO1         K2           3         CO2         K1           4         CO2         K2           5         CO3         K1           6         CO3         K2           7         CO4         K1           8         CO4         K2           9         CO5         K1           10         CO5         K2           Section B (Short Answers)         Answer All Questions         (5x2=10 max           Q.No         CO         K Level         Questions           11         CO1         K1         11           12         CO2         K1         11           13         CO3         K2         14           14         CO4         K2         15           15         CO5         K2         15           Section C (Either/Or Type)         Answer All Questions         (5 x 5 = 25 max           16) a         CO1         K2         16) b           16) a         CO1         K2         17) b         CO2           17) b         CO2         K3         11           18) b	Answe	r All Q	uestions	(10x1=10 marks)
2       CO1       K2         3       CO2       K1         4       CO2       K2         5       CO3       K1         6       CO3       K2         7       CO4       K1         8       CO4       K2         9       CO5       K1         10       CO5       K2         Section B (Short Answers)       Answer All Questions       (5x2=10 max <b>Q.No</b> CO       K Level       Questions         11       CO1       K1       11         12       CO2       K1       11         13       CO3       K2       14         14       CO4       K2       15         15       CO5       K2       15         Section C (Either/Or Type)       Answer All Questions       (5 x 5 = 25 max <b>Q.No</b> CO       K2       16) a       17) a         16) a       CO1       K2       17) b       10         17) b       CO2       K3       18) a       10         18) a       CO3       K3       19) b       10         19) b       CO4       K3       10     <	Q.No	CO	K Level	Questions
3       CO2       K1         4       CO2       K2         5       CO3       K1         6       CO3       K2         7       CO4       K1         8       CO4       K2         9       CO5       K1         10       CO5       K2         Section B (Short Answers)       Answer All Questions         Answer All Questions       (5x2=10 ma)         Q.No       CO       K Level         11       CO1       K1         12       CO2       K1         13       CO3       K2         14       CO4       K2         15       CO5       K2         Section C (Either/Or Type)       Answer All Questions         Answer All Questions       (5 x 5 = 25 ma)         (6) a       CO1       K2         16) b       CO1       K2         17) a       CO2       K3         18) a       CO3       K3         18) a       CO3       K3         19) b       CO4       K3         19) b       CO5       K3         20) b       CO5       K3         20	1	CO1	K1	
4       CO2       K2         5       CO3       K1         6       CO3       K2         7       CO4       K1         8       CO4       K2         9       CO5       K1         10       CO5       K2         Section B (Short Answers)         Answer All Questions         11       CO1       K1         12       CO2       K1         13       CO3       K2         14       CO4       K2         15       CO5       K2         Section C (Either/Or Type)         Answer All Questions       (5 x 5 = 25 ma)         Q.No       CO       K Level       Questions         16) a       CO1       K2          17) a       CO2       K3          18) a       CO3       K3          19) b       CO4       K3          20) a       CO5       K3          20) b       CO5       K3          20) b       CO5       K3          20) b       CO5       K3	2	CO1	K2	
5       CO3       K1         6       CO3       K2         7       CO4       K1         8       CO4       K2         9       CO5       K1         10       CO5       K2         Section B (Short Answers)         Answer All Questions         11       CO1       K1         12       CO2       K1         13       CO3       K2         Section C (Either/Or Type)         Answer All Questions       (5 x 5 = 25 ma)         Q.No       CO       K Level       Questions         16) a       CO1       K2       (5 x 5 = 25 ma)         Q.No       CO       K Level       Questions         16) a       CO1       K2       (5 x 5 = 25 ma)         Q.No       CO       K Level       Questions         17) b       CO2       K3       (5 x 5 = 25 ma)         17) b       CO2       K3       (5 x 5 = 25 ma)         18) a       CO3       K3       (5 x 5 = 25 ma)         19) b       CO4       K3       (5 x 5 = 25 ma)         17) b       CO2       K3       (5 x 5 = 25 ma)	3	CO2	K1	
6         CO3         K2           7         CO4         K1           8         CO4         K2           9         CO5         K1           10         CO5         K2           Section B (Short Answers)           Answer All Questions           11         CO1         K1           12         CO2         K1           13         CO3         K2           14         CO4         K2           15         CO5         K2           Section C (Either/Or Type)           Answer All Questions           16) a         CO1         K2           17) a         CO2         K3           17) b         CO2         K3           17) b         CO2         K3           18) a         CO3         K3           18) b         CO3         K3           19) b         CO4         K3           20) a         CO5         K3           20) b         CO5         K3           20) b         CO5         K3           20) b         CO5         K3           20) b         CO5	4	CO2	K2	
7       CO4       K1         8       CO4       K2         9       CO5       K1         10       CO5       K2         Section B (Short Answers)       Answer All Questions       (5x2=10 ma)         Q.No       CO       K Level       Questions         11       CO1       K1       11         12       CO2       K1       11         13       CO3       K2       11         14       CO4       K2       11         15       CO5       K2       15         Section C (Either/Or Type)       Answer All Questions       (5 x 5 = 25 ma)         Q.No       CO       K Level       Questions         16) a       CO1       K2       16         17) a       CO2       K3       11         18) b       CO3       K3       11         19) a       CO4       K3       11         19) b       CO4       K3       11         19) b       CO5       K3       11         19) b       CO4       K3       11         19) b       CO4       K3       12         20) b       CO5	5	CO3	K1	
8         CO4         K2           9         CO5         K1           10         CO5         K2           Section B (Short Answers)         Answer All Questions         (5x2=10 mail)           Q.No         CO         K Level         Questions           11         CO1         K1         11           12         CO2         K1         11           13         CO3         K2         11           14         CO4         K2         11           15         CO5         K2         11           Section C (Either/Or Type)         Answer All Questions         (5 x 5 = 25 mail)           Q.No         CO         K Level         Questions           16) a         CO1         K2         11           17) a         CO2         K3         11           17) b         CO2         K3         11           18) a         CO3         K3         11           19) a         CO4         K3         11           20) a         CO5         K3         11           20) b         CO5         K3         11           20) b         CO5         K3         11 <th>6</th> <td>CO3</td> <td>K2</td> <td></td>	6	CO3	K2	
9         CO5         K1           10         CO5         K2           Section B (Short Answers)           Answer All Questions         (5x2=10 mail           Q.No         CO         K Level         Questions           11         CO1         K1         11           12         CO2         K1         11           13         CO3         K2         11           14         CO4         K2         11           15         CO5         K2         11           Section C (Either/Or Type)           Answer All Questions         (5 x 5 = 25 mail)           Q.No         CO         K Level         Questions           16) a         CO1         K2         11           17) b         CO2         K3         11           17) b         CO2         K3         11           18) a         CO3         K3         11           19) b         CO4         K3         12           20) a         CO5         K3         12           20) b         CO5         K3         12           20) b         CO5         K3	7	CO4	K1	
10       CO5       K2         Section B (Short Answers)         Answer All Questions         Q.No       CO       K Level       Questions         11       CO1       K1       12         12       CO2       K1       13         13       CO3       K2       14         14       CO4       K2       15         15       CO5       K2       15         Section C (Either/Or Type)         Answer All Questions         16) a       CO1       K2         17) b       CO2       K3         17) b       CO2       K3         18) a       CO3       K3         19) a       CO4       K3         20) a       CO5       K3         20) b       <	8	CO4	K2	
Section B (Short Answers)Answer All Questions $(5x2=10 \text{ mar})$ Q.NoCOK LevelQuestions11CO1K1112CO2K1113CO3K2114CO4K2115CO5K2Section C (Either/Or Type)Answer All QuestionsAnswer All Questions $(5 x 5 = 25 \text{ mar})$ Q.NoCOK LevelQuestions16) bCO1K2117) aCO2K3118) aCO3K3119) aCO4K3119) bCO4K3120) aCO5K31NB: Higher level of performance of the students is to be assessed by attempting high level of K levelsSection D (Open Choice)Answer Any Three questions(3x10=30 maQ.NoCOK LevelQuestions	9	CO5	K1	
Answer All Questions         (5x2=10 markstyle           Q.No         CO         K Level         Questions           11         CO1         K1           12         CO2         K1           13         CO3         K2           14         CO4         K2           15         CO5         K2           Section C (Either/Or Type)         Answer All Questions         (5 x 5 = 25 markstyle           Q.No         CO         K Level         Questions           16) a         CO1         K2         (5 x 5 = 25 markstyle           Q.No         CO         K Level         Questions           16) a         CO1         K2         (5 x 5 = 25 markstyle           17) a         CO2         K3         (5 x 5 = 25 markstyle           16) b         CO1         K2         (5 x 5 = 25 markstyle           17) a         CO2         K3         (5 x 5 = 25 markstyle           18) a         CO3         K3         (5 x 5 = 25 markstyle           19) b         CO4         K3         (5 x 5 = 25 markstyle           19) a         CO4         K3         (5 x 5 = 25 markstyle           20) a         CO5         K3         (5 x 5 = 25	10	CO5	K2	
Q.No         CO         K Level         Questions           11         CO1         K1           12         CO2         K1           13         CO3         K2           14         CO4         K2           15         CO5         K2           Section C (Either/Or Type)         Answer All Questions         (5 x 5 = 25 max)           Q.No         CO         K Level         Questions           16) a         CO1         K2         (5 x 5 = 25 max)           16) a         CO1         K2         (5 x 5 = 25 max)           16) a         CO1         K2         (7) a           17) a         CO2         K3         (7) b           17) a         CO2         K3         (7) b           18) a         CO3         K3         (7) b           18) a         CO3         K3         (7) b           19) b         CO4         K3         (7) b           20) a         CO5         K3         (7) b           20) b         CO5         K3         (7) b           20) b         CO5         K3         (7) b           20) b         CO5         K3         (7) c <th>Section</th> <th>B (Sho</th> <th>ort Answei</th> <th>rs)</th>	Section	B (Sho	ort Answei	rs)
11       CO1       K1         12       CO2       K1         13       CO3       K2         14       CO4       K2         15       CO5       K2         Section C (Either/Or Type)         Answer All Questions         16) a       CO1       K2         16) b       CO1       K2         17) a       CO2       K3         17) b       CO2       K3         18) a       CO3       K3         18) b       CO3       K3         19) b       CO4       K3         20) a       CO5       K3         20) b       CO5       K3         Section D (Open Choice)         Answer Any Three questions       (3x10=30 ma         Q.No       CO       K Level	Answe	r All Q	uestions	(5x2=10 marks)
12       CO2       K1         13       CO3       K2         14       CO4       K2         15       CO5       K2         Section C (Either/Or Type)         Answer All Questions         (5 x 5 = 25 max         Q.No         CO         K Level         Questions         16) a       CO1       K2         17) a       CO2       K3         17) b       CO2       K3         17) b       CO2       K3         18) a       CO3       K3         19) a       CO4       K3         19) b       CO4       K3         20) a       CO5       K3         20) b       CO5       K3         NB: Higher level of performance of the students is to be assessed by attempting higher         level of K       levels         Section D (Open Choice)         Answer Any Three questions       (3x10=30 max         Q.No       CO       K Level       Questions         21       C01       K2	Q.No	CO	K Level	Questions
13       CO3       K2         14       CO4       K2         15       CO5       K2         Section C (Either/Or Type)         Answer All Questions         (5 x 5 = 25 max         Q.No         CO         K Level         Questions         16) a       CO1       K2         17) a       CO2       K3         17) b       CO2       K3         18) a       CO3       K3         19) a       CO4       K3         19) b       CO4       K3         20) a       CO5       K3         Questions is to be assessed by attempting high         level of K levels       Section D (Open Choice)         Answer Any Three questions         Questions         21       CO1       K2	11	CO1	K1	
14 $CO4$ $K2$ 15 $CO5$ $K2$ Section C (Either/Or Type)Answer All QuestionsQ.NoCOK LevelQ.NoCOK LevelQuestions(5 x 5 = 25 mar)16) aCO1K216) bCO1K217) aCO2K317) bCO2K318) aCO3K319) aCO4K320) aCO5K320) bCO5K320) bCO5K3NB: Higher level of performance of the students is to be assessed by attempting high level of K levelsSection D (Open Choice)Answer Any Three questions(3x10=30 maQ.NoCOK LevelQuestions21CO1K2	12	CO2	K1	
15 $CO5$ $K2$ Section C (Either/Or Type)Answer All QuestionsQ.NoCOK LevelQuestions16) aCO1K216) bCO1K217) aCO2K317) bCO2K318) aCO3K318) bCO3K319) aCO4K320) aCO5K320) bCO5K3NB: Higher level of performance of the students is to be assessed by attempting high level of K levelsSection D (Open Choice)Answer Any Three questions21CO1K2	13	CO3	K2	
Section C (Either/Or Type)Answer All Questions $(5 x 5 = 25 mar)$ Q.NoCOK LevelQuestions16) aCO1K216) bCO1K217) aCO2K317) bCO2K318) aCO3K319) aCO4K320) aCO5K320) bCO5K3NB: Higher level of performance of the students is to be assessed by attempting higherlevel of K levelsSection D (Open Choice)Answer Any Three questions21CO1K2	14	CO4	K2	
Answer All Questions         (5 x 5 = 25 ma)           Q.No         CO         K Level         Questions           16) a         CO1         K2         (16) b         CO1         K2           16) b         CO1         K2         (17) a         CO2         K3           17) b         CO2         K3         (17) b         CO2         K3           17) b         CO2         K3         (17) b         CO2         K3           18) a         CO3         K3         (17) b         CO4         K3           19) a         CO4         K3         (17) b         CO4         K3           19) b         CO4         K3         (17) b         CO5         K3           20) a         CO5         K3         (17) b         (17) b <td< th=""><th>15</th><td>CO5</td><td>K2</td><td></td></td<>	15	CO5	K2	
Q.No         CO         K Level         Questions           16) a         CO1         K2           16) b         CO1         K2           17) a         CO2         K3           17) b         CO2         K3           17) b         CO2         K3           18) a         CO3         K3           18) b         CO3         K3           19) a         CO4         K3           20) a         CO5         K3           20) b         CO5         K3           NB: Higher level of performance of the students is to be assessed by attempting high           level of K levels         Section D (Open Choice)           Answer Any Three questions         (3x10=30 ma           Q.No         CO         K Level           Questions         21         C01	Section	C (Eit	her/Or Ty	pe)
16) a         CO1         K2           16) b         CO1         K2           17) a         CO2         K3           17) b         CO2         K3           17) b         CO2         K3           18) a         CO3         K3           18) b         CO3         K3           19) a         CO4         K3           20) a         CO5         K3           20) b         CO5         K3           20) b         CO5         K3           NB: Higher level of performance of the students is to be assessed by attempting highe           level of K levels         Section D (Open Choice)           Answer Any Three questions         (3x10=30 ma           Q.No         CO         K Level           Questions         21         CO1	Answe	r All Q	uestions	(5 x 5 = 25 marks)
16) b         CO1         K2           17) a         CO2         K3           17) b         CO2         K3           17) b         CO2         K3           17) b         CO2         K3           18) a         CO3         K3           18) b         CO3         K3           19) a         CO4         K3           19) b         CO4         K3           20) a         CO5         K3           20) b         CO5         K3           20) b         CO5         K3           NB: Higher level of performance of the students is to be assessed by attempting high           level of K         levels           Section D (Open Choice)         (3x10=30 ma)           Answer Any Three questions         (3x10=30 ma)           21         CO1         K2	Q.No	CO	K Level	Questions
17) a       CO2       K3         17) b       CO2       K3         18) a       CO3       K3         18) b       CO3       K3         19) a       CO4       K3         19) b       CO4       K3         20) a       CO5       K3         20) b       CO5       K3         20) b       CO5       K3         20) b       CO5       K3         NB: Higher level of performance of the students is to be assessed by attempting high         level of K levels       Section D (Open Choice)         Answer Any Three questions       (3x10=30 ma         Q.No       CO       K Level         Questions       21       C01	/			
17) b         CO2         K3           18) a         CO3         K3           18) b         CO3         K3           19) a         CO4         K3           19) b         CO4         K3           20) a         CO5         K3           20) b         CO5         K3           20) b         CO5         K3           20) b         CO5         K3           NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels           Section D (Open Choice)           Answer Any Three questions         (3x10=30 ma)           Q.No         CO         K Level           Questions         21         CO1				
18) a       CO3       K3         18) b       CO3       K3         19) a       CO4       K3         19) b       CO4       K3         20) a       CO5       K3         20) b       CO5       K3         20) b       CO5       K3         20) b       CO5       K3         20) b       CO5       K3         Section D (Open Choice)       (3x10=30 ma)         Answer Any Three questions       (3x10=30 ma)         Q.No       CO       K Level         Questions       21       C01				
18) b         CO3         K3           19) a         CO4         K3           19) b         CO4         K3           20) a         CO5         K3           20) b         CO5         K3           20) b         CO5         K3           20) b         CO5         K3           NB: Higher level of performance of the students is to be assessed by attempting high           level of K levels           Section D (Open Choice)           Answer Any Three questions         (3x10=30 ma           Q.No         CO         K Level           Questions         21         C01	17) b			
19) aCO4K319) bCO4K320) aCO5K320) bCO5K3NB: Higher level of performance of the students is to be assessed by attempting higher level of K levelsSection D (Open Choice)Answer Any Three questions(3x10=30 maQ.NoCOK LevelQuestions21CO1K2	18) a			
19) bCO4K320) aCO5K320) bCO5K3NB: Higher level of performance of the students is to be assessed by attempting high level of K levelsSection D (Open Choice)Answer Any Three questions(3x10=30 maQ.NoCOK LevelQuestions21CO1K2				
20) aCO5K320) bCO5K3NB: Higher level of performance of the students is to be assessed by attempting high level of K levelsSection D (Open Choice)Answer Any Three questions(3x10=30 maQ.NoCOK LevelQuestions21CO1K2	,			
20) bCO5K3NB: Higher level of performance of the students is to be assessed by attempting high level of K levelsSection D (Open Choice) Answer Any Three questions(3x10=30 maQ.NoCOK LevelQ.NoCOK LevelQ1CO1K2				
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels         Section D (Open Choice)         Answer Any Three questions       (3x10=30 ma)         Q.No       CO       K Level       Questions         21       CO1       K2				
level of K levels         Section D (Open Choice)         Answer Any Three questions       (3x10=30 ma         Q.No       CO       K Level       Questions         21       CO1       K2       K	,			
Section D (Open Choice)         Answer Any Three questions       (3x10=30 ma)         Q.No       CO       K Level       Questions         21       CO1       K2       (3x10=30 ma)				ormance of the students is to be assessed by attempting higher
Answer Any Three questions       (3x10=30 ma)         Q.No       CO       K Level       Questions         21       CO1       K2       (3x10=30 ma)				
Q.No         CO         K Level         Questions           21         CO1         K2				
21 CO1 K2				
	-			Questions
22 CO2 K3				
23 CO3 K3				
24 CO4 K4				
25 CO5 K4	25	CO5	K4	

# **Summative Examinations - Question Paper – Format**



## MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name				RACTICAL – I ualitative Analysis)	)					
Course Code	21UCHCP1		<b>\</b>	,				L	Р	(
Category	Core							-	2	
ature of cours	e: EMPLOY	AB	ILITY 🗸 SI	KILL ORIENTED	✓	ENT	REPRENE	EUR	SHIP	$\checkmark$
Course Object	ives:				1	1				
• To Recall the	ne basic prope	rtie	s of salt mixt	ures.						
• To Reminis	cence the anio	onic	and cationic	species in the salt n	nixt	ures.				
• To Apply th	ne concept of a	anio	nic and catio	nic species in semi	mic	ro qua	alitative ana	lysis	5.	
• To Execute	the confirmat	ion	test for the a	nions and cations pr	esei	nt in t	he salt mixt	ures.		
• To Constru	ct four radicals	s wi	th correct pro	ocedure during analy	ysis	of the	e salt mixtu	res.		
Duration o	f examination	<b>n:</b> 31	hrs							
Ana	lysis of a mix	ture	containing t	two anions of which	n on	ie is a	n interferin	g in	semi-	
micro meth	od two cations	5								
Anions:										
	-			ide, chloride, bromi	de,	iodide	e, oxalate,			
Bo	rate, phosphat	e ar	nd chromate.							
ſ	Aagnesium and	J a1	<u>Distrib</u>	<u>ution of marks</u> x marks: 100						3
Internal	: 40 marks	5				Ext	ternal : 60	) mai	rks	
Laborator	/	:	30 marks	Vivo voce		:	10 mark			
	on note book	:	10 marks	Record note bool	k	:	10 mark	S		
				Four radicals wit correct procedure	h	:	40 mark	S		
Total		:	40 marks	Total		:	60 mark	S		
										30
						Т	otal Lectur	e Ho	ours	Hr
Books for Stu	dv:								I	
<b>l.</b> Dr. V. V	•		U	emimicro Qualitati	ve	Anal	ysis, Natio	nal	Publis	hir
÷ ,										
Books for Ref									~ ~ -	<b>.</b>
	book of Qual	itat	ive Analysis	including Semi Mi	cro	Meth	ods, Longn	nan S	Sc & 7	lec

Web I	Resources:	
1. <u>httr</u>	os://www.youtube.com/watch?v=cEOvj6jkdDw	
2. <u>httr</u>	os://www.youtube.com/watch?v=T3hi_xEpaDg	
3. <u>httr</u>	<u>os://www.youtube.com/watch?v=BK7rf4XE4f8</u>	
4. <u>httr</u>	os://www.youtube.com/watch?v=QQo1e-BUZWs	
Cours	e Outcomes:	K Level
On th	e completion of the course the student will be able to	
CO1:	Identify the basic radical and its group in the given salt mixture.	[Up to K2]
<b>CO2:</b>	Understand the qualitative analysis skill of any given inorganic salt mixture.	[Up to K3]
CO3:	Develop the acid radicals present in the given inorganic salt mixture.	[Up to K3]
<b>CO4:</b>	Analyze the basic radical systematically.	[Up to K4]
CO5:	Apply the four radicals with correct procedure during analysis of the salt mixtures	[Up to K4]

## CO & PO Mapping:

Course Outcomes	Programme Outcomes (POs)									
(COs)	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	PO 4	<b>PO 5</b>	<b>PO 6</b>				
CO 1	3	1	2	3	1	2				
CO 2	1	3	1	1	2	3				
CO 3	2	2	3	2	3	3				
<b>CO 4</b>	3	1	2	2	1	2				
CO5	2	3	1	3	2	1				
Weightage	11	10	9	11	9	11				

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

## LESSON PLAN

UNIT	INORGANIC SEMI MICRO – QUALITATIVE ANALYSIS	Hrs	Mode
Ι	<ul> <li>Duration of examination: 3hrs</li> <li>Analysis of a mixture containing two anions of which one is an interfering in semi-micro method two cations</li> <li>Anions: <ul> <li>Carbonate, sulphate, nitrate, fluoride, chloride, bromide, iodide, oxalate, Borate, phosphate and chromate.</li> </ul> </li> <li>Cations: Lead, bismuth, copper, cadmium, antimony, iron (II and III), aluminium, Chromium, zinc, manganese, cobalt, nickel, barium, calcium, Magnesium and ammonium.</li> </ul>	30	Practical

Course Designed by: Dr. V. Ramasamy Raja & Dr. R. Satheesh



## MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	ALLIED PHYSICS-	I: (Mechanics, Properties	of Matter, Heat a	nd So	ound	)
Course Code	21UPHA11			L	P	С
Category	Allied			4	-	4
Nature of cours	e: EMPLOYABILITY	✓ SKILL ORIENTED	✓ ENTREPREN	EURS	HIP	
Course Objecti	ives:					
The learners will	ll be able:					
	lect Newton's law of m					
		perty and types of modulus				
	•	application of Bernoulli's t	heorem			
	lect Kinetic theory of ga					
	rstand the concepts of S	.H.M			- [	
	chanics				13	
1 0		ent of Inertia –Perpendicu				
		lewton's laws of gravitation			Ear	th –
		lum-Expression for period-	Experiment to find	<b>"</b> g"		
	sticity				12	
	-	t moduli of Elasticity-Poi		-		
		mination of Young's modu				
		ple per unit twist-Work			Torsi	onal
		isting- Rigidity modulus by	y torsion pendulum	1	1.1	
	cosity	D	26: . :	f .	11	
	•	Poiseuille's formula - coef	•		-	•
	_	continuity-Bernoulli's theo	orem-derivation-A	ppiic	ation	s oi
	orem (Venturimeter and				10	•
Unit: IV Hee					12	
		h – Transport phenomena –				
		nductivity – Degrees of				
		$\Upsilon$ for mono atomic and d				
	•	amics (statement only) – onversion of ice into stream		or e	nuop	y III
Unit: V Sou		onversion of ice into stream	11		12	,
		on of two S.H.M's of equa	al time periods at	right		
-	-	tionary waves – Melde's	-	-	-	
		nsverse and Longitudinal n				
		indt's tube and Piezoelectri				
	netilou – Detection – Kt		Total Lecture Ho		60 H	re
Books for Stud	v:			uis	<b>JV 1</b>	11.3
	-	of Matter and Sound, Mad	lurai first			
0	2016.[B.Sc.AncillaryPh		iurai, 1115i			
-	Unit–I: 1.1, 2.1–2.7, 2.1	-				
* (	Unit–II: 4.1-4.5, 4.7,4.8,	4.10-4.13				

	* Unit–III: 5.2-5.7 -	
	* Unit-V: 6.1, 6.3,6.4, 6.7-6.9, 6.12	
2 P N	Murugeshan, Thermal Physics, Madurai, First edition July, 2016. (B.Sc., Ancillar	v <b>Dhysics</b> )
2. <b>R</b> N		y Filysics)
	* Unit–IV: 6.1, 6.3-6.7, 6.9-6.11, 7.4-7.7	
	for References:	2011
	Kakani, C.Hemarajani, S.Kakani, <b>Mechanics</b> , IIIedition, VivaBooks Ltd, NewDelhi	
	dayResnic,JearlWalker, <b>PrinciplesofPhysics</b> ,9 <sup>th</sup> Edition,WileyIndia Pvt.Ltd, New	Delni,
2012.		
	Mathur, <b>Mechanics</b> , S. ChandandCo., NewDelhi, 2008	
	laland N.Subramanyam, <b>Propertiesofmatter</b> ,S.ChandandCo., New Delhi,2004	2004
•	lalandN.Subramanyam,HeatandThermodynamics, S.Chandand Co, New Delhi,	2004.
	esources:	
	tps://latestcontents.com/bsc-physics-mechanics-notes/	
	ww.khanacademy.org/science/physics/elasticity/surface_tension	
	tps://www.askiitians.com/revision-notes/physics/kinetic-theory-of-gases/	
	tps://www.askiitians.com/revision-notes/physics/thermodynamics/	
	Outcomes	K Level
After su	uccessful completion of the course, the student is expected to	
	Understand the concepts of Newton's law of Gravitation, different modulus of	
CO1:	elasticity, mean free path, degrees of freedom, laws of thermodynamics and	K2
	stationary waves	
	Define centripetal and centrifugal force, angular velocity, moment of inertia,	
<b>CO2:</b>	elasticity, Poisson's ratio, bending of beams, Bernouli's theorem, Transport	K3
	Phenomena, mono and diatomic gases, S.H.M, properties of Ultrasonic waves	
	Apply torque, angular momentum, expression for bending moment, couple per	
CO3:	unit twist, Bernouli's theorem, Boltzmann's law of equipartition of energy,	K3
005:	change of entropy in conversion of ice to steam, applications of Ultrasonic	КJ
	waves	
	Analyze parallel and perpendicular axis theorem, Boy's method for G,	
<b>CO4:</b>	determine and analyze uniform and non-uniform bending, Poiseuille's	K4
	formula to find the coefficient viscosity of liquid	
	Analyze the change of entropy in Carnot's cycle, Kundt's tube and Piezo	
CO5:	Analyze the change of entropy in Carnot's cycle, Kundt's tube and Piezo electric method for the production of Ultrasonic waves, Melde's experiment	K4

## CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	2	2	2	2
CO 2	3	2	1	2	2	2
CO 3	3	2	2	2	2	2
CO 4	3	2	2	1	2	2
CO 5	2	2	1	1	2	2

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

#### LESSON PLAN

Unit	ALLIEDPHYSICS–I Mechanics, Properties of Matter, Heat and Sound	Hrs	Pedagogy
I	Mechanics Torque – Angular momentum –Moment of Inertia –Perpendicular and Parallel axes theorem - Kepler'slawsofplanetarymotion- Newton'slawsofgravitation–Massanddensityof Earth–Boy's method for G–Compound pendulum-Expression for period- Experiment to find "g"	13	Lecture method, PPT, Demonstration
п	<b>Elasticity</b> Different moduli of Elasticity-Poisson'sratio–Bendingofbeams– Expression for bending moment–Determination of Young's modulus by uniform and non uniform bending – Torsion– Expression for couple per unit twist – Workdone in twisting Torsional oscillations of a body - Workdone in twisting– Rigidity modulus by torsion pendulum	12	Lecture method, PPT, Demonstration
ш	Viscosity Viscosity - Derivation of Poiseuille's formula - coefficient of viscosity of a liquid by Poiseuille's method – Equation of continuity - Bernoulli's theorem – derivation – Applications of Bernoulli's theorem (Venturimeter and Pitot tube )	11	Lecture method, PPT, Model
IV	<b>Heat</b> Kinetic theory of gases – Mean free path – Transport phenomena – Expression for the coefficient of Diffusion, viscosity and thermal conductivity – Degree of freedom – Boltzman's law of equipartition of energy – calculation of $\Upsilon$ for mono atomic and diatomic gases - Thermodynamics – First and second laws of thermodynamics (statement only) – Entropy – change of entropy in Carnot's cycle – Change of entropy in conversion of ice into stream	12	Lecture method, PPT
V	<b>Sound</b> Simple harmonic motion Composition of two S.H.M's of equal time periods at right angles - Stationary wavesProperties of stationary waves Melde's experiment for the frequency of electrically maintained tuning fork (Ttransverse and Longitudinal modes) - Ultrasonics Production Piezo electric method Detection Kundt's tube and Piezo electric Properties Applications	12	Lecture method, PPT

Course Designed by: 1. Mrs.A.Lakshmi, 2. Dr.S.S.Jayabalakrishnan

	Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)												
Inter		К-	К-			Secti		Secti		Secti (Eith	ion C ner or pice)		on D Choice)
Inter nal	COs	Le vel	vel	MC No. of. Questions	CQs K - Level	Short A No. of. Questio ns	nswers K - Level	No. of. Quest ions	K - Level	No. of. Quest ions	K - Level		
CI	CO1	K1	Ι	2	K1 & K2	1	K1	2	K2	1	K2		
AI	to CO5	to K4	II	2	K1 & K2	2	K2	2	K3	2	K3		
СІ	CO1	K1	III	2	K1 & K2	1	K2	2	K3	1	K3		
AII	to CO5	to K4	IV	2	K1 & K2	2	K2	2	K4	2	K4		
		No. of Questions to be asked		4		3			4		3		
~	Question		o. of estions o be wered	4		3			2		2		
Pattern CIA I & II		e	ks for ach estion	1		2		5		1	10		
			otal ks for ach ction	4		6		1	0	2	0		

		Dist	ribution of <b>I</b>	Marks with	K Level C	IA I & 0	CIA II		
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %	
	K1	2	2			4	6.7	50	
	K2	2	4	10	10	26	43.3	50	
CIA	K3			10	20	30	50.0	50	
	K4							-	
I	Marks	4	6	20	30	60	100	100	
	K1	2	2			4	6.7	167	
	K2	2	4			6	10.0	16.7	
CIA	K3			10	10	20	33.3	33.3	
II	K4			10	20	30	50.0	50	
	Marks	4	6	20	30	60	100	100	

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

**K3**- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Summ	ative Ex	aminatio	on – Blu	e Print A	rticulati	on Mapp	ing – K l	Level wit	h Course	e Outcom	es (COs)
C No	COr	К -	vel	MOQs		Short Answers		Section C (Either / or Choice)		Section D (Open Choice)	
S.No.	COs	Level		No.of Ques tions	K – Level	No.of Quest ions	K – Level	No.of Quest ions	K – Level	No.of Quest ions	K – Level
1	CO1 - CO5	K1 to K4	Ι	2	K1 & K2	1	K1	2	K2 & K2	1	K2
2	CO1 - CO5	K1 to K4	Π	2	K1 & K2	1	K1	2	K3 & K3	1	K3
3	CO1 - CO5	K1 to K4	III	2	K1 & K2	1	K2	2	K3 & K3	1	K3
4	CO1 - CO5	K1 to K4	IV	2	K1 &K2	1	K2	2	K4 & K4	1	K4
5	CO1 - CO5	K1 to K4	v	2	K1 & K2	1	K2	2	K4 & K4	1	K4
No. of	Questio	ns to be A	Asked	10		5		1	0		5
	-	stions to		10		5		4	5		3
Mai	ks for ea	ach questi	ion	1		2		5			10
Total	Marks fo	or each se	ction	10		10		2	5		30

<u>UNIT-V</u> will be allotted for individual Assignment in <u>CO5 - K4</u> level which carries five marks as part of CIA component.

		D	istribution of	Marks with	K Level			
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D ( Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %	
K1	5	4			9	12	47	
K2	5	6	10	10	31	34.66	47	
K3			20	20	40	27	27	
K4			20	20	40	26.66	26	
Marks	10	10	50	50	120	100	100	
	NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Section	A (Mu	ltiple Cho	ice Questions)
Answer	All Q	uestions	(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section	B (Sho	ort Answei	rs)
Answer	: All Q	uestions	(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section	C (Eit	her/Or Ty	pe)
Answer	: All Q	uestions	(5  x 5 = 25  marks)
Q.No	CO	K Level	Questions
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K4	
20) b	CO5	K4	
			ormance of the students is to be assessed by attempting higher
level of			
		en Choice	
		Three ques	
Q.No	<u>CO</u>	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

# **Summative Examinations - Question Paper – Format**



#### MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	ALLIED PHYSICS PRACTICAL - I									
Course Code	21UPHAP1			L	Р	С				
Category	Allied			-	2	-				
Nature of cours	se:EMPLOYABILITY	✓ SKILL ORIENTED	✓ ENTREPREN	EURS	HIP					
Course Object	ives:					_				
The learners will be able:										
Ū.	0	ents based on Optics, Elec	ctricity and Electro	onics						
	ate modulus of elasticity		0							
		orward and reverse biasin	g, frequency respon	nce						
	d current conduction in e		1. 6.							
	*	cillator and Operational a								
		S (Any Fourteen Experime	,							
1 Uniform ben 2. Torsion Pend		- (Pin & Micr	1 /	1	1	r				
			on of Rigidity mod	ulus ar	na M.I					
	ductivity of Bad conduct		6.1							
4. Sonometer		- Verification								
	f low range Voltmeter	- Potentiomet		•						
6. Carey Foster	0		& resistivity of a w ndexof a Prism	ire.						
7. Spectrometer										
8Mirror Galva			current sensitiven	ess						
9.LCR – Series	resonance		on of L & Q factor							
10.Air wedge	A NT 1 · · 1	- Thickness of								
<u> </u>	$\lambda$ Normal incidence	- Spectrometer	•							
	transistor amplifier	- CE mode	6.6							
13.Hartley oscil		- Determinatio								
	– NAND and NOR		ete Components.	, <b>.</b>						
15.Zener diode			everse Characteris	tics						
16.OP AMP		- Adder and Su			20.77					
			Total Practical H	ours	30 H	rs				
<b>Books for Stud</b>	ly:									

2. Srinivasan.M.N.,Balasubramanian.S.,Ranganathan.R., A Text Book of Practical Physics, 2017 Edition Sultan Chand & Sons

#### **Books for References:**

- 1. Ouseph.C., Practical Physics and Electronics, 2013.S. Viswanathan.P.Ltd
- **2.** Practical Physics and Electronics, C.C.Ouseph, U.J.Rao, V.Vijayendran, S.Viswanathan Publishers(2007)

#### Web Resources:

- 1. https://nptel.ac.in/course.html/physics/experimental physics I, II and III
- 2. <u>https://nptel.ac.in/courses/115/105/115105110/</u>
- 3. <u>https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn\_LgLofRX7n8z4tHYK</u>

Course	Course Outcomes					
On suc	On successful completion of the course, the learners should be able to					
	Understand and evaluate the Young's modulus and Rigidity modulus of the					
<b>CO1:</b>	given material, the ways to calibrate a low range voltmeter using	K4				
	potentiometer					
<b>CO2:</b>	Acquire the knowledge of the characteristics of an operational amplifier	K3				
CO3:	Apply the basic principles of optics to determine the thickness of a wire	K4				
CO4:	Analyze the electrical parameters like resistance and resistivity using Carrey	K4				
C04:	Foster bridge and characteristics of Zener diode	<b>N</b> 4				
CO5:	Construct Amplifier and Oscillator	K4				

### CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	<b>PO 6</b>
CO 1	3	2	3	3	3	2
CO 2	2	2	2	2	5	2
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	3	2
CO 5	3	2	2	3	3	3

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

## LESSON PLAN

Semester	Allied Physics Practical - I	Hrs	Pedagogy
	1. Uniform bending - Pin & Microscope		
Ι	2. Torsion Pendulum - Determination of Rigidity modulus and		
	M.I		
	3. Thermal conductivity of Bad conductor - Lee's disc		
	4. Sonometer - Verification of laws		Demonstration
	5. Calibration of low range Voltmeter - Potentiometer		
	6. LCR – Series resonance - Determination of L & Q factor		
	7. Logic gates – NAND and NOR - (Discrete Components).		
	8. Zener diode - Forward & Reverse Characteristics		

Course Designed by: 1. Mrs.A.Lakshmi, 2. Dr.R.Sangeetha



## MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	COSMETIC CHEMISTRY			
Course Code	21UCHS11	L	Р	С
Category	Skill	2	-	2
Nature of cours	e: EMPLOYABILITY 🗸 SKILL ORIENTED 🗸 ENTREPREN	NEUF	SHIP	•
Course Objecti	ves:			
• To Remember $To Compare To Compare To Execute To Determine To Determine To Dental Preparat (Composition of Soap. Problems Unit: II CO$	he basic properties of soap and detergents and also ingredients on too ber the preparations of hair care products. It the consumer products with their compositions. The composition and physical properties of milk products. In the adulterants in food materials and first aid and antidots for pois <b>SMETICS I</b> ions: Tooth pastes- ingredients, their characteristics and functions. Inly). Soap and Detergents: Manufacture of Soap and Detergents. Cle of Detergents as waste water in water resources. <b>SMETICS II</b> ations: shampoo; different types and formulations, Moisturizing creating the state of the state	oned Mou ansing	person 0 th was g actio	96 shes n of 96
	ng creams, after shave preparations. (Composition and applications f			
	NSUMER PRODUCTS			6
	ucts: Composition and Uses of Safety Matches, Agarbattis, Naphtha lish, Gum, Ink, Chalk crayons.	lene E	Balls, V	Nax
	GAR		0	6
alcohol from mo – power alcohol			ated s	pirit
	OD ADULTERATION		-	6
and toxic chem	1	natura J). Fii	al pois st aid	sons and
Books for Stud	Total Lecture	Hour	5 30	Hrs
<ol> <li>Sharma, B.I</li> <li>Poucher, W Chemistry a</li> <li>K.S. Rangaj 1975.</li> <li>Chopra H.K</li> <li>Books for Refer</li> <li>R.V.Shreve, Mumbai.</li> <li>Mohan Mal</li> </ol>	K., Industrial Chemistry, Meerut: GOEL Publishing House, 1st Editio A. Perfumes, Cosmetics and soaps, Vol. III, Modern Cosmetics. Sin and the beauty business, 2018. Opa and K.T Acharya, Indian Dairy products, Asia Publishing House A. Panesar, P.S, "Food Chemistry" Narosa Publishing House, New Do	nons, , , New <u>elhi, 2</u> y, 200	J.V. <sup>7</sup> Delhi <u>010.</u> )5,	
	uncil Meeting Held On 29.04.2021	]	Page 18	8

Web R	esources:	
	os://bit.ly/3rVPCex	
2. <u>httr</u>	os://bit.ly/380FFI8	
Course	e Outcomes:	K Level
On th	e completion of the course the student will be able to	
<b>CO1:</b>	Relate the characteristics of tooth pastes, hair care products.	[Up to K2]
CO2:	Understand the concepts of manufacture of soaps, detergents, hair care and	[Up to K3]
CO2.	consumer products.	
CO3:	Compare the milk and sugar products on their composition.	[Up to K3]
<b>CO4:</b>	Correlate the consumer products, sugar and food adulteration.	[Up to K4]
CO5:	Construct the characteristics and understand the consumer products	[Up to K4]

## CO & PO Mapping:

Course Outcomes	Programme Outcomes (POs)						
(COs)	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	PO 4	<b>PO 5</b>	<b>PO 6</b>	
CO 1	3	1	2	3	1	2	
CO 2	1	3	1	1	2	3	
CO 3	2	2	3	2	3	3	
CO 4	3	1	2	2	1	2	
CO5	2	3	1	3	2	1	
Weightage	11	10	9	11	9	11	

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

#### LESSON PLAN

UNIT	COSMETIC CHEMISTRY	Hrs	Mode
I	<b>COSMETICS I</b> Dental Preparations: Tooth pastes- ingredients, their characteristics and functions. Mouth washes (Composition only). Soap and Detergents: Manufacture of Soap and Detergents. Cleansing action of Soap. Problems of Detergents as waste water in water resources.	06	Chalk & Talk, Power Point
Ш	<b>COSMETICS II</b> Hair care preparations: shampoo; different types and formulations, Moisturizing creams, perfumes, Lip sticks, shaving creams, after shave preparations. (Composition and applications for the above).	06	Chalk & Talk, Power Point
Ш	CONSUMER PRODUCTS Consumer Products: Composition and Uses of Safety Matches, Agarbattis, Naphthalene Balls, Wax candles, shoe polish, Gum, Ink, Chalk crayons.	06	Chalk & Talk, Power Point
IV	SUGAR Preparation of bagasse-use of bagasse for the manufacture of paper and electricity- preparation of alcohol from molasses-preparation of absolute alcohol-manufacture of wine, beer, methylated spirit – power alcohol.	06	Chalk & Talk, Power Point
V	<b>FOOD ADULTERATION</b> <b>Food adulteration -</b> Contamination of wheat, rice, dhal, milk, butter, with clay, sand, stone, water and toxic chemicals (e.g., Kasseri dhal with mentanil yellow). Food poisons: natural poisons (alkaloids, nephrotoxins), pesticides (DDT, BHC, Follidol), chemical poisons (KCN). First aid and Antidotes for poisoned persons.	06	Chalk & Talk, Power Point

Course Designed by: Dr. J.E. Sangeetha & Dr. R. Satheesh



## MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	GREEN CHEMISTRY						
Course Code	21UCHS12			L	Р	С	
Category	Skill			2	-	2	
Nature of Cours	e: EMPLOYABILITY	✓ SKILL ORIENTED	✓ ENTREPRE	NEUR	SHIP	•	
Course Objecti	ves:						
To Reco	llect the green environment	nt and basic definition for g	green chemistry.				
To Rem	ember the twelve principle	es of green chemistry and e	xamples.				
• To Compare the concept of yield and its calculation on atom economy.							
<ul> <li>To Exec</li> </ul>	ute the concept of selectiv	ity, types of selectivity and	reactions using gr	een so	lvent	s.	
To Deter	mine the basic concepts in	n designing green synthesis	and choice of star	ting n	nateri	als.	
	RODUCTION					б	
	-	Green Chemistry- Goals o	-				
	Green chemistry, Progress	of Green Chemistry- Twe	elve principles of C	Breen	Chen	nistry	
and Examples.							
	LD AND ATOM ECON					6	
		om economy – Definition,	Calculation of At	om e	conor	ny in	
· · · ·	addition, substitution and					-	
Unit: IIISELECTIVITY IN GREEN CHEMISTRYConcept of selectivity, Types of selectivity -Chemo-, regio-, enantio- and diast						<u>6</u>	
		critical $CO_2$ - Cleaner te		$\mathbf{J}_2$ .10n	ic liq	uids-	
	LVENT FREE REACTI	els- Alder reaction. and wat	er.			6	
		eactions, rearrangements &	mhotochemical rea	otion			
		nic-Advantages of MW tec					
reduction & rea	-	ine-Auvantages of Mive tee	iniques. Reaction	5 IIKC	UNIU	ation,	
	SIGNING OF GREEN S	YNTHESIS				6	
		esis - choice of starting ma	terials, reagents, ca	atalysi		-	
	en chemistry and solvents		,	·····j~·		<u>j</u>	
	2	1	Total Lecture Ho	ours	30	Hrs	
<b>Books for Stud</b>	y:						
1. V. Kumar, "A	n Introduction to Green C	Chemistry" Vishal publishir	ng Co. Reprint Edit	tion 20	010		
2. Rashmi Sang	ni, M.M Srivastava "Gree	n Chemistry" Fourth Reprin	nt - 2009				
<b>Books for Refe</b>	rences:						
		ew Trends in Green Chemis	•				
	s, and J.K. Warner: Green	n Chemistry - Theory and	Practical, Oxford U	Jnive	sity I	Press,	
1998.							
Web Resources							
	youtube.com/watch?v=F						
	<u>youtube.com/watch?v=q</u>	<u>INIT W-11909g</u>			ΖΙ		
Course Outcon		dant will be able to			K Lev	vei	
	tion of the course the stu the twelve principles of C			гт	In to	<b>K</b> 21	
	the twelve principles of C	neen Chennsu y.		ונ	p to	184]	
Academic (	Council Meeting Held On 2	9.04.2021		Pa	age 21	<b></b>	

<b>CO2:</b>	Understand the need for green chemistry and goals of Green Chemistry.	[Up to K3]
<b>CO3:</b>	Apply Green Chemistry principles to organic synthesis.	[Up to K3]
<b>CO4:</b>	Analyze the uses of Microwave and ultrasonic radiations to carry our reaction.	[Up to K4]
CO5:	Construct the basic concepts and twelve principles of Green Chemistry in designing green synthesis	[Up to K4]

## CO & PO Mapping:

<b>Course Outcomes</b>	Programme Outcomes (POs)						
(COs)	<b>PO 1</b>	<b>PO 2</b>	PO 3	PO 4	<b>PO 5</b>	PO 6	
CO 1	2	1	2	3	3	2	
CO 2	1	3	1	1	2	3	
CO 3	2	2	3	2	2	3	
<b>CO 4</b>	3	1	2	2	1	2	
CO5	2	3	1	3	2	1	
Weightage	10	10	9	11	10	11	

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

## LESSON PLAN

UNIT	GREEN CHEMISTRY	Hrs	Mode
I	<b>INTRODUCTION</b> Definition for Green Chemistry, Need for Green Chemistry- Goals of Green Chemistry – Obstacles and Advantages of Green chemistry, Progress of Green Chemistry- Twelve principles of Green Chemistry and Examples.	06	Chalk & Talk, Power Point
П	<b>YIELD AND ATOM ECONOMY</b> Concept of Yield and its calculation, Atom economy – Definition, Calculation of Atom economy in rearrangement, addition, substitution and elimination reactions.	06	Chalk & Talk, Power Point
III	<b>SELECTIVITY IN GREEN CHEMISTRY</b> Concept of selectivity, Types of selectivity -Chemo-, regio-, enantio- and diastereoselectivities, Reactions using Green solvents - Super critical CO <sub>2</sub> - Cleaner technology with CO <sub>2</sub> .Ionic liquids-Friedel-crafts reaction, halogenation &Diels- Alder reaction. and water.	06	Chalk & Talk, Power Point
IV	<b>SOLVENT FREE REACTIONS</b> Organic synthesis in solid state-Thermal reactions, rearrangements &photochemical reactions. Mode of supplying energy-microwave and ultrasonic-Advantages of MW techniques. Reactions like oxidation, reduction & rearrangements.	06	Chalk & Talk, Power Point
V	<b>DESIGNING OF GREEN SYNTHESIS</b> Basic concepts in designing Green synthesis - choice of starting materials, reagents, catalysts-catalytic approach in green chemistry and solvents with suitable examples.	06	Chalk & Talk, Power Point





## MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	ORGANIC CHEMIS	TRY	- I					
Course Code	21UCHC21				L	Р	С	
Category	Core				4	-	4	
Nature of course	: EMPLOYABILITY	✓	SKILL ORIENTED	ENTREPRE	INEUI	RSHIP	✓	
Course Objecti	ves:						I	
<ul> <li>To Underst and carboxy</li> <li>To Classify</li> <li>To Execute</li> </ul>	<ul> <li>To Understand the preparation, properties of hydrocarbons, alcohols, ethers, aldehydes, ketones and carboxylic acids.</li> </ul>							
• To Constr polysacchai	uct the preparation a ides.	ana	properties of mono	saccharides, dis	saccina	nues	and	
1 4	DROCARBONS					1	12	
HydrocarbonsIntroductionDefinition and Classifications.AlkanesNomenclatureGeneralmethods of preparation and Chemical properties.AlkenesNomenclatureGeneral methods ofpreparation– chemical properties– Electrophilic additions– Addition of hydrogen halide–Markownikov's rule– Antimarkovinkov's addition– Addition of H2SO4, H2O, Halogen–Hydroboration– oxidation– ozonolysis– hydroxylation– polymerization.Alkynes- Generalmethods of preparation– physical and chemical properties– polymerization.12Unit: IIALCOHOLS, ETHERS, THIOALCOHOLS AND THIOETHERS12Alcohols:Preparation by hydroboration; reduction of carbonyl compounds, acids and esters, by12using Grignard reagents.Reaction with metals.Mechanism and reactivity towards HX, dehydration– rearrangement.Ascending and descending the alcohol series– estimation of number of hydroxylgroups.Ethers:Mechanism of Williamson's synthesis, mechanism of cleavage by HX, estimationof methoxygroup by Zeisel method.Application of crown ethers.Thioalcohols and thioethers:Preparation and properties of sulphonal and mustard gas.Preparation of sulphonal and mustard gas.Preparation								
Unit: IIIALDEHYDES, KETONES AND CARBOXYLIC ACIDS12Aldehydesand Ketones: Nomenclature and structure of carbonyl group – Preparation of Aldehydes and Ketones.Aldehydesand Ketones: – Physical properties – Chemical reactions and uses of Aldehydes and Ketones.Carboxylic Acids: Nomenclature and structure of carboxyl group – Methods of preparation of Carboxylic acids – Physical properties – Chemical reactions and uses of Carboxylic acids.I2Unit: IVSTEREO ISOMERISM12Geometrical isomerism: Definition – geometrical isomerism of maleic and fumaric acids – aldoximes – determination of configuration of geometric isomers – E, Z notations – stereo chemistry of addition of bromine to double bond. Optical isomerism: Optical activity – specific rotation – definition of optical isomerism – elements of symmetry - Optical isomerism of compounds containing asymmetric carbon atom – racemization and resolution of racemic mixtures – Walden inversion – asymmetric synthesis – chirality – specifications of absolute configuration by R and S notations. Optical activity of compounds without asymmetric carbon atoms, allenes, spiranes and bi phenyl compounds.								
Unit: V Car	bohydrates:					1	12	

Definition – classification – monosaccharides – properties and uses of glucose and fructose – configuration of glucose and fructose – Haworth structure – conversion of glucose to fructose and vice versa. **Disaccharides**: Preparation, properties, constitution and configuration of sucrose. **Poly saccharides**: A general study of starch and cellulose – uses of cellulose in industries.

Total Lecture Hours 60 Hrs

#### **Books for Study:**

1. B. S Bahl and Arun Bahl S.Chand, Advanced Organic Chemistry Co Ltd, New Delhi, 2012.

#### **Books for References:**

- 1. B-Mehta and M.Mehta, Organic Chemistry E.E Edition, New Delhi, 2010.
- 2. P.L Soni and H.M Chawla, Organic Chemistry, 29th Edition, Sultan Chand and sons, New Delhi, 2007.

#### Web Resources:

**Course Outcomes:** 

- 1. https://courses.lumenlearning.com/chemistryformajors/chapter/alcohols-and-ethers/
- 2. <u>https://www.youtube.com/watch?v=\_vq9T0htW0Y</u>
- 3. <u>https://courses.lumenlearning.com/chemistryformajors/chapter/aldehydes-ketones-</u> <u>carboxylic-acids-and-esters-2/</u>
- 4. https://www.youtube.com/watch?v=JxK5rZxbyQY

K Level

On th	e completion of the course the student will be able to	
<b>CO1:</b>	Identify the basic idea of organic compounds and carbohydrates.	[Up to K2]
<b>CO2:</b>	Classify the hydrocarbons, alcohols, ethers and carbohydrates.	[Up to K3]
CO3:	Determine the preparation of hydrocarbons, alcohols, ethers and the given carbonyl compounds.	[Up to K3]
CO4:	Analyze the physical and chemical properties of hydrocarbons, alcohols, ethers and the given carbonyl compounds.	[Up to K4]
CO5:	Construct the basic idea of preparation, properties of organic compounds and carbohydrates.	[Up to K4]

#### CO & PO Mapping:

<b>Course Outcomes</b>	Programme Outcomes (POs)									
(COs)	<b>PO 1</b>	PO 2	PO 3	PO 4	PO 5	<b>PO 6</b>				
CO 1	3	1	2	3	1	2				
CO 2	1	3	1	1	2	3				
CO 3	2	2	3	2	3	3				
<b>CO 4</b>	3	1	2	2	1	2				
CO5	2	3	1	3	2	1				
Weightage	11	10	9	11	9	11				

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

# **LESSON PLAN**

UNIT	ORGANIC CHEMISTRY – I	Hrs	Mode
Ι	<ul> <li>HYDROCARBONS</li> <li>Hydrocarbons – Introduction – Definition and Classifications. Alkanes – Nomenclature - General methods of preparation and Chemical properties.</li> <li>Alkenes – Nomenclature – General methods of preparation – chemical properties – Electrophilic additions – Addition of hydrogen halide – Markownikov's rule – Antimarkovinkov's addition – Addition of H<sub>2</sub>SO<sub>4</sub>, H<sub>2</sub>O, Halogen – Hydroboration – oxidation – ozonolysis – hydroxylation – polymerization. Alkynes – Nomenclature – General methods of preparation – physical and chemical properties – polymerization.</li> </ul>	12	Chalk & Talk, Power Point
II	ALCOHOLS, ETHERS, THIOALCOHOLS AND THIOETHERS Alcohols: Preparation by hydroboration; reduction of carbonyl compounds, acids and esters, by using Grignard reagents. Reaction with metals. Mechanism and reactivity towards HX, dehydration – rearrangement. Ascending and descending the alcohol series – estimation of number of hydroxyl groups. Ethers: Mechanism of Williamson's synthesis, mechanism of cleavage by HX, estimation of methoxy group by Zeisel method. Application of crown ethers. Thioalcohols and thioethers: Preparation and properties of sulphonal and mustdard gas.	12	Chalk & Talk, Power Point
III	ALDEHYDES, KETONES AND CARBOXYLIC ACIDS Aldehydes and Ketones: Nomenclature and structure of carbonyl group – Preparation of Aldehydes and Ketones – Physical properties – Chemical reactions and uses of Aldehydes and Ketones. Carboxylic Acids: Nomenclature and structure of carboxyl group – Methods of preparation of Carboxylic acids – Physical properties – Chemical reactions and uses of Carboxylic acids.	12	Chalk & Talk, Power Point
IV	STEREO ISOMERISMGeometrical isomerism: Definition – geometrical isomerism of maleicand fumaric acids – aldoximes and ketoximes – determination ofconfiguration of geometric isomers – E, Z notations – stereo chemistry ofaddition of bromine to double bond. Optical isomerism: Optical activity –specific rotation – definition of optical isomerism – elements of symmetry- Optical isomerism of compounds containing asymmetric carbon atom –racemization and resolution of racemic mixtures – Walden inversion –asymmetric synthesis – chirality – specifications of absolute configurationby R and S notations. Optical activity of compounds without asymmetric	12	Chalk & Talk, Power Point

	carbon atoms, allenes, spiranes and bi phenyl compounds.		
V	<b>Carbohydrates</b> : Definition – classification – monosaccharides – properties and uses of glucose and fructose – configuration of glucose and fructose – Haworth structure – conversion of glucose to fructose and vice versa. <b>Disaccharides</b> : Preparation, properties, constitution and configuration of sucrose. <b>Poly saccharides</b> : A general study of starch and cellulose – uses of cellulose in industries.	12	Chalk & Talk, Power Point

Course Designed by: Dr. K. Muthupandi & Dr. V. Ramasamy Raja

	Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print											
	Articulation Mapping – K Levels with Course Outcomes (COs)											
Section A Section B Section												
Inte	Cos	K Level	MCQ	5	Short Ans	swers	Section C	Section D				
rnal	005	II Level	No. of. Questions	K – Level	No. of. Questions	K - Level	Either or Choice	Open Choice				
CI CO1		Up to K2	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)				
AI	CO2	Up to K3	2	K1 & K2	2	K2	2 (K3&K3)	2(K2 & K3)				
CI	CO3	Up to K2	2	K1 & K2	1	K2	2 (K2&K2)	1(K2)				
AII	CO4	Up to K4	2	K1 & K2	2	K2	2 (K3&K3)	2(K3 &K4)				
		No. of Questions to be asked	4		3		4	3				
-	estion tern	No. of Questions to be answered	4		3		2	2				
CIA	I & II	Marks for each question	1		2		5	10				
		Total Marks for each section	4		6		10	20				

		Dist	ribution of ]	Marks with	K Level C	IAI&	CIA II	
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
	K1	2	2	-	-	4	6.67	67
	K2	2	4	10	20	36	60	07
CIA	K3	-	-	10	10	20	33.33	33
I	K4	-	-	-	-	-	-	-
I	Marks	4	6	20	30	60	100	100
	K1	2	2	-	-	4	6.67	50
	K2	2	4	10	10	26	43.33	
CIA	K3	-	-	10	10	20	33.33	33
II	K4	-	-	-	10	10	16.67	17
	Marks	4	6	20	30	60	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

S	Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)										
			MCC		Short An	swers	Section C	Castier D			
S.No	COs	K - Level	No. of Questions	K – Level	No. of Question	K – Level	(Either / or Choice)	Section D (Open Choice)			
1	CO1	Up to K 2	2	K1,K2	1	K1	2 (K2&K2)	1(K2)			
2	CO2	Upto K 3	2	K1&K 2	1	K1	2 (K3&K3)	1(K3)			
3	CO3	Up to K 3	2	K1&K 2	1	K2	2 (K3&K3)	1(K3)			
4	CO4	Up to K 4	2	K1&K 2	1	K2	2 (K3&K3)	1(K4)			
5	CO5	Up to K 4	2	K1&K 2	1	K2	2 (K3&K3)	1(K4)			
No. of	Questions	s to be Asked	10		5		10	5			
No	No.of Questions to be answered		10		5		5	3			
Mai	rks for eac	h question	1		2		5	10			
Total	Marks for	each section	10		10		25	30			
	(Figures	in parenthes	is denotes, qu	estions s	hould be as	ked with	the given K	level)			

		D	istribution of	Marks with	K Level		
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D ( Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4	-	-	9	7.5	22
K2	5	6	10	10	31	25.83	33
K3	-	-	40	20	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Hig of K lev		erformance o	of the students	s is to be asso	essed by a	attempting	higher level

Section	A (Mu	Itiple Cho	ice Questions)
Answei	r All Q	uestions	(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section	B (Sho	ort Answei	rs)
Answe	r All Q	uestions	(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section	C (Eit	her/Or Ty	pe)
Answei	r All Q	uestions	(5 x 5 = 25 marks)
Q.No	CO	K Level	Questions
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
			ormance of the students is to be assessed by attempting higher
level of			<u></u>
		en Choice	
		Three ques	
Q.No	CO	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

# **Summative Examinations - Question Paper – Format**



## MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

				PRACTICAL – I Oualitative Analysis)						
Course Code(Inorganic Semi Micro – Qualitative Analysis)Course Code21UCHCP1LPCourse CodeCourse Code									С	
Category	Core						L         P           -         2			
lature of Course:	EMPLOYABI	LITY	✓	SKILL ORIENTED	✓	ENTREPRE	NEU	✓		
<ul> <li>Reminiscend</li> <li>Apply the construct for</li> <li>Execute the</li> <li>Construct for</li> <li>Duration of Anal micro method</li> <li>Anions:</li> <li>Cations: La Construct for</li> </ul>	ves: asic properties ce the anionic a oncept of anion confirmation te our radicals with <b>f examination</b> : lysis of a mixtu od two cations rbonate, sulphat rate, phosphate ead, bismuth, co	of salt n nd catic ic and c est for th <u>n correc</u> 3hrs ure cont e, nitrat and chr opper, c manga	nixtu onic ation e ar t pro- cainin te, flr oma cadm nese ium. <b>Dis</b>	ares. species in the salt mixtunic species in semi micro species in semi micro species in semi micro species and cations present ocedure during analysis of the semi semi semi semi species of the semi species of the semi semi species of the semi semi semi semi species of the semi semi semi semi semi semi semi species of the semi semi semi semi semi semi semi sem	res. o qua t in th of the n one le, ioo and I calci	litative analys ne salt mixture salt mixtures. is an interfer dide, oxalate, II), aluminium	is. s. ing i	n sem		3
Laboratory Performance	ce	: 30 n : 10 n			:	10 mark 10 mark 40 mark	.S .S	I KS		
Total		: 40 n	narks	s Total	:	60 mark	S			
						<b>Total Lec</b>	ture	Hour	S	30 Hi

2. <u>htt</u> 3. <u>htt</u>	1. <a href="https://www.youtube.com/watch?v=cEOvj6jkdDw">https://www.youtube.com/watch?v=cEOvj6jkdDw</a> 2. <a href="https://www.youtube.com/watch?v=T3hi_xEpaDg">https://www.youtube.com/watch?v=T3hi_xEpaDg</a> 3. <a href="https://www.youtube.com/watch?v=BK7rf4XE4f8">https://www.youtube.com/watch?v=BK7rf4XE4f8</a> 4. <a href="https://www.youtube.com/watch?v=QQ01e-BUZWs">https://www.youtube.com/watch?v=QQ01e-BUZWs</a>						
Cours	Course Outcomes: K Level						
On th	On the completion of the course the student will be able to						
<b>CO1:</b>	Identify the basic radical and its group in the given salt mixture.	[Up to K2]					
<b>CO2:</b>	Understand the qualitative analysis skill of any given inorganic salt mixture.	[Up to K3]					
<b>CO3:</b>	Develop the acid radicals present in the given inorganic salt mixture.	[Up to K3]					
<b>CO4:</b>	Analyze the basic radical systematically.	[Up to K4]					
CO5:	Apply the four radicals with correct procedure during analysis of the salt mixtures	[Up to K4]					

## CO & PO Mapping:

<b>Course Outcomes</b>	Programme Outcomes (POs)									
(COs)	<b>PO 1</b>	PO 2	PO 3	PO 4	PO 5	PO 6				
CO 1	3	1	2	3	1	2				
CO 2	1	3	1	1	2	3				
CO 3	2	2	3	2	3	3				
CO 4	3	1	2	2	1	2				
CO5	2	3	1	3	2	1				
Weightage	11	10	9	11	9	11				

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

## LESSON PLAN

UNIT	INORGANIC SEMI MICRO – QUALITATIVE ANALYSIS	Hrs	Mode
I	<ul> <li>Duration of examination: 3hrs <ul> <li>Analysis of a mixture containing two anions of which one is an interfering in semi-micro method two cations</li> </ul> </li> <li>Anions: <ul> <li>Carbonate, sulphate, nitrate, fluoride, chloride, bromide, iodide, oxalate, Borate, phosphate and chromate.</li> </ul> </li> <li>Cations: Lead, bismuth, copper, cadmium, antimony, iron (II and III), aluminium, Chromium, zinc, manganese, cobalt, nickel, barium, calcium, Magnesium and ammonium.</li> </ul>	30	Practical

Course Designed by: Dr. V. Ramasamy Raja & Dr. R. Satheesh



## MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

	ALLIED PHYSI	C <b>S-II:</b> (1	Electricit	ty, Electroi	nics,	Op	otics a	nd Mo	dern	Physi	ics)
Course Code	21UPHA21								L	Р	С
Category	Allied								4	-	3
Nature of cours	e: EMPLOYABIL	JTY ✓	SKILL (	ORIENTE	D 🗸	E	NTRE	PREN	EURS	SHIP	
Course Objecti	ives:										
The learners wil											
	d the laws of electr	•									
	lifferent types of di			ors							
	imal and binary nun	•				_					
	d the various types of		-		inter	fer	ence a	nd diffi	raction	n	
	d and apply the basi	ic concep	ots of lase	er							
	ctricity									12	
	pression for C of a p										
	ng of charges betwe										
	tone's network – C	•	-					istance	– Pri	nciple	e of
	Calibration of amn	neter and	voltmete	er(low rang	ge on	ly)					
	ctronics									12	
	orking of n-p-n tra						•				
	fier – Frequency res										
OPAMP and it	s characteristics –	OPAME	N 11							D I	
							-	c circu	iits –	Boo	lear
algebra – De Mo	organ's theorem – C						-	c circı	iits –		
algebra – De Mo Unit: III Geo	organ's theorem – C ometrical Optics	OR, AND	D, NOR ,	NOT , NAI	VD g	ate	S			12	2
algebra – De Mo Unit: III <i>Geo</i> Deviation produ	organ's theorem – Cometrical Optics Inced by thin lens – H	DR, AND	D, NOR , gth of tw	NOT , NAM	$\frac{\text{ND g}}{\text{s in a}}$	ate and	s out o	f conta	ct – R	12 lefrac	2 tior
algebra – De MeUnit: IIIGeoDeviation productionthrough a thin p	organ's theorem – C ometrical Optics aced by thin lens – H orism – Dispersion -	DR, AND Focal len – Dispers	D, NOR , gth of tw	NOT , NAM	ND g s in a natio	ate and n o	s out o f thin	f conta prisms	ct – R to pro	12 lefrac oduce	2 tior e (a)
algebra – De MaUnit: IIIGeaDeviation productthrough a thin pDeviation with	organ's theorem – Cometrical Optics acced by thin lens – Horism – Dispersion – but dispersion and (	DR, AND Focal len – Dispers (b) Dispe	D, NOR , gth of tw sive powe ersion wit	NOT , NAN to thin lense er – Combin thout deviat	ND g s in a nation	ate and n o – I	s out o f thin Direct	f conta prisms vision	ct – R to pro	12 defrac oduce oscop	tior e (a)
algebra – De MeUnit: IIIGeoDeviation productionthrough a thin pDeviation witheChromatic aberr	organ's theorem – C ometrical Optics aced by thin lens – H orism – Dispersion -	DR, AND Focal len – Dispers (b) Dispe	D, NOR , gth of tw sive powe ersion wit	NOT , NAN to thin lense er – Combin thout deviat	ND g s in a nation	ate and n o – I	s out o f thin Direct	f conta prisms vision	ct – R to pro	12 defrac oduce oscop	tion e (a)
algebra – De Mo Unit: III <i>Geo</i> Deviation producthrough a thin p Deviation withouthrough a thin p Chromatic abern rainbows.	organ's theorem – Cometrical Optics aced by thin lens – Horism – Dispersion - but dispersion and ( ration in lenses – Sp	DR, AND Focal len – Dispers (b) Dispe	D, NOR , gth of tw sive powe ersion wit	NOT , NAN to thin lense er – Combin thout deviat	ND g s in a nation	ate and n o – I	s out o f thin Direct	f conta prisms vision	ct – R to pro	12 defrac oduce oscop econd	tior e (a) pe – lary
algebra – De MaUnit: IIIGeaDeviation production production withough a thin pDeviation withough a thin pDeviation withough a thin pChromatic abernrainbows.Unit: IVPhy	organ's theorem – Cometrical Optics acced by thin lens – Horism – Dispersion – out dispersion and ( ration in lenses – Sp osical Optics	DR, AND Focal len – Dispers (b) Dispe pherical a	D, NOR , gth of tw sive powe ersion wit aberration	NOT , NAM to thin lense er – Combin thout deviat n in lenses	ND g s in a nation - The	ate and n o – I eor	s out o f thin Direct y of p	f conta prisms vision rimary	ct – R to pro spectr and s	12 defrac oduce oscop econd 12	tion e (a) pe – lary
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	Unit – I : 1.5,1.6, 1.9-1.14, 1.18,1.19,2.1,2.3-2.7	
	Unit – II : 4.1,4.2,4.4,4.5.4.6,4.10-4.12,4.14-4.18,4.24,4.25, 5.1-5.7,5.9-14,5.16	
	2. R.Murugeshan, Optics Spectroscopy and Modern Physics, Madurai, First	Edition,
	July 2016.	
	Unit – IIII : 1.1-1.3,1.5-1.11,1.13,1.17,1.23,1.24	
	Unit – IV : 2.1,2.2,2.4-2.6,2.9,2.10,3.1,3.2,3.4,3.5-3.10	
	3. P.Mani, A Text book of Engineering Physics, 12th edition, , Dhanam Publica	tions,
	Chennai	
	Unit – V : 7.1 – 7.45	
Books	for References:	
1. Kal	kaniand Bhandari Sultan, <b>Optics and Spectroscopy</b> , Chand and Sons, New	
Delhi		
	laland Subramanyam., A Text book of Optics, S. Chandand Co, New Delhi, 2004.	
	K.Sharma, Spectroscopy, GOEL Publishing House, Meerut, 2006.	
	rayanamoorthyandNagarathinam, <b>Electricity and Magnetism</b> , National Publishin	ng Co.
	Resources:	-8 ,
	tps://www.youtube.com/watch?v=ML7HcZo6IaE	
	tps://www.khanacademy.org/science/physics/light-waves/introduction-to-ligh	t_
	aves/v/polarization-of-light-linear-and-circular	<u>E</u>
	e Outcomes	K Level
		K Level
After s	uccessful completion of the course, the student is expected to	
001	Remember principle of capacitors, Kirchhoff's laws, forward and reverse bias,	17.0
CO1:	frequency response, modulation, focal length, dispersive power, cordinal	K2
	points, double refraction, Biot's law, Principals of Laser.	
	Understand energy of a capacitor, principle of potentiometer, diode	
<b>CO2:</b>	characteristics, working of npn transistor, logic circuits, basics of types of	K3
	laser.	
CO3:	Apply Kirchhoff's laws, Boolean algebra, Refraction through a prism,	K3
005.	Einstein's coefficients	KJ
	Calibration of ammeter and voltmeter, OP AMP as an adder and subtractor,	
<b>CO4:</b>	logic gates, deviation without dispersion , dispersion without deviation, Q.W.P,	K4
	H.W.P, Applications of lacer.	
	Examine parallel plate capacitor, Cary Foster bridge, transistor characteristics	
COL	CE mode, frequency of Hartley oscillator, Specific rotatory power,	K4
UUS:		
CO5:	Nd:YAG,CO <sub>2</sub> ,Semiconductor lasers	

## CO & PO Mapping:

COS	PO 1	PO 2	<b>PO 3</b>	PO 4	PO 5	PO 6
CO 1	3	2	2	2	2	2
CO 2	3	2	1	2	2	2
CO 3	3	2	2	2	2	2
CO 4	3	2	2	1	2	2
CO 5	2	2	1	1	2	2

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

#### **LESSON PLAN – ALLIED PHYSICS - II**

Unit	Electricity, Electronics , Optics and Modern Physics	Hrs	Pedagogy
Ι	<b>Electricity</b> Capacitors –Expression for C of a parallel plate capacitor – Energy of a charged capacitor – Loss of energy on sharing of charges between two capacitors- Kirchoff's laws – Application of Kirchhoff's laws to Wheatstone's network – Carey Foster Bridge – Measurement of resistance – Principle of Potentiometer – Calibration of ammeter and voltmeter( low range only)	13	Lecture method, PPT, Demonstration
Ш	<b>Electronics</b> Transistor – Working of n-p-n transistor– Characteristics(CE mode only) –Common - Emitter transistor amplifier – Frequency response - Hartley oscillator –Modulation – Types of Modulation - OPAMP and its characteristics – OPAMP as adder and subtractor– Logic circuits – Boolean algebra – De Morgan's theorem – OR, AND, NOR, NOT, NAND gates	12	Lecture method, PPT, Demonstration
Ш	<b>Geometrical Optics</b> Deviation produced by thin lens – Focal length of two thin lenses in and out of contact – Refraction through a thin prism – Dispersion – Dispersive power – Combination of thin prisms to produce (a) Deviation without dispersion and (b) Dispersion without deviation – Direct vision spectroscope – Chromatic aberration in lenses – Spherical aberration in lenses – Theory of primary and secondary rainbows.	11	Lecture method, PPT, Model
IV	Physical Optics Interference in thin films – air wedge – Newton's rings (reflected beam only) – Determination of wavelength – Diffraction – Theory of plane transmission grating (normal incidence only) – Experiment to determine wavelengths - Double refraction – Nicol prism – Construction, action and uses – Quarter wave plate (QWP) – Half wave plate (HWP) – Optical activity – Biot's laws – Specific rotatory power – Laurente' Half shade polarimeter – Determination of specific rotatory power	12	Lecture method, PPT
V	Lasers Introduction of Lasers-Spontaneous and stimulated emission- Population Inversion-Einstein's A and B coefficients-derivation. Types of lasers-Nd:YAG,CO <sub>2</sub> ,Semiconductor lasers-Industrial and Medical Applications.	12	Lecture method, PPT

Course Designed by: 1. Mrs.A.Lakshmi, 2. Dr.R.Sangeetha

	Learning Outcome Based Education & Assessment (LOBE)										
	Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)										
				Section A		Sectio		Secti (Eith	ion C ier or bice)	Section D (Open Choice)	
Inte rnal	COs	- Le	Unit	MC	Qs		Short Answers			No.	
11181	vel		No. of. Questions	K - Level	No. of. Question s	K - Level	of. Ques tions	K - Level	of. Ques tions	K - Level	
CI	CO1	K1	Ι	2	K1&K2	1	K1	2	K2	1	K2
AI	to CO5	to K4	Π	2	K1&K2	2	K2	2	K3	2	K3
CI	CO1	K1	III	2	K1&K2	1	K2	2	K3	1	K3
AII	to CO5	to K4	IV	2	K1&K2	2	K2	2	K4	2	K4
		No. of Questions to be asked		4		3		4		3	
-	estion tern	No Que to	o. of estions o be wered	4		3		2		2	
CIA	CIA I & II		ks for ach estion	1		2		5		1	0
			otal ks for ach ction	4		6		1	0	2	0

		Dist	ribution of <b>I</b>	Marks with	K Level C	IA I & (	CIA II	
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
	K1	2	2			4	6.7	50
	K2	2	4	10	10	26	43.3	30
CIA	K3			10	20	30	50.0	50
	K4							-
L	Marks	4	6	20	30	60	100	100
	K1	2	2			4	6.7	167
	K2	2	4			6	10.0	16.7
CIA	K3			10	10	20	33.3	33.3
II	K4			10	20	30	50.0	50
	Marks	4	6	20	30	60	100	100

K1- Remembering and recalling facts with specific answersK2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

**K4**- Examining, analyzing, presentation and make inferences with evidences

<u>UNIT-V</u> will be allotted for individual Assignment in <u>CO5 - K4</u> level which carries five marks as part of CIA component.

S	ummati	ive Exar	ninatio	n – Blue		rticulati mes (CC	-	ping – H	K Level	with Cou	ırse
S.No.	COs	К-	Unit	MO	)Qs	Sh	ort wers	(Eithe	on C er / or bice)		tion D Choice)
<b>5.</b> 1 <b>N</b> 0.	COS	Level	Umt	No.of Ques tions	K – Level	No.of Ques tions	K – Level	No.of Ques tions	K – Level	No.of Ques tions	K – Level
1	CO1 - CO5	K1 to K4	Ι	2	K1 & K2	1	K1	2	K2 & K2	1	K2
2	CO1 - CO5	K1 to K4	II	2	K1 & K2	1	<b>K</b> 1	2	K3 & K3	1	K3
3	CO1 - CO5	K1 to K4	ш	2	K1 & K2	1	K2	2	K3 & K3	1	K3
4	CO1 - CO5	K1 to K4	IV	2	K1 &K2	1	K2	2	K4 & K4	1	K4
5	CO1 - CO5	K1 to K4	V	2	K1 & K2	1	K2	2	K4 & K4	1	K4
No. of	No. of Questions to be Asked		10		5		1	0		5	
No.	No. of Questions to be answered		10		5		5		3		
-		ach ques		1		2		5		10	
Total N	Aarks fo	or each s	ection	10		10		2	5		30

K Level	Section A (Multiple Choice Questions)	Dis Section B (Short Answer Questions)	stribution of Section C (Either/ or Choice)	Marks with Section D ( Open Choice)	n K Leve Total Marks	l % of (Marks without choice)	Consolidated %
K1	5	4			9	12	47
K2	5	6	10	10	31	34.66	47
K3			20	20	40	27	27
K4			20	20	40	26.66	26
Marks	10	10	50	50	120	100	100
NB: Hig of K lev	· •	erformance o	of the students	s is to be asso	essed by a	ttempting	higher level

		-	ice Questions)
	-	uestions	(10x1=10 marks)
Q.No	CO	K Level K1	Questions
$\frac{1}{2}$	CO1 CO1	K1 K2	
3			
	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
		ort Answei	
	-	uestions	(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
		her/Or Ty uestions	pe) (5 x 5 = 25 marks)
Q.No	CO	K Level	Questions
16) a	00		
16) b			
17) a			
17) b			
18) a			
18) b			
19) a			
19) b			
20) a			
20) b			
,	gher le	vel of nerf	ormance of the students is to be assessed by attempting higher
level of			service of the statements is to se assessed by attempting ingher
		en Choice	)
		Three ques	
Q.No	CO	K Level	Questions
21			
22			
23			
24			
25			
<i></i>			

# **Summative Examinations - Question Paper – Format**



#### MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	ALLIED PHYSICS PR	RACTIC	CAL - I							
Course Code	21UPHAP1					L	Р	С		
Category	Allied					-	2	1		
Nature of cours	se: EMPLOYABILITY	✓ SKI	LL ORIENTED	$\checkmark$	ENTREPREN	EURS	HIP			
Course Object	ives:	L L		1	l					
The learners wi	ll be able:									
0	vledge about the experim	ents bas	ed on Optics, Elec	tric	ity and Electro	nics				
	<ul><li>2. To demonstrate modulus of elasticity</li><li>3. To understand the bending of beam, forward and reverse biasing, frequency responce</li></ul>									
				g, fre	equency respon	nce				
	d current conduction in e									
5. To learn about	ut transistor amplifier, os	cillator a	and Operational an	npli	fier					
LIS	ST OF EXPERIMENTS	S (Any F	ourteen Experime	nts)	)					
1. Uniform ben	ding		- (Pin & Micro	osco	ope)					
2. Torsion Pend	lulum		- Determination	on o	f Rigidity mod	ulus ar	nd M.I	[		
3. Thermal con	ductivity of Bad conduct	or	- Lee's disc							
4. Sonometer			- Verification	of l	aws					
5. Calibration o	f low range Voltmeter		- Potentiomete	er						
6. Carey Foster	Bridge		- Resistance &	z res	sistivity of a wi	ire.				
7. Spectrometer			- Refractive in	Idex	of a Prism					
8Mirror Galva	nometer		- Voltage and	curi	rent sensitivene	ess				
9.LCR – Series	resonance		- Determination		-					
10.Air wedge			- Thickness of	a w	ire					
11.Grating N by	y $\lambda$ Normal incidence		- Spectrometer							
	transistor amplifier		- CE mode							
13.Hartley osci			- Determination							
	– NAND and NOR		- Using Discret		1					
15.Zener diode			- Forward & Re	ever	rse Characterist	tics				
16.OP AMP			- Adder and Sul							
			]	<u>Fot</u> a	al Practical Ho	ours	30 H	rs		
<b>Books for Stud</b>	lv:									

#### Books for Study:

1. Srinivasan.M.N.,Balasubramanian.S.,Ranganathan.R., **A Text Book of Practical Physics**, 2017 Edition Sultan Chand & Sons

### **Books for References:**

- 3. Ouseph.C., Practical Physics and Electronics, 2013.S. Viswanathan.P.Ltd
- 4. Practical Physics and Electronics, C.C.Ouseph, U.J.Rao, V.Vijayendran, S.Viswanathan Publishers(2007)

#### Web Resources:

- 1. https://nptel.ac.in/course.html/physics/experimental physics I, II and III
- 2. https://nptel.ac.in/courses/115/105/115105110/
- 3. https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn\_LgLofRX7n8z4tHYK

Course	e Outcomes	K Level
On suc	ccessful completion of the course, the learners should be able to	
	Understand and evaluate the Young's modulus and Rigidity modulus of the	
CO1:	given material, the ways to calibrate a low range voltmeter using	K4
	potentiometer	
<b>CO2:</b>	Acquire the knowledge of the characteristics of an operational amplifier	K3
CO3:	Apply the basic principles of optics to determine the thickness of a wire	K4
CO4:	Analyze the electrical parameters like resistance and resistivity using Carrey	K4
C04:	Foster bridge and characteristics of Zener diode	<b>N4</b>
<b>CO5</b> :	Construct Amplifier and Oscillator	K4

### CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	2	1	2	2
CO 2	3	2	2	1	2	2
CO 3	3	2	2	1	2	2
CO 4	3	2	2	1	2	2
CO 5	3	2	2	1	2	2

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

## LESSON PLAN

Semester	Allied Physics Practical - I	Hrs	Pedagogy
II	<ol> <li>Carey Foster Bridge - Resistance &amp; resistivity of a wire.</li> <li>Spectrometer - Refractive indexof a Prism</li> <li>Mirror Galvanometer - Voltage and current sensitiveness</li> <li>Air wedge - Thickness of a wire</li> <li>Grating N by λ Normal incidence - Spectrometer</li> <li>Single stage transistor amplifier - CE mode</li> <li>Hartley oscillator - Determination of frequency</li> <li>OP AMP - Adder and Subtractor</li> </ol>	30	Demonstration

Course Designed by: 1. Mrs.A.Lakshmi, 2. Dr.R.Sangeetha



## MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Na	me	DA	IRY CHEMISTRY							
Course Co	de	21U	CHS21					L	Р	С
Category	;	Ski	1					2	-	2
Nature of c	ourse:		EMPLOYABILITY		SKILL ORIENTED	✓	ENTREPREN	EURS	SHIP	✓
<ul> <li>Course Objectives:</li> <li>To Recollect the composition of milk and processing of milk</li> <li>To Remember the major milk products and its estimation.</li> <li>To Classify the special milk and fermented milk products on their ingredients</li> <li>To Execute the types of milk products and its applications.</li> <li>To Determine the composition of milk products and their physical properties.</li> </ul>										
Unit: I	Milk prote	OMPOSITION OF MILK         ilk – definition – general composition of milk – constituents of milk – lipids,         oteins, carbohydrate, vitamins and minerals – physical properties of milk –         lour, odour, acidity, specific, gravity, viscosity and conductivity.								
Unit: II	PRO Micr chem paste	ROCESSING OF MILKacrobiology milk – destruction of microorganisms in milk – physico – emical changes taking place in milk due to processing – boiling, steurization – types of pasteurization –Vacuum pasteurization – Ultra High mperature Pasteurization.6								
Unit: III	Creat gravi creat	IAJOR MILK PRODUCTS         ream – definition – composition – chemistry of creaming process –         ravitational and centrifugal methods of separation cream – estimation of fat in         eam. Butter – definition -estimation of acidity and moisture content in butter.         hee – major constituents – common adulterants added to ghee.								
Unit: IV	SPE Stand diagr milk	CIA darc ram – d	<b>L MILK</b> lised milk – definition of manufacture – He efinition composition	– r omc and	merits – reconstituted r ogenised milk – flavor nutritive value.	nilk -	-definition – flov		6	
Unit: V	FERMENTED AND OTHER MILK PRODUCTSFermentation of milk – definition, condition- Indigeneous products– Gulabjamun, chana sweet, Rasogolla. Ice cream – definition – percentage								6	
						Tota	al Lecture Hour	S	30 H	rs
& C	Shree ompan vathi S	Gh ny L Suno	td, 2013. lari. K, Applied Chem	-	ots of Applied Chemist y, 1st Edition. Chennai	-			: S.Cl	hand
				Mat	rh,E.H, Fundamentals of	of Da	iry Chemistry. 1s	st Ed	ition. ]	New

Delhi: CBS Publishers & Distributors Pvt.Ltd., 1998.

- 2. Sukumar De. Outlines of Dairy Technology. 1st Edition. New Delhi: Oxford University Press, 2000.
- 3. K.S. Rangappa and K.T Acharya, Indian Dairy products, Asia Publishing House, 1975.

Web Resources:

**Course Outcomes:** 

- 1. <u>https://www.youtube.com/watch?v=Vo8m9QvNeAU</u>
- 2. <u>https://www.youtube.com/watch?v=uYhbekSGMZY</u>
- 3. <u>https://www.youtube.com/watch?v=oHCntgYIJbE</u>
- 4. https://nptel.ac.in/courses/126/105/126105013/

K Level

000110										
On th	On the completion of the course the student will be able to									
<b>CO1:</b>	Understand the chemistry of milk products.	[Up to K2]								
<b>CO2:</b>	Outline the techniques of milk processing.	[Up to K3]								
<b>CO3:</b>	Construct the flow chart diagram in the manufacture of special milk	[Up to K3]								
<b>CO4:</b>	Illustrate the manufacture of various dairy products	[Up to K4]								
CO5:	Determine the chemistry of milk products and manufacture of various dairy	[Up to K4]								
005.	products.									

#### CO & PO Mapping:

Course Outcomes	Programme Outcomes (POs)							
(COs)	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	PO 4	<b>PO 5</b>	<b>PO 6</b>		
CO 1	3	1	2	3	1	2		
CO 2	1	3	1	1	2	3		
CO 3	2	2	3	2	3	3		
CO 4	3	1	2	2	1	2		
CO5	2	3	1	3	2	1		
Weightage	11	10	9	11	9	11		

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

## **LESSON PLAN**

UNIT	DAIRY CHEMISTRY	Hrs	Mode
I	<b>COMPOSITION OF MILK</b> Milk – definition – general composition of milk – constituents of milk – lipids, proteins, carbohydrate, vitamins and minerals – physical properties of milk – colour, odour, acidity, specific, gravity, viscosity and conductivity.	06	Chalk & Talk, Power Point
II	<b>PROCESSING OF MILK</b> Microbiology milk – destruction of microorganisms in milk – physico – chemical changes taking place in milk due to processing – boiling, pasteurization – types of pasteurization –Vacuum pasteurization – Ultra High Temperature Pasteurization.	06	Chalk & Talk, Power Point
ш	MAJOR MILK PRODUCTS Cream – definition – composition – chemistry of creaming process – gravitational and centrifugal methods of separation cream – estimation of fat in cream. Butter – definition -estimation of acidity and moisture content in butter. Ghee – major constitutents – common adulterants added to ghee.	06	Chalk & Talk, Power Point
IV	<b>SPECIAL MILK</b> Standardised milk – definition – merits – reconstituted milk –definition – flow diagram of manufacture – Homogenised milk – flavoured milk – condensed milk – definition composition and nutritive value.	06	Chalk & Talk, Power Point
V	<ul> <li>FERMENTED AND OTHER MILK PRODUCTS</li> <li>Fermentation of milk – definition, condition- Indigeneous products– Gulabjamun, chana sweet, Rasogolla. Ice cream – definition – percentage composition types – Ingredients – manufacture of ice-cream -milk powder – definition – need for making milk powder.</li> <li>Visit to a pasteurization factory / Milk product company and submission of a report.</li> </ul>	06	Chalk & Talk, Power Point

Course Designed by: Dr. V. Ramasamy Raja & Dr. K. Muthupandi



## MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Na	Course Name DYE CHEMISTRY												
Course Co	ode	21	UCH	S22							L	P	С
Category		Sk	ill								2	-	2
Nature of c	ourse	:	EMP	LOYAE	BILITY		SKILL OR	IENTED	✓	ENTREPREN	EUR	SHIP	✓
<b>Course Ol</b>	ojecti	ves	•										
					colour a		•						
	-		-				f its various						
	-		-	-	•		-	•		ir applications			
			-				-	-		ng vat dyes base	ed		
• To Det							nt and applic		l the	eir uses.			
	-				-		OF COLO		muod	to wavalangth			
Unit: I		Colour and Constitution – Relationship of Colour observed to wavelength									06		
		of light absorbed – Terms used in Colour Chemistry – Chromophores, Auxochromes, Bathochromes shift, Hypsochromic shift.											
	DIRECT AND DISPERSE DYES												
Unit: II	Direct or substantive dyes, mordent dyes, vat dyes, Ingrain or developed								06				
	-		-	•	-	•	•		-	irit soluble dye,			
			-							examples only).			
	NITROGENOUS, TRIPHENYL, AZO AND PHTHALEIN DYES												
	Classification according to shomical structures a) Nitra and Nitras des												
Unit: III	Classification according to chemical structure: a) Nitro and Nitroso dyes. b) Tripheyl methane dye -malachite green, crystal violet and its								06				
	applications. c) Azo dyes –, methyl orange, and congo red. d) Phthalein								00				
	dye- phenolphthalein and fluorescein. (Definition, applications and												
	examples only)												
		-			AND T	RIA	<b>ZINE DYE</b>	S					
Unit: IV												06	
	Azi	ne,	Oxaz	zine an	d Triazi	ne	Dyes – Sy	nthesis a	nd	applications of		vu	
	-				<u> </u>		es based on a	<u> </u>	one.				
							PLICATION						
Unit: V				-	0	•	1 0		<u> </u>	nic pigments –		06	
						-		cations of	dye	es in other areas			
	— m	eat	cine, c	cosmetic	cs, 100d a	and	beverages.	Та	tal	Lecture Hours		30 H	
Doole for	. St	d						10	nai	Lecture nours		<u>зо п</u>	15
Books for		•	wal s	vntheti	Dvec	Hin	nalaya Publis	hing Hou	se '	2016			
Books for	-			ynnieth	- Dyes –	1111	nalaya i uolis	ining 110u	3C, 4	2010.			
				ahl Ad	vanced (	)roa	nic Chemisti	v 2012					
						-		-	ltan	& Sons Publicat	tions	2019	Э.
							0	•		c Chemistry, Vi			
House 197							,	2		···· J ? · · -			-

House, 1976.

Web I	Web Resources:							
1. <u>http</u>	1. https://www.youtube.com/watch?v=a6Lw7Dzwvqo							
2. <u>http</u>	os://www.youtube.com/watch?v=sLcT7P-ZS4E							
3. <u>http</u>	os://www.youtube.com/watch?v=SFH0iJmnTLY							
Cours	Course Outcomes: K Level							
On th	On the completion of the course the student will be able to							
<b>CO1:</b>	Identify the colour and constitution observed to wavelength of light.	[Up to K2]						
<b>CO2:</b>	Outline the direct or disperse dyes and applications.	[Up to K3]						
<b>CO3:</b>	Apply Azine, Oxacine, triazine dyes, pigments towards its applications.	[Up to K3]						
<b>CO4:</b>	Classify the Nitro, Nitroso, Triphenyl methane, Azo and Phthalein dyes.	[Up to K4]						
CO5:	Determine the properties of dyes and apply in medicine, cosmetics, food and	[Up to K4]						
005:	beverages.							

## CO & PO Mapping:

Course Outcomes	Programme Outcomes (POs)							
(COs)	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	PO 4	<b>PO 5</b>	PO 6		
CO 1	2	3	2	3	1	2		
CO 2	1	2	3	1	2	3		
CO 3	2	2	2	2	3	3		
<b>CO 4</b>	3	1	2	2	1	2		
CO5	2	3	1	3	2	1		
Weightage	10	11	10	11	9	11		

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

#### LESSON PLAN

UNIT	DYE CHEMISTRY	Hrs	Mode
I	CHEMISTRY AND THEORY OF COLOURS Colour and Constitution – Relationship of Colour observed to wavelength of light absorbed – Terms used in Colour Chemistry – Chromophores, Auxochromes, Bathochromes shift, Hypsochromic shift.	06	Chalk & Talk, Power Point
II	<b>DIRECT AND DISPERSE DYES</b> Direct or substantive dyes, mordent dyes, vat dyes, Ingrain or developed dyes, Disperse dyes, sulphur dyes, reactive dyes, oil and spirit soluble dye, food, dry and cosmetic dyes. (Definition, applications and examples only).	06	Chalk & Talk, Power Point
ш	NITROGENOUS, TRIPHENYL, AZO AND PHTHALEIN DYES Classification according to chemical structure: a) Nitro and Nitroso dyes. b) Tripheyl methane dye -malachite green, crystal violet and its applications. c) Azo dyes –, methyl orange, and congo red. d) Phthalein dye– phenolphthalein and fluorescein. (Definition, applications and examples only)	06	Chalk & Talk, Power Point
IV	AZINE, OXACINE AND TRIAZINE DYES Azine, Oxazine and Triazine Dyes – Synthesis and applications of quinonoid dyes including vat dyes based on anthraquinone.	06	Chalk & Talk, Power Point
V	<b>PIGMENTS AND THEIR APPLICATIONS</b> Requirement of a pigment – Typical Organic and Inorganic pigments – Applications and their uses in paints – Applications of dyes in other areas – medicine, cosmetics, food and beverages.	06	Chalk & Talk, Power Point

Course Designed by: Dr. R. Satheesh & Dr. J.E. Sangeetha





# MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY

(For those who joined in 2021-2022 and after)

Course Name	PHYSICAL CHEMIST	TRY	Y – I								
Course Code	21UCHC31				L	Р	С				
Category	Core				4	-	4				
Nature of cours	e: EMPLOYABILITY	✓	SKILL ORIENTED	ENTREPREN	URSH	HIP	$\checkmark$				
Course Objectives:											
• To Recall the characteristics of ideal and real gases and deviations of real gases from ideal											
behaviour.											
	er the law of distribution			tics of colloids.							
-	the classification of adso	-	•								
	the purification of colloid	ls ar	nd comparison between o	order and molecu	ılarity	of a					
reaction											
	the effect of temperature	re o	n various velocities and	applications of c	olloid	ls,					
<b>^</b>	nd catalysis.										
	SEOUS STATE		<u>C 1 D 1 1 1</u>	<u>C1 1 1 1 7</u>		12					
	of Gases and its parameter										
	Lussac's law, Avogadro'			1							
	Derivation of ideal gas la		1								
	l – Boltzmann law of dist - Effect of temperature										
-	Different types of m			-							
	ge Velocity and their calc					11006	1010				
	LLOIDAL STATE	Juiu	tions i incipie of equipu	ittelon of energy	•	12					
	Distinction between tr	ue	solution. colloidal di	spersion and	suspe						
	colloids. Difference bet			1	-						
	sis and Ultrafiltration.										
	Origin of Charge on Col										
Number. Appli	cation of colloids in	foo	ds, medicines, industr	ial goods, sew	age	dispo	sal,				
clarification of v	vater, smoke screens and	dete	ergent action of soap.								
	SORPTION					12					
	lsorption, adsorbent, ads			-							
	orption and chemisorp		-	_							
-	gative adsorption, Adsorp	-	-			-					
	- factors influencing ad										
	ations of adsorption in		s masks, chromatograp	ny, cleaning of	suga	rs, p	aint				
	is and adsorption indicate	ors				10					
	TALYSIS		Tourses of a statements	:		12					
	inition – Characteristics			-							
•	t-Theories of catalysis -		-		•						
-	ry- Action of Promoters atures-Mechanism – Micl			xampies. Elizyi		laiys	18 -				
characteristic lea	atures-wieenamism – Mici	nael	ns - memen equation.								

Uı	nit: V	it: V CHEMICAL KINETICS 12										
Int	roduct	ion – Rate of Re	eaction –	Rate law a	and Rate constant	nt – Order a	and Molecul	arity of a				
rea	action.	Derivation of ra	te equation	on and hal	f-life period for	r first order-	- examples-	Catalytic				
De	ecompo	sition of hydro	gen pero	xide – D	ecomposition o	f Dinitroger	n pentoxide	e. Pseudo				
un	unimolecular reaction - Derivation of rate equation and half-life period. examples- inversion of											
ca	cane sugar and hydrolysis of ester by acid. second, third and zero order reactions – examples – rate											
eq	equation - half period (no derivation required). Methods for the determination of the order of a											
rea	reaction. Influence of temperature on the rate of reaction – Arrhenius rate equation and its											
sig	significance. Collision Theory of Reaction Rate and its limitations.											
						Total Lect	ture Hours	60 Hrs				
Bo	ooks fo	r Study:										
5.		Bahl, B. S Bahl	& G.D. T	uli, Essent	ials of Physical	Chemistry, S	S.Chand and	Co, New				
	Delhi	, 2014.										
Bo	ooks fo	r References:										
4.	Gilber	t. W. Castellan, P	hysical Ch	nemistry, N	arosa Publishing	house, third	edition 1985	5.				
5.	P.W. 4	Atkins, Physical C	hemistry,	7th edition	, Oxford univers	ity press, 200	)1.					
6.	S.K. I	Dogra and S. Dog	gra, Physic	cal Chemist	try Through Pro	blems, New	age internat	ional, 4th				
ed	ition 1	996.										
7.	B.R. I	Puri, L.R. Sharma	and S.Pa	athania, Pri	nciples of Physi	cal Chemistr	ry, Shoban I	Lal Nagin				
Cł	nand ar	d Co, 47 <sup>th</sup> edition	, 2017.									
8.	S.H. 1	Maron and J.B. I	Lando, Fu	ndamentals	of Physical Ch	emistry, Ma	cmillan lim	ited, New				
Y	ork, 19	66.										
W	eb Res	ources:										
1.	https://	youtu.be/u3BWeog	wNN4									
		youtu.be/fctkOV_v										
		youtu.be/UIVJ4Jk										
		voutu.be/B_fg6ED										
		youtu.be/W8FhlG	<u>NnMkg</u>									
		Dutcomes						K Level				
		completion of the										
		lecall the postulate			-	ification of co		Up to K2]				
		Discuss the gaseou						Up to K3]				
C	<b>D3:</b> E	inumerate the prop	perties of g	gaseous stat	e, colloids, adso	rption and ca	talysis [	Up to K3]				
C	<b>D4:</b> E	Examine the charac	cteristics of	of adsorptio	n and catalysis		[]	Up to K4]				
C	$\mathbf{D5:} \begin{bmatrix} A \\ A \end{bmatrix}$	apply the order and	d molecul	arity of the	reaction and der	ivation of orc	ler of	Up to K4]				
	<b>J5</b> . tl	ne reactions					L	0p to K4]				
	CO 8	DO Monsing										
Г		PO Mapping:			<b>D</b>		<b>.</b> .					
	Cou	rse Outcomes			Programme O							
┝		(COs)	PO 1	PO 2	PO 3	PO 4	PO 5	<b>PO 6</b>				
		CO 1	3	1	2	3	1	2				

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

Academic Council Meeting Held On 17.05.2022

**CO 2** 

**CO 3** 

CO 4

CO5

Weightage

#### LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
Ι	<b>GASEOUS STATE</b> Characteristics of Gases and its parameters. Gas laws- Boyle's law, Charles's law, The Combined Gas law, Gay Lussac's law, Avogadro's law and the Ideal Gas equation. Postulates of kinetic theory gases – Derivation of ideal gas laws from the expression on the basis of kinetic theory of gases – Maxwell – Boltzmann law of distribution of velocities (Derivation not necessary) graphical representation – Effect of temperature on various velocities – Experimental verification of Maxwell's law. Different types of molecular velocities– Average Velocity, Most Probable Velocity, Average Velocity and their calculations-Principle of equipartition of energy.	12	Chalk, Talk & Power point
II	<b>COLLOIDAL STATE</b> Introduction– Distinction between true solution, colloidal dispersion and suspension – classification of colloids. Difference between Lyophilic and Lyophobic colloids. Purification of colloids- Dialysis and Ultrafiltration. Properties of colloids-Tyndall effect, Sedimentation, Electrophoresis. Origin of Charge on Colloids- Hardy – Schulze law. Protection of Colloids – Gold Number. Application of colloids in foods, medicines, industrial goods, sewage disposal, clarification of water, smoke screens and detergent action of soap.	12	Chalk, Talk & Power point
III	ADSORPTION Definition – Adsorption, adsorbent, adsorbate & occlusion - types of adsorptions - Differences between physisorption and chemisorption- Langmuir's and Freundlich adsorption isotherms, positive and negative adsorption, Adsorption of gases on solids - characteristics of adsorption of gases on solids - factors influencing adsorption – adsorption isotherm – BET (Elementary idea only) – Applications of adsorption in gas masks, chromatography, cleaning of sugars, paint industry, catalysis and adsorption indicators.	12	Chalk, Talk & Power point
IV	CATALYSIS Catalysis – Definition – Characteristics – Types of catalysts – positive – negative - auto and induced catalyst-Theories of catalysis –The Intermediate Compound Formation theory & The Adsorption theory- Action of Promoters and Poisons with suitable examples. Enzyme Catalysis –characteristic features-Mechanism – Michaelis - Menten equation.	12	Chalk, Talk & Power point
V	<b>CHEMICAL KINETICS</b> Introduction – Rate of Reaction – Rate law and Rate constant – Order and Molecularity of a reaction. Derivation of rate equation and half-life period for first order- examples- Catalytic Decomposition of hydrogen peroxide – Decomposition of Dinitrogen pentoxide. Pseudo unimolecular reaction - Derivation of rate equation and half-life period. examples- inversion of cane sugar and hydrolysis of ester by acid. second, third and zero order reactions – examples – rate equation – half	12	Chalk, Talk & Power point

period (no derivation required). Methods for the determination of the	
order of a reaction. Influence of temperature on the rate of reaction -	
Arrhenius rate equation and its significance. Collision Theory of	
Reaction Rate and its limitations.	

## Course Designed by: Dr. V. Ramasamy Raja & Dr. A. J. Sunija

	Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print											
	Articulation Mapping – K Levels with Course Outcomes (COs)											
			Sectio	on A	Section	B	Section C					
Inte	Cos	K Level	MC	Qs	Short Ans	swers	Either or	Section D Open				
rnal	COS	K Levei	No. of. Questions	K – Level	No. of. Questions	K - Level	Choice	Choice				
CI	CO1	Up to K2	2	K1&K2	1	K1	2 (K2&K2)	1(K2)				
AI	CO2	Up to K3	2	K1&K2	2	K2	2 (K3&K3)	2(K2&K3)				
CI	CO3	Up to K2	2	K1&K2	1	K2	2 (K2&K2)	1(K2)				
AII	CO4	Up to K4	2	K1&K2	2	K2	2 (K3&K3)	2(K3&K4)				
		No. of Questions to be asked	4		3		4	3				
Pat	stion tern	No. of Questions to be answered	4		3		2	2				
CIA	I & II	Marks for each question	1		2		5	10				
		Total Marks for each section	4		6		10	20				

		Dist	ribution of 1	Marks with	K Level C	IA I & (	CIA II	
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
	K1	2	2	-	-	4	6.67	
	K2	2	4	10	20	36	60	67
CI	K3	-	-	10	10	20	33.33	33
AI	K4	-	-	-	-	-	-	-
	Marks	4	6	20	30	60	100	100
	K1	2	2	-	-	4	6.67	
	K2	2	4	10	10	26	43.33	50
CI	K3	-	-	10	10	20	33.33	33
A II	K4	-	-	-	10	10	16.67	17
	Marks	4	6	20	30	60	100	100

K1- Remembering and recalling facts with specific answers

 $\ensuremath{\mathbf{K2}}\xspace$  Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

S	Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)									
			MC		Short Answers		Section C	Section D		
S.No	Cos	K - Level	No. of Questions	K – Level	No. of Question	K – Level	(Either / or Choice)	(Open Choice)		
1	CO1	Up to K 2	2	K1,K2	1	K1	2 (K2&K2)	1(K2)		
2	CO2	Upto K 3	2	K1&K2	1	K1	2 (K3&K3)	1(K3)		
3	CO3	Up to K 3	2	K1&K2	1	K2	2 (K3&K3)	1(K3)		
4	CO4	Up to K 4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)		
5	CO5	Up to K 4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)		
No. of	Questions	s to be Asked	10		5		10	5		
No.of Questions to be answered		10		5		5	3			
Marks for each question			1		2		5	10		
Total Marks for each section			10		10		25	30		
	(Figures	in parenthes	sis denotes, q	uestions s	hould be as	ked with	the given K	level)		

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

		D	istribution of	Marks with	K Level		
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D ( Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4	-	-	9	7.5	33
K2	5	6	10	10	31	25.83	
K3	-	-	40	20	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Hig of K lev	· ·	erformance o	of the students	s is to be asso	essed by a	attempting	higher level

Section	A (Mu	Itiple Cho	ice Questions)
Answe	r All Q	uestions	(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section	B (Sho	ort Answei	rs)
Answe	r All Q	uestions	(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section	C (Eit	her/Or Ty	pe)
Answe	r All Q	uestions	$(5 \times 5 = 25 \text{ marks})$
Q.No	CO	K Level	Questions
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Hi	gher le	vel of perf	ormance of the students is to be assessed by attempting higher
level of			
Section	D (Op	en Choice	
Answe	r Any T	Three ques	tions (3x10=30 marks)
Q.No	CO	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
23			
23	CO4	K4	

# **Summative Examinations - Question Paper – Format**



#### MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	INORGANIC CHEMISTRY – II								
Course Code	21UCHC32 L								
Category	Core	4	-	4					
Nature of cours	Nature of course: EMPLOYABILITY & SKILL ORIENTED & ENTREPRENURSHIP								
Course Objectives:									

- To Recall the general characteristics of s-, p- block elements and its basic properties.
- To Remember the electronic configurations of the elements and naming the coordination compounds.
- To Compare the role of transition elements in coordination compounds.
- To Execute the structure, preparation and properties of important compounds.
- To Determine the properties and uses of the elements in biological systems and EAN rule.

Unit: Is - Block Elements12Group 1 Elements: Alkali Metals – general characteristics – atomic and ionic radii – ionizationenergies – electropositive character – chemical properties – complexes of alkali metals – comparisonof lithium with other members of the family – resemblance of lithium and magnesium – role of Na<sup>+</sup>and K<sup>+</sup> ions in biological systems – sodium pump.

**Group 2 Elements**: Alkaline Earth Metals – general characteristics – atomic and ionic radii – ionization energies – chemical properties – comparison of beryllium with other elements of Group 2 – properties and uses of alkaline earth metals – Portland cement – role of  $Mg^{2+}$  and  $Ca^{2+}$  ions in biological systems.

#### Unit: II p – Block Elements – I

**Group 13 Elements**: general characteristics - ionization energies – oxidation states – electropositive character – tendency to form ionic and covalent compounds – diagonal relationship between boron and silicon – properties of elements – relative strengths of trihalides as Lewis acids – borides – boron hydrides – boranes – preparation, properties and structure of diborane – bonding in boranes. Group 14 Elements: general characteristics – ionization energy – tendency to form chains, catenation – properties and structure of allotropes of carbon – Structure, preparation and properties of Nickel, Cobalt and Iron carbonyls, silicates and silicons – types of silicates – zeolites.

Unit: III p – Block Elements – II

12

12

**Group 15 Elements**: general characteristics – metallic and non – metallic character – variation in physical state – anomalous properties of nitrogen – allotropic forms of phosphorus – marsh test – preparation and properties of urotropine. **Group 16 Elements**: general characteristics – oxidation states – anomalous behaviour of oxygen – structure and properties of ozone – allotropes of sulphur – preparation and properties of sulphuric acid, caros's acid, marshall's acid. **Group 17 Elements**: general characteristics – electron affinity – oxidation states - preparation and properties of chlorine – oxoacids of halogens – interhalogen compounds. **Group 18 Elements**: occurrence – general characteristics – general physical properties of noble gases – structure and shape of XeF<sub>6</sub>, XeOF<sub>4</sub>, XeO<sub>2</sub>F<sub>2</sub> and XeO<sub>2</sub>F<sub>4</sub> molecules.

#### Unit: IV | COORDINATIN COMPOUNDS – I

Double salts – coordination compounds – coordination complexes and complex ions – coordination number – unidentate, bidentate and polydentate ligands, chelating ligands and chelates – Werner's theory – Nomenclature of coordination compounds – EAN rule – stability of complex ions - factors

Academic Council Meeting Held On 17.05.2022

12

affecti	ng the stability of a complex ion – isomerism in coordination compounds: structu	ural isomerism				
– link	age isomerism, coordination position isomerism, ionization isomerism, hydrat	e isomerism -				
stereo	isomerism – geometrical isomerism, optical isomerism.					
Unit:	· · ·	12				
Valence bond theory – shortcomings of valence bond theory – the crystal field theory – crystal field						
	ng of energy levels – crystal field stabilization energy (CFSE) – factors in					
	tude of crystal field splitting – colour of transition metal complexes – ligand					
	ce of covalent bonding in metal ligand bonding – molecular orbital theory o					
	exes – pi bonding in octahedral complexes – sigma bonding in tetrahedral comp					
-	bonding in square planar complexes.	U				
···· r	Total Lecture Ho	ours 60 Hrs				
Books	for Study:	ł				
	R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, Vishal P	ublishing Co.				
	har, Delhi, 2018.	U				
Books	for Reference:					
4. J. E	E. Huheey, E. A. Kieter and R. L. Keiter, Inorganic Chemistry, 4th ed., Harper	Collins, New				
York,						
5. F. A	A. Cotton, G. Wilkinson, C. Murillo and M. Bochman, Advanced Inorganic Che	mistry 6th ed				
John V		mou j,ou ou.				
	Viley, New York, 1999.	nnser y,our ea.				
	Viley, New York, 1999. Moeller, Inorganic Chemistry: A Modern Introduction, Wiley, New York, 1990.	inistry,oth ed.				
6. T. I		inistry,our ea.				
6. T. I 7. R. I	Moeller, Inorganic Chemistry: A Modern Introduction, Wiley, New York, 1990.					
6. T. M 7. R. I Web I	Moeller, Inorganic Chemistry: A Modern Introduction, Wiley, New York, 1990. D Madan S.Chand, Modern Inorganic Chemistry band Co.Ltd, New Delhi 2012. Resources:					
6. T. N 7. R. I Web I 1. <u>httr</u>	Moeller, Inorganic Chemistry: A Modern Introduction, Wiley, New York, 1990. D Madan S.Chand, Modern Inorganic Chemistry band Co.Ltd, New Delhi 2012. Resources: bs://youtu.be/1uJk4K_irP8					
6. T. N 7. R. I Web I 1. <u>httr</u> 2. <u>httr</u>	Moeller, Inorganic Chemistry: A Modern Introduction, Wiley, New York, 1990. D Madan S.Chand, Modern Inorganic Chemistry band Co.Ltd, New Delhi 2012. Resources:					
6. T. N 7. R. I Web I 1. http 2. http 3. http	Moeller, Inorganic Chemistry: A Modern Introduction, Wiley, New York, 1990. D Madan S.Chand, Modern Inorganic Chemistry band Co.Ltd, New Delhi 2012. Resources: ps://youtu.be/1uJk4K_irP8 ps://youtu.be/xQJOfAKgSOY	K Level				
6. T. M 7. R. I Web I 1. http 2. http 3. http Cours	Moeller, Inorganic Chemistry: A Modern Introduction, Wiley, New York, 1990. D Madan S.Chand, Modern Inorganic Chemistry band Co.Ltd, New Delhi 2012. Resources: ps://youtu.be/1uJk4K_irP8 ps://youtu.be/xQJOfAKgSOY ps://youtu.be/xMjJxjhJWj4					
6. T. M 7. R. I Web I 1. http 2. http 3. http Cours	Moeller, Inorganic Chemistry: A Modern Introduction, Wiley, New York, 1990. D Madan S.Chand, Modern Inorganic Chemistry band Co.Ltd, New Delhi 2012. Resources: ps://youtu.be/1uJk4K_irP8 ps://youtu.be/xQJOfAKgSOY ps://youtu.be/xMjJxjhJWj4 e Outcomes:					
6. T. N 7. R. I Web I 1. http 2. http 3. http Cours On th CO1:	Moeller, Inorganic Chemistry: A Modern Introduction, Wiley, New York, 1990. D Madan S.Chand, Modern Inorganic Chemistry band Co.Ltd, New Delhi 2012. Resources: ps://youtu.be/1uJk4K irP8 ps://youtu.be/xQJOfAKgSOY ps://youtu.be/xMjJxjhJWj4 e Outcomes: ne completion of the course the student will be able to	K Level				
6. T. N 7. R. I Web I 1. http 2. http 3. http Cours On th CO1:	Moeller, Inorganic Chemistry: A Modern Introduction, Wiley, New York, 1990. D Madan S.Chand, Modern Inorganic Chemistry band Co.Ltd, New Delhi 2012. Resources: ps://youtu.be/1uJk4K_irP8 ps://youtu.be/xQJOfAKgSOY ps://youtu.be/xMjJxjhJWj4 e Outcomes: the completion of the course the student will be able to Relate the general characteristics of s-block, p-block elements.	K Level				
6. T. M 7. R. I Web I 1. http 2. http 3. http Cours On th	Moeller, Inorganic Chemistry: A Modern Introduction, Wiley, New York, 1990. D Madan S.Chand, Modern Inorganic Chemistry band Co.Ltd, New Delhi 2012. Resources: ps://youtu.be/1uJk4K_irP8 ps://youtu.be/xQJOfAKgSOY ps://youtu.be/xMjJxjhJWj4 e Outcomes: the completion of the course the student will be able to Relate the general characteristics of s-block, p-block elements. Understand the concepts of important compounds of s-, p- block and naming	K Level				
6. T. N 7. R. I Web I 1. http 2. http 3. http 3. http Cours On th CO1: CO2: CO3:	Moeller, Inorganic Chemistry: A Modern Introduction, Wiley, New York, 1990. D Madan S.Chand, Modern Inorganic Chemistry band Co.Ltd, New Delhi 2012. Resources: DS://voutu.be/1uJk4K_irP8 DS://voutu.be/xQJOfAKgSOY DS://voutu.be/xMjJxjhJWj4 e Outcomes: The completion of the course the student will be able to Relate the general characteristics of s-block, p-block elements. Understand the concepts of important compounds of s-, p- block and naming the coordination compounds.	K Level [Up to K2] [Up to K3] [Up to K3]				
6. T. N 7. R. I Web I 1. http 2. http 3. http Course On th CO1: CO2:	Moeller, Inorganic Chemistry: A Modern Introduction, Wiley, New York, 1990. D Madan S.Chand, Modern Inorganic Chemistry band Co.Ltd, New Delhi 2012. Resources: ps://youtu.be/1uJk4K_irP8 ps://youtu.be/xQJOfAKgSOY ps://youtu.be/xMjJxjhJWj4 e Outcomes: te completion of the course the student will be able to Relate the general characteristics of s-block, p-block elements. Understand the concepts of important compounds of s-, p- block and naming the coordination compounds. Compare the isomerism of coordination compounds.	K Level [Up to K2] [Up to K3]				

# CO & PO Mapping:

<b>Course Outcomes</b>	Programme Outcomes (POs)							
(COs)	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	PO 4	<b>PO 5</b>	<b>PO 6</b>		
CO 1	3	1	2	3	1	2		
CO 2	1	3	1	1	2	3		
CO 3	2	2	3	2	3	3		
CO 4	3	1	2	2	1	2		
CO5	2	3	1	3	2	1		
Weightage	11	10	9	11	9	11		

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

# **LESSON PLAN**

UNIT	INORGANIC CHEMISTRY – II	Hrs	Mode
I	s – BLOCK ELEMENTS Group 1 Elements: Alkali Metals – general characteristics – atomic and ionic radii – ionization energies – electropositive character – chemical properties – complexes of alkali metals – comparison of lithium with other members of the family – resemblance of lithium and magnesium – role of Na <sup>+</sup> and K <sup>+</sup> ions in biological systems – sodium pump. Group 2 Elements: Alkaline Earth Metals – general characteristics – atomic and ionic radii – ionization energies – chemical properties – comparison of beryllium with other elements of Group 2 – properties and uses of alkaline earth metals – Portland cement – role of Mg <sup>2+</sup> and Ca <sup>2+</sup> ions in biological systems.	12	Chalk & Talk, Power Point
Π	p – BLOCK ELEMENTS Group 13 Elements: general characteristics - ionization energies – oxidation states – electropositive character – tendency to form ionic and covalent compounds – diagonal relationship between boron and silicon – properties of elements – relative strengths of trihalides as Lewis acids – borides – boron hydrides – boranes – preparation, properties and structure of diborane – bonding in boranes. Group 14 Elements: general characteristics – ionization energy – tendency to form chains, catenation – properties and structure of allotropes of carbon – Structure, preparation and properties of Nickel, Cobalt and Iron carbonyls, silicates and silicones – types of silicates – zeolites.	12	Chalk & Talk, Power Point
III	<ul> <li>p – BLOCK ELEMENTS – II</li> <li>Group 15 Elements: general characteristics – metallic and non – metallic character – variation in physical state – anomalous properties of nitrogen – allotropic forms of phosphorus – marsh test – preparation and properties of urotropine. Group 16 Elements: general characteristics – oxidation states – anomalous behaviour of oxygen – structure and properties of ozone – allotropes of sulphur – preparation and properties of sulphuric acid, caros's acid, marshall's acid. Group 17 Elements: general characteristics – electron affinity – oxidation states - preparation and properties of chlorine – oxoacids of halogens – interhalogen compounds. Group 18 Elements: occurrence – general characteristics – general physical properties of noble gases – structure and shape of XeF<sub>6</sub>, XeOF<sub>4</sub>, XeO<sub>2</sub>F<sub>2</sub> and XeO<sub>2</sub>F<sub>4</sub> molecules.</li> </ul>	12	Chalk & Talk, Power Point
IV	COORDINATION COMPOUNDS – I Double salts – coordination compounds – coordination complexes and complex ions – coordination number – unidentate, bidentate and polydentate ligands, chelating ligands and chelates – Werner's theory – Nomenclature of coordination compounds – EAN rule – stability of complex	12	Chalk & Talk, Power Point

	ions - factors affecting the stability of a complex ion – isomerism in coordination compounds: structural isomerism – linkage isomerism, coordination position isomerism, ionization isomerism, hydrate isomerism - stereo isomerism – geometrical isomerism, optical isomerism.		
V	COORDINATION COMPOUNDS – II Valence bond theory – shortcomings of valence bond theory – the crystal field theory – crystal field splitting of energy levels – crystal field stabilization energy (CFSE) – factors influencing the magnitude of crystal field splitting – colour of transition metal complexes – ligand field theory – evidence of covalent bonding in metal ligand bonding – molecular orbital theory of coordination complexes – pi bonding in octahedral complexes – sigma bonding in tetrahedral complexes – sigma and pi bonding in square planar complexes.	12	Chalk & Talk, Power Point

Course Designed by: Dr. K. Muthupandi & Dr. V. Ramasamy Raja

			rning Outcon Formativ ion Mapping	ve Examina	tion - Blue P	rint		
Inte			Section A MCQs		Section B Short Answers		Section C	Section D
rnal	Cos	K Level	No. of. Questions	K – Level	No. of. Questions	K - Leve l	Either or Choice	Open Choice
CI	CO1	Up to K2	2	K1&K2	1	K1	2 (K2&K2)	1(K2)
AI	CO2	Up to K3	2	K1&K2	2	K2	2 (K3&K3)	2(K2 & K3)
CI	CO3	Up to K2	2	K1&K2	1	K2	2 (K2&K2)	1(K2)
AII	<b>CO4</b>	Up to K4	2	K1 & K2	2	K2	2 (K3&K3)	2(K3 &K4)
		No. of Questions to be asked	4		3		4	3
Ques Patt		No. of Questions to be answered	4		3		2	2
CIA		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	20

		Dist	ribution of ]	Marks with	K Level C	IAI&(	CIA II	
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
	K1	2	2	-	-	4	6.67	67
	K2	2	4	10	20	36	60	07
CIA	K3	-	-	10	10	20	33.33	33
I	K4	-	-	-	-	-	-	-
-	Marks	4	6	20	30	60	100	100
	K1	2	2	-	-	4	6.67	50
	K2	2	4	10	10	26	43.33	50
CIA II	K3	-	-	10	10	20	33.33	33
	K4	-	-	-	10	10	16.67	17
	Marks	4	6	20	30	60	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

S	ummativ	ve Examinatio		rint Articu Dutcomes		ping – K	Level with C	Course
			MCQs		Short Answers		Section C	C D
S.No	COs	K - Level	No. of Question s	K – Level	No. of Question	K – Level	Section C (Either / or Choice)	Section D (Open Choice)
1	CO1	Up to K2	2	K1,K2	1	K1	2 (K2&K2)	1(K2)
2	CO2	Up to K3	2	K1&K2	1	K1	2 (K3&K3)	1(K3)
3	<b>CO3</b>	Up to K3	2	K1&K2	1	K2	2 (K3&K3)	1(K3)
4	CO4	Up to K4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)
5	CO5	Up to K4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)
No. of	No. of Questions to be Asked				5		10	5
No.of Questions to be answered			10		5		5	3
Mar	Marks for each question				2		5	10
Total N	Total Marks for each section				10		25	30
	(Figures	in parenthesi	is denotes, q	uestions s	hould be as	ked with	the given K l	evel)

	Distribution of Marks with K Level								
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %		
K1	5	4	-	-	9	7.5	22		
K2	5	6	10	10	31	25.83	33		
K3	-	-	40	20	60	50	50		
K4	-	-	-	20	20	16.67	17		
Marks	Marks 10 10 50 50 120 100 100								
	NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.								

	-	uestions	(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
		ort Answer	
	-	uestions	(5x2=10 marks
Q.No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
		her/Or Ty	-
		uestions	(5  x  5 = 25  marks)
Q.No	CO	K Level	Questions
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
			ormance of the students is to be assessed by attempting higher
	<u>K leve</u>		
		en Choice	
		Three ques	
Q.No	<b>CO</b>	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4 K4	
25	CO5		

# Summative Examinations - Question Paper – Format



# MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Na		/Iaj Vol	-				-		actic s)	al –	II	I																
Course Co		21U						- <b>J</b> ~-	~)																L	Р		С
Category	C	Core	e l	<b>Pr</b>	ıcti	cal	l																		-	2		-
Nature of co	ourse:	]	EN	<b>1P</b> :	LO	YA	BI	LII	Y	<b>√</b>		ŝ	KI	LL	0	RIE	ENT	ΓEI	)		EN	TR	EP	REN	IURS	HIP		
Course Ob	jective	es:										1																
	recollec				-				•		-								-									
	rememt										•												ons	•				
	compar execute					-														10	wate	er.						
	determi				-		-		0			•				mc	/110											
UNIT	Theor	ry c	of	Vo	lur	net	t <b>ric</b>	: Aı	nalysi	s an	d	١I	ist	of	'Ex											Hr	S	
Ŧ	Theor	•							•							•			•					<u> </u>				
Ι	Soluti and ch									ty, I	M	10.	alit	ty.	H	anc	1111	ıg	01 8	app	aratu	18,	gla	SSW	ares		6	
II	List o																										24	
	I. Aci	dim	net	ry	and	1 A	lka	lim	netry																			
	1. Esti	ima	atio	n	of ]	Na	$_2$ CC	<b>D</b> <sub>3</sub>																				
	2. Esti	ima	atio	n	of ]	Na	OH	[ / <b>K</b>	ΚОН																			
	3. Esti	ima	atio	n	of	)Xa	alic	aci	d.																			
	II. Ree	dox	хT	itr	atic	ons																						
	a. Per	mai	ng	ano	om	etr	У																					
	1.	Est	stin	ıat	ion	of	fer	rou	is ion																			
	2.	Est	stin	ıat	ion	of	ox	alic	acid																			
	3.	Est	stin	ıat	ion	of	cal	lciu	m (di	rect	m	ne	ho	d)														
	b. Dic	chro	om	etr	у																							
	1.	Est	stin	ıat	ion	of	fer	rou	is ion																			
	2.	Est	stin	ıat	ion	of	fer	ric	ion u	sing	ey	ext	ern	al	ind	lica	ato	r										
	V. ED	DTA	4 7	ìtr	atio	on																						
	1.	E	Esti	ma	ıtio	n c	of H	Iarc	lness	of w	at	te	us	sing	g E	D	ГA	•										
	<u>Distri</u>	ibut	tic	<u>n (</u>	<u>əf 1</u>	na	rks	5																				
	Max I Intern marks	nal					KS													Ex	erna	al	: 6	0				

Laboratory Performance	:	30 marks	Vivo voce	:	5 mark	(S
Observation note book	:	10 marks	Record note book	:	10 mai	rks
	-		Procedure writing	:	15 mai	rks
			Volumetric estimation	:	30 mai	rks
Total	:	40 marks	Total	:	60 mai	rks
For Volumetric Estimation i Less than 2%			0 marks			
		ror - 3	0 marks 5 marks			

15 marks

10 marks

#### **Books for Study:**

1. Vogel, Text book of Inorganic quantitative analysis, Longman Sc & Tech, 2008.

#### **Books for References:**

1. Jeyavathana Samuel, Chemistry Practical Book, G.G.Printers, Chennai, 2012.

3-5% Error

Greater than 5%

2. Vickie. M.Williamson, M.Larry Peck, Lab manual for General Chemistry, Cengage Learning India

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Private Limited, New Delhi, 2009.

#### Web Resources:

1. https://youtu.be/xQDQNghs5dc

2. https://youtu.be/AdbK86BnXN8

3. https://youtu.be/dmnElKapQ00

e Outcomes:	K Level						
On the completion of the course the student will be able to							
Discuss the theory of safety measures in chemistry laboratory.	[Up to K2]						
Understand the quantitative analysis in practical chemistry.	[Up to K3]						
Apply the theory on quantitative titration methods.	[Up to K3]						
Analyze the titrated values in tabular format.	[Up to K4]						
CO4:Analyze the titrated values in tabular format.[Up to K4]CO5:Construct the estimated value of the given compounds.[Up to K4]							
	e completion of the course the student will be able to Discuss the theory of safety measures in chemistry laboratory. Understand the quantitative analysis in practical chemistry. Apply the theory on quantitative titration methods. Analyze the titrated values in tabular format.						

# CO & PO Mapping:

<b>Course Outcomes</b>	Programme Outcomes (POs)									
(COs)	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	PO 4	PO 5	PO 6				
CO 1	2	1	2	3	3	2				
CO 2	1	3	1	1	2	3				
CO 3	2	2	3	2	3	3				
CO 4	3	1	2	2	1	2				
CO5	2	3	1	3	2	1				
Weightage	10	10	9	11	10	11				

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

# **LESSON PLAN**

UNIT	Theory of Volumetric Analysis and Laboratory Safety Measures	Hrs	Mode
Ι	Theory of Volumetric Analysis and Laboratory Safety Measures: Strength of Solutions – Normality, Molarity, Molality. Handling of apparatus, glasswares and chemicals – Safety aspects	6	
	List of Experiments		
II	<ul> <li>I. Acidimetry and Alkalimetry</li> <li>1. Estimation of Na<sub>2</sub>CO<sub>3</sub></li> <li>2. Estimation of NaOH / KOH</li> <li>3. Estimation of oxalic acid.</li> <li>II. Redox Titrations <ul> <li>a. Permanganometry</li> <li>1. Estimation of ferrous ion</li> <li>2. Estimation of oxalic acid</li> <li>3. Estimation of calcium (direct method)</li> </ul> </li> <li>b. Dichrometry <ul> <li>1. Estimation of ferrous ion</li> <li>2. Estimation of ferrous ion</li> <li>3. Estimation of ferrous ion</li> <li>4. Estimation of ferric ion using external indicator</li> <li>V. EDTA Titration</li> <li>1. Estimation of Hardness of water using EDTA.</li> </ul> </li> </ul>	24	Practical

Course Designed by: Dr. Ramasamy Raja & Dr. K. Muthupandi



# MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Na	me A	ALI	LIED MATHEMATICS	– I							
Course Co	de 2	21U	MCA32			L	Р	С			
Category	A	ALI	LIED			6	-	4			
Nature of o	course:		EMPLOYBILITY	SKILL ORIENTED	ENTREP	RENI	JRS	HIP			
COURSE	OBJEC	CTIV	/ES:								
<ul><li>To</li><li>To</li><li>To</li></ul>	develop teach tr develop apply a	op sk trigo op th and	e with the concepts of the cills in solving equations phometry and Expressing ' e skills in expanding Trig prove trigonometric ident	Trigonometric functions onometric functions. ities.							
Unit: I	Theor coeffic			Equations - Relation betw	veen the roo	ts and	1	8 hrs			
Unit: II			al Equations - Transforma				1	8 hrs			
Unit: III			nate solutions of Numeric Cardan's method	al Equations: Newton's M	ethod - Hor	ner's	1	8 hrs			
Unit: IV	cos n <i>e</i>	rigonometry: Applications of Demoivre's Theorem - Expression for sin $n\theta$ , os $n\theta$ and tan $n\theta$ - Expression of sin <sup>n</sup> $\theta$ and cos <sup>n</sup> $\theta$ - Expansion of sin $\theta$ , os $\theta$ and tan $\theta$ in powers of $\theta$ . <b>18 hrs</b>									
Unit: V			ic Functions – Inverse Hy	perbolic Functions			1	8 hrs			
				]	<b>Fotal Lecture</b>	e Hour	rs 9	0 hrs			
Unit I : Unit II: Unit III: Unit III:	Gamm Chapter Chapte Chapte Chapte	na P er 1: er 1: er 1: er 4:	umugam and A.Thangapa ublishing House, Palayan Sections 1.1 & 1.2 Sections 1.3 & 1.4 Sections 1.5 (1), 1.5 (2) Sections 4.1, 4.2, 4.3 Sections 5.1, 5.2		nematics Pa	per I,	Nev	V			
<b>Books for</b>	Refere	ence									
Printers 2. T. K . M Printers	s Publis Ianicka Publish Tumuga	sher avas hers am	s Pvt. Ltd, Chennai, 2007 hagam Pillai and S.Naray Pvt. Ltd, Chennai, 2011.	anan, <b>Algebra – Volume</b> anan, <b>Trigonometry,</b> S.V ora, New Gamma Publishi	Viswanathan		mko	ttai,			
			and com/2/jiticomethe	matics.com/www/conte/o	madratic o	anotia	ne/1	2.			
<u>rel</u>	ation-b	betv		<u>nts-of-any-polynomial-ec</u>		yuall	<u>/115/</u>	<u>_</u>			

Course	Outcomes:	K Level					
After the completion of the course, Students will be able to							
CO1:	Learn and solve system of linear equations.	K3					
CO2:	Develop and maintain problem solving skills in Numerical Equations.	K4					
CO3:	Solve the exponential and trigonometric equations	K3					
<b>CO4:</b>	Recognize the relationship between $\sin \theta$ , $\cos \theta$ and $\tan \theta$ .	К3					
CO5:	Understand the ideas about the Hyperbolic functions and Inverse Hyperbolic Functions	K3					

### CO & PO Mappings:

COS	<b>PO 1</b>	PO 2	<b>PO 3</b>	<b>PO 4</b>	PO 5	PO 6
CO 1	3	2	3	2	3	2
CO 2	2	2	2	2	3	2
CO 3	3	3	2	3	3	2
<b>CO 4</b>	2	2	2	2	2	3
CO 5	3	3	2	2	2	3

\*3 –Advanced Application; 2 – Intermediate Development; 1 – Introductory Level

# LESSON PLAN

UNIT	COURSE NAME	Hrs	Pedagogy
Ι	Theory of Equations: Formation of Equations - Relation between the roots and coefficients	18	Chalk & Talk, PPT
п	Reciprocal Equations - Transformation of Equations	18	Chalk & Talk, Group Discussion
III	Approximate solutions of Numerical Equations: Newton's Method - Horner's Method & Cardan's method	18	Chalk & Talk, LCD
IV	Trigonometry: Applications of Demoivre's Theorem - Expression for sin $n\theta$ , cos $n\theta$ and tan $n\theta$ - Expression of sin <sup>n</sup> $\theta$ and cos <sup>n</sup> $\theta$ - Expansion of sin $\theta$ , cos $\theta$ and tan $\theta$ in powers of $\theta$ .	18	Chalk & Talk, Seminar
V	Hyperbolic Functions – Inverse Hyperbolic Functions	18	Chalk & Talk, Seminar

### Course designed by: Mr. A. Nambi Krishna and Dr. S. Suriyakala

	Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)													
Internal	Cos	K Level	Section MC No. of. Questions	on A	Section Short An No. of. Questions	on B	Section C Either or Choice	Section D Open Choice						
CI	CO1	K3	2	K1&K2	1	K1	2(K3&K3)	1 (K3)						
AI	CO2	K4	2	K2&K2	2	K2&K2	2(K4&K4)	2 (K4)						
CI	CO3	K3	2	K1&K2	1	K1	2(K3&K3)	2 (K3)						
AII	<b>CO4</b>	K3	2	K2&K1	2	K2&K2	2(K3&K3)	1 (K3)						
		No. of stions to be asked	4		3		4	3						
Question Pattern CIA I &	Que	No. of stions to be nswered	4		3		2	2						
П		ks for each uestion	1		2		5	10						
		l Marks for th section	4		6		10	20						

		Dist	ribution of 1	Marks with	K Level C	IA I & (	CIA II	
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
	K1	1	2	-	-	3	5	17
	K2	3	4	-	-	7	11.67	17
CIA	K3	-	-	10	10	20	33.33	33
	K4	-	-	10	20	30	50	50
-	Marks	4	6	20	30	60	100	100
	K1	2	2	-	-	4	6.67	17
	K2	2	4	-	-	6	10	1/
CIA	K3	-	-	20	30	50	83.33	83
II	K4	-	-	-	-	-	-	-
	Marks	4	6	20	30	60	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

S	Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)											
			MCC		Short An	swers	Section C	Section D				
S.No	COs	K - Level	No. of Questions	K – Level	No. of Question	K – Level	(Either / or Choice)	(Open Choice)				
1	CO1	K3	2	K1&K2	1	K1	2 (K3& K3)	1 (K3)				
2	CO2	K4	2	K1&K2	1	K1	2 (K4 &K4)	1 (K4)				
3	CO3	K3	2	K1&K2	1	K2	2 (K3& K3)	1 (K3)				
4	CO4	К3	2	K1&K2	1	K2	2 (K3& K3)	1 (K3)				
5	CO5	К3	2	K1&K2	1	K2	2 (K3 &K3)	1 (K3)				
No.	of Quest. Aske	ions to be ed	10		5		10	5				
No.	No. of Questions to be answered		10		5		5	3				
Mar	Marks for each question		1		2		5	10				
Total Marks for each section		10		10		25	30					
	(Figures in parenthesis denotes, questions should be asked with the given K level)											

		Dis	tribution of	Marks with	n K Leve	l	
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D ( Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4	-	-	9	7.5	17
K2	5	6	-	-	11	9.17	1/
K3	-	-	40	40	80	66.67	67
K4	-	-	10	10	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Hig of K lev	,	erformance o	f the students	s is to be asse	essed by a	ttempting	higher level

			e Questions)
	· All Qu		(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
		rt Answers)	
	All Qu		(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section	C (Eith	er/Or Type	
Answer	· All Qu	estions	(5 x 5 = 25 marks)
Q.No	CO	K Level	Questions
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K4	
17) b	CO2	K4	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Hi	gher lev	el of perfor	mance of the students is to be assessed by attempting higher level of K
levels			
Section	D (Ope	n Choice)	
Answer	· Any Tl	hree questic	
Q.No	CO	K Level	Questions
21	CO1	K3	
22	CO2	K4	
23	CO3	K3	
23			
23	CO4	K3	

# **Summative Examinations - Question Paper – Format**



# MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	FUNDAMENTALS (	OF N	AICROBIOLOGY					
<b>Course Code</b>	21UMBA32						Р	C
Category	ALLIED MICROBIO	OLO	GY - I			6	-	4
Nature of cours	EMPLOYABILITY		SKILL ORIENTED	$\checkmark$	ENTREPREN	URSH	ΗP	
Course Objecti	ives:							
	rstand history of microb				•••			
	y the basic morpholog	gy s	tructure, classification	n ar	nd biological	and e	econo	mic
-	nce of bacteria.	تم ام من	ionificance of Euroi					
-	pret the characteristics a ain the nomenclature and							
-	le the students to explor			20- 2	nd Protozoa			
	VELOPMENT OF MI						18	8
	scope of Microbiology. 1					eral n		-
	nomenclature of Microo							
	imple and Compound m	-	-	ľ	8,			
**	CTERIOLOGY		1				18	8
General charact	eristics of Bacteria-Clas	ssific	ation, Ultra Structure-	Gra	m positive and	Gran	n	
negative cell wa	all, Reproduction, Biolog	gical	and Economic import	ance	e of <i>Bacillus, R</i>	hizob	ium,	
E.coli and Vibri	0.							
	COLOGY						18	8
	eristics of Fungi- Classi			-		gical a	und	
	rtance of Saccharomyce	es, A	spergillus, Agaricus, H	Penic	cillium.		- T	
	ROLOGY						18	-
	eristics of Viruses-Class							
	Animal virus-(Pox and A			anc	i lambda) - An	tıvıral	- T	
	YCOLOGY AND PAI				- le d'en D'ele	1	18	8
	eristics of Algae – Class			-		-		
-	rtance of <i>Chlorella</i> , <i>Spi</i> oduction of <i>Entamoeba I</i>		•	roto	zoa - Classifica	uion,	Unra	L
	duction of Entamoeda r	nisio	iyiica, 1 iasmoaiam.	Tot	tal Lecture Ho	iirc	90 H	Inc
Books for Stud	y:			10		Juis	<b>70 I</b>	115
1 Prescott I		n D /	A Microbiology 6/e	Mc	Graw Hill Publ	ishers	200	6
	I.J., Chan E.C.S. & Krei							
	v Delhi, 1993.	-8				,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	.9 00	••
Books for refer	,							
1. Ananthana	arayanan R & Jayaram F	Panic	ker, C.K., Textbook o	f M	icrobiology, C	rient		
Longman,								
•	Michael T., Martinko., J		<b>-</b>			Brock	's	
	<b>f Microorganisms</b> Glob							
	Y. Ingraham J.L. Wheol			he N	Aicrobial worl	<b>d</b> , 5th	n Ed.	
-	rks Cliffs N.J. Prentice H	Hall,	1986.					
Web Resources	5:							

1. <u>http</u>	s://www.britannica.com/science/microbiology						
2. <u>http</u>	2. https://www.brainkart.com/article/Ultrastructure-of-a-Bacterial-cell_32841/						
3. <u>http</u>	3. https://www.toppr.com/guides/biology/biological-classification/kingdom-fungi/						
4. <u>http</u>	s://www.toppr.com/guides/biology/plant-kingdom/algae/						
5. <u>http</u>	<u>s://www.sciencedirect.com/topics/immunology-and-microbiology/virus-c</u>	lassification					
Course	Course Outcomes K Level						
On Suc	On Successful Completion of Course the student will be able to						
CO1:	Describe the knowledge and historical perspective of microbiology.	Up to K2					
<b>CO2:</b>	Determine about the structure and classification of Bacteria.	Up to K3					
<b>CO3:</b>	Illustrate about the Fungi classification, Structure and reproduction.	Up to K4					
CO4:	Differentiate the different types of Virus structure, classification and reproduction.	Up to K4					
CO5:	Identify the structural organization of Algae and Protozoa.	Up to K3					

# CO & PO Mapping:

CO's	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	PO 4	PO 5	<b>PO 6</b>
CO 1	3	1	1	3	3	2
CO 2	3	2	3	2	2	2
CO 3	2	1	1	1	1	2
CO 4	3	2	3	2	2	1
CO 5	3	2	3	2	2	1

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

Unit	Course Name	Hrs	Pedagogy
I	<b>Development of Microbiology and Microscopy</b> - Definition and scope of Microbiology. History & development of Microbiology. General principal and Binominal nomenclature of Microorganism. Microscope- Principles, Working, Mechanism and Application - Simple and Compound microscope.	18	Chalk &Talk
П	<b>Bacteriology -</b> General characteristics of Bacteria-Classification, Ultra Structure- Gram positive and Gram negative cell wall, Reproduction, Biological and Economic importance of <i>Bacillus, Rhizobium, E.coli</i> and <i>Vibrio</i> .	18	PPT, Chalk &Talk
ш	<b>Mycology</b> - General characteristics of Fungi- Classification, Ultra structure, Reproduction, Biological and Economic importance of <i>Saccharomyces, Aspergillus, Agaricus, Penicillium</i> .	18	PPT, Chalk &Talk
IV	<b>Virology</b> - General characteristics of Viruses-Classification, Ultra Structure, Reproduction of Plant virus – (TMV, CMV); Animal virus-(Pox and Adeno); Bacterial virus (T4 and lambda) - Antiviral agent.	18	Chalk &Talk & PPT
V	<b>Phycology and Parasitology</b> - General characteristics of Algae – Classification, Ultra structure, Reproduction, Biological and Economic importance of <i>Chlorella</i> , <i>Spirulina</i> , <i>Chlamydomonas</i> , Protozoa – Classification, Ultra structure, Reproduction of <i>Entamoeba histolytica</i> , <i>Plasmodium</i> .	18	Chalk &Talk, Assignment

### LESSON PLAN

Course Designed by: 1. Ms. C. Thenmozhi, Assistant Professor. 2. Mrs. M.R.S. Saranya, Assistant Professor.

	Learning Outcome Based Education & Assessment (LOBE)										
	Formative Examination - Blue Print										
			Articulatio	on Mapping	– K Levels v	with Course	Outcom	es (COs)			
				Section A MCQs		Section	n B	Section C	Section D		
Inter	C	06	K Level			Short Answers		Either or	Open		
nal	Ŭ	05	K Levei	No. of. Questions	K - Level	No. of. Questions	K - Level	Choice	Choice		
СПАТ		D1	Up to K2	2	K1& K2	1	K2	2(K2&K2)	1(K2)		
	CIA I CO2		Up to K3	2	K1 &K2	2	K2	2(K3&K3)	2(K3&K3)		
CIA	CO	O3 Up to K4		2	K1&K2	1	K2	2(K2&K2)	1(K4)		
II	<b>CO4</b>		Up to K4	2	K1&K2	2	K2	2(K3&K3)	2(K4&K4)		
		No. of Questions to be asked No. of Questions to be answered		4		3		4	3		
Questi	on			4		3		2	2		
Patter CIA I	rn		Marks for each question 1			2		5	10		
п			otal Marks for each section	4		6		10	20		

		Di	stribution of	Marks with	K Level CI	A I & Cl	AII	
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
	K1	2	-	-	-	2	3.33	50
	K2	2	6	10	10	28	46.66	50
CIA	K3	-	-	10	20	30	50	50
	K4	-	-	-	-	-	-	-
-	Marks	4	6	20	30	60	100	100
	K1	2	2	-	-	4	6.66	33
CIA	K2	2	4	10	-	16	26.66	
CIA II	K3	-	-	10	-	10	16.66	17
11	K4	-	-	-	30	30	50	50
	Marks	4	6	<b>20</b>	30	60	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Sum	mative	Examination ·	– Blue Print .	Articulation (COs)		K Level	with Course	Outcomes
S.No Cos		K - Level	Section (MC		Section B (Short Answers)		Section C	Section D
<b>5.</b> 1NO	Cos	K - Level	No. of Questions	K – Level	No. of Question	K – Level	(Either / or Choice)	(Open Choice)
1	CO1	Up to K2	2	K1&K2	1	K2	2(K2&K2)	1(K2)
2	CO2	Up to K3	2	K1&K2	1	K2	2(K3&K3)	1(K3)
3	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
4	CO4	Up to K4	2	K1&K2	1	K2	2(K4&K4)	1(K4)
5	CO5	Up to K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
No.	of Ques Ask	stions to be ted	10		5		10	5
No.	of Ques	stions to be ered	10		5		5	3
Marks for each question		ch question	1		2		5	10
Total Marks for each section		10		10		25	30	
	(Figu	res in parenth	esis denotes,	questions s	hould be ask	ed with	the given K lev	vel)

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

			Distribution o	of Marks wit	h K Leve	1			
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %		
K1	5	-	-	-	05	4.16	4		
K2	5	10	20	10	45	37.5	38		
K3	-	-	20	20	40	33.33	33		
K4	-	-	10	20	30	25	25		
Marks	10	10	50	50	120	100	100		
	NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.								

#### Section A (Multiple Choice Questions) **Answer All Questions** (10x1=10 marks) Q.No CO **K** Level Questions CO1 K1 1 2 CO1 K2 3 CO<sub>2</sub> K1 CO2 K2 4 5 CO3 K1 CO3 6 K2 7 CO4 K1 CO4 K2 8 9 CO5 K1 10 CO5 K2 Section B (Short Answers) **Answer All Questions** (5x2=10 marks) Q.No K Level CO **Ouestions** CO1 K2 11 12 CO2 K2 13 CO3 K2 CO4 14 K2 CO5 15 K2 Section C (Either/Or Type) **Answer All Questions** (5 x 5 = 25 marks)Q.No CO K Level Questions 16) a CO1 K2 K2 16) b CO1 CO2 K3 17) a CO2 K3 17) b 18) a CO3 K3 CO3 K3 18) b CO4 K4 19) a CO4 19) b K4 CO5 **K**2 20) a 20) b CO5 **K**2 NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels Section D (Open Choice) **Answer Any Three questions** (3x10=30 marks) K Level Questions Q.No CO 21 CO1 K2 K3 22 CO2 23 CO3 K4 CO4 K4 24 K3 25 CO5

#### **Summative Examinations - Question Paper – Format**



# MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

	BASIC CONCEPTS IN CHEMISTRY			
<b>Course Code</b>	21UCHN31	L	Р	С
Category	Non Major Elective	2	-	2
Nature of cours	se: EMPLOYABILITY SKILL ORIENTED 🗸 ENTREF	PRENURS	SHIP	
Course Object	ives:			
• To recall the	e atoms and molecules and basic properties of both metals and no	n-metals.		
• To remember	er the basics of pure substance and mixtures, fuels and catalysts.			
To compare	the homogeneous and heterogeneous mixtures and types of catal	ysts.		
• To perform	the properties of states of matter and separation process.			
• To determin	the the various concepts on atoms, molecules, fuels and catalysis.			
Unit: I MA	ATTER		06	,
Atoms and Mo	elecules – atom – molecule – subatomic particles of atom – st	tructure of	fator	n –
	ns – valency – Bohr's model of an atom – states of matter – solid,			
evaporation		1	U	
Unit: II PU	RE SUBSTANCE AND MIXTURES		06	)
Pure Substance	- Mixtures - Homogeneous and Heterogeneous mixtures - solut	ion – true	solut	ion,
	spension. Separation process of mixtures – evaporation, centrifu			
	tion, simple distillation – difference between pure substance and r	-	1	U
	ETALS AND NON-METALS		06	j
Metals – physic	cal properties of Metals – Hardness, lustrous, malleability, ducti	lity, condu	ictioi	ı of
	icity and sonorous. Non – Metals – exceptional cases of metals			
		s and non-	meta	15 -
ionic bond.		s and non-	meta	15
	ELS		06	
Unit: IV FU			06	)
Unit: IV FU	ELS tion – classification - Solid, liquid and gases, petroleum, refi		06	)
Unit: IVFUFuels– Definitbetween petrola	ELS tion – classification - Solid, liquid and gases, petroleum, refi		06	ence
Unit: IVFUFuels $-$ Definitbetween petrol aUnit: VCA	ELS tion – classification - Solid, liquid and gases, petroleum, refi and diesel. TALYSIS	ining – d	06 iffere 06	ence
Unit: IVFUFuels - Definitbetween $p$ =trolUnit: VCACatalyst:	<b>ELS</b> tion – classification - Solid, liquid and gases, petroleum, refa	ining – d	06 iffere 06	ence
Unit: IVFUFuels - Definitbetween $p$ =trolUnit: VCACatalyst:	ELS tion – classification - Solid, liquid and gases, petroleum, refr and diesel. TALYSIS ition, homogeneous and heterogeneous catalysis (definitions is, catalytic promoters, enzyme catalysts.	ining – d and exar	06 iffere 06	ence () –
Unit: IVFUFuels - Definitbetween $p$ =trolUnit: VCACatalyst:	ELS tion – classification - Solid, liquid and gases, petroleum, refr and diesel. TALYSIS ition, homogeneous and heterogeneous catalysis (definitions is, catalytic promoters, enzyme catalysts. Total Lecture	ining – d and exar	06 iffere 06 nples	ence () –
Unit: IVFUFuels $-$ Definitbetween petrol aUnit: VCACatalyst: definitcatalytic poisonBooks for Stud	ELS tion – classification - Solid, liquid and gases, petroleum, refr and diesel. TALYSIS ition, homogeneous and heterogeneous catalysis (definitions is, catalytic promoters, enzyme catalysts. Total Lecture ly:	ining – d and exar e <b>Hours</b>	06 iffere 06 nples <b>30 H</b>	ence ) –
Unit: IVFUFuels $\neg$ Definitbetween petrol aUnit: VCACatalyst:definitcatalytic poisonBooks for Stud1. Ramesh Kap	ELS tion – classification - Solid, liquid and gases, petroleum, refr and diesel. TALYSIS ition, homogeneous and heterogeneous catalysis (definitions is, catalytic promoters, enzyme catalysts. Total Lecture	ining – d and exar e <b>Hours</b>	06 iffere 06 nples <b>30 H</b>	ence ) –
Unit: IVFUFuels $\neg$ between $\neg$ between $\neg$ $\neg$ Unit: VCACatalyst: $\neg$ catalytic $\neg$ $\neg$ Books for Stud1. Ramesh KapDelhi, 2018.	ELS tion – classification - Solid, liquid and gases, petroleum, refr and diesel. TALYSIS ition, homogeneous and heterogeneous catalysis (definitions is, catalytic promoters, enzyme catalysts. Total Lecture ly: poor, R S Chopra, Sunita Bhagat, Fundamental Chemistry, R. C	ining – d and exar e <b>Hours</b>	06 iffere 06 nples <b>30 H</b>	nce ) –
Unit: IVFUFuels $\neg$ Definitbetween petrol aUnit: VCACatalyst: definitcatalytic poisonBooks for Stud1. Ramesh KapDelhi, 2018.Books for Reference	ELS tion – classification - Solid, liquid and gases, petroleum, refr and diesel. TALYSIS ition, homogeneous and heterogeneous catalysis (definitions is, catalytic promoters, enzyme catalysts. Total Lecture ly: poor, R S Chopra, Sunita Bhagat, Fundamental Chemistry, R. C erences:	ining – d and exar e <b>Hours</b> [ Chand & C	06 iffere 06 nples <b>30 H</b>	ence ) – Trs New
Unit: IVFUFuels $\neg$ Definitbetween petrol aUnit: VCACatalyst:definitcatalytic poisonaBooks for Stud1. Ramesh KapDelhi, 2018.Books for Refer1. Anil Kumar	ELS tion – classification - Solid, liquid and gases, petroleum, refr and diesel. TALYSIS ition, homogeneous and heterogeneous catalysis (definitions is, catalytic promoters, enzyme catalysts. Total Lecture ly: poor, R S Chopra, Sunita Bhagat, Fundamental Chemistry, R. C erences: Tomar and Pallabi B. Tomar, Basics of Chemistry, Pegasus Enc	ining – d and exar e <b>Hours</b> [ Chand & C	06 iffere 06 nples <b>30 H</b>	ence ) – Trs New
Unit: IVFUFuels $-$ Definitbetween petrol aUnit: VCACatalyst: definitcatalytic poisonBooks for Stud1. Ramesh KapDelhi, 2018.Books for Refe1. Anil KumarNew Delhi, 201	ELS tion – classification - Solid, liquid and gases, petroleum, refr and diesel. TALYSIS ition, homogeneous and heterogeneous catalysis (definitions as, catalytic promoters, enzyme catalysts. Total Lecture ly: boor, R S Chopra, Sunita Bhagat, Fundamental Chemistry, R. C erences: Tomar and Pallabi B. Tomar, Basics of Chemistry, Pegasus Enc 8	ining – d and exar e <b>Hours</b> [ Chand & C	06 iffere 06 nples <b>30 H</b>	ence ) – Trs New
Unit: IVFUFuels $\neg$ Definitbetween petrol aUnit: VCACatalyst: definitcatalytic poisonadditional catalytic poisonBooks for Stud1. Ramesh KapDelhi, 2018.Books for Refe1. Anil KumarNew Delhi, 201Web Resources	ELS tion – classification - Solid, liquid and gases, petroleum, refr and diesel. TALYSIS ition, homogeneous and heterogeneous catalysis (definitions is, catalytic promoters, enzyme catalysts. Total Lecture ly: boor, R S Chopra, Sunita Bhagat, Fundamental Chemistry, R. C erences: Tomar and Pallabi B. Tomar, Basics of Chemistry, Pegasus Enc 8 s:	ining – d and exar e <b>Hours</b> [ Chand & C	06 iffere 06 nples <b>30 H</b>	ence ) – Trs New
Unit: IVFUFuels $\neg$ between petrol abetween petrol aCAUnit: VCACatalyst: definit catalytic poisonaaBooks for Stud1. Ramesh KapDelhi, 2018.Books for Refe1. Anil KumarNew Delhi, 201Web Resources1. shorturl.at/gl	ELS tion – classification - Solid, liquid and gases, petroleum, refr and diesel. TALYSIS ition, homogeneous and heterogeneous catalysis (definitions as, catalytic promoters, enzyme catalysts. Total Lecture ly: boor, R S Chopra, Sunita Bhagat, Fundamental Chemistry, R. C erences: Tomar and Pallabi B. Tomar, Basics of Chemistry, Pegasus Enc 8 s: KP6	ining – d and exar e Hours Chand & C	06 iffere 06 nples <b>30 H</b> Co., N	) – rrs Jew ary,
Unit: IVFUFuels $\neg$ Definitbetween petrol aUnit: VCACatalyst: definitcatalytic poisonadditional stressBooks for Stud1. Ramesh KapDelhi, 2018.Books for Refe1. Anil KumarNew Delhi, 201Web Resources1. shorturl.at/glCourse Outcom	ELS tion – classification - Solid, liquid and gases, petroleum, refr and diesel. TALYSIS ition, homogeneous and heterogeneous catalysis (definitions as, catalytic promoters, enzyme catalysts. Total Lecture ly: boor, R S Chopra, Sunita Bhagat, Fundamental Chemistry, R. C erences: Tomar and Pallabi B. Tomar, Basics of Chemistry, Pegasus Enc 8 s: KP6 nes	ining – d and exar e Hours Chand & C	06 iffere 06 nples <b>30 H</b>	) – rrs Jew ary,
Unit: IVFUFuels $-$ Definitbetween petrol aUnit: VCACatalyst: definitcatalytic poisonadditional catalytic poisonBooks for Stud1. Ramesh KapDelhi, 2018.Books for Refe1. Anil KumarNew Delhi, 201Web Resources1. shorturl.at/gICourse Outcom	ELS tion – classification - Solid, liquid and gases, petroleum, refr and diesel. TALYSIS ition, homogeneous and heterogeneous catalysis (definitions is, catalytic promoters, enzyme catalysts. Total Lecture ly: boor, R S Chopra, Sunita Bhagat, Fundamental Chemistry, R. C erences: Tomar and Pallabi B. Tomar, Basics of Chemistry, Pegasus Enc 8 s: KP6 mes etion of the course the student will be able to	ining – d and exar e Hours Chand & C cyclopedia	06 iffere 06 nples <b>30 H</b> Co., N Libr	ince ince ince ince ince ince ince ince
Unit: IVFUFuels $-$ Definitbetween petrol aUnit: VCACatalyst: definitcatalytic poisonadditional stressBooks for Stud1. Ramesh KapDelhi, 2018.Books for Refe1. Anil KumarNew Delhi, 201Web Resources1. shorturl.at/glCourse OutcomOn the completeCO1:Ability	ELS tion – classification - Solid, liquid and gases, petroleum, refr and diesel. TALYSIS ition, homogeneous and heterogeneous catalysis (definitions as, catalytic promoters, enzyme catalysts. Total Lecture ly: boor, R S Chopra, Sunita Bhagat, Fundamental Chemistry, R. C erences: Tomar and Pallabi B. Tomar, Basics of Chemistry, Pegasus Enc 8 s: KP6 nes	ining – d and exar e Hours Chand & C cyclopedia ysis. [U	06 iffere 06 nples <b>30 H</b> Co., N	ince ince irs New ary, rel K2]

<b>CO3:</b>	Interpret the knowledge of atoms, molecules, fuels and catalysts.	[Up to K3]
<b>CO4:</b>	Examine the properties of metals and non-metals and role of catalysts.	[Up to K4]
CO5:	Distinguish between pure substance and mixtures, various types of catalysts.	[Up to K4]

# CO & PO Mapping:

<b>Course Outcomes</b>	s Programme Outcomes (POs)						
(COs)	<b>PO 1</b>	<b>PO 2</b>	PO 3	PO 4	PO 5	<b>PO 6</b>	
CO 1	3	1	2	3	1	2	
CO 2	1	3	1	1	2	3	
CO 3	2	2	3	2	3	3	
<b>CO 4</b>	3	1	2	2	1	2	
CO5	1	3	2	3	2	1	
Weightage	10	10	10	11	9	11	

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

### LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	MATTER Atoms and Molecules – atom – molecule – subatomic particles of atom – structure of atom – valence electrons – valency – Bohr's model of an atom – states of matter – solid, liquid and gases – evaporation	06	Chalk, Talk & Power point
II	<b>PURE SUBSTANCE AND MIXTURES</b> Pure Substance – Mixtures – Homogeneous and Heterogeneous mixtures – solution – true solution, colloidal and suspension. Separation process of mixtures – evaporation, centrifugation, separating funnel, sublimation, simple distillation – difference between pure substance and mixtures.	06	Chalk, Talk & Power point
ш	<b>METALS AND NON-METALS</b> Metals – physical properties of Metals – Hardness, lustrous, malleability, ductility, conduction of heat and electricity and sonorous. Non – Metals – exceptional cases of metals and non-metals – ionic bond.	06	Chalk, Talk & Power point
IV	<b>FUELS</b> Fuels – Definition – classification - Solid, liquid and gases, petroleum, refining – difference between petrol and diesel	06	Chalk, Talk & Power point
V	<b>CATALYSIS</b> Catalyst: definition, homogeneous and heterogeneous catalysis (definitions and examples) – catalytic poisons, catalytic promoters, enzyme catalysts	06	Chalk, Talk & Power point

Course Designed by: Dr. A. J. Sunija & Dr. R. Satheesh





# MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	ORGANIC CHEMISTRY – II						
Course Code	21UCHC41	L	Р	С			
Category	Core	4	-	4			
Nature of courses	: EMPLOYABILITY 🗸 SKILL ORIENTED ENTREPREN	URS	HIP	$\checkmark$			
<b>Course Objectiv</b>	es:						
• To recall the	general characteristics of aromatic compounds and reaction mechanic	sms.					
	the basics of aromatic compounds and polynuclear compounds.						
-	he preparation, properties of ortho, para, meta directing and aromatic	com	poun	ds.			
-	ne mechanism of reactions and effects of substituents.						
	the various concepts on mechanisms and polynuclear compounds. <b>MATIC COMPOUNDS – I</b>		12				
	eneral characteristics of aromatic compounds – Aromaticity and H	uckel					
	zene – Mechanism of aromatic electrophilic substitution (Halogenat						
	Friedel – Crafts reactions. Directive influence of substituents based						
effects (ortho/par	ra/meta directing) -Di-substituted benzenes - Steric hindrance - I	Mecha	anism	ı of			
	hilic substitution, unimolecular, bimolecular and benzyne mechanism	ns.					
	DMATIC COMPOUNDS – II		12				
•	des: Mechanism of Cannizzaro, Perkins, Claisen, Knoevenagel						
	sation – Preparation and properties of cinnamaldehyde and vani						
	ctetophenone – preparation – Houben – Hosch synthesis. Pheno		ciaity	01			
ARO	of substituents on the acidity of phenol – mechanism of Kolbe's react <b>DMATIC HYDROCARBONS, HALOGEN, NITRO AND AMIN</b>						
	APOUNDS	U	12				
	carbons: Preparation, properties and uses of toluene xylene and						
	n compounds: preparation, Properties and uses of bromobenzen						
	vity of aryl halides, distinction between nuclear and side chair		0				
	matic nitro compounds: preparation and properties of nitrotoluer ls: Preparation by reduction of nitro compounds and from chlorober						
-	n the basic character of aromatic amines – Comparison between						
	– Preparation of aniline, sulphanilic acid, nitroanilines and phenyle	-					
	ynthetic applications of benzene diazonium chloride.						
	OMATIC ACIDS		12				
	tuents on acidic character. Monocarboxylic acids: preparation,						
salicylic acid and anthranilic acid. Dicarboxylic acids: preparation, properties of phthalic acid,							
phenylacetic acid, mandelic acid, cinnamic acid & coumarin. Aromatic Sulphonic acids: preparation, properties and uses of benzene sulphonic acid and saccharin.							
	Y NUCLEAR HYDROCARBONS AND THEIR DERIVATIVE	c	12				
Isolated system				cid,			
Isolated systems: Preparation and properties of diphenyl, benzidine diphenic acid, diphenylmethane, triphenylmethane and stilbene. Condensed systems: Preparation properties, uses							
	of Naphthalene, Naphthylamines, Naphthols, Naphthaquinones	-					
	lizarin and phenanthrene.						

	Total Lecture Ho	urs 60 Hrs
Books	for Study:	
1. Soni	. P.L and Chawla. H.M, Textbook of Organic Chemistry, S. Chand & Sor	ns, 2007, New
Delhi.		, ,
Books	for References:	
1. Jain	. M.K, and Sharma. S.C, Modern Organic Chemistry, 4 <sup>th</sup> Edition, Vishal P	ublishing Co.,
2016, J	alandhar.	-
2. Aru	n Bahl and Bahl. B.S, A Textbook of Organic Chemistry, S. Chand & Co	o., 2012, New
Delhi.		
	y March, Advanced Organic Chemistry, 4th Edition, John Wiley and Sons, 199	
4. S.H	. Pine, Organic Chemistry, 5th Edition, McGraw Hill International Edition, Che	emistry Series,
	Jew York.	
5. Moi	rison. R.T and Boyd. R.N, Organic Chemistry, 6th Edition, Printice-Hall of In-	dia Ltd., 1992,
New D	elhi.	
Web R	esources:	
	://youtu.be/IVbuBY0YMu4	
	://youtu.be/Ywgkw4vK01s	
	://youtu.be/Ixe0swwcca0	
	://youtu.be/A11zmE_r7NY	
	://youtu.be/vKmTUIKoJVM	K Level
	e Outcomes	K Level
Un th	e completion of the course the student will be able to	
CO1:	Recall the general characteristics of aromatic compounds and discuss the	[Up to K2]
	reaction	
<b>CO2:</b>	Prepare the aromatic compounds like aromatic hydrocarbons, halogen,	[Up to K3]
	amino, substituted Examine the effect of substituents on acidic/basic character of aromatic	
CO3:		[Up to K3]
	compounds.	
<b>CO4:</b>	Interpret the directive influence of substituent on electronic effects and properties of aromatic compounds.	[Up to K4]
CO5:	Integrate the reaction mechanism of aromatic compounds and formulate in the surthetic applications	[Up to K4]
	the synthetic applications.	

# CO & PO Mapping:

Course Outcomes		Programme Outcomes (POs)						
(COs)	PO 1	PO 2	PO 3	PO 4	<b>PO 5</b>	<b>PO 6</b>		
CO 1	3	1	2	3	1	2		
CO 2	1	3	1	1	2	3		
CO 3	2	2	3	2	3	3		
<b>CO 4</b>	3	1	2	2	1	2		
CO5	1	3	2	3	2	1		
Weightage	10	10	10	11	9	11		

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

#### LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	AROMATIC COMPOUNDS – I Introduction – General characteristics of aromatic compounds – Aromaticity and Huckel's rule – Structure of benzene – Mechanism of aromatic electrophilic substitution (Halogenation, nitration, sulphonation and Friedel – Crafts reactions. Directive influence of substituents based on electronic effects (ortho/para/meta directing) –Di-substituted benzenes – Steric hindrance – Mechanism of aromatic nucleophilic substitution, unimolecular, bimolecular and benzyne mechanisms.	12	Chalk, Talk & Power point
II	AROMATIC COMPOUNDS – II Aromatic aldehydes: Mechanism of Cannizzaro, Perkins, Claisen, Knoevenagel reaction and Benzoin condensation – Preparation and properties of cinnamaldehyde and vanillin. Phenolic ketones: Phloroactetophenone – preparation – Houben – Hosch synthesis. Phenols: Acidity of phenols – effect of substituents on the acidity of phenol – mechanism of Kolbe's reaction.	12	Chalk, Talk & Power point
III	AROMATIC HYDROCARBONS, HALOGEN, NITRO AND AMINO COMPOUNDS Aromatic Hydrocarbons: Preparation, properties and uses of toluene xylene and mesitylene –Aromatic halogen compounds: preparation, Properties and uses of bromobenzene and benzyl bromide- Reactivity of aryl halides, distinction between nuclear and side chain halogenated derivatives. Aromatic nitro compounds: preparation and properties of nitrotoluenes. Aromatic amino compounds: Preparation by reduction of nitro compounds and from chlorobenzene – Effect of substituents on the basic character of aromatic amines – Comparison between aliphatic and aromatic amines – Preparation of aniline, sulphanilic acid, nitroanilines and phenylenediamines – Preparation and synthetic applications of benzene diazonium chloride.	12	Chalk, Talk & Power point
IV	AROMATIC ACIDS Effect of substituents on acidic character. Substituted acids: preparation, properties of salicylic acid and anthranilic acid. Mono & Dicarboxylic acids: preparation, properties of phthalic acid, phenylacetic acid, mandelic acid, cinnamic acid & coumarin. Aromatic Sulphonic acids: preparation, properties and uses of benzene sulphonic acid and saccharin.	12	Chalk, Talk & Power point
V	POLYNUCLEARHYDROCARBONSANDTHEIRDERIVATIVESIsolated systems:Preparation and properties of diphenyl, benzidinediphenic acid, diphenylmethane, triphenylmethane and stilbene.Condensed systems:Preparation properties, uses and structure ofNaphthalene,Naphthylamines,Naphthols,Naphthalene, anthraquinone, alizarin and phenanthrene.	12	Chalk, Talk & Power point

Course Designed by: Dr. K. Muthupandi & Dr. V. Ramasamy Raja

	Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)									
<b>.</b> .			Sectio		Section		Section C	Section D		
Inte rnal	Cos	K Level	MC	-	Short An		Either or	Open		
11141			No. of. Questions	K – Level	No. of. Questions	K - Level	Choice	Choice		
CI	CO1	Up to K2	2	K1&K2	1	K1	2 (K2&K2)	1(K2)		
AI	CO2	Up to K3	2	K1&K2	2	K2	2 (K3&K3)	2(K2 & K3)		
CI	CO3	Up to K2	2	K1&K2	1	K2	2 (K2&K2)	1(K2)		
AII	<b>CO4</b>	Up to K4	2	K1&K2	2	K2	2 (K3&K3)	2(K3 &K4)		
		No. of Questions to be asked	4		3		4	3		
~	stion tern	No. of Questions to be answered	4		3		2	2		
CIA	I & II	Marks for each question	1		2		5	10		
		Total Marks for each section	4		6		10	20		

	Distribution of Marks with K Level CIA I & CIA II									
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %		
	K1	2	2	-	-	4	6.67			
	K2	2	4	10	20	36	60	67		
CIA	K3	-	-	10	10	20	33.33	33		
	K4	-	-	-	-	-	-	-		
-	Marks	4	6	20	30	60	100	100		
	K1	2	2	-	-	4	6.67			
	K2	2	4	10	10	26	43.33	50		
CIA	K3	-	-	10	10	20	33.33	33		
II	K4	-	-	-	10	10	16.67	17		
	Marks	4	6	20	30	60	100	100		

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

S	Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
			MCQs		Short Answers		Section C	Section D	
S. No	Cos	K - Level	No. of Question s	K – Level	No. of Question	K – Level	(Either / or Choice)	Section D (Open Choice)	
1	CO1	Up to K 2	2	K1, K2	1	K1	2 (K2&K2)	1(K2)	
2	CO2	Upto K 3	2	K1&K2	1	K1	2 (K3&K3)	1(K3)	
3	CO3	Up to K 3	2	K1&K2	1	K2	2 (K3&K3)	1(K3)	
4	CO4	Up to K 4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)	
5	CO5	Up to K 4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)	
No. of	Questions	s to be Asked	10		5		10	5	
No.of Questions to be answered		10		5		5	3		
Marks for each question		1		2		5	10		
Total Marks for each section			10		10		25	30	
	(Figures	in parenthesi	is denotes, q	uestions s	hould be asl	ked with	the given K	level)	

**Distribution of Marks with K Level** Section B Section A % of Section C **Section D** Consolidated K (Multiple (Short Total (Marks (Either/ or (Open Choice Marks without % Level Answer Choice) Choice) **Questions**) **Questions**) choice) K1 4 9 7.5 5 -33 K2 31 5 6 10 10 25.83 K3 50 40 20 50 60 --K4 -20 20 16.67 17 \_ \_ Marks 10 10 50 50 120 100 100

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.

Section .	A (Mul	tiple Choic	ce Questions)
Answer	All Qu	estions	(10x1=10 marks)
Q. No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section 1	B (Shoi	t Answers	)
Answer			(5x2=10 marks)
Q. No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section	C (Eith	er/Or Typ	e)
Answer	All Qu	estions	$(5 \times 5 = 25 \text{ marks})$
Q. No	CO	K Level	Questions
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Hig	her lev	el of perfo	rmance of the students is to be assessed by attempting higher
level of l		-	• • • • • •
Section 1	D (Ope	n Choice)	
	-	nree questi	ons (3x10=30 marks)
Q. No	CO	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
25		17.4	
23	CO4	K4	

# **Summative Examinations - Question Paper – Format**



# MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	PHYSICAL CHEMISTRY – II			
Course Code	21UCHC42	L	Р	С
Category	Core	4	-	4
Nature of course	:: EMPLOYABILITY 🖌 SKILL ORIENTED 🖌 ENTREPRE	NUR	SHIP	$\checkmark$
<b>Course Objectiv</b>	ves:			
• To recall	the basic thermodynamic laws and gibbs phase rule.			
• To remen	nber the symmetry operations, absorption, emission and vibrational s	spectr	a.	
To Comp	are the relationship between Kp and Kc, two component system and	grou	p table	s.
• To execu	te the group multiplication tables and phase rules.			
• To Deter	mine the Le-chatelier principle, distillation, Condon principle and po	oint gi	oups.	
	EMICAL EQUILIBRIUM		12	
The law of mass	s action- Thermodynamic treatment of law of mass action, Relatio	nship	betwe	een
Kp and Kc. App	lication of Law of mass action to Homogeneous system- Dissociati	on of	PCl <sub>5</sub> a	ind
N <sub>2</sub> O <sub>4</sub> . Application	on of Law of mass action to Heterogeneous system -Calcium	carbo	nate. I	Le-
Chatelier Princip	le-Formation of Ammonia – Haber's process.			
	ASE RULE		12	
Gibbs phase rule	e - Definition of terms involved - Derivation of Gibb's phase rule -	- appli	ication	of
phase rule to one	e component system -water system. Two component system-simple	eutect	ic-Pb-	Ag
system. Compou	nd formation-Congruent melting point-Zn-Mg system, Incongruent	melti	ng poi	nt-
Na <sub>2</sub> SO <sub>4</sub> -H <sub>2</sub> O sy	stem. Liquid system - partially miscible liquid system-phenol-	water	syste	em.
- ·	bile system-Alcohol-water system Completely immiscible system-b	enzei	ne –wa	ter
	of fractional distillation - steam distillation.			
	OUP THEORY		12	
	netry elements and symmetry operations - operations - production			
	perties of a group - classes and sub groups - groups multiplication			$2_{2v}$ .
	classification of molecules into point groups $-C_{2v}$ , $C_{3v}$ , $C_{2h}$ , $D_{2h}$ , $D_{6h}$ ,	and T		
	CTROSCOPY – I		12	
	bsorption and Emission spectra (Elementary ideas)-Electromagnetic			
	es in each region. Molecular spectra – Types of molecular spec			
1	nic molecules – Rigid rotator – selection rule-determination of mo			
-	h. UV Visible spectroscopy - Types of electronic transitions			
probability-Chro	1 1	tensity	/	ifts
	hypsochromic, hyperchromic and hypochromic shifts). Theory	01 6	electro	nic
<u> </u>	ranck and Condon principle - Applications of UV – Visible spectra.		10	
	CTROSCOPY – II		12	a <b>t</b> a #
-	tra – IR spectra of diatomic molecules – Hooke's law – simple hard			
	Force constant – selection rule – Vibrational energy level diagram etermination and calculation of zero-point energy. Modes of vibratio		-	
	$_2$ and H <sub>2</sub> O molecules. Raman spectra — Quantum theory of Raman			
	$\frac{1}{2}$ and $\frac{1}{2}$ of molecules. Kannah spectra — Quantum theory of Kannah spectra $M$ spectra — Quantum theory of Kannah spectra $M$ spectra — Quantum theory of Kannah spectra $M$			
	Raman spectra – Rotational-vibrational Raman spectra of a diatomic		-	u
	Total Lecture 1		1	Hrc
		iour		

#### **Books for Study:**

1. B.S. Puri, L.R. Sharma and S. Pathania, Principles of Physical Chemistry, 47<sup>th</sup> Edition, Shoban Lal Nagin Chand & Co., New Delhi, 2012.

2. A.S. Negi, S. C. Anand, A Text Book of Physical Chemistry. 2<sup>nd</sup> Edition, New Delhi: New Age International Publishers, 1998.

3. Y. R. Sharma, Elementary Organic spectroscopy - Principles and Chemical Applications, 3<sup>rd</sup> Edition, New Delhi, 2011.

### **Books for Reference:**

8. W. Gilbert, Castellan, Physical Chemistry, 4<sup>th</sup> Edition, Narosa Publishing House, New Delhi, 2004.

9. P.W. Atkins, Physical Chemistry, 7th Edition, Oxford University, Press, 2001.

10. S.K. Dogra, S. Dogra, Physical Chemistry through Problems, 4<sup>th</sup> Edition, New Age International Publishers, 1996.

#### Web Resources:

1. https://youtu.be/Ye1ZD3wEJXM

- 2. https://youtu.be/lrosz8N-9tA
- 3. https://youtu.be/Ioi6YiPGV4A
- 4. https://youtu.be/x56OIrdFJrw
- 5. https://youtu.be/i07KnMEGjS8
- 6. https://youtu.be/WukUvN721Ag
- 7. https://youtu.be/RRME2G7k4Tw

Course	Course Outcomes:						
On th	On the completion of the course the student will be able to						
<b>CO1:</b>	Outline the basic principles and applications of chemistry in detail.	[Up to K2]					
CO2:	Apply the concept of duality, spectroscopic techniques, symmetry aspects, theory of dilute solutions and phase equilibrium for chemical systems.	[Up to K3]					
CO3:	Analyze the concept of quantum theory, the physical properties of various equilibria and spectroscopic parameters.	[Up to K3]					
<b>CO4:</b>	Evaluate the practical utility of complicated problem-solving skill aspects.	[Up to K4]					
CO5:	Develop a strategy to acquire advanced knowledge in various analytical techniques.	[Up to K4]					

### CO & PO Mapping:

<b>Course Outcomes</b>	Programme Outcomes (POs)								
(COs)	<b>PO 1</b>	PO 2	<b>PO 3</b>	PO 4	<b>PO 5</b>	<b>PO 6</b>			
CO 1	3	1	2	3	1	2			
CO 2	1	3	1	1	2	3			
CO 3	2	2	3	2	3	3			
<b>CO 4</b>	3	1	2	2	1	2			
CO5	2	3	1	3	2	1			
Weightage	11	10	9	11	9	11			

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

# **LESSON PLAN**

UNIT	PHYSICAL CHEMISTRY – II	Hrs	Mode
Ι	<b>CHEMICAL EQUILIBRIUM</b> The law of mass action- Thermodynamic treatment of law of mass action, Relationship between Kp and Kc. Application of Law of mass action to Homogeneous system- Dissociation of PCl <sub>5</sub> and N <sub>2</sub> O <sub>4</sub> . Application of Law of mass action to Heterogeneous system -Calcium carbonate. Le-Chatelier Principle-Formation of Ammonia – Haber's process.	12	Chalk & Talk, Power Point
II	<b>PHASE RULE</b> Gibbs phase rule – Definition of terms involved – Derivation of Gibb's phase rule – application of phase rule to one component system -water system. Two component system-simple eutectic – Pb -Ag system. Compound formation-Congruent melting point-Zn-Mg system, Incongruent melting point-Na <sub>2</sub> SO <sub>4</sub> -H <sub>2</sub> O system. Liquid system – partially miscible liquid system-phenol-water system. Completely miscible system-Alcohol-water system Completely immiscible system-benzene –water system – Theory of fractional distillation - steam distillation.	12	Chalk & Talk, Power Point
III	<b>GROUP THEORY</b> Molecular symmetry elements and symmetry operations – operations – production of symmetry operations – properties of a group – classes and sub groups – groups multiplication table – $C_{2v}$ . Point groups – Classification of molecules into point groups – $C_{2v}$ , $C_{3v}$ , $C_{2h}$ , $D_{2h}$ , $D_{6h}$ , and $T_d$ .	12	Chalk & Talk, Power Point
IV	<b>SPECTROSCOPY – I</b> Introduction – Absorption and Emission spectra (Elementary ideas)- Electromagnetic radiation with relative intensities in each region. Molecular spectra – Types of molecular spectra. Rotational spectra of diatomic molecules – Rigid rotator – selection rule-determination of moment of inertia and bond length. UV Visible spectroscopy - Types of electronic transitions – Transition Probability - Chromophore and Auxochrome concepts – Absorption and Intensity shifts (Bathochromic, hypsochromic, hyperchromic and hypochromic shifts). Theory of electronic spectroscopyFranck and Condon principle - Applications of UV – Visible spectra.	12	Chalk & Talk, Power Point
V	<b>SPECTROSCOPY – II</b> Vibrational spectra – IR spectra of diatomic molecules – Hooke's law – simple harmonic oscillator (no derivation) force constant – selection rule – Vibrational energy level diagram – Applications- force constant determination and calculation of zero-point energy. Modes of vibration in polyatomic molecules – CO <sub>2</sub> and H <sub>2</sub> O molecules. Raman spectra — Quantum theory of Raman effect– Stokes and Anti - Stokes lines – experimental study – Comparison between IR and Raman spectra – Applications of Raman spectra – Rotational-vibrational Raman spectra of a diatomic molecule.	12	Chalk & Talk, Power Point

Course Designed by: Dr. R. Satheesh & Dr. K. Muthupandi

	Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)									
			Sectio	on A	Sectior	n B	Section C	Section D		
Inte	Cos	K Level	MC	Qs	Short Ans	swers	Either or	Open D		
rnal	005		No. of. Questions	K – Level	No. of. Questions	K - Level	Choice	Choice		
CI	CO1	Up to K2	2	K1&K2	1	K1	2 (K2&K2)	1(K2)		
AI	CO2	Up to K3	2	K1&K2	2	K2	2 (K3&K3)	2(K2 & K3)		
CI	CO3	Up to K2	2	K1&K2	1	K2	2 (K2&K2)	1(K2)		
AII	<b>CO4</b>	Up to K4	2	K1&K2	2	K2	2 (K3&K3)	2(K3 &K4)		
		No. of Questions to be asked	4		3		4	3		
-	stion tern	No. of Questions to be answered	4		3		2	2		
CIA I & II		Marks for each question	1		2		5	10		
		Total Marks for each section	4		6		10	20		

	Distribution of Marks with K Level CIA I & CIA II										
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %			
	K1	2	2	-	-	4	6.67	67			
	K2	2	4	10	20	36	60	07			
CIA	K3	-	-	10	10	20	33.33	33			
I	K4	-	-	-	-	-	-	-			
-	Marks	4	6	20	30	60	100	100			
	K1	2	2	-	-	4	6.67	50			
	K2	2	4	10	10	26	43.33	50			
CIA	K3	-	-	10	10	20	33.33	33			
II	K4	-	-	-	10	10	16.67	17			
	Marks	4	6	20	30	60	100	100			

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

S	Summativ	ve Examina	tion – Blue P		-	ping – K	Level with (	Course
			MC	Outcomes Qs	(COs) Short An	swers	Section C	Section D
S. No	COs	K - Level	No. of Questions	K – Level	No. of Question	K – Level	(Either / or Choice)	(Open Choice)
1	CO1	Up to K2	2	K1,K2	1	K1	2 (K2&K2)	1(K2)
2	CO2	Up to K3	2	K1&K2	1	K1	2 (K3&K3)	1(K3)
3	CO3	Up to K3	2	K1&K2	1	K2	2 (K3&K3)	1(K3)
4	CO4	Up to K4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)
5	CO5	Up to K4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)
No.	of Questie Askee		10		5		10	5
No.of Questions to be answered		10		5		5	3	
Marl	Marks for each question		1		2		5	10
Total N	Aarks for e	each section	10		10		25	30
	(Figures	in parenthe	esis denotes, o	questions s	hould be as	ked with	the given K	level)

		Dis	stribution of	Marks with	n K Leve	1		
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D ( Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %	
K1	5	4	-	-	9	7.5	33	
K2	5	6	10	10	31	25.83		
K3	-	-	40	20	60	50	50	
K4	-	-	-	20	20	16.67	17	
Marks	10	10	50	50	120	100	100	
	NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Answer A	-	iple Choice stions	(10x1=10 marks)
Q. No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section E	(Short	Answers)	
Answer A		,	(5x2=10 marks)
Q. No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section (	C (Eithe	r/Or Type	)
Answer A	All Que	stions	(5  x 5 = 25  marks)
Q. No	CO	K Level	Questions
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
		l of perfor	mance of the students is to be assessed by attempting higher
level of K		~	
Section I	-		
	1	ree questio	
Q. No	CO	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
	001	17.4	
23 24 25	CO4 CO5	K4 K4	

# **Summative Examinations - Question Paper – Format**



# MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	Major	Chemistry Practical	– II	(Volumetric Analysis )						
Course Code	21UCI	HCP2				L	Р	С		
Category	Core I	Practical				-	2	2		
Nature of cours	se:	EMPLOYABILITY	~	SKILL ORIENTED	ENTRE	PREN	URS	HIP		
Course Objectives:										
<ul> <li>To recollect the theory of laboratory safety measures and strength of solutions.</li> <li>To remember the estimation of acidimetry and alkalimetry and redox titrations.</li> <li>To compare the concept of titration based on redox and hardness of water.</li> <li>To execute the concept of permanganometry and dichrometry.</li> <li>To determine the estimation of volumetric analysis.</li> </ul>										
		Volumetric Analysis a		-	~			Hrs		
So	olutions -	Volumetric Analysis and List of Experiments Volumetric Analysis and Laboratory Safety Measures: Strength of 6 - Normality, Molarity, Molality. Handling of apparatus, glasswares als – Safety aspects								
II Li	st of Exp	periments						24		
I. Acidimetry a	und Alkal	limetry								
1. Estimation of	of Na <sub>2</sub> CO	3								
2. Estimation of	of NaOH	/ KOH								
3. Estimation of	of oxalic a	acid.								
II. Redox Titra	tions									
a. Permangano	metry									
1. Estimati	on of ferr	rous ion								
2. Estimati	on of oxa	alic acid								
3. Estimati	on of cale	cium (direct method)								
b. Dichrometry	1									
1. Estimati	on of ferr	rous ion								
2. Estimati	on of ferr	ric ion using external ir	ndica	tor						
V. EDTA Titra	tion									
1. Estimat	1. Estimation of Hardness of water using EDTA.									

### **Distribution of marks**

#### Max marks: 100 Internal : 40 marks

#### External : 60 marks

Laboratory Performance	:	30 marks	Vivo voce	:	5 marks
Observation note book	:	10 marks	Record note book	:	10 marks
			Procedure writing	:	15 marks
			Volumetric estimation	:	30 marks
Total	••	40 marks	Total	:	60 marks

For Volumetric Estimation if the student have

Less than 2% Error	-	30 marks
2-3% Error	-	25 marks
3-4% Error	-	20 marks
3-5% Error	-	15 marks
Greater than 5%	-	10 marks

#### TOTAL HOURS 30 Hrs

#### **Books for Study:**

1. Vogel, Text book of Inorganic quantitative analysis, Longman Sc & Tech, 2008.

#### **Books for References:**

1. Jeyavathana Samuel, Chemistry Practical Book, G.G.Printers, Chennai, 2012.

2. Vickie. M.Williamson, M.Larry Peck, Lab manual for General Chemistry, Cengage Learning India

Private Limited, New Delhi, 2009.

3. Dr. V. V. Ramanujam, Inorganic Semimicro Qualitative Analysis, National Publishing Company,

Chennai, 3rd edition, 1974.

#### Web Resources:

1. https://youtu.be/xQDQNghs5dc

- 2. https://youtu.be/AdbK86BnXN8
- 3. https://youtu.be/dmnElKapQ00

Course	Course Outcomes:					
On the completion of the course the student will be able to						
<b>CO1:</b>	Discuss the theory of safety measures in chemistry laboratory.	[Up to K2]				
<b>CO2:</b>	<b>D2:</b> Understand the qualitative and quantitative analysis in practical chemistry.					
<b>CO3:</b>	Apply the theory on quantitative titration methods.	[Up to K3]				
<b>CO4:</b>	Analyze the titrated values in tabular format.	[Up to K4]				
CO5:	Construct the estimated value of the given compounds.	[Up to K4]				

# CO & PO Mapping:

Course Outcomes	Programme Outcomes (POs)								
(COs)	<b>PO 1</b>	PO 2	PO 3	PO 4	PO 5	PO 6			
CO 1	2	1	2	3	3	2			
CO 2	1	3	1	1	2	3			
CO 3	2	2	3	2	3	3			
<b>CO 4</b>	3	1	2	2	1	2			
CO5	2	3	1	3	2	1			
Weightage	10	10	9	11	10	11			

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

# LESSON PLAN

UNIT	Theory of Volumetric Analysis and Laboratory Safety Measures	Hrs	Mode
Ι	Theory of Volumetric Analysis and Laboratory Safety Measures: Strength of Solutions – Normality, Molarity, Molality. Handling of apparatus, glasswares and chemicals – Safety aspects	6	
	List of Experiments		
П	<ul> <li>I. Acidimetry and Alkalimetry</li> <li>1. Estimation of Na<sub>2</sub>CO<sub>3</sub></li> <li>2. Estimation of NaOH / KOH</li> <li>3. Estimation of oxalic acid.</li> <li>II. Redox Titrations <ul> <li>a. Permanganometry</li> <li>1. Estimation of ferrous ion</li> <li>2. Estimation of oxalic acid</li> <li>3. Estimation of calcium (direct method)</li> </ul> </li> <li>b. Dichrometry <ul> <li>1. Estimation of ferrous ion</li> <li>2. Estimation of ferrous ion</li> <li>3. Estimation of ferrous ion</li> <li>4. Estimation of ferric ion using external indicator</li> </ul> </li> <li>V. EDTA Titration <ul> <li>1. Estimation of Hardness of water using EDTA.</li> </ul> </li> </ul>	24	Practical

Course Designed by: Dr. Ramasamy Raja & Dr. K. Muthupandi



# MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Na	me Al	lied Mathematics – II (	(B.Sc., Chemistry )					
Course Co	de 21	21UMCA43						
Category	Al	lied			6	-	4	
Nature of	Course:	EMPLOYBILITY	SKILL ORIENTED	ENTREPR	ENU	RSHI	P	
<ul> <li>To a</li> <li>To a</li> <li>Prob</li> </ul>	understan apply the develop t blem.	nd mathematical models ese techniques constructive	used in Operations Resear vely to make effective bus natical formulation and So problems.	iness decisions		ımmir	ıg	
<ul> <li>To develop mathematical skills to analyze and solve network models.</li> <li>Unit: I Mathematical Formulation of a LPP: General form of a LPP – Summation notation – Matrix form – Canonical form – Standard form - Solution of LPP 2</li> <li>by Graphical Method - The Simplex Method</li> </ul>								
Unit: II	Transportation Problems: Mathematical Formulation of TP - Initial Basic Feasible Solution – North west corner rule- Least cost method- Vogels Approximation method - Optimum solution of TP (MODI Method).							
Unit: III	Assignment Problems: Mathematical formulation of Assignment Problems – Solution to Assignment Problems							
Unit: IV	Games and Strategies: Introduction – Two person zero sum game – The Maximin – Minimax Principle - Saddle point – Games without saddle point – Graphic Solution of 2 x n and m x 2 Games – Dominance Property							
Unit: V		k Flow Problems – Min	imal Spanning Tree Prob		t Rou	te 18	3 hrs	
				Fotal Lecture	Hou	<b>s</b> 90	) hrs	
Books for Study:         Text Book 1: Dr. S. Arumugam and A.Thangapandi Isaac, Topics in Operations Research Linear Programming, New Gamma Publishers Pvt. Ltd, Palayamkottai, Tirunelveli, March 2015.         Text Book 2: Kanti Swarup, P.K. Gupta, Man Mohan, Operations Research, 17 <sup>th</sup> Edition, Sultan Chand and Sons, New Delhi, 2014.								
Unit I : Unit II : Unit III : Unit IV : Unit V : Books for	Text Text Text Text	±	ction: 4.1 ctions: 5.1 & 5.2					
Nev 2. Sha	v Delhi, rma J.K.	2010.	rch Algorithms and App : Problems and Solutions					

Web I	Resources:			
1. <u>htt</u>	os://nptel.ac.in/courses/111/107/111107128/			
2. <u>htt</u>	<u>ps://onlinecourses.swayam2.ac.in/cec20_ma10/preview</u>			
Course Outcomes:				
After	the completion of the course, Students will be able to			
CO1:	Develop the notions about Mathematical formulation and Solving Linear Programming Problem.	K4		
CO2:	Acquire the knowledge about the view of transportation and assignment problems.	К3		
CO3:	Identify and develop the real life problems into network problems.	K3		
<b>CO4:</b>	Distinguish a game situation from a pure individuals decision problems	K4		
CO5:	Understand the Mathematical tools that are needed to solve various optimization problems.	К3		

### CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	3	2	2	3	2
CO 2	2	3	3	2	2	2
CO 3	2	2	2	2	2	3
CO 4	2	3	2	2	2	2
CO 5	2	2	3	2	2	3

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

#### LESSON PLAN

UNIT	COURSE NAME	Hrs	Pedagogy
I	Mathematical Formulation of a LPP: General form of a LPP (2 hrs) – Summation notation – Matrix form – Canonical form (4 hrs) – Standard form (2 hrs) - Solution of LPP by Graphical Method. (7 hrs) - The Simplex Method (8 hrs)	23	Chalk & Talk , LCD
II	Transportation Problems: Mathematical Formulation of TP (4 hrs)- Initial Basic Feasible Solution (all methods) (7 hrs)- Optimum solution of TP (MODI Method). (7 hrs)	18	Chalk & Talk , PPT
III	Assignment Problems : Mathematical formulation of Assignment Problems(3 hrs) – Solution to Assignment Problems. (7 hrs) – Travelling Salesman Problem (5 hrs)	15	Chalk & Talk , Seminar
IV	Games and Strategies: Introduction – Two person zero sum game (1 hr) – The Maximin – Minimax Principle(3 hrs) - Saddle point (2 hrs) – Games without saddle point (3 hrs) – Graphic Solution of 2 x n and m x 2 Games (3 hrs) – Dominance Property (4 hrs)	16	Chalk & Talk , Group Discussion
V	Network Flow Problems(5 hrs) – Minimal Spanning Tree Problem (6 hrs)– Shortest Route Problems(7 hrs)	18	Chalk & Talk , PPT

Course Designed By: Dr. S. Suriyakala and Dr. M. Sasikala

	Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)										
Into		K Level	Section A MCQs		Secti Short A	on B	Section C	Section			
Inte rnal	Cos		No. of. Questio ns	K - Level	No. of. Questions	K - Level	Either or Choice	D Open Choice			
CI	<b>CO1</b>	K4	2	K1 & K2	1	K2	2 (K3 & K3)	1 (K4)			
AI	CO2	K3	2	K2 & K2	2	K2 & K2	2 (K3 & K3)	2 (K3)			
CI	<b>CO3</b>	K3	2	K1& K2	1	K2	2 (K3 & K3)	2 (K3)			
AII	<b>CO4</b>	K4	2	K2 & K2	2	K2 & K2	2 (K4 & K4)	1 (K4)			
		No. of Questions to be asked	4		3		4	3			
-	estion tern	No. of Questions to be answered	4		3		2	2			
CIA I & II		Marks for each question	1		2		5	10			
		Total Marks for each section	4		6		10	20			

	Distribution of Marks with K Level CIA I & CIA II									
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %		
	K1	1	-	-	-	1	1.67	16.67		
	K2	3	6	-	-	9	15	10.07		
CIA	K3	-	-	20	20	40	66.67	66.67		
I	K4	-	-	-	10	10	1.67	1.67		
•	Marks	4	6	20	30	60	100	100		
	K1	1	-	-	-	1	1.67	16.67		
	K2	3	6	-	-	9	15	10.07		
CIA	K3	-	-	10	20	30	50	50		
II	K4	-	-	10	10	20	33.33	33.33		
	Marks	4	6	20	30	60	100	100		

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

S	Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)									
		V	MCQs		· /	Short Answers		Section D		
S.No	COs	K - Level	No. of	K –	No. of	K –	(Either / or	(Open		
		Level	Questions	Level	Question	Level	Choice)	Choice)		
1	CO1	K4	2	K1&K2	1	K1	2 (K3 &K3)	1 (K4)		
2	CO2	K3	2	K1&K2	1	K1	2 (K3 &K3)	1 (K3)		
3	CO3	K3	2	K1&K2	1	K2	2 (K3 &K3)	1 (K3)		
4	CO4	K4	2	K1&K2	1	K2	2 (K4 &K4)	1 (K4)		
5	CO5	K3	2	K1&K2	1	K2	2 (K3 &K3)	1 (K3)		
No. o	of Questic	ons to be	10		5		10	5		
	Asked	ļ	10		3		10	3		
No. o	of Questic	ons to be	10		5		5	3		
	answered		10		5		5	5		
Mark	Marks for each question		1		2		5	10		
Tota	Total Marks for each		10		10		25	30		
section			10		10		25	30		
	(Figures	in parenth	esis denotes,	questions	should be a	sked wit	th the given K	level)		

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Marks with K Level										
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D ( Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %			
K1	5	4	-	-	9	7.5	16.67			
K2	5	6	-	-	11	9.17	10.07			
K3	-	-	40	30	70	58.33	58.33			
K4	-	-	10	20	30	25	25			
Marks	10	10	50	50	120	100	100			
	NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.									

	-	-	ice Questions)
		uestions	(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
		ort Answei	·
	·	uestions	(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
		her/Or Ty	
	-	uestions	(5  x  5 = 25  marks)
Q.No	CO	K Level	Questions
<u>16) a</u>	CO1	K3	
16) b	CO1	K3	
<u>17) a</u>	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K3	
20) b	CO5	K3	
	-	-	ormance of the students is to be assessed by attempting higher
level of			
	•	en Choice	
	•	Three ques K Level	
<b>Q.No</b> 21	<b>CO</b> CO1	K Level K4	Questions
$\frac{22}{23}$	CO2	K3 K3	
23 24	CO3 CO4	K3 K4	
24	C04 C05	K4 K3	
23	005	КJ	

# **Summative Examinations - Question Paper – Format**



### MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	APPLIED MICROB	IO	LOGY					
Course Code	21UMBA42							С
Category	ALLIED MICROBIOLOGY - II							4
Nature of course	ENTREPREN	URSI	HIP	$\checkmark$				
Course Objectiv								
	le information regardin							
	he Knowledge about m			nme	nts			
	to isolate industrially in	-	-					
	stand the key concepts							
	e various basic concept		f medical microbiolog	gy			10	
	cultural microbiology						18	
	properties - Soil micro							
	en and phosphorus.					re: E	Bacte	rial
	izobium, Bacterial inse		eides - Bacillus thurin	gien	sis.		10	
	ronmental microbiolo	<u> </u>					18	
	Microbial assessment							
1 2	- sewage water treati	mer	t-primary, secondary	/ and	d tertiary - Mi	crobe	s in	the
production of bio	0						10	
	strial microbiology		<b>D</b> ! ( <b>D</b>				18	
	ortant microorganism							
	ications -microbial pro	odu	ction of Industrial pr	odu	cts - Ethanol, I	enici	llin a	and
vitamin B12.							10	
Unit: IV Food			· · · · · 1.1. · · · 1 · · · · · · · · ·	C.			18	
	organisms in food (bac							
	fluence microbial gr					insic	Tacto	ors.
	as food - SCP, edible n	nusi	inouns. Froundies an	u in	en benefits.		18	
	ical microbiology ora of the human body		ala of normal flora	ha	national and ha		-	ota
	diseases -Typhoid, He					IIIIIUI	CIIC	cis.
	ruiseases - rypholu, rie	pai	nis, Asperginosis & I		tal Lecture Ho	INC	90 H	ma
				10	lai Lecture 110	uis	90 II	15
Text Books:								
	U. Biotechnology, 12 <sup>th</sup>							
	man K AND Wood D,	Pro	escott's Microbiolog	<b>y.</b> 11	1 <sup>th</sup> Edition. McC	Graw	Hill	
education, 201								
-	d Crueger A. Biotechno	-		lust	rial Microbiolo	<b>9 gy</b> , 2	nd	
	na Publishing Company	, N	ew Delhi, 2000.					
<b>Books For Refe</b>								
-	el. Environmental asp	pect	s of Microbiology, 1	<sup>st</sup> ed	ition, Bright Su	n		
publications, C	Chennai, 1999.							
2. Mitchell R. In	troduction to Environ	me	ntal Microbiology, F	Print	ice Hall. Inc., E	nglew	vood	
1	rsey, 1974.							

3. Patel A.H. Industrial microbiology, 2<sup>nd</sup> edition, Mac Millan India Ltd., New Delhi, 2005.

- 4. Sivashankar B. Food Processing and Preservation, Eastern Economy edition, PHI Learning Pvt. Ltd., New Delhi, 2009.
- 5. SubbaRao N.S. **Soil Microbiology**, 4<sup>th</sup> edition, Oxford and BH Publishing Co. Pvt. Ltd., New Delhi, 2004.

, -							
Web Res	ources:						
1. <u>http://w</u>	www.swayam.gov.in/						
2.http://w	www.nptel.ac.in/						
3. <u>https://</u>	www.sciencedirect.com/food-microbiology						
COURSE	OUTCOME	K Level					
On succe	On successful completion of the course, the learners will be able to						
CO1:	Recognize the Beneficial microorganism in agriculture	Up to K2					
<b>CO2:</b>	Experiment with the role of microbes present in air and water.	Up to K3					
CO3:	Analyze and compare the important microorganisms in food	Up to K4					
CO4:	Examine the Industrially important microorganisms and its products.	Up to K4					
CO5:	Summarize the importance of microbes in human diseases	Up to K3					

#### CO & PO Mapping:

COs	PO 1	PO 2	<b>PO 3</b>	PO 4	PO 5	<b>PO 6</b>
CO 1	3	3	3	3	2	2
CO 2	3	3	3	3	3	2
CO 3	3	3	3	3	3	1
CO 4	3	3	3	3	3	2
CO5	3	3	3	3	3	2

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

Unit	Course Name	Hrs	Mode
I	Agricultural microbiology - Soil - general properties - Soil microflora and its importance. Microbial transformation of Carbon, Nitrogen and phosphorus. Beneficial microorganism in agriculture: Bacterial biofertilizer – Rhizobium, Bacterial insecticides - <i>Bacillus</i> <i>thuringiensis</i>	18	Chalk and talk, PPT
ш	<b>Environmental microbiology</b> - Microbes in air - Microbial assessment of air quality - Microbes in water - Microbial assessment of water quality - sewage water treatment-primary, secondary and tertiary - Microbes in the production of biogas	18	Chalk and talk, PPT
ш	<b>Industrial microbiology-</b> Industrially important microorganisms- Bioreactors / Fermenter-components of typical fermenter - applications -microbial production of Industrial products–Ethanol, Penicillin and vitamin B12	18	Chalk and talk, PPT
IV	<b>Food microbiology</b> -Important microorganisms in food (Bacteria, Molds and Yeasts) Sources of contamination of food. Factors that influence microbial growth in food - Intrinsic factors -extrinsic factors. Microorganisms as food - SCP, edible mushrooms. Probiotics and their benefits.	18	Chalk and talk, PPT
v	<b>Medical microbiology</b> - Normal micro flora of the human body- role of normal flora – beneficial and harmful effect. Important human diseases -Typhoid, Hepatitis, Aspergillosis & Malaria.	18	Chalk and talk, PPT, Assignment

Course Designed by: 1. Dr. S. Subramani, Assistant Professor. 2. Ms. C. Thenmozhi, Assistant Professor.

Volume IV – Science Syllabus / 2022 - 2023 Learning Outcome Based Education & Assessment (LOBE) **Formative Examination - Blue Print** Articulation Mapping – K Levels with Course Outcomes (COs) Section B Section A Section C Section D **MCQs Short Answers** Internal Cos **K** Level Either or Open No. of. No. of. К-Choice Choice K - Level Questions Questions Level CO1 Up to K2 K1& K2 **K2** 1(K2) 2 1 2(K2&K2) CIA I **CO2** 2 2 K2 Up to K3 K1 & K2 2(K2&K3) 2(K3&K3) Up to K4 **CO3** 2 K1 & K2 1 2(K2&K2) 1(K4) K2 CIA II **CO4** Up to K4 2 K1 & K2 2 K2 2(K3&K3) 2(K3&K4) No. of Questions to 4 3 3 4 be asked No. of Ouestions to 4 3 2 2 Question be answered Pattern CIA I & II Marks for 5 1 2 10 each question **Total Marks** for each 4 6 10 20 section

	Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %	
	K1	2	-	-	-	2	3.33	67	
	K2	2	6	10	20	38	63.34	07	
CIA	K3	-	-	10	10	20	33.33	33	
I	K4	-	-	-	-	-	-	-	
-	Marks	4	6	20	30	60	100	100	
	K1	2	-	-	-	2	3.33	24	
CIA	K2	2	6	10	-	18	30	34	
CIA II	K3	-	-	10	10	20	33.33	33	
11	K4	-	-	-	20	20	33.33	33	
	Marks	4	6	20	30	60	100	100	

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

S	Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S. No	COs	K - Level	MC No. of Questions	,	Short An No. of Question	swers K – Level	Section C (Either / or Choice)	Section D (Open Choice)	
1	CO1	Up to K2	2	K1&K2	1	K2	2(K2&K2)	1(K2)	
2	CO2	Up to K3	2	K1&K2	1	K2	2(K3&K3)	1(K3)	
3	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)	
4	CO4	Up to K4	2	K1&K2	1	K2	2(K4&K4)	1(K4)	
5	CO5	Up to K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)	
No.	of Questi Aske	ons to be d	10		5		10	5	
No.	No. of Questions to be answered		10		5		5	3	
Mark	s for eacl	n question	1		2		5	10	
Total Marks for each section		10		10		25	30		
	(Figures in parenthesis denotes, questions should be asked with the given K level)								

	Distribution of Marks with K Level									
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %			
K1	5	-	-	-	5	4.16	42			
K2	5	10	20	10	45	37.5	42			
K3	-	-	20	20	40	33.33	33			
K4	-	-	10	20	30	25	25			
Marks	10	10	50	50	120	100	100			

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.

Answe	r All Q	uestions	(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section	B (Sho	ort Answer	rs)
Answe	r <u>All</u> Qu	uestions	(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section	C (Eit	her/Or Ty	pe)
Answe	r All Q	uestions	(5  x  5 = 25  marks)
Q.No	CO	K Level	Questions
16) a	CO1	K1	
16) b	CO1	K1	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K2	
20) b	CO5	K2	
			ormance of the students is to be assessed by attempting higher
level of			
		en Choice)	
		Three ques	
Q. No	CO	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K4	
25	CO5	K3	

## **Summative Examinations - Question Paper – Format**



### MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	WATER TREATMENT										
Course Code	21UCHN41			L	Р	С					
Category	Non Major Elective			2	-	2					
Nature of course	EMPLOYABILITY S	SKILL ORIENTED	ENTREPREN	URS	HIP	$\checkmark$					
<b>Course Objecti</b>	Course Objectives:										
• To Recall th	e hardness of water, boiling, b	oiler feed water and des	alination.								
	er the estimation of hardness of			hniqu	ies.						
To Compare	the ultraviolet treatment, inter	rnal and external conditi	oning and osmo	osis.							
-	he break point chlorination, d		-								
	e the water quality standards,	• 1		cess.							
	RDNESS OF WATER	1 0, 0			06						
	pes of impurities present in w	vater - Hardness of water	r - Estimation of	f ha	ardne						
	d - Domestic water treatment										
-	<b>CRILIZATION METHODS</b>	1 2			06						
Sterilization - Be	oiling - Ozone gas treatment -	- Ultraviolet treatment -	Chlorination – I	Break	p	oint					
chlorination.	6 6				1						
Unit: III BO	LER TROUBLES				06						
Boiler feed way	er - Scale and sludge form	nation - Comparison of	f sludge and s	cale	- Bo	iler					
	oval of carbon dioxide and di										
	rements of boiler feed water	20				U					
	TER CONDITIONING				06						
	ning - Colloidal conditioning	g - Phosphate condition	ning - Calgon d	condit	ionin	ıg -					
	tioning. External conditioning										
	vantages and disadvantages of										
_	external conditioning.	0 1									
	SALINATION				06						
Desalination - 1	Reverse osmosis – Electrodi	ialysis – Thermal disti	llation – Solar	disti	llatio	n –					
Membrane Tech		2									
		Tot	tal Lecture Ho	irs	30 H	rs					
Books for Study	7:										
	Cheremisinoff, Handbook of w		eatment technol	ogies	, Bos	ston					
	and Johannesburg Melbourne	e, New Delhi, 2002									
<b>Books for Refer</b>											
	Industrial Chemistry, Goel pu	-									
2. R.V.Shreve, Industrial Chemical Process, Tata McGraw Hill publishing company, 2005,											
Mumbai.											
Web Resources											
	1. https://youtu.be/ByCMhI2yi2M										
	e/XKNDXrlBnLM										
	<u>e/aGo0GUAAeuA</u> <u>e/zXKHjS_Q9wE</u>										
Course Outcom				K	Lev	el					
					LCV	<b>U</b> I					

Academic Council Meeting Held On 17.05.2022

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On th	On the completion of the course the student will be able to						
<b>CO1:</b>	Recall the general characteristics of hardness of water and its estimation.	[Up to K2]					
<b>CO2:</b>	Discuss the sterilization methods and comparison of sludge and scale.	[Up to K3]					
<b>CO3:</b>	Understand the concepts of internal conditioning and external conditioning.	[Up to K3]					
<b>CO4:</b>	Examine the boiler corrosion and demineralization processes.	[Up to K4]					
CO5:	Apply the domestic water treatment and ultraviolet treatment on water analysis.	[Up to K4]					

## CO & PO Mapping:

<b>Course Outcomes</b>	Programme Outcomes (POs)									
(COs)	<b>PO 1</b>	PO 2	PO 3	PO 4	PO 5	<b>PO 6</b>				
CO 1	3	1	2	3	1	2				
CO 2	1	3	1	1	2	3				
CO 3	2	2	3	2	3	3				
CO 4	3	1	2	2	1	2				
CO5	1	3	2	3	2	1				
Weightage	10	10	10	11	9	11				

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

#### LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	HARDNESS OF WATER Introduction - Types of impurities present in water - Hardness of water - Estimation of hardness by EDTA method - Domestic water treatment - water quality standards.	12	Chalk, Talk & Power point
II	<b>STERILIZATION METHODS</b> Sterilization - Boiling - Ozone gas treatment - Ultraviolet treatment - Chlorination – Break point chlorination.	12	Chalk, Talk & Power point
III	<b>BOILER TROUBLES</b> Boiler feed water - Scale and sludge formation - Comparison of sludge and scale - Boiler corrosion - Removal of carbon dioxide and dissolved oxygen – Caustic embrittlement - Priming - Foaming - Requirements of boiler feed water.	12	Chalk, Talk & Power point
IV	WATER CONDITIONING Internal conditioning - Colloidal conditioning - Phosphate conditioning - Calgon conditioning - Carbonate conditioning. External conditioning - Demineralization process - Regeneration of ion exchangers - Advantages and disadvantages of ion exchange process - Difference between internal conditioning and external conditioning.	12	Chalk, Talk & Power point
V	<b>DESALINATION</b> Desalination - Reverse osmosis – Electrodialysis – Thermal distillation – Solar distillation – Membrane Technologies.	12	Chalk, Talk & Power point

Course Designed by: Dr. A. J. Sunija & Dr. K. Muthupandi





### MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	ORGANIC CHEMISTRY – III			
Course Code	21UCHC51	L	Р	С
Category	Core	6	-	6
Nature of cours	e: EMPLOYABILITY 🗸 SKILL ORIENTED ENTREPRENT	JRSH	IIP	$\checkmark$
Course Objecti	ves:			
	e characteristics of alicyclic compounds, conformational analysis and	Cive	tone	and
Muscone.				
	er the free radicals and molecular rearrangements.			
	the heterocyclic compounds, alkaloids and terpenes. the structure and classifications of proteins and nucleic acids.			
-	the structure and classifications of proteins and nucleic acids.			
	ICYCLIC COMPOUNDS, CONFORMATIONAL ANALYSIS,		18	
	/ETONE AND MUSCONE		10	,
Alicyclic comp	ounds: General methods of preparation and properties of cyc	lopar	affin	<b>s</b> –
•	theory and its modification. Conformational Analysis: Different			
<u> </u>	and conformation- Fisher- Saw horse and Newman Projection			
	l analysis of ethane, n-butane 1,2- dichloroethane, cyclo			
	ed cyclohexane. Civetone and Muscone any one method of	syn	thesi	<b>s</b> –
	(no Structural elucidation)		10	
	DLECULAR REARRANGEMENT AND FREE RADICALS	D	18	
	rrangements: Detailed mechanisms of the following: pinacol - tius, benzil-benzilic acid, claisen, benzidine, Fries and Wagn			· · · ·
	s. Free radicals: Definition – preparation and reactions of she			
	radicals – Reaction and Mechanism of Sand Meyer reaction			
<u> </u>	Hofmann-Loeffler reaction – chain reactions – photochemical			<u> </u>
	ns isomerization.			
Unit: III HE	TEROCYCLIC COMPOUNDS		18	5
	ompounds: Introduction and definition, Preparation and basic			
	ine, quinoline and isoquinoline. Alkaloids: Definition – occ			
	alkaloids – general methods for determining the structure of			
	f alkaloids – structural elucidation – coniine, piperine and nicoti			
	lassification, occurrence and isolation – general properties – iso	-		le –
	Is of determining structure. Properties, Structure of citral and ter	pineo	1	
	OTEINS AND NUCLEIC ACIDS	411	18	
	nition – Classification of Amino Acids – Zwitter ion – Pep			
	of proteins – colour reactions of proteins – primary, secondary, ucture of proteins (an elementary idea only). Nucleic acids:		•	
•	of Nucleic acids – nucleosides – nucleotides – difference between			
	s – RNA and DNA general structure – Basic structure of DNA			
	NA and RNA – RNA types.	anu	INI (	
	INCIPLES AND APPLICATIONS OF SPECTROSCOPY		18	;
	ion– Type of electronic transition – absorption law bathochron	nic s		

hypso chromic shift – hyperchromic and hypochromic effect – applications of UV to organic compounds – Woodward - Fieser calculation of  $\lambda$ max. IR: Introduction – Instrumentation–different regions of IR, finger print regions – fundamental, overtone, Hot bands and combination bands – applications of IR to organic compounds – effect of hydrogen bonding – NH2. NMR: Introduction – Conditions for NMR active – chemical shift – shielding and deshielding effects - factors influencing chemical shift – solvent used (TMS) – splitting of signals –NMR spectra of simple ethanol and anisole.

#### Total Lecture Hours90 Hrs

#### **Books for Study:**

CO5:

6. Soni, P.L and Chawla. H.M, A Textbook of Organic Chemistry, S. Chand & Co., 2007, New Delhi.

#### **Books for References:**

9. Jain. M.K and Sharma. S.C, Modern Organic Chemistry, 4th Edition, Vishal Publishing CO., 2016. Jalandhar. 10. Bahl. B.S and ArunBahl, A Textbook of Organic Chemistry, S. Chand & Co., 2012, New Delhi. Jerry March, Advanced Organic Chemistry, 4th Edition, John Wiley & Sons, 1992, New 11. York. Pine, S.H, Organic Chemistry, 5<sup>th</sup> Edition, McGraw Hill International Edition, Chemistry 12. Series, 1987, New York. 13. Sehan N. Ege, Organic Chemistry – Structure and Reactivity, 3rd Edition, A.I.T.B.S., 1998, New Delhi. 14. Morrison. R.T and Boyd. R.N, Organic Chemistry, 6th Edition, Printice-Hall of India Ltd., 1992, New Delhi. Web Resources: 1. https://youtu.be/uJWy8mPxIzw 2. https://voutu.be/12hmgzeiGo4 3. https://youtu.be/MM4IcBYZrb4 4. https://youtu.be/6OOUDOVWm0M 5. https://youtu.be/YoQORrw\_5Yk **Course Outcomes** K Level On the completion of the course the student will be able to Reminiscence the alicyclic compounds, free radicals and proteins and **CO1:** [Up to K2] deliberate the reaction mechanism of aromatic compounds. Prepare the heterocyclic compounds, short lived and long-lived free radicals. **CO2:** [Up to K3] Differentiate between configuration and conformation and distinguish **CO3**: [Up to K3] between proteins and nucleic acids. Interpret the directive influence of substituents on electronic effects and **CO4:** [Up to K4] properties of aromatic compounds. Integrate the reaction mechanism of aromatic compounds and formulate in

the synthetic applications.

[Up to K4]

Course Outcomes			Programme O	utcomes (PC	)s)	
(COs)	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	PO 4	<b>PO 5</b>	<b>PO 6</b>
CO 1	3	1	2	3	1	2
CO 2	1	3	1	1	2	3
CO 3	2	2	3	2	3	3
CO 4	3	1	2	2	1	2
CO5	1	3	2	3	2	1
Weightage	10	10	10	11	9	11

#### CO & PO Mapping:

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

## LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
Ι	ALICYCLIC COMPOUNDS, CONFORMATIONAL ANALYSIS, CIVETONE AND MUSCONE Alicyclic compounds: General methods of preparation and properties of cycloparaffins – Baeyer's strain theory and its modification. Conformational Analysis: Difference between configuration and conformation- Fisher- Saw horse and Newman Projection formulate – Conformational analysis of ethane, n-butane 1,2– dichloroethane, cyclohexane and monosubstituted cyclohexane. Civetone and Muscone any one method of synthesis – Structure only (no Structural elucidation)	18	Chalk, Talk & Power point
II	<b>MOLECULAR REARRANGEMENT AND FREE RADICALS</b> Molecular rearrangements: Detailed mechanisms of the following: pinacol - Pinacolone, Hofmann, Curtius, benzil-benzilic acid, claisen, benzidine, Fries and Wagner-Meerwein rearrangements. Free radicals: Definition – preparation and reactions of short lived and long-lived free radicals – Reaction and Mechanism of Sand Meyer reaction, Gomberg reaction and Hofmann-Loeffler reaction – chain reactions – photochemical reactions of olefins – cis-trans isomerization.	18	Chalk, Talk & Power point
III	HETEROCYCLIC COMPOUNDS Heterocyclic compounds: Introduction and definition, Preparation and basic properties of pyrrole, pyridine, quinoline and isoquinoline. Alkaloids: Definition – occurrence and extraction of alkaloids – general methods for determining the structure of alkaloids – classification of alkaloids – structural elucidation – coniine, piperine and nicotine. Terpenes: Introduction, classification, occurrence and isolation – general properties – isoprene rule – general methods of determining structure. Properties, Structure of citral and terpineol.	18	Chalk, Talk & Power point
IV	PROTEINS AND NUCLEIC ACIDSProteins: Definition – Classification of Amino Acids – Zwitter ion –Peptide bond - Classification of proteins – colour reactions of proteins –primary, secondary, tertiary and quaternary structure of proteins (an	18	Chalk, Talk & Power point

	elementary idea only). Nucleic acids: Definition – Classification of Nucleic acids – nucleosides – nucleotides – difference between nucleosides and nucleotides – RNA and DNA general structure – Basic structure of DNA and RNA – Functions of DNA and RNA – RNA types.		
V	<b>PRINCIPLES AND APPLICATIONS OF SPECTROSCOPY</b> UV: Introduction– Type of electronic transition – absorption law bathochromic shift and hypso chromic shift – hyperchromic and hypochromic effect – applications of UV to organic compounds – Woodward - Fieser calculation of $\lambda$ max. IR: Introduction – Instrumentation– different regions of IR, finger print regions – fundamental, overtone, Hot bands and combination bands – applications of IR to organic compounds – effect of hydrogen bonding – NH2. NMR: Introduction – Conditions for NMR active – chemical shift – shielding and deshielding effects - factors influencing chemical shift – solvent used (TMS) – splitting of signals –NMR spectra of simple ethanol and anisole.	18	Chalk, Talk & Power point

Course Designed by: Dr. K. Muthupandi & Dr. A. J. Sunija

			-		ication & Ass on - Blue Pri		t (LOBE)	
		Articulation N					s (COs)	
			Section	n A	Section	B	Section C	Section D
Inte	Cos	K Level	MCQ	s	Short Ans	swers	Either or	Open
rnal	0.05	IX LEVEL	No. of. Questions	K – Level	No. of. Questions	K - Level	Choice	Choice
CI	CO1	Up to K2	2	K1	1	K1	2 (K2&K2)	1(K2)
AI	CO2	Up to K3	2	K2	2	K2	2 (K3&K3)	1(K3)
CI	CO3	Up to K3	2	K1	1	K1	2 (K2&K2)	1(K2)
AII	<b>CO4</b>	Up to K4	2	K2	2	K2	2 (K3&K3)	1(K4)
		No. of Questions to be asked	4		3		4	2
Pat	stion tern I & II	No. of Questions to be answered	4		3		2	1
	1 & 11	Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

		Dist	ribution of 1	Marks with	K Level C	IAI&(	CIA II	
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
	K1	2	2	-	-	4	8	
	K2	2	4	10	10	26	52	60
CIA	K3	-	-	10	10	20	40	40
	K4	-	-	-	-	-	-	-
-	Marks	4	6	20	20	50	100	100
	K1	2	2	-	-	4	8	
	K2	2	4	10	10	26	52	60
CIA	K3	-	-	10	-	10	20	20
II	K4	-	-	-	10	10	20	20
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summ	native Exa	mination – Bl	ue Print Artic	ulation Ma	pping – K I	Level with	Course Outco	mes (COs)
			MCQs		Short Answers		Section C	Section D
S.No	Cos	K - Level	No. of	K –	No. of	K –	(Either / or	(Open
			Questions	Level	Question	Level	Choice)	Choice)
1	CO1	Up to K 2	2	K1,K2	1	K1	2 (K2&K2)	1(K2)
2	CO2	Upto K 3	2	K1&K2	1	K1	2 (K3&K3)	1(K3)
3	CO3	Up to K 3	2	K1&K2	1	K2	2 (K3&K3)	1(K3)
4	CO4	Up to K 4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)
5	CO5	Up to K 4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)
No. of	Questions	s to be Asked	10		5		10	5
No	No.of Questions to be answered		10		5		5	3
Marks for each question		1		2		5	10	
Total N	Total Marks for each section		10		10		25	30
	(Figu	res in parenthe	esis denotes, q	uestions sh	ould be aske	ed with th	e given K level	)

		Dis	tribution of	Marks with	n K Leve	1	
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4	-	-	9	7.5	33
K2	5	6	10	10	31	25.83	
K3	-	-	40	20	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Hig of K lev	· ·	erformance o	f the students	s is to be asso	essed by a	ttempting	higher level

Section	A (Mu	Itiple Cho	ice Questions)
Answei	r All Q	uestions	(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section	B (Sho	ort Answei	rs)
Answei	r All Q	uestions	(5x2=10 marks)
Q.No	СО	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section	C (Eit	her/Or Ty	pe)
Answer	r All Q	uestions	(5  x 5 = 25  marks)
Q.No	CO	K Level	Questions
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
			ormance of the students is to be assessed by attempting higher
level of			
		en Choice	
		Three ques	
Q.No	CO	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

# **Summative Examinations - Question Paper – Format**



### MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	MAJOR CHEMISTRY PRACTICAL – III (PHYSICAL CHEM EXPERIMENTS)	MIST	RY	
Course Code	21UCHCP3	L	Р	C
Category	Core	-	6	5
Nature of cours	e: EMPLOYABILITY 🗸 SKILL ORIENTED 🖌 ENTREPRE	NUR	SHIP	✓
<b>Course Object</b>	ves:			
• To learn	the general methods for the determination of molecular weight.			
• To analy	ze the concept of phase diagram, CST and potentiometric titrations.			
• To study	the equilibrium constant for the reaction			
• To deter	mine the relative strength of acids by hydrolysis of ester			
• To inter	pret the cell constant and conductivity titration between as acid and a	base.		
	of Experiments			
	nation of Molecular weight by			
,	mperature method – Sodium thiosulphate pentahydrate			
,	nethod – Naphthalene as Solvent			
II. Phase d	agram involving			
a) Simple eutec	ic b) Compound formation			
	solution temperature (CST)			
Determination of	f CST of phenol – water system			
IV. Potentio	metric titrations			
(a) HCl Vs NaC	$H \qquad (b) K_2 Cr_2 O_7 Vs FeSO_4.$			
V. Partitio	n Coefficient experiments:			
Study of the eq	alibrium constant for the reaction			
$KI + I_2 \leftrightarrow KI_3$				
By determining	the partition Co-efficient of $I_2$ between water an $CCl_4$			
Determination of	f strength of given KI.			
VI. Kinetic	Determination of relative strength of acids by hydrolysis of ester.			
VII. Conduc	tivity: Determination of cell constant and conductivity titration betw	veen a	is acid	and
a base (HCl Vs	NaOH).			
	<b>Distribution of Marks (Max. marks – 100)</b>			

	Dura	tion of examination: 6 hrs	
Regula	ar Test in the Class	: 30 Marks	
Observ	vation note book	: 10 Marks	
Total		: 40 Marks	
Viva v	voce	 : 10 marks	
	d Note book	: 10 marks	
For co	mpletion of the experiment	: 20 marks	
Graph		: 2 marks	
Calcul	ation	: 5 marks	
Tabula	ation	: 3 marks	
Result		: 10 marks	
Total		 : 60 marks	
		Total Lecture H	lours 45 Hrs
Th Pu		ok of Practical Chemistry, 4 <sup>th</sup> Revised Edit	ion, Scientific
Pu Books 1. J. F Yo	omas. A.O and Mani, Textboo blication, 1976. <b>for Reference:</b> E. Huheey, E. A. Kieter and R. L rk, 1993.	ok of Practical Chemistry, 4 <sup>th</sup> Revised Edit L. Keiter, Inorganic Chemistry, 4th ed., Harpe Ilo and M. Bochman, Advanced Inorganic Che	r Collins, New
Th Pu Books 1. J. F Yo 2. F. A	omas. A.O and Mani, Textboo blication, 1976. <b>for Reference:</b> E. Huheey, E. A. Kieter and R. L rk, 1993.	2. Keiter, Inorganic Chemistry, 4th ed., Harpe	r Collins, New
Th Pu Books 1. J. H Yo 2. F. A John V	omas. A.O and Mani, Textboo blication, 1976. <b>for Reference:</b> E. Huheey, E. A. Kieter and R. I. rk, 1993. A. Cotton, G. Wilkinson, C. Muri Viley, New York, 1999.	2. Keiter, Inorganic Chemistry, 4th ed., Harpe	r Collins, New emistry,6th ed.,
Th Pui Books 1. J. F Yo 2. F. A John V 3. T. N	omas. A.O and Mani, Textboo blication, 1976. <b>for Reference:</b> E. Huheey, E. A. Kieter and R. L rk, 1993. A. Cotton, G. Wilkinson, C. Muri Viley, New York, 1999. Moeller, Inorganic Chemistry: A J	2. Keiter, Inorganic Chemistry, 4th ed., Harpe Ilo and M. Bochman, Advanced Inorganic Che	r Collins, New emistry,6th ed.,
Th Pu Books 1. J. F Yo 2. F. A John V 3. T. M 4. R. I	omas. A.O and Mani, Textboo blication, 1976. <b>for Reference:</b> E. Huheey, E. A. Kieter and R. L rk, 1993. A. Cotton, G. Wilkinson, C. Muri Viley, New York, 1999. Moeller, Inorganic Chemistry: A J	L. Keiter, Inorganic Chemistry, 4th ed., Harpe llo and M. Bochman, Advanced Inorganic Che Modern Introduction, Wiley, New York, 1990.	r Collins, New emistry,6th ed.,
Th Pui Books 1. J. F Yo 2. F. A John V 3. T. N 4. R. I Web F	omas. A.O and Mani, Textboo blication, 1976. <b>for Reference:</b> E. Huheey, E. A. Kieter and R. L rk, 1993. A. Cotton, G. Wilkinson, C. Muri Viley, New York, 1999. Moeller, Inorganic Chemistry: A D D Madan S.Chand, Modern Inorg	L. Keiter, Inorganic Chemistry, 4th ed., Harpe llo and M. Bochman, Advanced Inorganic Che Modern Introduction, Wiley, New York, 1990.	r Collins, New emistry,6th ed.,
Th Pu Books 1. J. H Yo 2. F. A John V 3. T. N 4. R. I Web H 1. http	omas. A.O and Mani, Textboo blication, 1976. <b>for Reference:</b> E. Huheey, E. A. Kieter and R. L rk, 1993. A. Cotton, G. Wilkinson, C. Muri Viley, New York, 1999. Moeller, Inorganic Chemistry: A D D Madan S.Chand, Modern Inorg Resources: ps://youtu.be/2VzEpsEZOYo	L. Keiter, Inorganic Chemistry, 4th ed., Harpe llo and M. Bochman, Advanced Inorganic Che Modern Introduction, Wiley, New York, 1990.	r Collins, New emistry,6th ed.,
Th Pui Books 1. J. F Yo 2. F. A John V 3. T. N 4. R. I Web F 1. http 2. http	omas. A.O and Mani, Textboo blication, 1976. <b>for Reference:</b> E. Huheey, E. A. Kieter and R. I. rk, 1993. A. Cotton, G. Wilkinson, C. Muri Viley, New York, 1999. Moeller, Inorganic Chemistry: A D D Madan S.Chand, Modern Inorg Resources:	L. Keiter, Inorganic Chemistry, 4th ed., Harpe llo and M. Bochman, Advanced Inorganic Che Modern Introduction, Wiley, New York, 1990.	r Collins, New emistry,6th ed.,
Th Pu Books 1. J. F Yo 2. F. A John V 3. T. M 4. R. I Web H 1. http 2. http 3. http	omas. A.O and Mani, Textboo blication, 1976. <b>for Reference:</b> E. Huheey, E. A. Kieter and R. L rk, 1993. A. Cotton, G. Wilkinson, C. Muri Viley, New York, 1999. Moeller, Inorganic Chemistry: A D D Madan S.Chand, Modern Inorg Resources: ps://youtu.be/2VzEpsEZOYo ps://youtu.be/2VzEpsEZOYo ps://youtu.be/2WzEpsEZOYo	L. Keiter, Inorganic Chemistry, 4th ed., Harpe llo and M. Bochman, Advanced Inorganic Che Modern Introduction, Wiley, New York, 1990.	r Collins, New emistry,6th ed.,
Th Pu Books 1. J. F Yo 2. F. A John V 3. T. N 4. R. I Web H 1. http 2. http 3. http 3. http	omas. A.O and Mani, Textboo blication, 1976. <b>for Reference:</b> E. Huheey, E. A. Kieter and R. I. rk, 1993. A. Cotton, G. Wilkinson, C. Muri Viley, New York, 1999. Moeller, Inorganic Chemistry: A I D Madan S.Chand, Modern Inorg Resources: DS://youtu.be/2VzEpsEZOYo DS://youtu.be/2VzEpsEZOYo DS://youtu.be/Xwm98B3gLPw DS://youtu.be/KD7amFclq4s	L. Keiter, Inorganic Chemistry, 4th ed., Harpe llo and M. Bochman, Advanced Inorganic Che Modern Introduction, Wiley, New York, 1990. ganic Chemistry band Co.Ltd, New Delhi 2012	r Collins, New emistry,6th ed.,
Th Pu Books 1. J. F Yo 2. F. A John V 3. T. N 4. R. I Web H 1. http 2. http 3. http 3. http	omas. A.O and Mani, Textboo blication, 1976. for Reference: E. Huheey, E. A. Kieter and R. L rk, 1993. A. Cotton, G. Wilkinson, C. Muri Viley, New York, 1999. Moeller, Inorganic Chemistry: A D D Madan S.Chand, Modern Inorg Resources: Dis://youtu.be/2VzEpsEZOYo Dis://youtu.be/2VzEpsEZOYo Dis://youtu.be/Xwm98B3gLPw Dis://youtu.be/KD7amFclq4s te Outcomes: The completion of the course the second	L. Keiter, Inorganic Chemistry, 4th ed., Harpe llo and M. Bochman, Advanced Inorganic Che Modern Introduction, Wiley, New York, 1990. ganic Chemistry band Co.Ltd, New Delhi 2012	r Collins, New emistry,6th ed.,
Th Pu Books 1. J. F Yo 2. F. A John V 3. T. N 4. R. I Web H 1. http 3. http 3. http 3. http Cours On th	omas. A.O and Mani, Textboo blication, 1976. <b>for Reference:</b> E. Huheey, E. A. Kieter and R. I. rk, 1993. A. Cotton, G. Wilkinson, C. Muri Viley, New York, 1999. Moeller, Inorganic Chemistry: A I D Madan S.Chand, Modern Inorg Resources: ps://youtu.be/2VzEpsEZOYo ps://youtu.be/Xwm98B3gLPw ps://youtu.be/KD7amFclq4s te Outcomes: The completion of the course the set of the course the course the set of the	L. Keiter, Inorganic Chemistry, 4th ed., Harpe llo and M. Bochman, Advanced Inorganic Che Modern Introduction, Wiley, New York, 1990. ganic Chemistry band Co.Ltd, New Delhi 2012. student will be able to	r Collins, New emistry,6th ed., K Level [Up to K2]
Th Pu Books 1. J. F Yo 2. F. A John V 3. T. N 4. R. I Web H 1. <u>http</u> 2. <u>http</u> 3. <u>http</u> Cours On th	omas. A.O and Mani, Textboo blication, 1976. <b>for Reference:</b> E. Huheey, E. A. Kieter and R. I. rk, 1993. A. Cotton, G. Wilkinson, C. Muri Viley, New York, 1999. Moeller, Inorganic Chemistry: A I D Madan S.Chand, Modern Inorg <b>Resources:</b> D:://youtu.be/2VzEpsEZOYo D:://youtu.be/Xwm98B3gLPw D:://youtu.be/KD7amFclq4s e Outcomes: e completion of the course the second	L. Keiter, Inorganic Chemistry, 4th ed., Harpe llo and M. Bochman, Advanced Inorganic Che Modern Introduction, Wiley, New York, 1990. ganic Chemistry band Co.Ltd, New Delhi 2012 student will be able to right by Transition Temperature method and and CST.	r Collins, New emistry,6th ed.,
Th Pu Books 1. J. F Yo 2. F. A John V 3. T. M 4. R. I Web H 1. http 2. http 3. http Cours On th CO1: CO2:	omas. A.O and Mani, Textboo blication, 1976. <b>for Reference:</b> E. Huheey, E. A. Kieter and R. I. rk, 1993. A. Cotton, G. Wilkinson, C. Muri Viley, New York, 1999. Moeller, Inorganic Chemistry: A I D Madan S.Chand, Modern Inorg Resources: ps://youtu.be/2VzEpsEZOYo ps://youtu.be/Xwm98B3gLPw ps://youtu.be/KD7amFclq4s te Outcomes: The completion of the course the set of the course the course the set of the	L. Keiter, Inorganic Chemistry, 4th ed., Harpe Illo and M. Bochman, Advanced Inorganic Che Modern Introduction, Wiley, New York, 1990. ganic Chemistry band Co.Ltd, New Delhi 2012 student will be able to eight by Transition Temperature method and and CST. f acids by hydrolysis of ester.	r Collins, New emistry,6th ed., K Level [Up to K2]

Course Outcomes			Programme O	utcomes (PC	)s)	
(COs)	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	PO 4	<b>PO 5</b>	<b>PO 6</b>
CO 1	3	1	2	3	1	2
CO 2	1	3	1	1	2	3
CO 3	2	2	3	2	3	3
<b>CO 4</b>	3	1	2	2	1	2
CO5	2	3	1	3	2	1
Weightage	11	10	9	11	9	11

#### CO & PO Mapping:

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

#### **LESSON PLAN**

UNIT	List of Experiments	Hrs	Mode
Ι	I. Determination of Molecular weight by		
	a) Transition Temperature method – Sodium thiosulphate		
	pentahydrate		
	b) Rast Macro method – Naphthalene as Solvent		
	II. Phase diagram involving		
	a) Simple eutectic b) Compound formation		
	III. Critical solution temperature (CST)		
	Determination of CST of phenol – water system		
	IV. Potentiometric titrations		
	(a) HCl Vs NaOH (b) $K_2Cr_2O_7$ Vs FeSO <sub>4</sub> .		
	V. Partition Coefficient experiments:	90	Practical
	Study of the equilibrium constant for the reaction		
	$KI+I_2 \leftrightarrow KI_3$		
	By determining the partition Co-efficient of I2 between water an		
	CCl <sub>4</sub>		
	Determination of strength of given KI.		
	VI. Kinetics: Determination of relative strength of acids by		
	hydrolysis of ester.		
	VII. Conductivity: Determination of cell constant and		
	conductivity titration between as acid and a base (HCl Vs NaOH).		

Course Designed by: Dr. A. J. Sunija & Dr. V. Ramasamy Raja



### MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name         MAJOR CHEMISTRY PRACTICAL – IV (GRAVIMETRIC ANALYSIS AND ORGANIC PREPARATION)							
Course Code	21UCHCP4	L	Р	С			
Category	Core	-	3	-			
Nature of course: EMPLOYABILITY 🗸 SKILL ORIENTED 🖌 ENTREPRENURSHI							
Course Objecti	ves:						
To learn	the concept of gravimetric analysis and organic preparation						
• To analy	ze the estimation of lead, calcium, copper and nickel						
• To study	the organic preparation methods						
• To under	rstand the various organic preparation methods						
• To interp	pret the gravimetric analysis and organic preparation						
List	t of Experiments						
1. Gravim	etric Analysis						
<ol> <li>Estin</li> <li></li></ol>	<ul> <li>mation of lead as lead chromate</li> <li>mation of barium as barium chromate</li> <li>mation of calcium as calcium oxalate monohydrate</li> <li>mation of copper as cuprous thiocyanate</li> <li>mation of nickel as Ni DMG.</li> <li><b>Preparation</b></li> <li>ration</li> <li>trobenzene from nitrobenzene</li> <li>ric acid from phenol</li> <li>mination: p-bromo acetanilide from acetanilide</li> <li>hrolysis : Aromatic acid from (a) an ester (b) an amide</li> <li>dation: Benzoic acid from benzaldehyde.</li> <li>azoylation: (a) Amine (b) phenols.</li> <li>atylation : (a) Amine (b) phenols</li> </ul>						
Distribution of Marks (Max.marks – 100)         Duration of examination: 6 hrs         Int: 40         Regular Test in the Class         : 30 Marks         Observation note book         : 10 Marks							
Total	: 40 Marks						

Volume VI – Science Syllabus / 2023 - 2024 Record Note Book - 10 Marks Viva Voce - 10 Marks Ext: 60 **Organic preparation (10 Marks) Gravimetric Estimation (30 Marks)** Procedure 2 Marks Procedure - 10 Marks Crude sample 6 Marks Estimation - 20 Marks Recrystallised sample -Less than 2 % Error – 20 Marks 2 Marks 2-3% Error – 18 Marks 3-4% Error – 16 Marks 4-5% Error – 14 Marks Greater than 5% Error – 8 Marks Total Lecture Hours | 45 Hrs **Books for Reference:** 1. Thomas. A.O and Mani, Textbook of Practical Chemistry, 4th Revised Edition, Scientific Publication, 1976. 2. N.S. Gnana pragasam and G. Ramamurthy, Organic Chemistry Lab Manual, Viswanath. S. Printers & Publishers Pvt. Ltd., 2010, Chennai. Web Resources: 1. https://youtu.be/tftNgFVAWCY 2. https://youtu.be/npxbO-pzUvU 3. https://youtu.be/peMyqdJ57dA **Course Outcomes:** K Level On the completion of the course the student will be able to **CO1:** Relate and classify between gravimetric analysis and organic preparation [Up to K2] **CO2:** Estimate lead, barium, calcium, copper and nickel. [Up to K3] **CO3:** Analyze the various types of organic preparation. [Up to K3] Interpret the organic preparation like nitration, bromination, hydrolysis, **CO4:** [Up to K4] oxidation, benzoylation and acetylation. Assemble the analyzed and prepared organic compounds samples. CO5: [Up to K4]

<b>Course Outcomes</b>	Programme Outcomes (POs)						
(COs)	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	
CO 1	3	1	2	3	1	2	
CO 2	1	3	1	1	2	3	
CO 3	2	2	3	2	3	3	
<b>CO 4</b>	3	1	2	2	1	2	
CO5	2	3	1	3	2	1	
Weightage	11	10	9	11	9	11	

#### CO & PO Mapping:

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

## LESSON PLAN

UNIT	List of Experiments	Hrs	Mode
	1. Gravimetric Analysis		
	<ol> <li>Estimation of lead as lead chromate</li> <li>Estimation of barium as barium chromate</li> <li>Estimation of calcium as calcium oxalate monohydrate</li> <li>Estimation of copper as cuprous thiocyanate</li> <li>Estimation of nickel as Ni DMG.</li> </ol>		
Ι	2. Organic Preparation	45	Practical
	1. Nitration		
	a. M-dinitrobenzene from nitrobenzene		
	b. Picric acid from phenol		
	2. Bromination: p-bromo acetanilide from acetanilide		
	3. Hydrolysis : Aromatic acid from (a) an ester (b) an amide		
	4. Oxidation: Benzoic acid from benzaldehyde.		
	5. Benzoylation: (a) Amine (b) phenols.		
	6. Acetylation : (a) Amine (b) phenols		

## Course Designed by: Dr. K. Muthupandi & Dr. V. Ramasamy Raja



### MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

	ESTIMATION)		PRACI	FICAL – V (	(ORG)	ANIC	C ANA	LYSI	IS A	AND	
Course Code	21UCHCP5							]	[]	Р	C
Category	Core								-	3	-
Nature of course:	EMPLOYAB	LITY	<b>SKILI</b>	L ORIENTE	D 🗸	<b>EN</b> I	REP	RENU	JRS	SHIP	$\checkmark$
Course Objectiv	es:										
• To learn the	he analysis of an	organic	compou	nd containin	g one o	or two	o func	tional	gro	ups.	
	e the concept of										
compound									-		
•	estimation of phe			-							
	tand the various			-	-						
	et organic analy	sis and e	stimation	n of organic	compo	unds					
List I. Organic Analy	of Experiments										
	ls, amines (prim ar halogen comp <b>STIMATION</b>										
<ol> <li>Estimation</li> <li>Estimation</li> <li>Estimation</li> </ol>	n of aniline										
2. Estimation	n of aniline n of glucose	istributi	ion of M	a <b>rks (M</b> ax. :	marks	- 100	))				
2. Estimation	n of aniline n of glucose			a <b>rks</b> (Max. ) mination: 6 l		- 100	))				
<ol> <li>Estimation</li> <li>Estimation</li> </ol>	n of aniline n of glucose <b>D</b>					- 100	))				
2. Estimation	n of aniline n of glucose <b>D</b> ne Class : 30	Duratio				- 100	))				
<ol> <li>Estimation</li> <li>Estimation</li> </ol> Regular Test in the set of	n of aniline n of glucose D ne Class : 30 book : 10 	Duratic Marks				- 100	))				
<ol> <li>Estimation</li> <li>Estimation</li> </ol> Regular Test in the Observation note	n of aniline n of glucose D ne Class : 30 book : 10  : 40 	Duratic Marks Marks		mination: 61				0 Mar	·ks)		
<ol> <li>Estimation</li> <li>Estimation</li> <li>Estimation</li> </ol> Regular Test in the Observation note Total Organic estimation	n of aniline n of glucose D ne Class : 30 book : 10  : 40  ion ( <b>30 Marks</b> )	Duratic Marks Marks		mination: 61	nrs			<b>0 Mar</b> – 10			
<ol> <li>Estimation</li> <li>Estimation</li> <li>Estimation</li> <li>Regular Test in the Observation note</li> <li>Total</li> <li>Organic estimation</li> <li>Record Note - 1</li> </ol>	n of aniline n of glucose D ne Class : 30 book : 10  : 40  ion ( <b>30 Marks</b> )	Duratic Marks Marks		mination: 6 l	nrs ganic :	analy			ma	ırks	
<ul> <li>2. Estimation</li> <li>3. Estimation</li> <li>3. Estimation</li> <li>Regular Test in the Observation note</li> <li>Total</li> <li>Organic estimation</li> <li>Record Note - 1</li> <li>Procedure - 5</li> </ul>	n of aniline n of glucose <b>D</b> ne Class : 30 book : 10  : 40  ion ( <b>30 Marks</b> ) .0 marks	Duratic Marks Marks		mination: 6 l Or Viva Voce	ırs <b>ganic</b> : y react	<b>analy</b> ion		- 10	ma narl	urks <s< td=""><td></td></s<>	
<ul> <li>2. Estimation</li> <li>3. Estimation</li> <li>3. Estimation</li> <li>3. Estimation</li> <li>Regular Test in the Observation note</li> <li>Total</li> <li>Organic estimation</li> <li>Record Note - 1</li> <li>Procedure - 5</li> <li>Estimation - 1</li> <li>Less than 3% Error</li> </ul>	n of aniline n of glucose <b>D</b> ne Class : 30 book : 10  : 40  ion (30 Marks) 0 marks marks 5 marks	Duratic Marks Marks		mination: 6 h Or Viva Voce Preliminar	ganic a y react present or aron	analy ion natic	sis (3	– 10 - 2 n	ma nark nark nark	urks cs cs cs	

		Volume VI – Science Sy	- 	2024
	4-5% Error – 10 Marks	Functional group	- 6 marks	
	Greater than 5% - 8 Marks	Derivative	- 2 marks	
		Total L	ecture Hours	45 Hrs
Books	for Reference:			
3. Th	omas. A.O and Mani, Textbook o	f Practical Chemistry, 4th Revi	ised Edition, So	cientific
Public	ation, 1976.	•		
4. N.S	S. Gnana pragasam and G. Ramam	urthy, Organic Chemistry Lab	Manual, Viswar	nath. S.
Printer	s & Publishers Pvt. Ltd., 2010, Chen	nai.		
Web R	lesources:			
1. http	s://youtu.be/1uJk4K_irP8			
2. http	s://youtu.be/xQJOfAKgSOY			
3. <u>http</u>	<u>s://youtu.be/xMjJxjhJWj4</u>			
Course	e Outcomes:		K	Level
On th	e completion of the course the stud	ent will be able to		
CO1:	Relate and classify between organic	e analysis and estimation of organ	nic <b>r</b>	to K2]
COI	compounds		lob	10 K2j
<b>CO2:</b>	Estimate the phenol, aniline and glu	lcose	[Up	to K3]
CO3:	Analyze the one or two functional g	roups of organic compounds	[Up	to K3]
CO4:	Interpret the organic analysis and es	stimation of organic compounds	[Up	to K4]
CO5:	Distinguish between analysis and es of organic compounds	stimation of one or two functional	l groups [Up	to K4]

### CO & PO Mapping:

Course Outcomes			Programme O	utcomes (PC	s)	
(COs)	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	PO 4	<b>PO 5</b>	<b>PO 6</b>
CO 1	3	1	2	3	1	2
CO 2	1	3	1	1	2	3
CO 3	2	2	3	2	3	3
CO 4	3	1	2	2	1	2
CO5	2	3	1	3	2	1
Weightage	11	10	9	11	9	11

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

#### LESSON PLAN

UNIT	List of Experiments	Hrs	Mode
I	<ul> <li>I. Organic Analysis <ul> <li>Analysis of an organic compound containing one or two functional groups and confirmation by the preparation of a solid derivative – acids, phenols, aldehydes, ketone, esters, nitro compounds, amines (primary, secondary and tertiary), aniline, aliphatic diamide, side chain and nuclear halogen compounds, diamide containing sulphur and monosaccharide.</li> </ul> </li> <li>II. ORGANIC ESTIMATION <ol> <li>Estimation of phenol</li> <li>Estimation of glucose</li> </ol> </li> </ul>	45	Practical

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### MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	ANALYTICAL CHEMISTRY			
Course Code	21UCHE51	L	Р	С
Category	CORE ELECTIVE	5	-	5
Nature of cours	e: EMPLOYABILITY 🗸 SKILL ORIENTED 🖌 ENTREPREN	URS	HIP	✓
Course Objecti	ves:			
• To Recall th	e principle involved in the gravimetric analysis.			
To Rememb	er the methods of precipitation and classification of errors.			
To Analysis	the instrumental methods and its principles and applications.			
• To Know the	e photocatalytic reactor and photocatalytic calorimeter.			
	theory of chromatographic technique and applications.			
Unit: I PR	INCIPLES OF GRAVIMETRIC ANALYSIS		15	
Introduction to	gravimetric analysis - precipitation methods - conditions for p	recip	itatio	n -
supersaturation	and precipitate formation - the purity of the precipitate: co-precip	oitatio	n - j	post
precipitation - s	solubility product and precipitation - precipitation from homogeneous	ous s	olutic	on -
washing of the p	precipitate - organic precipitants: dimethylglyoxime, cupferron, oxine	and c	uproi	1.
Unit: II ER	ROR ANALYSIS		15	
Classification o	f errors - determinate errors (systematic errors) and indeterminate	(rand	lom	and
accidental) - min	nimization of errors: calibration of apparatus, analysis of standard san	nples,	runn	ing
a blank determi	nation and independent analysis - absolute and relative error - typ	es of	erro	rs -
	terminate errors and indeterminate errors - precision and accuracy:			
	culation of mean - median and standard deviation - F-test, t- test		Q-te	st -
	- method of least squares - significant figures - rounding off the value			
	ERMO ANALYTICAL AND ELECTRO ANALYTICAL METH		15	
-	tical Methods: Thermogravimetric analysis (TGA): principle - therm		•	
	no gravimetry (DTG) - factors affecting thermogram - TGA			
	hermo gravimetry - differential thermal analysis (DTA), DTA instru			
	e monohydrate. Electro Analytical Methods: Electrogravimetry			•
÷	netals - polarography - principles and applications - amperometr	ic tit	ratior	18 -
principles and a				
	TRUMENTAL METHODS OF ANALYSIS		15	
· · · · · · · · · · · · · · · · · · ·	imentation and applications of fluorimetry - nephelometry - flame	-		ry -
	on spectrophotometry - photocatalytic reactor and photoelectric colorin	meter		
	ROMATOGRAPHY	1	15	
· · · · · · · · · · · · · · · · · · ·	ication, definition of terms, principles, basic theory of chromatograp			
1	dling. Band broadening and column efficiency: Definition, plate th	•		
-	atographic technique, their limitation and applications. Basic principle			
	natography – Column Chromatography – Thin layer Chromatography – Ion exchange Chromatography – Applications of each technique.	apny	- ra	iper
Chiomatograph	<u>Total Lecture Hor</u>	INC	75 H	PC
Books for Stud		415	75 11	19
	•	~ .		
1. R. Gopalan, I	P.S. Subramanian, K. Rengarajan, Elements of Analytical Chemistry, S	Sultar	ı Cha	nd

& sons, 3rd edition 2004.

- 2. S.M.Khopkar, Basic concepts of Analytical Chemistry, Wiley Eastern Ltd.
- 3. A.I Vogel, A Text book of Qualitative Inorganic Analysis, ELBS 4th edition, 2002,
- 4. V.K. Srivastava, K.K. Srivastava, Introduction to Chromatography, S. Chand and Company Ltd., 3rd edition,1985.

#### **Books for References:**

- 2. P.L. Soni, M. Katyal, Test book of Inorganic Chemistry, Sultan Chand and Sons, Reprint, 2015
- 3. Chatwal Anand, Instrumental methods of chemical analysis, Himalaya Publishing House, 5th edition, 2005

#### Web Resources:

- 1. https://youtu.be/KHpRNb\_38OM
- 2. https://youtu.be/IB3Uni2gRkA
- 3. https://youtu.be/NzbDEjI8IKE
- 4. <u>https://youtu.be/ck0qEruFy\_o</u>

Course	Course Outcomes					
On th	On the completion of the course the student will be able to					
<b>CO1:</b>	Ability to understand the concept of chromatography	[Up to K2]				
<b>CO2:</b>	Discuss the interplanar spacing and principles of gravimetric analysis	[Up to K3]				
<b>CO3:</b>	Interpret the methods of obtaining precipitate and types of errors	[Up to K3]				
<b>CO4:</b>	Examine the experimental analysis of methods	[Up to K4]				
CO5:	Analyze the chromatographic technique and applications	[Up to K4]				

#### CO & PO Mapping:

Course Outcomes	Programme Outcomes (POs)							
(COs)	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	PO 4	<b>PO 5</b>	<b>PO 6</b>		
CO 1	3	1	2	3	1	2		
CO 2	1	3	1	1	2	3		
CO 3	2	2	3	2	3	3		
CO 4	3	1	2	2	1	2		
CO5	1	3	2	3	2	1		
Weightage	10	10	10	11	9	11		

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

#### LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	<b>PRINCIPLES OF GRAVIMETRIC ANALYSIS</b> Introduction to gravimetric analysis - precipitation methods - conditions for precipitation - supersaturation and precipitate formation - the purity of the precipitate: co-precipitation - post precipitation - solubility product and precipitation - precipitation from homogeneous solution - washing of the precipitate - organic precipitants: dimethylglyoxime, cupferron, oxine and cupron.	15	Chalk, Talk & Power point
II	<b>ERROR ANALYSIS</b> Classification of errors - determinate errors (systematic errors) and indeterminate (random and accidental) - minimization of errors: calibration of apparatus, analysis of standard samples, running a blank determination and independent analysis - absolute and relative error - types of errors - correction of determinate errors and indeterminate errors - precision and accuracy: definition and difference - calculation of mean - median and standard deviation - F-test, t- test and Q-test - confidence limit - method of least squares - significant figures - rounding off the values.	15	Chalk, Talk & Power point
III	THERMO ANALYTICAL AND ELECTRO ANALYTICAL METHODS Thermo Analytical Methods: Thermogravimetric analysis (TGA): principle - thermal analysis – derivative thermo gravimetry (DTG) - factors affecting thermogram - TGA instrument - applications of thermo gravimetry - differential thermal analysis (DTA), DTA instrument- DTA of calcium oxalate monohydrate. Electro Analytical Methods: Electrogravimetry - electrolytic separation of metals - polarography - principles and applications - amperometric titrations - principles and applications.	15	Chalk, Talk & Power point
IV	INSTRUMENTAL METHODS OF ANALYSIS         Principle, instrumentation and applications of fluorimetry -         nephelometry -       flame photometry -         atomic absorption         spectrophotometry -       photocatalytic reactor and photoelectric	15	Chalk, Talk & Power point

	colorimeter.		
V	CHROMATOGRAPHY History, Classification, definition of terms, principles, basic theory of chromatographic technique and sample handling. Band broadening and column efficiency: Definition, plate theory and rate theory of chromatographic technique, their limitation and applications. Basic principles of common types of Chromatography – Column Chromatography – Thin layer Chromatography – Paper Chromatography – Ion exchange Chromatography – Applications of each technique.	15	Chalk, Talk & Power point

Course Designed by: Dr. V. Ramasamy Raja & Dr. R. Satheesh

	Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)										
<b>.</b>			Section A MCQs		Section B Short Answers		Section C	Section D			
Inte rnal Cos		K Level	No. of. Question	K – Level	No. of. Question s	K - Level	Either or Choice	D Open Choice			
CI	CO1	Up to K2	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)			
AI	CO2	Up to K3	2	K1 & K2	2	K2 & K2	2 (K3&K3)	1(K3)			
CI	CO3	Up to K3	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)			
AII	CO4	Up to K4	2	K1 & K2	2	K2 & K2	2 (K3&K3)	1(K4)			
		No. of Questions to be asked	4		3		4	2			
-	estion tern	No. of Questions to be answered	4		3		2	1			
CIA	I & II	Marks for each question	1		2		5	10			
		Total Marks for each section	4		6		10	10			

Distribution of Marks with K Level CIA I & CIA II									
	K (Multiple Level Choice Questions		Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %	
	K1	2	2	-	-	4	8		
	K2	2	4	10	10	26	52	60	
CIA	K3	-	-	10	10	20	40	40	
I	K4	-	-	-	-	-	-	-	
-	Marks	4	6	20	20	50	100	100	
	K1	2	2	-	-	4	8		
	K2	2	4	10	10	26	52	60	
CIA	K3	-	-	10	-	10	20	20	
II	K4	-	-	-	10	10	20	20	
	Marks	4	6	20	20	50	100	100	

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summa	Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)									
			MCQs		Short Answers		Section C	Section		
S. No	COs	K - Level	No. of Question s	K – Level	No. of Question	K – Level	(Either / or Choice)	D (Open Choice)		
1	CO1	Up to K2	2	K1,K2	1	K1	2 (K2&K2)	1(K2)		
2	CO2	Up to K3	2	K1&K2	1	K1	2 (K3&K3)	1(K3)		
3	CO3	Up to K3	2	K1&K2	1	K2	2 (K3&K3)	1(K3)		
4	<b>CO4</b>	Up to K4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)		
5	CO5	Up to K4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)		
No. of (	Questions	to be Asked	10		5		10	5		
No. of Questions to be answered		10		5		5	3			
Marks for each question		1		2		5	10			
Total Marks for each section		10		10		25	30			
(	Figures i	n parenthesis	s denotes, qu	estions sl	nould be ask	ed with t	the given K lev	vel)		

	Distribution of Marks with K Level									
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %			
K1	5	4	-	-	9	7.5	33			
K2	5	6	10	10	31	25.83	55			
K3	-	-	40	20	60	50	50			
K4	-	-	-	20	20	16.67	17			
Marks	10	10	50	50	120	100	100			
NR• Hic	oher level of n	erformance o	f the students	s is to be asse	essed by a	ottemnting	higher level			

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.

		-	ce Questions)
Answer			(10x1=10 marks)
Q. No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
		t Answers	
Answer			(5x2=10 marks)
Q. No	CO	K Level	Questions
11	C01	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
		er/Or Typ	
Answer	-		(5  x  5 = 25  marks)
Q. No	CO	K Level	Questions
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Hig	her lev	el of perfo	rmance of the students is to be assessed by attempting higher
level of l			
	-	n Choice)	
	1	nree questi	
Q. No	CO	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
		K4	

# **Summative Examinations - Question Paper – Format**



### MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	SUPRAMOLECULAR CHEMISTRY							
Course Code	21UCHE53	L	Р	С				
Category	CORE ELECTIVE	5	-	5				
Nature of cours	e: EMPLOYABILITY 🗸 SKILL ORIENTED 🖌 ENTREPREN	URS	HIP	$\checkmark$				
Course Object	ives:							
• To Recall th	e selectivity, kinetic and thermodynamic concepts							
• To Remember the ionic and dipole – dipole interactions and hydrogen bonding								
• To Compare the host – guest method and cation binding								
-	the anion and neutral binding and hydrogen binding interactions							
To Determine	ne the structure of zeolite and properties of coordination polymers							
	<b>FRODUCTION TO SUPRAMOLECULAR CHEMISTRY</b>		15					
	electivity - the lock and key principle and induced-fit model - compler		-					
operativity and	the chelate effect - preorganisation - binding constants - kinetic and the	nermo	odyna	mic				
selectivity.								
	PRAMOLECULAR INTERACTIONS		15					
	interactions: ionic and dipolar interactions - hydrogen bonding - $\pi$	-inter	actio	ns -				
	teractions - hydrophobic effects - supramolecular design.							
	ST - GUEST CHEMISTRY AND CATION BINDING		15					
	<b>Chemistry:</b> Introduction - guests in solution - macrocyclic versus acycl							
	sis - template synthesis. Cation Binding: Introduction, crown ethers							
	spherands - hemispherands - cryptaspherands - heterocrowns - hete	erocry	/ptan	ds –				
calixarenes.								
	ION AND NEUTRAL BINDINGS		15					
-	charged receptaors, electrostatic interactions, electrostatic, hydr	-		-				
	utral receptors, Lewis-acid receptors and anticrowns - metal containi	ng re	cepto	ors -				
	tion and anion receptors - neutral binding.							
	LID STATE SUPRAMOLECULAR CHEMISTRY		15					
	zeolites: structure, composition, zeolites and catalysis - clathrates -							
	mesic acid clathrates - hydroquinone and Dianin"s compound -	<b>C</b> 00	rdina	tion				
polymers: meta	l organic frameworks and properties of coordination polymers.							
	Total Lecture Hou	irs	75 H	rs				
Books for Stud	-							
	Steed, David R. Turner and Karl J. Wallace, Core Concepts in Supram and Nanochemistry, Johny Wiley & Sons, Ltd., 2007,	nolecu	ular					
Books for Refe								
	Ariga, Toyoki Kunitake, Supramolecular Chemistry – Funda	men	tals	and				
	, Advanced Textbook, Original Japanese edition published by Iw							
	Tokyo, <u>https://doi.org/10.1007/b137036</u> , Springer-Verlag Berlin Heidel							
Web Resource		0						
	u.be/dsJzRxnz2Qg							
	u.be/YbeRLkhYZM0							

Course	e Outcomes	K Level							
On th	On the completion of the course the student will be able to								
CO1:	Ability to understand the ionic and dipole – dipole interactions and hydrogen	[Up to K2]							
COI.	bonding								
<b>CO2:</b>	Discuss the host – guest method and cation binding	[Up to K3]							
<b>CO3:</b>	Interpret the anion and neutral binding and hydrogen binding interactions	[Up to K3]							
<b>CO4:</b>	Examine the structure of zeolite and properties of coordination polymers	[Up to K4]							
CO5:	Distinguish between selectivity, kinetic and thermodynamic concepts	[Up to K4]							

# CO & PO Mapping:

Course Outcomes	Programme Outcomes (POs)							
(COs)	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	PO 4	<b>PO 5</b>	<b>PO 6</b>		
CO 1	3	1	2	3	1	2		
CO 2	1	3	1	1	2	3		
CO 3	2	2	3	2	3	3		
<b>CO 4</b>	3	1	2	2	1	2		
CO5	1	3	2	3	2	1		
Weightage	10	10	10	11	9	11		

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

### LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
	<b>INTRODUCTION TO SUPRAMOLECULAR CHEMISTRY</b> Distillation and fractionation of petroleum. Commercial uses of different		<i>(</i> ], 1
Ι	petroleum fractions. Analysis of petroleum products. Analysis of traces	15	Chalk, Talk & Daman
	of petroleum products in forensic exhibits. Comparison of petroleum		Power point
	products. Adulteration of petroleum products.		
	SUPRAMOLECULAR INTERACTIONS		Chalk,
II	Supramolecular interactions: ionic and dipolar interactions - hydrogen bonding - $\pi$ -interactions - van der waals interactions - hydrophobic	15	Talk & Power
	effects - supramolecular design.		point
	HOST – GUEST CHEMISTRY AND CATION BINDING		
	Host – Guest Chemistry: Introduction - guests in solution - macrocyclic		
	versus acyclic hosts - high dilution synthesis - template synthesis. Cation		Chalk, Talk &
III	Binding: Introduction, crown ethers, lariat ethers and cryptands -	15	Power
	spherands - hemispherands - cryptaspherands - heterocrowns -		point
	heterocryptands – calixarenes.		
	ANION AND NEUTRAL BINDINGS		
	Anion binding: charged receptaors, electrostatic interactions,		Chalk,
IV	electrostatic, hydrogen binding interactions, neutral receptors, Lewis-	15	Talk & Power
	acid receptors and anticrowns - metal containing receptors -		point
	simultaneous cation and anion receptors - neutral binding.		
	SOILD STATE SUPRAMOLECULAR CHEMISTRY		
	Introduction - zeolites: structure, composition, zeolites and catalysis -		Chalk,
V	clathrates - urea/thiourea clathrates - trimesic acid clathrates -	15	Talk & Power
	hydroquinone and Dianin"s compound - coordination polymers: metal		point
	organic frameworks and properties of coordination polymers.		

Course Designed by: Dr. A. J. Sunija & Dr. R. Satheesh

	Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)										
				on A CQs		tion B Answers		Section			
Inte rnal Cos		K Level	No. of. Questions	K – Level	No. of. Ques tions	K - Level	Section C Either or Choice	D Open Choice			
CI	CO1	Up to K2	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)			
AI	CO2	Up to K3	2	K1 & K2	2	K2 & K2	2 (K3&K3)	1(K3)			
CI	CO3	Up to K3	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)			
AII	CO4	Up to K4	2	K1 & K2	2	K2 & K2	2 (K3&K3)	1(K4)			
		No. of Questions to be asked	4		3		4	2			
Pat	stion tern	No. of Questions to be answered	4		3		2	1			
CIA I & II		Marks for each question	1		2		5	10			
		Total Marks for each section	4		6		10	10			

	Distribution of Marks with K Level CIA I & CIA II										
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %			
	K1	2	2	-	-	4	8				
	K2	2	4	10	10	26	52	60			
CIA	K3	-	-	10	10	20	40	40			
I	K4	-	-	-	-	-	-	-			
-	Marks	4	6	20	20	50	100	100			
	K1	2	2	-	-	4	8				
	K2	2	4	10	10	26	52	60			
CIA	K3	-	-	10	-	10	20	20			
II	K4	-	-	-	10	10	20	20			
	Marks	4	6	20	20	50	100	100			

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summa	Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)									
			MC	Qs	Short A	nswers	Section C	Section D		
S. No	COs	K - Level	No. of Questions	K – Level	No. of Questio n	K – Level	(Either / or Choice)	(Open Choice)		
1	CO1	Up to K2	2	K1,K2	1	K1	2 (K2&K2)	1(K2)		
2	CO2	Up to K3	2	K1&K2	1	K1	2 (K3&K3)	1(K3)		
3	CO3	Up to K3	2	K1&K2	1	K2	2 (K3&K3)	1(K3)		
4	CO4	Up to K4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)		
5	CO5	Up to K4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)		
No. of	Questions	to be Asked	10		5		10	5		
No. of Q	uestions to	be answered	10		5		5	3		
Marks for each question			1		2		5	10		
Total Marks for each section			10		10		25	30		
()	Figures i	n parenthesis	denotes, qu	estions sho	uld be ask	ed with t	he given K l	evel)		

	Distribution of Marks with K Level										
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %				
K1	5	4	-	-	9	7.5	33				
K2	5	6	10	10	31	25.83	55				
K3	-	-	40	20	60	50	50				
K4	-	-	-	20	20	16.67	17				
Marks	10	10	50	50	120	100	100				
NB: Hig	her level of p	erformance o	f the students	s is to be asse	essed by a	attempting	higher level				

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.

Section .	A (Mul	tiple Choic	e Questions)
Answer	All Que	estions	(10x1=10 marks)
Q. No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section 1	B (Shor	t Answers	)
Answer	All Que	estions	(5x2=10 marks)
Q. No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section	C (Eith	er/Or Typ	e)
Answer	All Que	estions	(5 x 5 = 25 marks)
Q. No	CO	K Level	Questions
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
			rmance of the students is to be assessed by attempting higher
level of l			
	· •	n Choice)	
		ree questi	
Q. No	CO	K Level	Questions
21	C01	K2	
22	CO2	K3	
23	CO3	K3	
		K4	
23 24 25	CO4 CO5	K4 K4	

# **Summative Examinations - Question Paper – Format**



## MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	BIOINORGANIC CHEMISTRY						
Course Code	21UCHE54	L	Р	С			
Category	tegory CORE ELECTIVE						
Nature of cours	e: EMPLOYABILITY 🗸 SKILL ORIENTED 🖌 ENTREPREN	URS	HIP	✓			
Course Objecti	ves:						
•	the fundamentals of biomolecules and metals in biological systems an	d gen	eraliz	ze			
their structu							
	er the structures of myoglobin & hemoglobin, copper & nitrogen enz						
-	the behavior of dioxygen bound to metals and role of metals in medi	cine					
	the structure of the active site in myoglobin & hemoglobin						
	the metals containing proteins and enzymes and metal toxicity						
	TALS IN BIOLOGY		15				
	Essential Chemical Elements – Metals in Biological Systems – Biolo						
÷	- Electronic and Geometric Structures of Metals -Metals in Biolog	gical S	System	ms –			
	ng proteins and enzymes.		1.0				
	NDAMENTALS OF BIOMOLECULES		15				
	o Acid Building Blocks – Protein Structure – Protein Sequencing and						
	otein Function, Enzymes, Classification of enzymes – Enzyme Kineti	cs –					
Enzyme Inhibiti			1.7				
	OGLOBIN AND HEMOGLOBIN		15				
	Hemoglobin: Structure of the Prosthetic Group – Mechanism for Rev						
	d Cooperativity of Oxygen Binding – Behavior of Dioxygen Bou						
	e Active Site in Myoglobin and Hemoglobin – Binding of CO	to M	lyogi	obin,			
Hemoglobin. Unit: IV CO	PPER AND NITROGEN ENZYMES		15				
	s: Occurrence – Structure – Function – Discussion of Specific Enzyn		-				
	emocyanin. Enzyme Nitrogenase: Iron–Sulfur Clusters – Fe–Prot						
Distilled Mecha			Iuciu	ne –			
	LE OF METALS IN MEDICINE		15				
	cinal Chemistry - Metal Toxicity and Homeostasis – Anti-cancer a	ante.					
_	pounds - Chelation therapy – Cancer treatment – Anti-arthritis drug	-	_				
MRI Imaging A	· · · · ·	3 – U	auom	mum			
	Total Lecture Ho	urs	75 H	rs			
Books for Stud		uib	///	15			
	•						
	dy. K, Bioinorganic Chemistry, New Age International, 2003, New D		~				
2. Malik. W.U, Tuli. G.D, Madan. R.D, Selected topics in Inorganic Chemistry, 7 <sup>th</sup> Edition, S.							
	003, New Delhi.						
Books for Refe		•	<b>T</b> 1				
	Roat Malone, Bioinorganic Chemistry: A short course, Wiley – Interso	eience	, Johi	n			
Wiley & Sons, I		n					
2. Miessier. G.	L and Donald A. Tarr, Inorganic Chemistry, Pearson Publication, 200	۷.					

3. James E. Huheey, Ellen Keiter and Richard Keiter, Inorganic Chemistry: Principles of Structure and Reactivity, Pearson Publication, 1993.

4. Lippard. S.T and Berg. T.M, Principles of Bioinorganic Chemistry, Panima Publishing Co., 1997, New York.

#### Web Resources:

- 1. https://youtu.be/pXztk04J7u0
- 2. https://youtu.be/eayeaUT5fus
- 3. https://youtu.be/6TVI\_cjBeOs
- 4. <u>https://youtu.be/2Xq-x1c8PZg</u>

	e Outcomes	K Level						
On th	On the completion of the course the student will be able to							
CO1:	Identify the fundamentals of biomolecules in biological systems and their structures	[Up to K2]						
CO2:	Remember the structures of myoglobin & hemoglobin, copper & nitrogen enzymes.	[Up to K3]						
CO3:	Compare the behavior of dioxygen bound to metals and role of metals in medicine	[Up to K3]						
<b>CO4:</b>	Perform the structure of the active site in myoglobin & hemoglobin	[Up to K4]						
CO5:	Determine the metals containing proteins and enzymes and metal toxicity	[Up to K4]						

### CO & PO Mapping:

Course Outcomes	Programme Outcomes (POs)							
(COs)	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	PO 4	<b>PO 5</b>	<b>PO 6</b>		
CO 1	3	1	2	3	1	2		
CO 2	1	3	1	1	2	3		
CO 3	2	2	3	2	3	3		
CO 4	3	1	2	2	1	2		
CO5	1	3	2	3	2	1		
Weightage	10	10	10	11	9	11		

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

### LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	METALS IN BIOLOGYIntroduction – Essential Chemical Elements – Metals in BiologicalSystems – Biological Metal Ion Complexation – Electronic andGeometric Structures of Metals –Metals in Biological Systems – Metalscontaining proteins and enzymes.	15	Chalk, Talk & Power point
II	FUNDAMENTALS OF BIOMOLECULESProteins – Amino Acid Building Blocks – Protein Structure – ProteinSequencing and Proteomics – Protein Function, Enzymes, Classificationof enzymes – Enzyme Kinetics – Enzyme Inhibition.	15	Chalk, Talk & Power point
ш	MYOGLOBIN AND HEMOGLOBINMyoglobin and Hemoglobin: Structure of the Prosthetic Group –Mechanism for Reversible Binding of Dioxygen and Cooperativity ofOxygen Binding – Behavior of Dioxygen Bound to Metals – Structureof the Active Site in Myoglobin and Hemoglobin – Binding of CO toMyoglobin, Hemoglobin.	15	Chalk, Talk & Power point
IV	COPPER AND NITROGEN ENZYMES Copper Enzymes: Occurrence – Structure – Function – Discussion of Specific Enzymes: Superoxide Dismutase – Hemocyanin. Enzyme Nitrogenase: Iron–Sulfur Clusters – Fe–Protein Structure – Detailed Mechanistic Studies.	15	Chalk, Talk & Power point
v	ROLE OF METALS IN MEDICINEInorganic Medicinal Chemistry - Metal Toxicity and Homeostasis -Anti-cancer agents: Cisplatin and related compounds - Chelation therapy- Cancer treatment - Anti-arthritis drugs - Gadolinium MRI ImagingAgents.	15	Chalk, Talk & Power point

Course Designed by: Dr. R. Satheesh & Dr. V. Ramasamy Raja

	Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)										
			Section			tion B	Section C	Sectio			
Inte rnal	Cos	K Level	MC No. of. Questions	XQS K – Level	Short A No. of. Questi ons	Answers K - Level	Section C Either or Choice	n D Open Choice			
CI	CO1	Up to K2	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)			
AI	CO2	Up to K3	2	K1 & K2	2	K2 & K2	2 (K3&K3)	1(K3)			
CI	CO3	Up to K3	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)			
AII	CO4	Up to K4	2	K1 & K2	2	K2 & K2	2 (K3&K3)	1(K4)			
		No. of Questions to be asked	4		3		4	2			
Pat	estion tern I & II	No. of Questions to be answered	4		3		2	1			
	1 & 11	Marks for each question	1		2		5	10			
		Total Marks for each section	4		6		10	10			

	Distribution of Marks with K Level CIA I & CIA II										
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %			
	K1	2	2	-	-	4	8				
	K2	2	4	10	10	26	52	60			
CIA	K3	-	-	10	10	20	40	40			
	K4	-	-	-	-	-	-	-			
	Marks	4	6	20	20	50	100	100			
	K1	2	2	-	-	4	8				
	K2	2	4	10	10	26	52	60			
CIA	K3	-	-	10	-	10	20	20			
II	K4	-	-	-	10	10	20	20			
	Marks	4	6	20	20	50	100	100			

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

S	Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)										
			MC	Qs	Short Answers		Section C	Section D			
S. No	COs	K - Level	No. of Questions	K – Level	No. of Questio n	K – Level	(Either / or Choice)	Section D (Open Choice)			
1	CO1	Up to K2	2	K1,K2	1	K1	2 (K2&K2)	1(K2)			
2	CO2	Up to K3	2	K1&K2	1	K1	2 (K3&K3)	1(K3)			
3	CO3	Up to K3	2	K1&K2	1	K2	2 (K3&K3)	1(K3)			
4	CO4	Up to K4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)			
5	CO5	Up to K4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)			
No. of	Questions	s to be Asked	10		5		10	5			
No	No.of Questions to be answered		10		5		5	3			
Ma	Marks for each question		1		2		5	10			
Total	Marks for	each section	10		10		25	30			
	(Figures	in parenthesi	is denotes, qu	estions sh	ould be asl	ked with	the given K	level)			

	Distribution of Marks with K Level									
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %			
K1	5	4	-	-	9	7.5	33			
K2	5	6	10	10	31	25.83	55			
K3	_	-	40	20	60	50	50			
K4	_	-	-	20	20	16.67	17			
Marks	10	10	50	50	120	100	100			

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.

Section	A (Mu	ltiple Choi	ce Questions)
Answer	-	-	(10x1=10 marks)
Q. No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section	B (Sho	rt Answer	s)
Answer	All Qu	iestions	(5x2=10 marks)
Q. No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section	C (Eitl	her/Or Typ	pe)
Answer	· All Qu	iestions	(5  x 5 = 25  marks)
Q. No	CO	K Level	Questions
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
			ormance of the students is to be assessed by attempting higher
level of			
		en Choice)	
		hree quest	
Q. No	CO	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

# **Summative Examinations - Question Paper – Format**



## MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	CHEMISTRY IN CRIME INVESTIGATION							
Course Code	21UCHE55	L	Р	С				
Category	CORE ELECTIVE	5	-	5				
Nature of cours	e: EMPLOYABILITY 🗸 SKILL ORIENTED 🖌 ENTREPREN	NURS	HIP	$\checkmark$				
Course Objecti	ives:							
	e concept of forensic science and criminology studies							
	ber the finger prints and classification and uses of finger prints							
-	<ul> <li>To Compare the concepts of arsons, explosives and ballistics</li> </ul>							
	the biological substances in the dead clinic symptom							
	the crime through network documents		1.5	,				
	IMINOLOGY AND FORENSIC SCIENCE	-1	15					
	definition - nature and scope - types of crimes penology - Indian per							
crime investigat	ndian criminal procedure code. Forensic science – definition - princi	pies a	na us	es m				
	IGER PRINTS & TRACKS-TRACES		15					
	patterns – classification - uses of finger print in crime investigation -	direct						
	ment by powders - other methods of development - transfer methods							
1 1	s - Foot prints - casting of foot prints - residue prints - walking patte		U I					
	races & tracks - glass fracture - tool marks – paints – fibres.							
	DLOGICAL SUBSTANCES AND POISONS		15					
Blood – semen	1 – saliva – sweat – urine – hair – skin - DNA analysis. Poise	ons -	types	and				
classification-di	agonosis of poisoning in the living and in the dead - clinical sympton	n - po	st-mc	rtem				
appearances - tr	eatment in cases of poisoning - antidotes.							
	SONS, EXPLOSIVES AND BALLISTICS		15					
	d arson - nature of action of fire - drifts and air supply - burning							
	lefinition - classification - compostion and mechanism of expl							
	sification - internal, external and terminal ballistics - small arms -c							
	- laboratory examination of barrel washing and detection of pow	der re	sidue	s by				
chemical tests.			1.5	,				
	BER CRIMES AND DOCUMENTS	•,•	15					
· · · · · · · · · · · · · · · · · · ·	crime through network Documents - Chemistry of paper and ink -		<b>U</b> I	•				
	chalk – adhesives - sealing waxes - different types of forged signat geries -inherent signs of forgery models - writing of forged m							
	dified - use of ultraviolet rays - comparison of type written letters			_				
currency and co	• • • • • • • • • • • • • • • • • • • •	- cou	mern					
	Total Lecture He	ours	75 H	rs				
Books for Stud								
1. Saferstein, R	, Criminalities and introduction to Forensic Science, Prentice Hall of	India	.1978					
<b>Books for Refe</b>	rences:							
1. James, T.H.,	Forensic Science.1987							
Web Resources								

	1. <u>https://youtu.be/Wtwx_uOgOUc</u> 2. <u>https://youtu.be/StcLHDM3Vng</u>					
Course	Course Outcomes K Level					
On th	e completion of the course the student will be able to					
CO1:	Ability to understand the concept of forensic science	[Up to K2]				
<b>CO2:</b>	Discuss the criminological studies through finger prints	[Up to K3]				
CO3:	Interpret the classification of finger print and biological substances	[Up to K3]				
CO4:	Examine the relationship between arsons, explosives and ballistics	[Up to K4]				
CO5:	Analyze the cyber crime through network documents	[Up to K4]				

# CO & PO Mapping:

<b>Course Outcomes</b>	Programme Outcomes (POs)							
(COs)	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	PO 4	PO 5	<b>PO 6</b>		
CO 1	3	1	2	3	1	2		
CO 2	1	3	1	1	2	3		
CO 3	2	2	3	2	3	3		
CO 4	3	1	2	2	1	2		
CO5	1	3	2	3	2	1		
Weightage	10	10	10	11	9	11		

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

# LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
Ι	<b>CRIMINOLOGY AND FORENSIC SCIENCE</b> Criminology – definition - nature and scope - types of crimes penology - Indian penal code - Indian evidence act - Indian criminal procedure code. Forensic science – definition - principles and uses in crime investigation.	15	Chalk, Talk & Power point
II	FINGER PRINTS & TRACKS – TRACES Finger prints – patterns – classification - uses of finger print in crime investigation - direct and latent prints - development by powders - other methods of development - transfer methods of finger prints. Tracks – Traces - Foot prints - casting of foot prints - residue prints - walking pattern - tire marks - miscellaneous traces & tracks - glass fracture - tool marks – paints – fibres.	15	Chalk, Talk & Power point
III	BIOLOGICAL SUBSTANCES AND POISONS	15	Chalk, Talk &

	Blood – semen – saliva – sweat – urine – hair – skin - DNA analysis. Poisons - types and classification-diagonosis of poisoning in the living and in the dead - clinical symptom - post-mortem appearances - treatment in cases of poisoning - antidotes.		Power point
IV	ARSONS, EXPLOSIVES AND BALLISTICS Natural fires and arson - nature of action of fire - drifts and air supply - burning characteristics. Explosives – definition – classification - compostion and mechanism of explosion - bombs. Ballistics – classification - internal, external and terminal ballistics - small arms - classification and characteristics - laboratory examination of barrel washing and detection of powder residues by chemical tests.	15	Chalk, Talk & Power point
v	<b>CYBER CRIMES AND DOCUMENTS</b> Cyber crimes - crime through network Documents - Chemistry of paper and ink - writing paper - carbon paper – chalk – adhesives - sealing waxes - different types of forged signatures - simulated and traced forgeries -inherent signs of forgery models - writing of forged models - writing deliberately modified - use of ultraviolet rays - comparison of type written letters - counterfeit of currency and coins.	15	Chalk, Talk & Power point

Course Designed by: Dr. K. Muthupandi & Dr. R. Satheesh

			g Outcome B Formative Ex Aapping – K	kamination -	Blue Pri	nt		
			Secti			tion B	Section C	Secti on D
Inte rnal	Cos	K Level	MC No. of. Questions	K – Level	No. of. Questi ons	Answers K - Level	Either or Choice	Open Choi ce
CI	CO1	Up to K2	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)
AI	CO2	Up to K3	2	K1 & K2	2	K2 & K2	2 (K3&K3)	1(K3)
CI	CO3	Up to K3	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)
AII	CO4	Up to K4	2	K1 & K2	2	K2 & K2	2 (K3&K3)	1(K4)
		No. of Questions to be asked	4		3		4	2
Pat	estion tern I & II	No. of Questions to be answered	4		3		2	1
	1 & 11	Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

	Distribution of Marks with K Level CIA I & CIA II										
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %			
	K1	2	2	-	-	4	8				
	K2	2	4	10	10	26	52	60			
CIA	K3	-	-	10	10	20	40	40			
	K4	-	-	-	-	-	-	-			
-	Marks	4	6	20	20	50	100	100			
	K1	2	2	-	-	4	8				
	K2	2	4	10	10	26	52	60			
CIA	K3	-	-	10	-	10	20	20			
II	K4	-	-	-	10	10	20	20			
	Marks	4	6	20	20	50	100	100			

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

S	Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)										
			MCC	``	Short Answers		Section C	Seather D			
S. No	COs	K - Level	No. of Questions	K – Level	No. of Questio n	K – Level	(Either / or Choice)	Section D (Open Choice)			
1	CO1	Up to K2	2	K1,K2	1	K1	2 (K2&K2)	1(K2)			
2	CO2	Up to K3	2	K1&K2	1	K1	2 (K3&K3)	1(K3)			
3	CO3	Up to K3	2	K1&K2	1	K2	2 (K3&K3)	1(K3)			
4	CO4	Up to K4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)			
5	CO5	Up to K4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)			
No. of	Questions	s to be Asked	10		5		10	5			
No	o. of Quest answe	ions to be red	10		5		5	3			
Ma	Marks for each question		1		2		5	10			
Total Marks for each section		10		10		25	30				
	(Figures	in parenthesi	is denotes, qu	estions sh	nould be as	ked with	the given K	level)			

	Distribution of Marks with K Level											
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %					
K1	5	4	-	-	9	7.5	33					
K2	5	6	10	10	31	25.83	55					
K3	-	-	40	20	60	50	50					
K4	_	-	-	20	20	16.67	17					
Marks	10	10	50	50	120	100	100					

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.

	-	-	e Questions)
Answer			(10x1=10 marks)
Q. No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
		t Answers	)
Answer	-	1	(5x2=10 marks)
Q. No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section	C (Eith	er/Or Type	e)
Answer	All Que	estions	(5  x 5 = 25  marks)
Q. No	CO	K Level	Questions
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Hig	her lev	el of perfoi	rmance of the students is to be assessed by attempting higher
level of I	K levels	-	
Section 1	D (Ope	n Choice)	
Answer	Any Th	ree questi	ons (3x10=30 marks)
Q. No	CO	K Level	Questions
21	CO1	K2	
22	CO2	K3	
	CO3	K3	
23	COS		
23 24	CO3	K4	

# **Summative Examinations - Question Paper – Format**



## MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name FOOD PROCESSING CHEMISTRY								
Course Code 21UCHE56	L	Р	С					
Category CORE ELECTIVE	5	-	5					
Nature of course: EMPLOYABILITY & SKILL ORIENTED & ENTREPREN	URSI	HIP	✓					
Course Objectives:								
To Recall the raw materials in food processing and its properties								
• To Remember the properties and deterioration reaction in fruits and vegetables								
To Compare small scale food processing and nutritional changes								
• To Perform the chemistry of sweeteners, legal aspects of food adulteration								
To Determine the adulterants in food processing								
Unit: I INTRODUCTION TO FOOD PROCESSING		15						
Introduction- importance of raw materials in food processing-properties of raw								
material cleaning and classifications: dry and wet cleaning, peeling, sorting, gr								
seeding, chilling and freezing- elements of food processing: food safety, food qual								
foods - unit operation - unit processing - common unit process: pasteurization, steriliz	ation,	dryi	ng,					
separation, evaporation, refrigeration, freezing.								
Unit: II         FRUITS AND VEGETABLES PROCESSING		15						
Introduction - properties of fruits and vegetables - Deterioration reactions in fruits		-						
changes in enzymes, chemical changes, nutritional quality changes, physical chan	iges, 1	biolo	gical					
changes - raw materials for fruits and vegetables processing.								
Unit: III SMALL-SCALE FOOD PROCESSING		15						
Processing of cereal and pulses- grain processing: puffing, flaking, milling, doug								
extrusion, baking, frying, porridge-baked products- snack foods processing- r	nanuf	actur	e of					
beverages- coffee processing.								
Unit: IV FOOD ADDITIVES		15						
Introduction-chemistry of sweeteners: intense sweetuieners, bulk sweeteners - food of								
colours, synthetic colours - permitted levels of colourants - list of permitted colourant								
agents-antioxidants: chemistry of antioxidants, type of antioxidants and uses:			-					
tocoperols, butylated hydroxyanisole (BHA), citric acid, Beta-carotene, lutein -								
foodstuff containing emulisifiers - types of emulsions - acidulants: acetic acid, citric a	icid, la	actic	acid,					
malic acid, phoaphoric acid, tartaric acid.		1.5						
Unit: V FOOD ADULTERATION	1 . 1.	15						
Introduction - Legal Aspects of food adulteration and prevention - common foo								
analysis of various food adulterants: analysis of adulterants in edible oils, ghee, coffe	-							
powder, turmeric powder, meat and milk - harmful effect of the adulterants. <b>Food Pr</b>								
and wheat products- classification of wheat - wheat flour - wheat products - milk and composition of milk - milk grades - some commercial milk products.	ШК	produ	icts -					
Total Lecture Hor	irc	75 H	rc					
Books for Study:	413	15 11	13					
	-	_						
1. Vikas Ahlluwalia, A text book of Food Processing Paragon International Publisher	s, Nev	v Del	hi,					
2007.								

2. A te	xt book of Food Chemistry, Alex V Ramani, MJP Publications, Chennai, 2009	).
Books	for References:	
1. P.J.	Fellows, Food Processing Technology. Principles and Practices, Second Edi	tion, Woodland
Pub	lishing Ltd, Cambridge, England, 2002.	
2. Ava	ntina Sharma, Text Book of Food Science and Technology, International Bo	ok, Distributing
Co,	Lucknow, UP, 2006.	_
3. Siva	sankar, Food Processing and Preservation, Prentice Hall of India Pvt. Ltd.,	New Delhi. 3rd
Prin	ting, 2005.	
4. Pete	er Zeuthen and Leif Bogh-Sorenson, Food Preservation Techniques, Wood	land Publishing
Ltd.	, Cambridge, England, 200	
Web R	lesources:	
	tps://youtu.be/naauUbo4Ick	
	tps://youtu.be/WRYoGiOobqU	
	tps://youtu.be/AMJYn3hgv3o	
	tps://youtu.be/a4aKLHCLyD8	
-	e Outcomes	K Level
On th	e completion of the course the student will be able to	
<b>CO1:</b>	Ability to understand the raw materials in food processing	[Up to K2]
CO2:	Discuss the various elements of food processing and properties fruits and	[Up to K3]
02.	vegetables	
CO3:	Interpret the study of small-scale food processing	[Up to K3]
<b>CO4:</b>	Examine the legal aspects of food adulteration and prevention	[Up to K4]
CO5:	Analyze the food additives, food adulterants in food processing	[Up to K4]

### CO & PO Mapping:

<b>Course Outcomes</b>	Programme Outcomes (POs)								
(COs)	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	PO 4	PO 5	PO 6			
CO 1	3	1	2	3	1	2			
CO 2	1	3	1	1	2	3			
CO 3	2	2	3	2	3	3			
<b>CO 4</b>	3	1	2	2	1	2			
CO5	1	3	2	3	2	1			
Weightage	10	10	10	11	9	11			

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

### LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
Ι	<b>INTRODUCTION TO FOOD PROCESSING</b> Introduction- importance of raw materials in food processing-properties of raw material-raw material cleaning and classifications: dry and wet cleaning, peeling, sorting, grading, cutting, seeding, chilling and freezing- elements of food processing: food safety, food quality, convenient foods - unit operation - unit processing - common unit process: pasteurization, sterilization, drying, separation, evaporation, refrigeration, freezing.	15	Chalk, Talk & Power point
II	<b>FRUITS AND VEGETABLES PROCESSING</b> Introduction - properties of fruits and vegetables - Deterioration reactions in fruits and vegetable: changes in enzymes, chemical changes, nutritional quality changes, physical changes, biological changes - raw materials for fruits and vegetables processing.	15	Chalk, Talk & Power point
III	<b>SMALL-SCALE FOOD PROCESSING</b> Processing of cereal and pulses- grain processing: puffing, flaking, milling, doughs and batters, extrusion, baking, frying, porridge-baked products- snack foods processing- manufacture of beverages- coffee processing.	15	Chalk, Talk & Power point
IV	<b>FOOD ADDITIVES</b> Introduction-chemistry of sweeteners: intense sweetuieners, bulk sweeteners - food colours: natural colours, synthetic colours - permitted levels of colourants - list of permitted colourants - flavouring agents- antioxidants: chemistry of antioxidants, type of antioxidants and uses: ascorbic acid, tocoperols, butylated hydroxyanisole (BHA), citric acid, Beta-carotene, lutein - emulisifiers - foodstuff containing emulisifiers - types of emulsions - acidulants: acetic acid, citric acid, lactic acid, malic acid, phoaphoric acid, tartaric acid.	15	Chalk, Talk & Power point
V	<b>FOOD ADULTERATION</b> Introduction - Legal Aspects of food adulteration and prevention - common food adulterants - analysis of various food adulterants: analysis of adulterants in edible oils, ghee, coffee powder, chili powder, turmeric	15	Chalk, Talk & Power point

powder, meat and milk - harmful effect of the adulterants. Food	
Products: Wheat and wheat products- classification of wheat - wheat	
flour - wheat products - milk and milk products - composition of milk -	
milk grades - some commercial milk products.	

### Course Designed by: Dr. V. Ramasamy Raja & Dr. K. Muthupandi

	Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)										
			Section A		Section B						
Inte rnal Cos		K Level	M No. of. Questio ns	CQs K – Level	Short A No. of. Questions	nswers K - Level	Section C Either or Choice	Section D Open Choice			
CI	CO1	Up to K2	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)			
AI	CO2	Up to K3	2	K1 & K2	2	K2 & K2	2 (K3&K3)	1(K3)			
CI	CO3	Up to K3	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)			
AII	CO4	Up to K4	2	K1 & K2	2	K2 & K2	2 (K3&K3)	1(K4)			
		No. of Questions to be asked	4		3		4	2			
Pat	estion tern	No. of Questions to be answered	4		3		2	1			
CIA	I & II	Marks for each question	1		2		5	10			
		Total Marks for each section	4		6		10	10			

	Distribution of Marks with K Level CIA I & CIA II											
	K (Multiple Level Choice Questions)		Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %				
	K1	2	2	-	-	4	8					
	K2	2	4	10	10	26	52	60				
CIA	K3	-	-	10	10	20	40	40				
I	K4	-	-	-	-	-	-	-				
-	Marks	4	6	20	20	50	100	100				
	K1	2	2	-	-	4	8					
	K2	2	4	10	10	26	52	60				
CIA	K3	-	-	10	-	10	20	20				
II	K4	-	-	-	10	10	20	20				
	Marks	4	6	20	20	50	100	100				

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

**K3**- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

S	Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)										
			MC	Qs	Short A	nswers	Section C	Section D			
S.No	COs	K - Level	No. of Questions	K – Level	No. of Questio n	K – Level	(Either / or Choice)	Section D (Open Choice)			
1	CO1	Up to K2	2	K1,K2	1	K1	2 (K2&K2)	1(K2)			
2	CO2	Up to K3	2	K1&K2	1	K1	2 (K3&K3)	1(K3)			
3	CO3	Up to K3	2	K1&K2	1	K2	2 (K3&K3)	1(K3)			
4	CO4	Up to K4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)			
5	CO5	Up to K4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)			
No. of	Questions	s to be Asked	10		5		10	5			
No.of Questions to be answered			10		5		5	3			
Mai	Marks for each question		1		2		5	10			
Total	Marks for	each section	10		10		25	30			
	(Figures	in parenthesi	is denotes, qu	estions sh	ould be asl	ked with	the given K	level)			

	Distribution of Marks with K Level											
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %					
K1	5	4	-	-	9	7.5	33					
K2	5	6	10	10	31	25.83						
K3	-	-	40	20	60	50	50					
K4	-	-	-	20	20	16.67	17					
Marks	10	10	50	50	120	100	100					
-	NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.											

Section	A (Mu	iltiple Cho	ice Questions)
Answei	r All Q	uestions	(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section	B (Sho	ort Answei	rs)
Answe	r All Q	uestions	(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section	C (Eit	her/Or Ty	pe)
Answei	r All Q	uestions	(5  x 5 = 25  marks)
Q.No	CO	K Level	Questions
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
			ormance of the students is to be assessed by attempting higher
level of			
		en Choice	
		Three ques	
Q.No	CO	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

# **Summative Examinations - Question Paper – Format**



## MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	DRUG CHEMISTRY							
Course Code	21UCHS51	L	Р	С				
Category	SKILL	2	-	2				
Nature of cours	e: EMPLOYABILITY 🗸 SKILL ORIENTED 🖌 ENTREPREN	URS	HIP	✓				
Course Object	ives:							
	the different systems of medicines and its drug actions							
To Rememb	per the basic of anaesthetics and chemotherapy							
• To Interpret the therapeutic function of synthetic drugs								
• To Understa	and about the antibiotics and indole derivatives							
	ne the various synthetic drugs, gaseous anaesthetics, chemotherapy ar		ises					
	<b>FRODUCTION TO THE DIFFERENT SYSTEMS OF MEDICIN</b>		06					
	ms of medicine: Ayurveda, Siddha, Homeopathy and Allopathy							
	istry – discovery of drugs – Introduction. Analgesics and Antipyre							
	forphine and derivatives. Total synthetic analgesics pethidine a							
	gesics – salicylic acid derivatives, Indole derivatives and p-amino ph							
	and structure only). Antibiotics – Definition, Penicillin – Tetracycl	ine (A	uron	iycin				
•	-Streptomycin and Chloromycetin – drug action and uses.							
	AESTHETICS	C1 1	06					
	thetics – Vinyl ether – Cyclopropane – Halo hydrocarbons –							
	ichloro ethylene – Intravenous anaesthetics – Thiopentone – Loca	i anae	stnet	1CS –				
	derivatives. (Therapeutic use only) TIBIOTICS AND ANTIMALARIALS		06					
	Sulphadiazine, prontosil and prontosil-S. Antimalarials – quinine and	ite d						
	– Salvarsan – 606 – Neosalvarsan.	i its u	criva	1005.				
	NTHETIC DRUGS		06					
	and its therapeutic function of paracetamol – Aspirin – naproxen	– An						
ciprofloxacin –		1 111	lionyi					
<b>•</b>	stry and submission of Report. For industrial visit / Assignment = $5$	mark	s inte	rnal)				
	Industrial Centre (DIC for visits)							
	DRMONES AND VITAMINS		06					
	Classification Testosterone, Progesterone, Thyroxine, Vitamin C,	Struc	ture	only				
	idation not necessary)			- 5				
	Total Lecture Ho	ours	<b>30 H</b>	rs				
Books for Stud	y:	ľ						
1. Jayashree G	hosh, A Textbook of Pharmaceutical Chemistry, S. Chand & Co., 199	99, Ne	w De	lhi.				
<b>Books for Refe</b>	rences:							
	Craig and Robert E. Stitzel, Modern Pharmacology, 3 <sup>rd</sup> Edition, Little	Brow	n and	Со.,				
Boston, 1990.				,				
	sch, Peter G. Sammer, John B. Taylor and Peter D.K. Kennewell,	Comp	rehei	nsive				
	nistry, Pergmon Press, Great Britain, 1990.	-						
3. Bertram G.	Katzung, Basic and Clinical Pharmocology, Lange Medical Publication	ons, A	tos, 1	982,				

Califor	nia.	
Web R	lesources:	
1. <u>http</u>	s://youtu.be/IUxkcEoGkVg	
2. <u>http</u>	<u>s://youtu.be/pss_sm2zaek</u>	
	<u>s://youtu.be/Z63xnlDNajE</u>	
4. <u>http</u>	<u>s://youtu.be/qaYBUz14B3w</u>	
Course	e Outcomes	K Level
On th	e completion of the course the student will be able to	
<b>CO1:</b>	Ability to know the basic of anaesthetics and chemotherapy	[Up to K2]
CO2:	Discuss various synthetic drugs, gaseous anaesthetics, chemotherapy and its	IIIm to V21
CO2:	uses	[Up to K3]
<b>CO3:</b>	Interpret the different systems of medicines and its drug actions	[Up to K3]
<b>CO4:</b>	Examine the antibiotics and indole derivatives	[Up to K4]
CO5:	Analyze the therapeutic function of synthetic drugs	[Up to K4]

## CO & PO Mapping:

Course Outcomes	Programme Outcomes (POs)							
(COs)	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	PO 4	<b>PO 5</b>	PO 6		
CO 1	3	1	2	3	1	2		
CO 2	1	3	1	1	2	3		
CO 3	2	2	3	2	3	3		
CO 4	3	1	2	2	1	2		
CO5	1	3	2	3	2	1		
Weightage	10	10	10	11	9	11		

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

### LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
Ι	<ul> <li>INTRODUCTION TO THE DIFFERENT SYSTEMS OF</li> <li>MEDICINE</li> <li>Different systems of medicine: Ayurveda, Siddha, Homeopathy and</li> <li>Allopathy – History of medicinal chemistry – discovery of drugs –</li> <li>Introduction. Analgesics and Antipyretics – Narcotic analgesics –</li> <li>Morphine and derivatives. Total synthetic analgesics pethidine and</li> <li>methadone. Antipyretic analgesics – salicylic acid derivatives, Indole</li> <li>derivatives and p-amino phenol derivatives (Medicinal uses and</li> <li>structure only). Antibiotics – Definition, Penicillin – Tetracycline</li> <li>(Auromycin &amp; Terramycin) –Streptomycin and Chloromycetin – drug</li> <li>action and uses.</li> </ul>	06	Chalk, Talk & Power point
II	ANAESTHETICS Gaseous anaesthetics – Vinyl ether – Cyclopropane – Halo hydrocarbons – Chloroform – Haloethane– Trichloro ethylene – Intravenous anaesthetics – Thiopentone – Local anaesthetics – Cocaine and its derivatives. (Therapeutic use only)	06	Chalk, Talk & Power point
III	ANTIBIOTICS AND ANTIMALARIALS Sulpha drugs – Sulphadiazine, prontosil and prontosil-S. Antimalarials – quinine and its derivatives. Arsenical drugs – Salvarsan – 606 – Neosalvarsan.	06	Chalk, Talk & Power point
IV	SYNTHETIC DRUGSSynthetic drugs and its therapeutic function of paracetamol – Aspirin –naproxen – Amoxyllin – ciprofloxacin – Ibuprofen.Visit to an Industry and submission of Report. For industrial visit /Assignment = 5 marks internal) Contact District Industrial Centre (DIC for visits)	06	Chalk, Talk & Power point
V	HORMONES AND VITAMINSDefinition and Classification Testosterone, Progesterone, Thyroxine,Vitamin C, Structure only (Structural elucidation not necessary)	06	Chalk, Talk & Power point

Course Designed by: Dr. R. Satheesh & Dr. A.J. Sunija





## MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name PHYSICAL CHEMISTRY – III	ame PHYSICAL CHEMISTRY – III									
Course Code 21UCHC61	L	Р	С							
Category Core	6	-	6							
Nature of course:         EMPLOYABILITY         ✓         SKILL ORIENTED         ENTREPREN	URS	HIP	✓							
Course Objectives:										
• To Recall the general characteristics of aromatic compounds and reaction mechanisms.										
• To Remember the basics of aromatic compounds and polynuclear compounds.										
• To Compare the preparation, properties of ortho, para, meta directing and aromatic	c com	pour	ıds.							
• To Perform the mechanism of reactions and effects of substituents.										
• To Determine the various concepts on mechanisms and polynuclear compounds.										
Unit: I THERMODYNAMICS – I		18								
Definition of thermodynamic terms: system, surroundings - types of systems,	inter	isive	and							
extensive properties - State and path functions and their differentials - Th	iermo	odyna	amic							
process - Concept of heat and work - Definition of internal energy and e										
capacity - Heat capacities at constant volume and pressure and their relation	-									
Thomson effect – Joule-Thomson coefficient and inversion temperature – Calcu										
dU & dH for the expansion of ideal gases under isothermal and adiabatic	condi	tions	s for							
reversible process – Hess's Law of constant heat summation and its applications										
Unit: II THERMODYNAMICS - II		18								
Need for the second law-different statements of the second law-Carnot cycle a										
Entropy as state function – entropy as a function of pressure and volume – Entro		<u> </u>								
an ideal gas – physical significances of entropy – Clausius inequality – entropy										
spontaneity and equilibrium. Gibbs function (G) and Helmholts fund										
thermodynamics quantities – Gibbs-Helmholts equation. Clausius Clapeyn	ron (	equa	tion-							
Application of Clausius- Clapeyron equation – Limitations of second law.Unit: IIIPHOTOCHEMISTRY		18								
Definition of photochemical reactions – comparative study of thermal and	nhoto	_								
reactions – laws of photochemistry – Lambert and Beer Law – Grothus – Draper	-									
Einstein law – quantum efficiency and its determination – Jablonski diagram –										
processes – fluorescence phosphorescene and other deactivating processes.										
processes – kinetics of photochemical reactions (H <sub>2</sub> /Br <sub>2</sub> reaction) – Photochemic										
(Dimerisation of anthracene)– flash photolysis – photosensitization- chemilu	-									
bioluminescence.		been	~~							
Unit: IV ELECTROCHEMISTRY – I		18								
Conductance-definition and determination of Specific conductance, equivalent conductance										
and molar conductance – variation of equivalent conductance with dilution – Mi										
- Kohlrausch's law – Arrhenius theory of electrolyte dissociation and its limitations - Ostwald's										
dilution law - Debye Huckel-Onsagar's equation for strong electrolytes (element	tary t	reati	nent							
only) – Definition of transport number – determination by Hittorfs method –										
conductivity measurements- determination of solubility products of sparingly so	luble	salts	and							
conductometric titrations – HCl Vs NaOH, CH <sub>3</sub> COOH Vs NaOH.										
Unit: V ELECTROCHEMISTRY – II		18								

a) Single electrode potential, sign convention, Reversible and irreversible cells, conditions for a cell to be a reversible and irreversible – Nernst Equation – measurement of Emf (Poggendorff's method) types of electrodes – reference electrode (SHE, Calomel electrode, Ag-AgCl electrode) Potentiometric titrations – HCl Vs NaOH and K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> Vs FeSO<sub>4</sub>. b) Commercial cells: Primary and secondary batteries – dry cell – lead storage cell – fuel cell – Hvdrogen-Oxygen fuel cell

Total Lecture Hours90 Hrs

#### **Books for Study:**

2. B.R. Puri, L.R. Sharma and S. Pathania, Principles of Physical Chemistry, 47th Edition, Shoban Lal Nagin Chand & Co., 2017.

#### **Books for References:**

6. Gilbert W. Castellan, Physical Chemistry, 3rd Edition, Narosa Publishing House, 1985.

7. S. Glasstone, Textbook of Physical Chemistry, McMillan and Co., London, 1974.

8. P.L. Soni and Dharmarha, Textbook of Physical Chemistry, S. Chand & Co., New Delhi, 1991.

9. Arun Bahl, B.S. Bahl and G.D. Tuli, Essentials of Physical Chemistry, S. Chand & Co., New Delhi, 2014.

10. S.K. Dogra and S. Dogra, Physical Chemistry through Problems, 4th Edition, New Age International, New Delhi 1996.

#### Web Resources:

- 1. https://youtu.be/hEZeQ\_HSnOU
- 2. <u>https://youtu.be/fHfv41HmIK0</u>
- 3. <u>https://youtu.be/BECSYfYhJGk</u>
- 4. https://youtu.be/fM8hwkW8bIw
- 5. https://youtu.be/tJj-ilJTo6Y
- 6. https://youtu.be/uHoKGy704jk
- 7. https://youtu.be/4swtYzEbl64
- 8. https://youtu.be/q9c3-8CE\_ro

## **Course Outcomes**

On th	On the completion of the course the student will be able to					
<b>CO1:</b>	To acquire elaborate the basic knowledge in thermodynamics.	[Up to K2]				
<b>CO2:</b>	To get more knowledge second law of thermodynamics, entropy.	[Up to K3]				
<b>CO3:</b>	To learn about the photochemical reactions and photochemical processes.	[Up to K3]				
<b>CO4:</b>	To determine the concept of conductance and conductometric titrations.	[Up to K4]				
CO5:	To analysis the basic knowledge in electrodes, electrode potentials and potentiometric titrations	[Up to K4]				

#### CO & PO Mapping:

Course Outcomes	Programme Outcomes (POs)							
(COs)	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	PO 4	<b>PO 5</b>	<b>PO 6</b>		
CO 1	3	1	2	3	1	2		
CO 2	1	3	1	1	2	3		
CO 3	2	2	3	2	3	3		
CO 4	3	1	2	2	1	2		
CO5	1	3	2	3	2	1		
Weightage	10	10	10	11	9	11		

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

Academic Council Meeting Held On 20.04.2023

**K** Level

### LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	THERMODYNAMICS – I Definition of thermodynamic terms: system, surroundings – types of systems, intensive and extensive properties – State and path functions and their differentials – Thermodynamic process – Concept of heat and work – Definition of internal energy and enthalpy. Heat capacity – Heat capacities at constant volume and pressure and their relationship – Joule- Thomson effect – Joule-Thomson coefficient and inversion temperature – Calculation of w, q, dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process – Hess's Law of constant heat summation and its applications	18	Chalk, Talk & Power point
Π	THERMODYNAMICS – II Need for the second law-different statements of the second law-Carnot cycle and efficiency. Entropy as state function – entropy as a function of pressure and volume – Entropy changes of an ideal gas – physical significances of entropy – Clausius inequality – entropy as criteria of spontaneity and equilibrium. Gibbs function (G) and Helmholts function (H) as thermodynamics quantities – Gibbs-Helmholts equation. Clausius Clapeyron equation- Application of Clausius- Clapeyron equation – Limitations of second law.	18	Chalk, Talk & Power point
III	<b>PHOTOCHEMISTRY</b> Definition of photochemical reactions – comparative study of thermal and photochemical reactions – laws of photochemistry – Lambert and Beer Law – Grothus – Draper law – Stark – Einstein law – quantum efficiency and its determination – Jablonski diagram – Photophysical processes – fluorescence phosphorescene and other deactivating processes. Photochemical processes – kinetics of photochemical reactions (H <sub>2</sub> /Br <sub>2</sub> reaction) – Photochemical equilibrium (Dimerisation of anthracene)– flash photolysis – photosensitization- chemiluminescence – bioluminescence.	18	Chalk, Talk & Power point
IV	ELECTROCHEMISTRY – I Conductance-definition and determination of Specific conductance,	18	Chalk, Talk & Power

	equivalent conductance and molar conductance – variation of equivalent conductance with dilution – Migration of ions - Kohlrausch's law – Arrhenius theory of electrolyte dissociation and its limitations - Ostwald's dilution law – Debye Huckel-Onsagar's equation for strong electrolytes (elementary treatment only) – Definition of transport number – determination by Hittorfs method – Application of conductivity measurements- determination of solubility products of sparingly soluble salts and conductometric titrations – HCl Vs NaOH,		point
	CH3COOH Vs NaOH.		
V	<ul> <li>ELECTROCHEMISTRY – II</li> <li>a) Single electrode potential, sign convention, Reversible and irreversible cells, conditions for a cell to be a reversible and irreversible – Nernst Equation – measurement of Emf (Poggendorff's method) types of electrodes – reference electrode (SHE, Calomel electrode, Ag-AgCl electrode) Potentiometric titrations – HCl Vs NaOH and K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> Vs FeSO<sub>4</sub>.</li> <li>b) Commercial cells: Primary and secondary batteries – dry cell – lead storage cell – fuel cell – Hydrogen-Oxygen fuel cell</li> </ul>	18	Chalk, Talk & Power point

Course Designed by: Dr. R. Satheesh & Dr. A.J. Sunija

Learning Outcome Based Education & Assessment (LOBE) **Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)** Section A Section B Short **MCQs** Answers Section C Section D Inte No. Cos K Level **Either or** Open rnal of. Choice Choice К-No. of. K – Level Que Questions Level stio ns **CO1** Up to K2 2 K1 & K2 K1 2 (K2&K2) 1(K2) 1 CI 2 K2 2(K2 & K3) AI **CO2** Up to K3 2 K1 & K2 2 (K3&K3) **CO3** Up to K3 2 K1 & K2 1 K1 1(K2) 2 (K2&K2) CI K1 & K2 AII **CO4** Up to K4 2 2 K2 2 (K3&K3) 2(K3 &K4) No. of 4 Questions to be 3 4 3 asked No. of Question Questions to be 4 3 2 2 Pattern answered CIA I & II Marks for each 2 5 1 10 question Total Marks for 4 6 10 20 each section

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	Distribution of Marks with K Level CIA I & CIA II										
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %			
	K1	2	2	-	-	4	6.67				
	K2	2	4	10	20	36	60	67			
CIA	K3	-	-	10	10	20	33.33	33			
I	K4	-	-	-	-	-	-	-			
-	Marks	4	6	20	30	60	100	100			
	K1	2	2	-	-	4	6.67				
	K2	2	4	10	10	26	43.33	50			
CIA	K3	-	-	10	10	20	33.33	33			
Π	K4	-	-	-	10	10	16.67	17			
	Marks	4	6	20	30	60	100	100			

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

S	Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)									
			MC		Short A	nswers	Section C	Carther D		
S.No	Cos	K - Level	No. of Questions	K – Level	No. of Questio n	K – Level	(Either / or Choice)	Section D (Open Choice)		
1	CO1	Up to K 2	2	K1, K2	1	K1	2 (K2&K2)	1(K2)		
2	CO2	Upto K 3	2	K1&K2	1	K1	2 (K3&K3)	1(K3)		
3	CO3	Up to K 3	2	K1&K2	1	K2	2 (K3&K3)	1(K3)		
4	CO4	Up to K 4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)		
5	CO5	Up to K 4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)		
No. of	Questions	s to be Asked	10		5		10	5		
No.of Questions to be answered		10		5		5	3			
Marks for each question		1		2		5	10			
Total Marks for each section		10		10		25	30			
(	(Figures	in parenthesi	is denotes, qu	estions sh	ould be asl	ked with	the given K	level)		

Distribution of Marks with K Level							
K	Section A	Section B	Section C	Section D	Total	% of	Consolidated
Level	(Multiple	(Short	(Either/ or	( Open	Marks	(Marks	%
	Choice	Answer	Choice)	Choice)		without	
	<b>Questions</b> )	Questions)				choice)	
K1	5	4	-	-	9	7.5	22
K2	5	6	10	10	31	25.83	33
K3	-	-	40	20	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level							

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.

Section	A (Mu	Itiple Cho	ice Questions)
Answer	r All Q	uestions	(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section	B (Sho	ort Answei	rs)
Answei	r All Q	uestions	(5x2=10 marks)
Q.No	СО	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section	C (Eit	her/Or Ty	pe)
Answer	r All Q	uestions	(5  x 5 = 25  marks)
Q.No	CO	K Level	Questions
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
			ormance of the students is to be assessed by attempting higher
level of			
		en Choice	
		Three ques	
Q.No	CO	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

# **Summative Examinations - Question Paper – Format**



## MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	MAJOR CHEMISTRY PRACTICAL – IV (GRAVIMETRIC ANALYSIS AND ORGANIC PREPARATION)							
Course Code	21UCHCP4	L	Р	С				
Category	Core	-	3	5				
Nature of cours	e: EMPLOYABILITY 🗸 SKILL ORIENTED 🖌 ENTREPREN	ENURSHIP 🗸		$\checkmark$				
Course Objecti	ves:							
To learn	the concept of gravimetric analysis and organic preparation							
• To analy								
• To study	• To study the organic preparation methods							
• To understand the various organic preparation methods								
• To interp	pret the gravimetric analysis and organic preparation							
List	t of Experiments							
1. Gravim	etric Analysis							
<ol> <li>Estimation of lead as lead chromate</li> <li>Estimation of barium as barium chromate</li> <li>Estimation of calcium as calcium oxalate monohydrate</li> <li>Estimation of copper as cuprous thiocyanate</li> <li>Estimation of nickel as Ni DMG.</li> </ol> <b>2. Organic Preparation</b> <ol> <li>Nitration</li> <li>M-dinitrobenzene from nitrobenzene</li> <li>Picric acid from phenol</li> <li>Bromination: p-bromo acetanilide from acetanilide</li> <li>Hydrolysis : Aromatic acid from (a) an ester (b) an amide</li> <li>Oxidation: Benzoic acid from benzaldehyde.</li> <li>Benzoylation: (a) Amine (b) phenols.</li> </ol>								
Regular Test in Observation not Total								

Volume VI – Science Syllabus / 2023 - 2024 Record Note Book - 10 Marks Viva Voce - 10 Marks Ext: 60 **Organic preparation (10 Marks) Gravimetric Estimation (30 Marks)** Procedure 2 Marks Procedure - 10 Marks Crude sample 6 Marks Estimation - 20 Marks Recrystallised sample -Less than 2 % Error – 20 Marks 2 Marks 2-3% Error – 18 Marks 3-4% Error - 16 Marks 4-5% Error – 14 Marks Greater than 5% Error – 8 Marks **Total Lecture Hours** 45 Hrs **Books for Reference:** 5. Thomas. A.O and Mani, Textbook of Practical Chemistry, 4th Revised Edition, Scientific Publication, 1976. 6. N.S. Gnana pragasam and G. Ramamurthy, Organic Chemistry Lab Manual, Viswanath. S. Printers & Publishers Pvt. Ltd., 2010, Chennai. Web Resources: 1. https://youtu.be/tftNgFVAWCY 2. https://youtu.be/npxbO-pzUvU 3. https://youtu.be/peMyqdJ57dA **Course Outcomes:** K Level On the completion of the course the student will be able to **CO1:** Relate and classify between gravimetric analysis and organic preparation [Up to K2] **CO2:** Estimate lead, barium, calcium, copper and nickel. [Up to K3] **CO3:** Analyze the various types of organic preparation. [Up to K3] Interpret the organic preparation like nitration, bromination, hydrolysis, **CO4:** [Up to K4] oxidation, benzoylation and acetylation.

#### CO & PO Mapping:

CO5:

Course Outcomes	Programme Outcomes (POs)						
(COs)	<b>PO 1</b>	<b>PO 2</b>	PO 3	PO 4	<b>PO 5</b>	PO 6	
CO 1	3	1	2	3	1	2	
CO 2	1	3	1	1	2	3	
CO 3	2	2	3	2	3	3	
CO 4	3	1	2	2	1	2	
CO5	2	3	1	3	2	1	
Weightage	11	10	9	11	9	11	

Assemble the analyzed and prepared organic compounds samples.

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

Academic Council Meeting Held On 20.04.2023

[Up to K4]

## LESSON PLAN

UNIT	List of Experiments	Hrs	Mode
	1. Gravimetric Analysis		
	<ol> <li>Estimation of lead as lead chromate</li> <li>Estimation of barium as barium chromate</li> <li>Estimation of calcium as calcium oxalate monohydrate</li> <li>Estimation of copper as cuprous thiocyanate</li> <li>Estimation of nickel as Ni DMG.</li> </ol>		
Ι	2. Organic Preparation	45	Practical
	1. Nitration		
	a. M-dinitrobenzene from nitrobenzene		
	b. Picric acid from phenol		
	2. Bromination: p-bromo acetanilide from acetanilide		
	3. Hydrolysis : Aromatic acid from (a) an ester (b) an amide		
	4. Oxidation: Benzoic acid from benzaldehyde.		
	5. Benzoylation: (a) Amine (b) phenols.		
	6. Acetylation : (a) Amine (b) phenols		

Course Designed by: Dr. K. Muthupandi & Dr. V. Ramasamy Raja



# MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	MAJOR O ESTIMAT		Y P	PRACTICAL – V (OR	GANIC AN	NALYSIS A	AND		
Course Code	21UCHCH	25				L	Р	C	
Category	Core					-	3	5	
Nature of cours	e: EMPLO	YABILITY	$\checkmark$	SKILL ORIENTED	✓ ENTRE	PRENURS	SHIP	✓	
Course Objecti	ives:								
To learn	the analysis	s of an organ	ic co	ompound containing or	e or two fu	nctional gro	oups.		
•		ept of confirm	mati	on of the prepared one	or two func	tional orga	nic		
compour									
•		-		e and glucose	_				
				groups of organic com	-				
_		-	esti	imation of organic com	pounds				
I. Organic Ana	t of Experin	nents							
and nucl II. ORGANIC 1. Estimati 2. Estimati	ear halogen ESTIMAT on of pheno	compounds, ION 1 e se	dia	dary and tertiary), anil mide containing sulphu <b>n of Marks</b> (Max. marl	r and mono			1141	
					(8 - 100)				
		Durat	tion	of examination: 6 hrs					
Regular Test in	the Class	: 30 Marks	s						
Observation not		: 10 Marks							
Total		: 40 Marks	 S						
			-						
Organic estima	tion (30 Ma	arks)		Organ	ic analysis (	(30 Marks)	)		
				Viva Voce		– 10 ma	antra		
Record Note -	10 marks		Procedure - 5 marks Preliminary reaction						
Procedure -	5 marks			•		- 2 mar			
Procedure - Estimation -	5 marks 15 marks	_		Elements prese	ent	- 2 mar - 4 mar	ks ks		
Procedure - Estimation - Less than 3% Ex	5 marks 15 marks			•	ent omatic	- 2 mar	ks ks ks		

		Volume VI – Science Sylla	abus / 2023 -	2024
	4-5% Error – 10 Marks	Functional group	- 6 marks	
	Greater than 5% - 8 Marks	Derivative	- 2 marks	
	Total Lecture Hours			
Books	for Reference:			
1. Th	omas. A.O and Mani, Textbook o	f Practical Chemistry, 4th Revise	ed Edition, S	Scientific
Pι	ublication, 1976.			
2. N.S	S. Gnana pragasam and G. Ramam	urthy, Organic Chemistry Lab M	lanual, Viswa	anath. S.
Printer	rs & Publishers Pvt. Ltd., 2010, Chen	nai.		
Web F	Resources:			
1. <u>http</u>	<u>s://youtu.be/1uJk4K_irP8</u>			
2. <u>http</u>	<u>s://youtu.be/xQJOfAKgSOY</u>			
3. <u>http</u>	<u>s://youtu.be/xMjJxjhJWj4</u>			
Course	e Outcomes:		K	Level
On th	e completion of the course the stud	ent will be able to		
CO1:	Relate and classify between organic	analysis and estimation of organic		n to VOI
COI:	compounds		[U]	p to K2]
<b>CO2:</b>	Estimate the phenol, aniline and glu	icose	<b>[U</b> ]	p to K3]
CO3:	Analyze the one or two functional g	roups of organic compounds		p to K3]
CO4:	Interpret the organic analysis and es			p to K4]
CO5:	Distinguish between analysis and es of organic compounds		rouns	p to K4]

# CO & PO Mapping:

<b>Course Outcomes</b>	Programme Outcomes (POs)						
(COs)	<b>PO 1</b>	PO 2	PO 3	PO 4	PO 5	<b>PO 6</b>	
CO 1	3	1	2	3	1	2	
CO 2	1	3	1	1	2	3	
CO 3	2	2	3	2	3	3	
CO 4	3	1	2	2	1	2	
CO5	2	3	1	3	2	1	
Weightage	11	10	9	11	9	11	

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

## LESSON PLAN

UNIT	List of Experiments	Hrs	Mode
I	<ul> <li>I. Organic Analysis <ul> <li>Analysis of an organic compound containing one or two functional groups and confirmation by the preparation of a solid derivative – acids, phenols, aldehydes, ketone, esters, nitro compounds, amines (primary, secondary and tertiary), aniline, aliphatic diamide, side chain and nuclear halogen compounds, diamide containing sulphur and monosaccharide.</li> </ul> </li> <li>II. ORGANIC ESTIMATION <ol> <li>Estimation of phenol</li> <li>Estimation of glucose</li> </ol> </li> </ul>	45	Practical

Course Designed by: Dr. V. Ramasamy Raja & Dr. A.J. Sunija



## MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) **DEPARTMENT OF CHEMISTRY** (For those who joined in 2021-2022 and after)

Course Name	PR	PROJECT AND VIVA - VOCE								
Course Code	210	IUCHPR1					С			
Category	Pro	Project					4			
Nature of cours	se:	EMPLOYABILITY	SKILL ORIENTED	ENTREP	RENU	JRSH	IIP			

#### **Course Objectives:**

#### To identify, describe the problem and scope of project

- To collect, analyse and present data into significant form using appropriate tools. •
- To choose, plan and implement a proper approach in problem solving.
- To work with team and ethically.
- To present the findings in both oral and written form

#### **Course Description**

• The Project is conducted by the following Course Pattern.

#### Internal

Internal	
Presentation	
Submission	40
External	
Project Report	60
Viva Voce	<b>}</b>
	60

**Total - 100** 

COUR	COURSE OUTCOMES						
On the	e successful completion of the course , the students will be able to						
CO1:	Apply the skill of presentation and communication techniques	K3					
<b>CO2:</b>	Motive as an individual or in a team in development of projects.	K4					
CO3:	Analyze the available resources and to select most appropriate one	K4					
CO4:	Make use of the fundamentals of Chemistry to search the related literature survey	К3					
CO5:	Explain the real life problems by using Chemistry and its Application.	K4					

# Course Designed by: Dr. V. Ramasamy Raja, & Dr. A.J. Sunija

# CO & PO Mappings:

COS	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	PO 4	<b>PO 5</b>	<b>PO 6</b>
CO 1	2	2	2	2	1	3
CO 2	1	2	2	1	2	3
CO 3	2	2	2	2	2	1
CO 4	3	2	2	2	1	2
CO 5	3	2	2	1	2	3

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level



# MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	APPLIED CHEMISTRY									
Course Code	21UCHE61	L	Р	С						
Category	CORE ELECTIVE	5	-	5						
Nature of cours	e: EMPLOYABILITY 🗸 SKILL ORIENTED 🖌 ENTREPREN	URS	HIP	$\checkmark$						
Course Objecti	ives:									
• To Recall th	e water treatment and quality analysis of water									
• To Remember the insecticides, pesticides and preparation of chemicals										
To Compare	e the knowledge of match and silicate industry									
To Perform	the elemental study of petrochemicals and lacquer paint									
To Determin	ne the nutrients for plants and know the fertilizer industry in India									
Unit: I WA	ATER AND SEWAGE TREATMENT		15							
Water Treatmen	nt: Water Quality Analysis - Chemical and Physical Analysis of w	ater -	Qua	ılity						
Parameters – St	tandards prescribed for Water Quality by WHO and other Indian st	andar	ds –	Sea						
	ce of Drinking Water - Electro dialysis method and Reverse osmo									
· · ·	water. Sewage Treatment: Municipal Waste Water - Sewage Treatm	nent –	Aero	obic						
	process – Miscellaneous Method of Sewage Treatment									
	SECTICIDES, PESTICIDES AND PREPARATION OF CHEMI									
	Pesticides: Definition – Classification – Inorganic pesticides: lead									
<b>U</b>	phur, hydrocyanic acid – Organic pesticides, natural, synthetic (DDT	, Gam	maxe	ene)						
– Fungicides – r	*									
	ATCH AND SILICATE INDUSTRY		15							
•	: Pyrotechnics and explosives - Raw materials needed for mat									
•	process – Pyrotechniques – Coloured smokes. Silicate Industry: Cen	nent C	lass	and						
	materials and manufacture of Cement, Glass and Ceramics.									
	FROCHEMICALS AND LACQUER PAINT		15							
	Elementary study – Definition – Origin – Composition – Chemical									
	Light Naphtha and Kerosene – Synthetic Gasoline. Paints and lacque	ers: Pi	gmen	ts –						
Y	ents in Paints – Manufacture – Lacquers – Varnishes.			,						
	RTILIZERS	1 1	15							
	rients for plants – role of various elements in plants growth – natura									
	fication of chemical fertilizers –urea, super phosphate and potassium	i nitra	te-mi	xea						
Tertifizer-Tertifiz	er industry in India.		75 TT							
Doolse for Stud	Total Lecture Ho	urs	75 H	rs						
<b>Books for Stud</b>	y:									
	K, Industrial Chemistry including Chemical Engineering, Goel Publi d enlarged Edition, 2009, New Delhi.	shing	Hous	se –						
<b>Books for Refe</b>										
1. Srilakshmi.	B, Food Science, 3rd Edition, New Age International Pvt. Ltd., Publi	shers,	2002	2.						
	Shosh, Fundamental concepts of Applied Chemistry, S. Chand & C									
1998.										
3. Thanlamma	Jacob, Text Books of Applied Chemistry for Home Science and A	llied S	Scien	ces,						

Ma	cmillan, 2000.							
We	Web Resources:							
1.	1. <u>https://youtu.be/FY7z9ymxXFQ</u>							
2.	nttps://youtu.be/cLZ_PQhOnDY							
Cou	urse Outcomes	K Level						
On	the completion of the course the student will be able to							
СО	Define insecticides, petrochemicals and fertilizers and discuss	[Up to K2]						
	their classification.							
СО	2. Determine water quality, raw materials needed for match and silicate	[Up to K3]						
co	<sup>2</sup> industries.							
со	<b>a.</b> Distinguish between water and sewage treatment and chemicals used between	[Up to K3]						
CO	petrochemicals and paints and lacquers.							
CO	<b>4:</b> Interpret the preparation of domestically useful chemical products.	[Up to K4]						
CO	<b>5:</b> Integrate the method of sewage treatment and fertilizer industries in India.	[Up to K4]						

# CO & PO Mapping:

Course Outcomes	Programme Outcomes (POs)							
(COs)	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	PO 4	<b>PO 5</b>	PO 6		
CO 1	3	1	2	3	1	2		
CO 2	1	3	1	1	2	3		
CO 3	2	2	3	2	3	3		
CO 4	3	1	2	2	1	2		
CO5	1	3	2	3	2	1		
Weightage	10	10	10	11	9	11		

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

#### LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
Ι	WATER AND SEWAGE TREATMENTWater Treatment: Water Quality Analysis – Chemical and PhysicalAnalysis of water - Quality Parameters – Standards prescribed for WaterQuality by WHO and other Indian standards – Sea Water as a source ofDrinking Water – Electro dialysis method and Reverse osmosis methodfor purifications of water. Sewage Treatment: Municipal Waste Water –Sewage Treatment – Aerobic and Anaerobic process – MiscellaneousMethod of Sewage Treatment	15	Chalk, Talk & Power point
II	INSECTICIDES, PESTICIDES AND PREPARATION OF         CHEMICALS         Insecticides and Pesticides: Definition – Classification – Inorganic         pesticides: lead arsenate, Paris green, lime, sulphur, hydrocyanic acid –         Organic pesticides, natural, synthetic (DDT, Gammaxene) – Fungicides         – repellants.	15	Chalk, Talk & Power point
III	MATCH AND SILICATE INDUSTRY Match Industry: Pyrotechnics and explosives – Raw materials needed for match industry – Manufacturing process – Pyrotechniques – Coloured smokes. Silicate Industry: Cement Glass and Ceramics, Raw materials and manufacture of Cement, Glass and Ceramics.	15	Chalk, Talk & Power point
IV	PETROCHEMICALS AND LACQUER PAINTPetrochemicals: Elementary study – Definition – Origin – Composition– Chemicals from natural gas, Petroleum, Light Naphtha and Kerosene –Synthetic Gasoline. Paints and lacquers: Pigments – Paints – Ingredientsin Paints – Manufacture – Lacquers – Varnishes.	15	Chalk, Talk & Power point
V	<b>FERTILIZERS</b> Definition – nutrients for plants – role of various elements in plants growth – natural and chemical fertilizers-classification of chemical fertilizers –urea, super phosphate and potassium nitrate-mixed fertilizer- fertilizer industry in India.	15	Chalk, Talk & Power point

Course Designed by: Dr. V. Ramasamy Raja & Dr. R. Satheesh

	Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)										
<b>T</b> (		K Level	Secti	Section A MCQs		on B	Section C	Section			
Inte rnal	Cos		No. of. Questions	K – Level	No. of. Question	K - Level	Either or Choice	D Open Choice			
CI	CO1	Up to K2	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)			
AI	CO2	Up to K3	2	K1 & K2	2	K2 & K2	2 (K3&K3)	1(K3)			
CI	CO3	Up to K3	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)			
AII	CO4	Up to K4	2	K1 & K2	2	K2 & K2	2 (K3&K3)	1(K4)			
		No. of Questions to be asked	4		3		4	2			
•	estion ttern	No. of Questions to be answered	4		3		2	1			
CIA	I & II	Marks for each question	1		2		5	10			
		Total Marks for each section	4		6		10	10			

	Distribution of Marks with K Level CIA I & CIA II										
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Mar ks witho ut choice )	Consolidate of %			
	K1	2	2	-	-	4	8				
	K2	2	4	10	10	26	52	60			
CIA	K3	-	-	10	10	20	40	40			
I	K4	-	-	-	-	-	-	-			
-	Marks	4	6	20	20	50	100	100			
	K1	2	2	-	-	4	8				
	K2	2	4	10	10	26	52	60			
CIA	K3	-	-	10	-	10	20	20			
II	K4	-	-	-	10	10	20	20			
	Marks	4	6	20	20	50	100	100			

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

**K3**- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

S	ummativ	ve Examinatio		nt Articu utcomes	-	ping – K	Level with (	Course
			MCC	)s	Short An	swers	Section C	Section D
S.No	COs	K - Level	No. of Questions	K – Level	No. of Question	K – Level	(Either / or Choice)	Section D (Open Choice)
1	CO1	Up to K2	2	K1,K2	1	K1	2 (K2&K2)	1(K2)
2	CO2	Up to K3	2	K1&K 2	1	K1	2 (K3&K3)	1(K3)
3	CO3	Up to K3	2	K1&K 2	1	K2	2 (K3&K3)	1(K3)
4	CO4	Up to K4	2	K1&K 2	1	K2	2 (K3&K3)	1(K4)
5	CO5	Up to K4	2	K1&K 2	1	K2	2 (K3&K3)	1(K4)
No. of	Questions	s to be Asked	10		5		10	5
No.of Questions to be answered		10		5		5	3	
Marks for each question		1		2		5	10	
Total Marks for each section		10		10		25	30	
	(Figures	in parenthesi	is denotes, qu	estions s	hould be asl	ked with	the given K	level)

	Distribution of Marks with K Level											
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %					
K1	5	4	-	-	9	7.5	33					
K2	5	6	10	10	31	25.83						
K3	-	-	40	20	60	50	50					
K4	-	-	-	20	20	16.67	17					
Marks	10	10	50	50	120	100	100					
NB: Hig of K lev	,	erformance o	of the students	s is to be asse	essed by a	ttempting	higher level					

Section	A (Mu	Itiple Cho	ice Questions)
Answei	r All Q	uestions	(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section	B (Sho	ort Answei	rs)
Answei	r All Q	uestions	(5x2=10 marks)
Q.No	СО	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section	C (Eit	her/Or Ty	pe)
Answer	r All Q	uestions	(5  x 5 = 25  marks)
Q.No	CO	K Level	Questions
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
			ormance of the students is to be assessed by attempting higher
level of			
		en Choice	
		Three ques	
Q.No	CO	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

# **Summative Examinations - Question Paper – Format**



# MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Code       21UCHE62       L       P       C         Category       CORE ELECTIVE       5       -       5         Nature of course:       EMPLOYABILITY       SKILL ORIENTED       ✓ ENTREPRENURSHIP       ✓         Course Objectives:       -       To Realize the volume and composition of soil and its importance on agriculture       -       To Parameter the properties of soil         To Discuss the various types of micronutrients needed to the soil       - </th <th>Course Name</th> <th>SOIL AND AGRICULTURE CHEMIS</th> <th>STRY</th> <th></th> <th></th> <th></th> <th></th> <th></th>	Course Name	SOIL AND AGRICULTURE CHEMIS	STRY						
Nature of course:       EMPLOYABILITY       ✓ SKILL ORIENTED       ✓ ENTREPRENURSHIP       ✓         Course Objectives:       • <t< th=""><th>Course Code</th><th>21UCHE62</th><th></th><th></th><th></th><th>L</th><th>Р</th><th>С</th></t<>	Course Code	21UCHE62				L	Р	С	
Course Objectives:         • To Realize the volume and composition of soil and its importance on agriculture         • To Realize the volume and composition of soil and its importance on agriculture         • To Discuss the various types of micronutrients needed to the soil         • To Discuss the neembed of analyzing the soil and applying the fertilizers.         Unit: I       SOIL COMPONENTS         Intervention       15         Definition - volume, composition - uses - mineral soil - chemical ions - soil colloids - importance - nature - properties of inorganic and organic soil colloid - general characteristics - properties and importance - types - silicate clays - silicate - silicato oxygen tetrahedron.         Unit: II       SOIL SALINITY AND ALKALINITY       15         Saline and alkaline soil - nature - classification - characteristics - formation of saline and alkaline soil - effect.       15         Saline and alkaline soil - nature - classification - characteristics - formation of saline and alkaline soil - effect.       15         Saline and alkaline soil - nature - classification - characteristics - formation of saline and alkaline soil - equality of irrigation water: introduction - criteria - irrigation water resources - water         uaity - classification of water.       15         Unit: III       ANALYSIS OF SOIL       15         v) Estimation of of soil pH and electrical conductivity.       v) Estimation of soil pH and electrical conductivity.       v) Estimation of soil pH and electrical conductivity.	Category	CORE ELECTIVE				5	-	5	
<ul> <li>To Realize the volume and composition of soil and its importance on agriculture</li> <li>To Remember the properties of soil</li> <li>To Discuss the various types of micronutrients needed to the soil</li> <li>To Analyze the chemical composition of biofertilizer and soil</li> <li>To Formulate the methods of analyzing the soil and applying the fertilizers.</li> <li>Unit: I SOIL COMPONENTS 15</li> <li>Definition - volume, composition - uses - mineral soil - chemical ions - soil colloids - importance - nature - properties of inorganic and organic soil colloid - general characteristics - properties and importance - types - silicate clays - silicon oxygen tetrahedron.</li> <li>Unit: II SOIL SALINITY AND ALKALINITY 15</li> <li>Saline and alkaline soil - nature - classification - characteristics - formation of saline and alkaline soil - general characteristics - formation of saline and alkaline soil - aquily of irrigation water: introduction - criteria - irrigation water resources - water quality - classification of water.</li> <li>Unit: II ANALYSIS OF SOIL 15</li> <li>Di Estimation of Ca, Mg, K and nitrate ii) Analysis of Soluble salt.</li> <li>iii) Analysis of Solub in sustainable agriculture - biodiversity - management strategies - comparison of chemical fertilizer and biofertilizer. Methods of applying fertilizer</li></ul>	Nature of cours	: EMPLOYABILITY 🖌 SKILL ORIE	NTED	√	ENTREPREN	URS	HIP	$\checkmark$	
<ul> <li>To Remember the properties of soil</li> <li>To Discuss the various types of micronutrients needed to the soil</li> <li>To Analyze the chemical composition of biofertilizer and soil</li> <li>To Formulate the methods of analyzing the soil and applying the fertilizers.</li> <li>Unit: I SOIL COMPONENTS 15</li> <li>Definition - volume, composition - uses - mineral soil - chemical ions - soil colloids - importance - nature - properties of inorganic and organic soil colloid - general characteristics - properties and importance - types - silicate clays - silicate - silicon oxygen tetrahedron.</li> <li>Unit: II SOIL SALINITY AND ALKALINITY 15</li> <li>Saline and alkaline soil - nature - classification - characteristics - formation of saline and alkaline soil - aquity of irrigation water: introduction - criteria - irrigation water resources - water quality - classification of water.</li> <li>Unit: III ANALYSIS OF SOIL 15</li> <li>i) Estimation of Ca, Mg, K and nitrate ii) Analysis of Soluble salt.</li> <li>ii) Analysis of Soluble salt.</li> <li>iii) Analysis of Soluble salt.</li> <li>iii Analysis of Solub is an sustainable agriculture - biodiversity - management strategies - comparison of chemical fertilizer and biofertilizer. Methods of applying fertilizers - application of</li></ul>	Course Objecti	es:							
<ul> <li>To Discuss the various types of micronutrients needed to the soil</li> <li>To Analyze the chemical composition of biofertilizer and soil</li> <li>To Formulate the methods of analyzing the soil and applying the fertilizers.</li> <li>Unit: I SOIL COMPONENTS [15]</li> <li>Definition - volume, composition - uses - mineral soil - chemical ions - soil colloids - importance - nature - properties of inorganic and organic soil colloid - general characteristics - properties and importance - types - silicate clays - silicates - silicon oxygen tetrahedron.</li> <li>Unit: II SOIL SALINITY AND ALKALINITY [15]</li> <li>Saline and alkaline soil - nature - classification - characteristics - formation of saline and alkaline soil - effects - quality of irrigation water: introduction - criteria - irrigation water resources - water quality - classification of water.</li> <li>Unit: II ANALVSIS OF SOIL [15]</li> <li>Stimation of Ca, Mg, K and nitrate ii) Analysis of soluble salt.</li> <li>ii) Analysis of soluble salt.</li> <li>iii) Analysis of soluble salt.</li> <li>iii) Analysis of NPK in fertilizer.</li> <li>v) Estimation of organic matter content of soil.</li> <li>Unit: IV VERMICOMPOSTING [15]</li> <li>Vermicomposting: Economic implications - materials - preliminary treatment - types of vermicomposting - requirements for vermicomposting. Eco-Friendly Farming System: organic farming - concet - options.</li> <li>Unit: V BIOFERTILIZERS [15]</li> <li>Biofertilizers: Soil biota in sustainable agriculture - biodiversity - management strategies - comparison of chemical fertilizer and biofertilizer. Methods of applying fertilizers - application of fertilizer is roladid fertilizers: Potassim sulphate: production - properties.</li> <li>Total Lecture Hours [75]</li> <li>Books for Study:</li> <li>Shivanand Tolanur, Soil Chemistry, International Book Distributing Co., 1st edition, 2006. (Unit I and II)</li> <li>P. K. Gupta, A Handbook of Soil, Fertiliz</li></ul>	• To Realize t	e volume and composition of soil and its	importa	nce	on agriculture				
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soil - effects - quality of irrigation water: introduction - criteria - irrigation water resources - water quality - classification of water.          Unit: III       ANALYSIS OF SOIL       15         i) Estimation of Ca, Mg, K and nitrate       15         ii) Analysis of soluble salt.       iii) Analysis of Soluble salt.         iii) Analysis of NPK in fertilizer.       iv) Determination of soil pH and electrical conductivity.         vy) Estimation of organic matter content of soil.       15         Vermicomposting:       Economic implications - materials - preliminary treatment - types of vermicomposting - requirements for vermicomposting. Eco-Friendly Farming System: organic farming - concept – options.         Unit: V       BIOFERTILIZERS       15         Biofertilizers:       Soil biota in sustainable agriculture - biodiversity - management strategies - comparison of chemical fertilizer and biofertilizer. Methods of applying fertilizers - application of fertilizer in solid form - liquid fertilizer - nitrogenous fertilizer - types - phosphatic fertilizers: forms - classification- potassic fertilizers: Potassium sulphate: production – properties.         Total Lecture Hours       75 Hrs         Books for Study:       1.         1.       Shivanand Tolanur, Soil Chemistry, International Book Distributing Co., 1st edition, 2006. (Unit I and II)         2.       P.K.Gupta, A Handbook of Soil, Fertilizer and Manure, Agrobios (India), 2 <sup>nd</sup> edition, 2012. (Unit III and IV)         3.       A. K. Mani, R. Santhi and M. Sellamuthu, A Handbook of Laborato	Unit: II SO	L SALINITY AND ALKALINITY					15	5	
quality - classification of water.       15         Unit: III       ANALYSIS OF SOIL       15         i) Estimation of Ca, Mg, K and nitrate       ii) Analysis of soluble salt.       iii) Analysis of NPK in fertilizer.         ii) Determination of soil pH and electrical conductivity.       v) Determination of organic matter content of soil.       15         Unit: IV       VERMICOMPOSTING       15         Vermicomposting - concept – options.       15         Unit: V       BIOFERTILIZERS       15         Biofertilizers: Soil biota in sustainable agriculture - biodiversity - management strategies - comparison of chemical fertilizer and biofertilizer. Methods of applying fertilizers - application of fertilizer in solid form - liquid fertilizer - nitrogenous fertilizer - types - phosphatic fertilizers: forms - classification- potassic fertilizers: Potassium sulphate: production – properties.       75 Hrs         Books for Study:       1       10         2.       P.K.Gupta, A Handbook of Soil, Fertilizer and Manure, Agrobios (India), 2 <sup>nd</sup> edition, 2012. (Unit III and IV)       2.         3.       A. K. Mani, R. Santhi and M. Sellamuthu, A Handbook of Laboratory Analysis, AE	Saline and alkal	ne soil - nature - classification - characte	ristics -	for	mation of salin	e and	alka	line	
Unit: III       ANALYSIS OF SOIL       15         i) Estimation of Ca, Mg, K and nitrate       ii) Analysis of soluble salt.       iii) Analysis of NPK in fertilizer.         ii) Determination of soil pH and electrical conductivity.       v) Estimation of organic matter content of soil.       15         Unit: IV       VERMICOMPOSTING       15         Vermicomposting:       Economic implications - materials - preliminary treatment - types of vermicomposting - requirements for vermicomposting. Eco-Friendly Farming System: organic farming - concept – options.         Unit: V       BIOFERTILIZERS       15         Biofertilizers:       Soil a in sustainable agriculture - biodiversity - management strategies - comparison of chemical fertilizer and biofertilizer. Methods of applying fertilizers - application of fertilizer in solid form - liquid fertilizer - nitrogenous fertilizer - types - phosphatic fertilizers: forms - classification- potassic fertilizers: Potassium sulphate: production – properties.       75 Hrs         Books for Study:       1.       Shivanand Tolanur, Soil Chemistry, International Book Distributing Co., 1st edition, 2006. (Unit I and II)       2.         P.K.Gupta, A Handbook of Soil, Fertilizer and Manure, Agrobios (India), 2 <sup>nd</sup> edition, 2012. (Unit III and IV)       3. A. K. Mani, R. Santhi and M. Sellamuthu, A Handbook of Laboratory Analysis, AE	soil - effects - q	ality of irrigation water: introduction - cr	iteria - i	irrig	gation water res	ource	s - w	ater	
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<ul> <li>iii) Analysis of NPK in fertilizer.</li> <li>iv) Determination of soil pH and electrical conductivity.</li> <li>v) Estimation of organic matter content of soil.</li> <li>Unit: IV VERMICOMPOSTING 15</li> <li>Vermicomposting: Economic implications - materials - preliminary treatment - types of vermicomposting - requirements for vermicomposting. Eco-Friendly Farming System: organic farming - concept – options.</li> <li>Unit: V BIOFERTILIZERS 15</li> <li>Biofertilizers: Soil biota in sustainable agriculture - biodiversity - management strategies - comparison of chemical fertilizer and biofertilizer. Methods of applying fertilizers - application of fertilizer in solid form - liquid fertilizer - nitrogenous fertilizer - types - phosphatic fertilizers: forms - classification- potassic fertilizers: Potassium sulphate: production – properties.</li> <li>Total Lecture Hours 75 Hrs</li> <li>Books for Study:</li> <li>1. Shivanand Tolanur, Soil Chemistry, International Book Distributing Co., 1st edition, 2006. (Unit I and II)</li> <li>2. P.K.Gupta, A Handbook of Soil, Fertilizer and Manure, Agrobios (India), 2<sup>nd</sup> edition, 2012. (Unit III and IV)</li> <li>3. A. K. Mani, R. Santhi and M. Sellamuthu, A Handbook of Laboratory Analysis, AE</li> </ul>	i) Estimation of	Ca, Mg, K and nitrate							
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<ul> <li>(Unit I and II)</li> <li>P.K.Gupta, A Handbook of Soil, Fertilizer and Manure, Agrobios (India), 2<sup>nd</sup> edition, 2012. (Unit III and IV)</li> <li>A. K. Mani, R. Santhi and M. Sellamuthu, A Handbook of Laboratory Analysis, AE</li> </ul>	Books for Stud	:							
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(Unit III and IV) 3. A. K. Mani, R. Santhi and M. Sellamuthu, A Handbook of Laboratory Analysis, AE									
3. A. K. Mani, R. Santhi and M. Sellamuthu, A Handbook of Laboratory Analysis, AE	-		Agrobi	os (	India), 2 <sup>nd</sup> editi	on, 20	)12.		
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				ла	ory Analysis, A	Ľ			

#### **Books for References:**

- 1. S. P. Majumdar and R. A. Singh, Analysis of Soil Physical Properties, Agrobios (India), 2012.
- 2. Pooja Kashyap, Agricultural Chemistry, Rajat Pubublications, New Delhi, 1<sup>st</sup> Published, 2009.

#### Web Resources:

**Course Outcomes** 

- 1. https://youtu.be/iaQjEDYyWKw
- 2. https://youtu.be/brKftIwoPjw
- 3. https://youtu.be/xEvo9udghgw
- 4. https://youtu.be/oJCBVfr3Mxw

K Level

On th	On the completion of the course the student will be able to							
<b>CO1:</b>	: Ability to understand the soil components and its composition [Up to K							
CO2:	Discuss the soil salinity and alkalinity and formation of saline and alkaline soil	[Up to K3]						
<b>CO3:</b>	Interpret the chemical composition of soil	[Up to K3]						
<b>CO4:</b>	Examine the vermicomposting and ecofriendly farming	[Up to K4]						
CO5:	Analyze the biofertilizers and methods of applying fertilizers	[Up to K4]						

#### CO & PO Mapping:

Course Outcomes	Programme Outcomes (POs)							
(COs)	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	PO 4	PO 5	PO 6		
CO 1	3	1	2	3	1	2		
CO 2	1	3	1	1	2	3		
CO 3	2	2	3	2	3	3		
CO 4	3	1	2	2	1	2		
CO5	1	3	2	3	2	1		
Weightage	10	10	10	11	9	11		

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

#### LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	<ul> <li>SOIL COMPONENTS</li> <li>Definition - volume, composition - uses - mineral soil - chemical ions - soil colloids - importance - nature - properties of inorganic and organic soil colloid - general characteristics - properties and importance - types - silicate clays - silicates - silicon oxygen tetrahedron.</li> <li>SOIL SALINITY AND ALKALINITY</li> </ul>	15	Chalk, Talk & Power point
п	Saline and alkaline soil - nature - classification - characteristics - formation of saline and alkaline soil - effects - quality of irrigation water: introduction - criteria - irrigation water resources - water quality - classification of water.	15	Chalk, Talk & Power point
ш	<ul> <li>ANALYSIS OF SOIL</li> <li>i) Estimation of Ca, Mg, K and nitrate</li> <li>ii) Analysis of soluble salt.</li> <li>iii) Analysis of NPK in fertilizer.</li> <li>iv) Determination of soil pH and electrical conductivity.</li> <li>v) Estimation of organic matter content of soil.</li> </ul>	15	Chalk, Talk & Power point
IV	VERMICOMPOSTING Vermicomposting: Economic implications - materials - preliminary treatment - types of vermicomposting - requirements for vermicomposting. Eco-Friendly Farming System: organic farming - concept – options	15	Chalk, Talk & Power point
V	<b>BIOFERTILIZERS</b> Biofertilizers: Soil biota in sustainable agriculture - biodiversity - management strategies - comparison of chemical fertilizer and biofertilizer. Methods of applying fertilizers - application of fertilizer in solid form - liquid fertilizer - nitrogenous fertilizer - types - phosphatic fertilizers: forms - classification- potassic fertilizers: Potassium sulphate: production – properties.	15	Chalk, Talk & Power point

Course Designed by: Dr. K. Muthupandi & Dr. A.J. Sunija

		C C	Formative	Based Educ Examination K Levels wit	n - Blue P	rint	. ,	
		K Level	Sect	tion A CQs	Sect	ion B Answers	Section C	Section
Inte rnal	Cos		No. of. Questio ns	K – Level	No. of. Questi ons	K - Level	Either or Choice	D Open Choice
CI	CO1	Up to K2	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)
AI	CO2	Up to K3	2	K1 & K2	2	K2 & K2	2 (K3&K3)	1(K3)
CI	CO3	Up to K3	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)
AII	<b>CO4</b>	Up to K4	2	K1 & K2	2	K2 & K2	2 (K3&K3)	1(K4)
		No. of Questions to be asked	4		3		4	2
Pat	estion tern I & II	No. of Questions to be answered	4		3		2	1
	1 & 11	Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

	Distribution of Marks with K Level CIA I & CIA II											
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %				
	K1	2	2	-	-	4	8					
	K2	2	4	10	10	26	52	60				
CIA	K3	-	-	10	10	20	40	40				
I	K4	-	-	-	-	-	-	-				
	Marks	4	6	20	20	50	100	100				
	K1	2	2	-	-	4	8					
	K2	2	4	10	10	26	52	60				
CIA	K3	-	-	10	-	10	20	20				
II	K4	-	-	-	10	10	20	20				
	Marks	4	6	20	20	50	100	100				

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

S	ummativ	ve Examinatio	on – Blue Pi	rint Articu	lation Map	ping – K	Level with C	ourse
			(	<b>Outcomes</b>	(COs)			
		MC	Qs	Short An	swers	Section C	Section D	
S.No	0 COs K - Level	No. of Question	K –	No. of	K –	(Either /	(Open	
			S	Level	Question	Level	or Choice)	Choice)
1	CO1	Up to K2	2	K1,K2	1	K1	2 (K2&K2)	1(K2)
2	CO2	Up to K3	2	K1&K2	1	K1	2 (K3&K3)	1(K3)
3	CO3	Up to K3	2	K1&K2	1	K2	2 (K3&K3)	1(K3)
4	<b>CO4</b>	Up to K4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)
5	CO5	Up to K4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)
No. of	Questions	s to be Asked	10		5		10	5
No.of Questions to be answered		10		5		5	3	
Mar	Marks for each question		1		2		5	10
Total N	<b>Total Marks for each section</b>				10		25	30
	(Figures	in parenthesi	is denotes, q	uestions s	hould be asl	<b>sed</b> with	the given K l	evel)

	Distribution of Marks with K Level						
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4	-	-	9	7.5	33
K2	5	6	10	10	31	25.83	
K3	-	-	40	20	60	50	50
K4	_	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.

Section	A (Mu	ltiple Cho	ice Questions)
Answe	r All Q	uestions	(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
		ort Answer	
	-	uestions	(5x2=10 marks)
Q.No	<u>CO</u>	K Level	Questions
11	CO1	K1	
12	$\frac{CO2}{CO2}$	K1	
13	CO3	K2	
14	CO4	K2	
15 Section	$\frac{CO5}{C}$	K2	
		her/Or Tyj uestions	$(5 \ge 5 = 25 \text{ marks})$
Q.No	CO	K Level	Questions
16) a	C01	K2	Questions
,	C01	K2 K2	
16) b			
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
,			ormance of the students is to be assessed by attempting higher
level of			statunee of the statemes is to be assessed by attempting ingher
		en Choice	
		Three ques	
Q.No	CO	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

# **Summative Examinations - Question Paper – Format**



# MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	FUEL CHEMISTRY				
Course Code	21UCHE63	L	Р	С	
Category	CORE ELECTIVE	5	-	5	
Nature of cours	e: EMPLOYABILITY 🗸 SKILL ORIENTED 🖌 ENTREPREN	URS	HIP	$\checkmark$	
Course Objecti	ives:				
• To Recall th	e knowledge of fuel sources and its types				
• To Remember the types of solid fuels and its advantages and disadvantages					
_	e the knowledge of solid, liquid, gaseous and bio fuels				
	the petroleum and petrochemical fuels and its refining process				
	ne the manufacture of fuels and catalysts used in petroleum industry				
	ERGY SOURCES		15		
	gy sources: solar, wind and geothermal energy - bioenergy hydrope				
	newable energy sources: fossil fuels and nuclear fuels - definition				
	- calorific value - determination of calorific value - classification of				
•	criterion for selection of fuel - properties: ignition temperature - flam	ie tem	perat	ure -	
flash point - fire	s point. LID FUELS		15		
	ial - industrial solid fuels - Coal: formation - properties - classification		-		
	verisation of coal - role of sulphur and ash in coal - analysis of coal:				
	ntages and disadvantages of solid fuels - fractional distillation of co				
coal tar-based c		ui tui	ub	05 01	
	QUID FUELS		15		
	petrochemicals - refining of petroleum - composition and uses of a	main	petro	leum	
	king - thermal - catalytic cracking - advantages - octane rating - anti		-		
	l - cetane rating - antidiesel knock agents - hydrocarbons from				
petrochemicals	- direct and indirect petrochemicals - catalysts used in petroleum indu	stry.			
Unit: IV GA	SEOUS FUELS		15		
	natural - artificial gaseous fuels - examples and their importanc				
	semi water gas - LPG - manufacture - composition and uses - gob	ar ga	s - bi	ogas	
	ntages and disadvantages.				
	) FUELS		15		
	rces and classification: biodiesel - bioethanol - hydrogen fuel from biodiesel - advantages of biofuels.	biom	ass -	uses	
	Total Lecture Ho	urs	75 H	rs	
Books for Stud		uis	75 11	15	
	, Industrial Chemistry, Goel Publishing House, 13th Edition, 2002.				
	Jain, Engineering Chemistry, Dhanpat Rai Publishing Company (P) L	TD 1	6th		
Edition, 20		<i>.</i> , 1	oui		
Books for Refe					
	batovskiy, Fuel Chemistry and Technology, LAMBERT Academic Pu	ıblishi	ng. 6	th	
June 2013, India			6, 0		
,					

Web R	Web Resources:					
1. <u>http</u>	s://en.m.wikipedia.org/wiki/Biofuels					
2. <u>http</u>	s://www.studentenergy.org/topics/biofuels					
Course	e Outcomes	K Level				
On th	On the completion of the course the student will be able to					
CO1:	Ability to remember the basic concepts of atoms, molecules, fuels, catalysis.	[Up to K2]				
<b>CO2:</b>	Discuss the composition of the solutions and mixtures and type of catalysts.	[Up to K3]				
CO3:	Interpret the knowledge of atoms, molecules, fuels and catalysts.	[Up to K3]				
<b>CO4:</b>	: Examine the properties of metals and non-metals and role of catalysts. [Up to K4]					
CO5:	Distinguish between pure substance and mixtures, various types of catalysts.	[Up to K4]				

# CO & PO Mapping:

<b>Course Outcomes</b>	Programme Outcomes (POs)							
(COs)	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	PO 4	<b>PO 5</b>	<b>PO 6</b>		
CO 1	3	1	2	3	1	2		
CO 2	1	3	1	1	2	3		
CO 3	2	2	3	2	3	3		
<b>CO 4</b>	3	1	2	2	1	2		
CO5	1	3	2	3	2	1		
Weightage	10	10	10	11	9	11		

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

#### LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
Ι	<b>ENERGY SOURCES</b> Renewable energy sources: solar, wind and geothermal energy – bioenergy hydropower and ocean energy - non-renewable energy sources: fossil fuels and nuclear fuels - definition and examples - fuel - definition - calorific value - determination of calorific value - classification of fuels: primary and secondary - criterion for selection of fuel - properties: ignition temperature - flame temperature - flash point - fire point.	15	Chalk, Talk & Power point
II	<b>SOLID FUELS</b> Natural - artificial - industrial solid fuels - Coal: formation - properties - classification - coking - non coking and pulverisation of coal - role of sulphur and ash in coal - analysis of coal: proximate and ultimate - advantages and disadvantages of solid fuels - fractional distillation of coal tar - uses of coal tar-based chemicals.	15	Chalk, Talk & Power point
III	LIQUID FUELS Petroleum and petrochemicals - refining of petroleum - composition and uses of main petroleum fractions - cracking - thermal - catalytic cracking - advantages - octane rating - anti knock agents - unleaded petrol - cetane rating - antidiesel knock agents - hydrocarbons from petroleum - petrochemicals - direct and indirect petrochemicals - catalysts used in petroleum industry.	15	Chalk, Talk & Power point
IV	GASEOUS FUELS Classification: natural - artificial gaseous fuels - examples and their importance - water gas- producer gas - semi water gas - LPG - manufacture - composition and uses - gobar gas - biogas generation- advantages and disadvantages.	15	Chalk, Talk & Power point
V	<b>BIO FUELS</b> Definition - sources and classification: biodiesel - bioethanol - hydrogen fuel from biomass - uses manufacture of biodiesel - advantages of biofuels.	15	Chalk, Talk & Power point

Course Designed by: Dr. A. J. Sunija & Dr. K. Muthupandi

			ng Outcome I Formative E	xamination	- Blue Pri	nt			
		Articulation	Sectio	Mapping – K Levels with Section A MCQs		Section B Short Answers		Section	
Inte rnal	Cos	K Level	No. of. Questions	Qs K – Level	No. of. Questi ons	K - Level	Section C Either or Choice	D Open Choice	
CI	CO1	Up to K2	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)	
AI	CO2	Up to K3	2	K1 & K2	2	K2 & K2	2 (K3&K3)	1(K3)	
CI	CO3	Up to K3	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)	
AII	CO4	Up to K4	2	K1 & K2	2	K2 & K2	2 (K3&K3)	1(K4)	
		No. of Questions to be asked	4		3		4	2	
Question Pattern		No. of Questions to be answered	4		3		2	1	
CIA	I & II	Marks for each question	1		2		5	10	
		Total Marks for each section	4		6		10	10	

	Distribution of Marks with K Level CIA I & CIA II							
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
	K1	2	2	-	-	4	8	
	K2	2	4	10	10	26	52	60
CIA	K3	-	-	10	10	20	40	40
I	K4	-	-	-	-	-	-	-
-	Marks	4	6	20	20	50	100	100
	K1	2	2	-	-	4	8	
	K2	2	4	10	10	26	52	60
CIA	K3	-	-	10	-	10	20	20
II	K4	-	-	-	10	10	20	20
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

S	Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)							
			MCQs		Short Ar	iswers	Section C	Castier D
S.No	COs	K - Level	No. of Questions	K – Level	No. of Questio n	K – Level	(Either / or Choice)	Section D (Open Choice)
1	CO1	Up to K2	2	K1,K2	1	K1	2 (K2&K2)	1(K2)
2	CO2	Up to K3	2	K1&K2	1	K1	2 (K3&K3)	1(K3)
3	CO3	Up to K3	2	K1&K2	1	K2	2 (K3&K3)	1(K3)
4	CO4	Up to K4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)
5	CO5	Up to K4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)
No. of	Questions	s to be Asked	10		5		10	5
No.of Questions to be answered		10		5		5	3	
Mar	ks for eac	h question	1		2		5	10
Total Marks for each section			10		10		25	30
	(Figures	in parenthesi	is denotes, qu	estions sh	nould be as	ked with	the given K	level)

	Distribution of Marks with K Level						
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4	-	-	9	7.5	33
K2	5	6	10	10	31	25.83	33
K3	-	-	40	20	60	50	50
K4	-	-	-	20	20	16.67	17
Marks	10	10	50	50	120	100	100

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.

Section	A (Mu	iltiple Cho	ice Questions)
Answei	r All Q	uestions	(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section	B (Sho	ort Answei	rs)
Answe	r All Q	uestions	(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section	C (Eit	her/Or Ty	pe)
Answei	r All Q	uestions	(5  x 5 = 25  marks)
Q.No	CO	K Level	Questions
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
			ormance of the students is to be assessed by attempting higher
level of			
		en Choice	
		Three ques	
Q.No	CO	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

# **Summative Examinations - Question Paper – Format**



# MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name NANO CHEMISTRY										
Course Code	21	UCHE64	1					L	Р	C
Category	C	CORE ELECTIVE5					-	5		
Nature of cour	se:	EMPLOY	YABILITY	</th <th>SKILL ORIENTED</th> <th><math>\checkmark</math></th> <th>ENTREPRI</th> <th>ENURS</th> <th>HIP</th> <th>✓</th>	SKILL ORIENTED	$\checkmark$	ENTREPRI	ENURS	HIP	✓
Course Object	tives	:			·	•				
• To Underst	and	the basic	concept of	nan	omaterials and its type	s.				
• To Identify	the	nanoparti	icles and its	s syr	nthetic methods of nane	oma	terials			
To Analyze	e the	classical	colloid the	ory	of nanomaterials					
To Perform	the	optical cl	haracteriza	tion	methods on prepared n	nano	materials			
To Determine	ine t	he applica	ation of na	noma	aterials and its environ	mer	ntal safety me	asures		
Unit: IINTRODUCTION TO NANOCHEMISTRY15										
				<u> </u>	ic Materials Chemis	•				
		-			tructures, Metal and so	emio	conductor nat	nocrysta	lls, Po	orous
inorganic nano									- <u>r</u>	
					NTHESIS				15	
Carbon-based 1		particles	(carbon na	notu	ibes, grapheme), Poroi	is in	organic nano	particle	s. Org	ganic
(latexes) and	cark									
			nanoparti	cles	(carbon nanotubes,	gra	pheme). Bas	sic syn	hesis	
	hod	s for nano	nanoparti materials (	cles CVI	(carbon nanotubes, D, sol-gel, microemuls	gra	pheme). Bas	sic syn	hesis nal).	and
Unit: III CI	hod LAS	s for nano SICAL C	nanoparti materials ( OLLOID	cles CVI TH	(carbon nanotubes, D, sol-gel, microemuls EORY	gra ion,	pheme). Bas template, hy	sic syn drotheri	hesis nal). 15	and
Unit: IIICINucleationan	hod LAS d g	s for nano SICAL C rowth, C	nanoparti materials ( OLLOID Ostwald rip	cles CVI TH	(carbon nanotubes, D, sol-gel, microemuls EORY ng, Homogeneous va	gra ion, s. h	pheme). Bas template, hy neterogeneous	sic synt drotheri s nucle	hesis nal). 15 ation	and i and
Unit: IIICINucleationanapplicationsof	hod LAS d g nai	s for nano SICAL C rowth, C nomateria	nanoparti materials ( OLLOID Ostwald rij ls, Anisotr	cles CVI TH penin opic	(carbon nanotubes, D, sol-gel, microemuls EORY ng, Homogeneous va c growth and shape co	gra ion, s. h	pheme). Bas template, hy neterogeneous	sic synt drotheri s nucle	hesis nal). 15 ation	and
Unit: IIICINucleationanapplicationsofNanocrystaldo	hod LAS d g nai ping	s for nano SICAL C rowth, C nomateria g, solid so	nanoparti materials ( COLLOID Ostwald rij ls, Anisotr lutions and	cles CVI TH penii opic Veg	(carbon nanotubes, D, sol-gel, microemuls EORY ng, Homogeneous ve growth and shape co gard's rule.	gra ion, s. h	pheme). Bas template, hy neterogeneous	sic synt drotheri s nucle	hesis nal). 15 ation 1) gro	and and owth,
Unit: IIICINucleationanapplicationsofNanocrystaldoUnit: IVOI	hod LAS d g nar ping PTI	s for nano SICAL C rowth, C nomateria g, solid so CAL CH	nanoparti materials ( OLLOID Ostwald rij ls, Anisotr lutions and IARACT	cles CVI TH penin opic Veg ERI	<ul> <li>(carbon nanotubes,</li> <li>D, sol-gel, microemuls</li> <li>EORY</li> <li>ng, Homogeneous va</li> <li>growth and shape co</li> <li>gard's rule.</li> <li>ZATION</li> </ul>	gra ion, s. h ontro	pheme). Bas template, hy neterogeneous ol, catalyzed	sic synt drotherr s nucle (seeded	hesis nal). 15 ation 1) gro	and and owth,
Unit: IIICINucleationanapplicationsofNanocrystaldoUnit: IVOIAbsorptionan	hod LAS d g nar ping PTI d ph	s for nano SICAL C rowth, C nomateria g, solid so CAL CH otolumine	nanoparti materials ( OLLOID Ostwald rij ls, Anisotr lutions and IARACT escence (Pl	cles CVI TH penin opic Veg ERI	<ul> <li>(carbon nanotubes,</li> <li>D, sol-gel, microemuls</li> <li>EORY</li> <li>ng, Homogeneous value</li> <li>growth and shape construction</li> <li>gard's rule.</li> <li>IZATION</li> <li>PLE) spectroscopies,</li> </ul>	gra ion, s. h ontro stea	pheme). Bas template, hy neterogeneous ol, catalyzed ndy-state vs.	sic synt drothern s nucle (seede fast spe	hesis nal). 15 ation d) gro 15 ctroso	and and owth, copy,
Unit: IIICINucleationanapplicationsofNanocrystaldoUnit: IVOIAbsorptionanddynamiclight	hod AS d g nar ping PTI d ph scat	s for nano SICAL C rowth, C nomateria g, solid so CAL CE otolumine tering, St	nanoparti materials ( OLLOID Ostwald rij ls, Anisotr lutions and IARACT escence (Pl ructural ch	cles CVI TH penin opic Veg ERI	<ul> <li>(carbon nanotubes,</li> <li>D, sol-gel, microemuls</li> <li>EORY</li> <li>ng, Homogeneous va</li> <li>growth and shape co</li> <li>gard's rule.</li> <li>ZATION</li> </ul>	gra ion, s. h ontro stea	pheme). Bas template, hy neterogeneous ol, catalyzed ndy-state vs.	sic synt drothern s nucle (seede fast spe	hesis nal). 15 ation d) gro 15 ctroso	and and owth, copy,
Unit: IIICINucleationanapplicationsofNanocrystaldoUnit: IVOIAbsorptionanddynamiclightand near-surface	hod AS d g nan ping PTI d ph scat	s for nano SICAL C rowth, C nomateria g, solid so CAL CE otolumine tering, St ystal strue	nanoparti materials ( OLLOID Ostwald rij ls, Anisotr lutions and IARACT escence (Pl ructural ch ctures.	cles CVI TH penin opic Veg ERI 2 & arac	<ul> <li>(carbon nanotubes,</li> <li>D, sol-gel, microemuls</li> <li>EORY</li> <li>ng, Homogeneous vantue</li> <li>growth and shape construction</li> <li>gard's rule.</li> <li>(ZATION)</li> <li>PLE) spectroscopies,</li> <li>pterization: XRD, TEM</li> </ul>	gra ion, s. h ontro stea	pheme). Bas template, hy neterogeneous ol, catalyzed ndy-state vs.	sic synt drothern s nucle (seede fast spe	hesis nal). 15 ation 1) gro 15 ctroso ween	and and owth, copy, bulk
Unit: IIICINucleationanapplicationsofNanocrystaldoUnit: IVOIAbsorptionanddynamiclightand near-surfaceUnit: VCHCH	hod AS d g nau ping PTI l ph scat ce cr HEM	s for nano SICAL C rowth, C nomateria s, solid so CAL CE otolumine tering, St ystal struc IISTRY	nanoparti materials ( OLLOID Ostwald rij ls, Anisotr lutions and IARACT escence (Pl ructural ch ctures. OF SMAL	cles CVI TH Denii opic Veg ERI Z & arac	<ul> <li>(carbon nanotubes,</li> <li>D, sol-gel, microemuls</li> <li>EORY</li> <li>ng, Homogeneous value</li> <li>growth and shape congard's rule.</li> <li>(ZATION)</li> <li>PLE) spectroscopies,</li> <li>terization: XRD, TEN</li> <li>URFACES</li> </ul>	gra ion, s. h ontro stea 4, A	pheme). Bas template, hy heterogeneous ol, catalyzed ady-state vs. FM, Deviati	sic synt drothern s nucle (seeded fast spe ons bet	hesis nal). 15 ation 1) gro 15 ctroso ween 15	and and owth, copy, bulk
Unit: IIICINucleationanapplicationsofNanocrystaldoUnit: IVOIAbsorptionanddynamiclightand near-surfaceUnit: VCurvatureand	hod AS d g nar ping PTI l ph scat ce cr HEM nei	s for nano SICAL C rowth, C nomateria g, solid so CAL CE otolumine tering, St ystal struc IISTRY ghboring	nanoparti materials ( COLLOID Ostwald rij ls, Anisotr lutions and IARACT escence (Pl ructural ch ctures. OF SMAL -charge ef	cles CVI THI Denii opic Veş ERI L & arac L S fects	<ul> <li>(carbon nanotubes, D, sol-gel, microemuls</li> <li>EORY</li> <li>ng, Homogeneous value</li> <li>growth and shape congard's rule.</li> <li>(ZATION</li> <li>PLE) spectroscopies, eterization: XRD, TEN</li> <li>URFACES</li> <li>s on chemical reactive</li> </ul>	gra ion, s. h ontro stea I, A	pheme). Bas template, hy heterogeneous ol, catalyzed ady-state vs. JFM, Deviati and equilib	sic synt drotherr s nucle (seeded fast spe ons bet ria (pK	hesis nal). 15 ation d) gro 15 ctroso ween 15 a's, r	and and owth, copy, bulk redox
Unit: IIICINucleationanapplicationsofNanocrystaldoUnit: IVOIAbsorptionanddynamiclightand near-surfactUnit: VCICICurvatureandpotentials),Ap	hoda AS d g nan ping PTI d ph scat ce cr HEM nei oplic	s for nano SICAL C rowth, C nomateria <u>s, solid so</u> CAL CH otolumine tering, St ystal struct IISTRY ghboring ations in	nanoparti materials ( OLLOID Ostwald rij ls, Anisotr lutions and IARACT escence (Pl ructural ch ctures. OF SMAL -charge ef structural	cles <u>CVI</u> <u>THI</u> penii opic Vegg ERI <u>&amp;</u> arac <u>LS</u> fects ma	<ul> <li>(carbon nanotubes, D, sol-gel, microemuls</li> <li>EORY</li> <li>ng, Homogeneous van en en</li></ul>	gra ion, s. h ontro stea A, A vity	pheme). Bas template, hy heterogeneous ol, catalyzed hdy-state vs. .FM, Deviati and equilib conversion	sic synt drotherr s nucle (seeded fast spe ons bet ria (pK (Solar (	hesis nal). 15 ation d) gro 15 ctroso ween 15 a's, r	and and owth, copy, bulk redox
Unit: IIICINucleationanapplicationsofNanocrystaldoUnit: IVOIAbsorptionanddynamiclightand near-surfactUnit: VCICICurvatureandpotentials),Ap	hoda AS d g nan ping PTI d ph scat ce cr HEM nei oplic	s for nano SICAL C rowth, C nomateria <u>s, solid so</u> CAL CH otolumine tering, St ystal struct IISTRY ghboring ations in	nanoparti materials ( OLLOID Ostwald rij ls, Anisotr lutions and IARACT escence (Pl ructural ch ctures. OF SMAL -charge ef structural	cles <u>CVI</u> <u>THI</u> penii opic Vegg ERI <u>&amp;</u> arac <u>LS</u> fects ma	<ul> <li>(carbon nanotubes, D, sol-gel, microemuls</li> <li>EORY</li> <li>ng, Homogeneous value</li> <li>growth and shape congard's rule.</li> <li>(ZATION</li> <li>PLE) spectroscopies, eterization: XRD, TEN</li> <li>URFACES</li> <li>s on chemical reactive</li> </ul>	gra ion, s. h ontro stea I, A vity gy f na	pheme). Bas template, hy neterogeneous ol, catalyzed ady-state vs. FM, Deviati and equilib conversion notechnology	sic synt drothern s nucle (seeded fast spe ons bet ria (pK (Solar ( 7.	hesis nal). 15 ation 1) gro 15 ctroso ween 15 a's, r Cells)	and and owth, copy, bulk redox and
Unit: IIICINucleationanapplicationsofNanocrystaldoUnit: IVOIAbsorptionanddynamiclightand near-surfaceUnit: VCurvatureCHCurvatureandpotentials),Applicationscatalysisapplications	hoda AS d g nan ping PTI l ph scat ce cr HEN nei pplic atio	s for nano SICAL C rowth, C nomateria <u>s, solid so</u> CAL CH otolumine tering, St ystal struct IISTRY ghboring ations in	nanoparti materials ( OLLOID Ostwald rij ls, Anisotr lutions and IARACT escence (Pl ructural ch ctures. OF SMAL -charge ef structural	cles <u>CVI</u> <u>THI</u> penii opic Vegg ERI <u>&amp;</u> arac <u>LS</u> fects ma	<ul> <li>(carbon nanotubes, D, sol-gel, microemuls</li> <li>EORY</li> <li>ng, Homogeneous van en en</li></ul>	gra ion, s. h ontro stea I, A vity gy f na	pheme). Bas template, hy heterogeneous ol, catalyzed hdy-state vs. .FM, Deviati and equilib conversion	sic synt drothern s nucle (seeded fast spe ons bet ria (pK (Solar ( 7.	hesis nal). 15 ation d) gro 15 ctroso ween 15 a's, r	and and owth, copy, bulk redox and
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- 4. Edelstein.A.S and Cammarata.R.C, Nanomaterials- Synthesis, Properties and Applications, Institute of Physics Publishing, 1998, London.
- 5. Ozin.G and Arsenault. A, Nanochemistry: A Chemical Approach to Nanomaterials, RSC Publishing, 2005.

#### Web Resources:

- 1. <u>https://youtu.be/BLNwNkdRiTI</u>
- 2. https://youtu.be/LbVg58LfvJc
- 3. https://youtu.be/evE08ycZfnM
- 4. https://youtu.be/41zegz4APPs

Course	Course Outcomes						
On th	On the completion of the course the student will be able to						
CO1:	D1: Define nanomaterials and its types of nanomaterials						
<b>CO2:</b>	Understand the nanoparticles and synthetic methods of nanomaterials	[Up to K3]					
CO3:	Analyze the classical colloid theory on nanomaterials	[Up to K3]					
<b>CO4:</b>	Interpret the optical characterization of prepared nanomaterials	[Up to K4]					
CO5:	Distinguish the application of nanomaterials	[Up to K4]					

#### CO & PO Mapping:

Course Outcomes	Programme Outcomes (POs)								
(COs)	<b>PO 1</b>	<b>PO 2</b>	PO 3	PO 4	<b>PO 5</b>	<b>PO 6</b>			
CO 1	3	1	2	3	1	2			
CO 2	1	3	1	1	2	3			
CO 3	2	2	3	2	3	3			
CO 4	3	1	2	2	1	2			
CO5	1	3	2	3	2	1			
Weightage	10	10	10	11	9	11			

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

### LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
Ι	<b>INTRODUCTION TO NANOMATERIALS</b> Nanomaterials – Definition – Inorganic Materials Chemistry and Nanochemistry; Basics Nanomaterials. Types, compositions, and structures, Metal and semiconductor nanocrystals, Porous inorganic nanoparticles, Organic (latexes).	15	Chalk, Talk & Power point
II	NANOPARTICLS AND SYNTHESIS Carbon-based nanoparticles (carbon nanotubes, grapheme), Porous inorganic nanoparticles, Organic (latexes) and carbon-based nanoparticles (carbon nanotubes, grapheme). Basic synthesis and fabrication methods for nanomaterials (CVD, sol-gel, microemulsion, template, hydrothermal).	15	Chalk, Talk & Power point
ш	CLASSICAL COLLOID THEORY Nucleation and growth, Ostwald ripening, Homogeneous vs. heterogeneous nucleation and applications of nanomaterials, Anisotropic growth and shape control, catalyzed (seeded) growth, Nanocrystal doping, solid solutions and Vegard's rule.	15	Chalk, Talk & Power point
IV	OPTICAL CHARACTERIZATION Absorption and photoluminescence (PL & PLE) spectroscopies, steady- state vs. fast spectroscopy, dynamic light scattering, Structural characterization: XRD, TEM, AFM, Deviations between bulk and near- surface crystal structures.	15	Chalk, Talk & Power point
v	CHEMISTRY OF SMALL SURFACES Curvature and neighboring-charge effects on chemical reactivity and equilibria (pKa's, redox potentials), Applications in structural materials, lighting, energy conversion (Solar Cells) and catalysis applications, Environmental, safety and ethical aspects of nanotechnology.	15	Chalk, Talk & Power point

Course Designed by: Dr. K. Muthupandi & Dr. V. Ramasamy Raja

	Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)										
Inte				ion A CQs		on B Answers	Section C	Section D			
rnal	Cos	K Level	No. of. Questions	K – Level	No. of. Question s	K - Level	Either or Choice	D Open Choice			
CI	CO1	Up to K2	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)			
AI	CO2	Up to K3	2	K1 & K2	2	K2 & K2	2 (K3&K3)	1(K3)			
CI	CO3	Up to K3	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)			
AII	CO4	Up to K4	2	K1 & K2	2	K2 & K2	2 (K3&K3)	1(K4)			
		No. of Questions to be asked	4		3		4	2			
Question Pattern		No. of Questions to be answered	4		3		2	1			
CIA	I & II	Marks for each question	1		2		5	10			
		Total Marks for each section	4		6		10	10			

	Distribution of Marks with K Level CIA I & CIA II											
	K (Multiple Level Choice Questions)		Section BSection C(Short(Either /AnswerOrQuestions)Choice)		Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidat e of %				
	K1	2	2	-	-	4	8					
	K2	2	4	10	10	26	52	60				
CIA	K3	-	-	10	10	20	40	40				
I	K4	-	-	-	-	-	-	-				
-	Marks	4	6	20	20	50	100	100				
	K1	2	2	-	-	4	8					
	K2	2	4	10	10	26	52	60				
CIA	K3	-	-	10	-	10	20	20				
II	K4	-	-	-	10	10	20	20				
	Marks	4	6	20	20	50	100	100				

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

S	ummativ	ve Examination			-	ping – K	Level with Co	ourse
			(	Dutcomes	(COs)			
	S.No COs		MC	Qs	Short An	swers	Section C	Section
S.No		K - Level	No. of Question	K –	No. of	<b>K</b> –	(Either / or	D (Open
			S	Level	Question	Level	Choice)	Choice)
1	CO1	Up to K2	2	K1,K2	1	K1	2 (K2&K2)	1(K2)
2	CO2	Up to K3	2	K1&K2	1	K1	2 (K3&K3)	1(K3)
3	CO3	Up to K3	2	K1&K2	1	K2	2 (K3&K3)	1(K3)
4	CO4	Up to K4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)
5	CO5	Up to K4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)
No. of	Question	s to be Asked	10		5		10	5
No	of Questi. answe	ions to be red	10		5		5	3
Mar	ks for eac	ch question	1		2		5	10
Total N	Marks for	each section	10		10		25	30
	(Figures	in parenthesi	is denotes, q	uestions s	hould be asl	<b>ked</b> with	the given K le	vel)

	Distribution of Marks with K Level										
K Level	Section ASection B(Multiple(ShortChoiceAnswerQuestions)Questions)		Section C (Either/ or Choice)Section D (Open 		Total Marks	% of (Marks without choice)	Consolidated %				
K1	5	4	-	-	9	7.5	33				
K2	5	6	10	10	31	25.83	55				
K3	-	-	40	20	60	50	50				
K4	_	-	-	20	20	16.67	17				
Marks	10	10	50	50	120	100	100				

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.

Section	A (Mu	Itiple Cho	ice Questions)
Answei	r All Qu	uestions	(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section	B (Sho	ort Answei	rs)
Answei	r All Qu	uestions	(5x2=10 marks)
Q.No	СО	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section	C (Eit	her/Or Ty	pe)
Answer	r All Qu	uestions	(5  x 5 = 25  marks)
Q.No	CO	K Level	Questions
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
			ormance of the students is to be assessed by attempting higher
level of			
		en Choice	
		Three ques	
Q.No	CO	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

# **Summative Examinations - Question Paper – Format**



# MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

Course Name	CLINICAL AND MEDICINAL CHEMISTRY			
Course Code	21UCHE65	L	Р	С
Category	CORE ELECTIVE	5	-	5
Nature of cours	e: EMPLOYABILITY 🗸 SKILL ORIENTED 🖌 ENTREPREN	URS	HIP	$\checkmark$
Course Object	ives:			
• To Recall the	e definitions of health, sterilization of surgical instrument and biocher	nical	analy	/sis.
	per the concept of drugs and learn the manufacture of common drugs.			
-	e the enzymes and its classification.			
	the concept of blood volume, blood group and coagulation of blood.			
	ne the knowledge on heredity and recombinant DNA and its possible h	azaro	1	
	INICAL HYGIENE AND BIOCHEMICAL ANALYSIS		15	
	ealth, Sterilization of surgical instruments, disinfectants, antiseptics a			
	alysis of urine, serum and fecal matter. Treatment for specific poisons	s-acic	ls, all	calis,
	cury compounds.		1.5	,
	MMON TESTING OF DRUGS	1.	15	
	drugs (e.g. quinine, reserpine, atopside and $d$ – tubocurarine) from In			
	of drugs: biological variation – screening and toxicity – Use of pha		_	
	ex – Types of drugs and their modes of action – Depressant drugs (sp d hypnotics) – Anticonvulsant drugs (sodium valproate, hydantoin			
	ne (glyceryl guaiacolate, diazepam). Cardiovascular drugs-nitrates,			
	d atenolol) and calcium channel blockers.	Deta		LICI S
	ZYMES		15	
	pecificity – factors influencing enzymes – Coenzymes – Cofactor, AT	ΓΡΝ	-	
	n and Immobilization of enzymes. Applications of enzymes.	,	leena	1115111
	DY FLUID		15	
	blood groups, coagulation of blood. Plasma lipoproteins. B	lood	-	
	, diseases affecting red cells: Hyperchromic and hypochromic a			
	od sugar and diabetes.			
Unit: V BI	DTECHNOLOGY		15	
	mbinant DNA, Genetic engineering and its possible hazards, G	Gene	spli	cing,
	interferon and human insulin (Humulin), Drug manufacture based o			
(only antibiotics				
	Total Lecture Hou	ırs	75 H	rs
<b>Books for Stud</b>	y:			
1. Jayashree C	hosh, A Textbook of Pharmaceutical Chemistry, S. Chand & Co., New	v Del	hi, 19	999.
	C, Biochemistry, Tata McGraw Hill Publishing Co., 1993.		, -	
	ar, Medicinal Chemistry, Wiley Eastern Ltd., 1993, New Delhi.			
<b>Books for Refe</b>				
1. Le Roy, O,	Natural and Synthetic Organic Medicinal Compounds, Ealemi, 1976.			
	Hawk's Physiological Chemistry, 14th Edition, Tata McGraw Hill F	Publis	hing	Co
<b>1</b> . 00001, <b>D</b> . <b>L</b> ,	Hawk's Thysiological Chemistry, 11 Eatlon, Tata McOlaw Thirt	uomo	mig	00.,

3. Kle	3. Kleiner. O and Martin. J, Biochemistry, Prentice-Hall of India, 1974, New Delhi.						
Web F	Resources:						
1. <u>htt</u>	os://youtu.be/IUxkcEoGkVg						
2. htt	os://youtu.be/pss_sm2zaek						
3. htt	os://youtu.be/Z63xnlDNajE						
4. htt	os://youtu.be/qaYBUz14B3w						
Course	e Outcomes	K Level					
On th	e completion of the course the student will be able to						
CO1:	Remember the basic definitions of clinical hygiene and biochemical analysis.	[Up to K2]					
CO2:	Discuss the manufacture of common drugs from medicinal plants and type of drugs.	[Up to K3]					
CO3:	Interpret the knowledge of enzymes and its classification	[Up to K3]					
CO4:	Examine the properties of blood volume, blood group and coagulation of blood.	[Up to K4]					
CO5:	Determine the heredity and recombinant DNA and its possible hazards.	[Up to K4]					

# CO & PO Mapping:

<b>Course Outcomes</b>	Programme Outcomes (POs)							
(COs)	<b>PO 1</b>	PO 2	PO 3	PO 4	PO 5	<b>PO 6</b>		
CO 1	3	1	2	3	1	2		
CO 2	1	3	1	1	2	3		
CO 3	2	2	3	2	3	3		
CO 4	3	1	2	2	1	2		
CO5	1	3	2	3	2	1		
Weightage	10	10	10	11	9	11		

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

Unit	Course Name	Hrs	Pedagogy
I	<b>CLINICAL HYGIENE AND BIOCHEMICAL ANALYSIS</b> Definition of health, Sterilization of surgical instruments, disinfectants, antiseptics and Sanitation. Biochemical analysis of urine, serum and fecal matter. Treatment for specific poisons-acids, alkalis, arsenic and mercury compounds.	15	Chalk, Talk & Power point
II	<b>COMMON TESTING OF DRUGS</b> Manufacture of drugs (e.g. quinine, reserpine, atopside and d – tubocurarine) from Indian medicinal plants. Testing of drugs: biological variation – screening and toxicity – Use of pharmacopeia and therapeutic index – Types of drugs and their modes of action – Depressant drugs (special reference to sedatives and hypnotics) – Anticonvulsant drugs (sodium valproate, hydantoins) – Acting at spinal cord alone (glyceryl guaiacolate, diazepam). Cardiovascular drugs- nitrates, beta blockers (propranolol and atenolol) and calcium channel blockers.	15	Chalk, Talk & Power point
III	<b>ENZYMES</b> Classification, specificity – factors influencing enzymes – Coenzymes – Cofactor, ATP, Mechanism of enzyme action and Immobilization of enzymes. Applications of enzymes.	15	Chalk, Talk & Power point
IV	<b>BODY FLUID</b> Blood volume, blood groups, coagulation of blood. Plasma lipoproteins. Blood pressure Arteriosclerosis, diseases affecting red cells: Hyperchromic and hypochromic anemia. Blood transfusion. Blood sugar and diabetes.	15	Chalk, Talk & Power point
V	<b>BIOTECHNOLOGY</b> Heredity, recombinant DNA, Genetic engineering and its possible hazards, Gene splicing, manufacture of interferon and human insulin (Humulin), Drug manufacture based on fermentation (only antibiotics)	15	Chalk, Talk & Power point

Course Designed by: Dr. R. Satheesh & Dr. K. Muthupandi

			ng Outcome I Formative E Mapping – K	Examination	- Blue Print	t		
				Section A		Section B		Sectio
Inte	C	T7 T 1	MC	Qs		Answers	Section C	n D
rnal	Cos	K Level	No. of. Questions	K – Level	No. of. Question s	K - Level	Either or Choice	Open Choice
CI	CO1	Up to K2	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)
AI	CO2	Up to K3	2	K1 & K2	2	K2 & K2	2 (K3&K3)	1(K3)
CI	CO3	Up to K3	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)
AII	CO4	Up to K4	2	K1 & K2	2	K2 & K2	2 (K3&K3)	1(K4)
		No. of Questions to be asked	4		3		4	2
•	estion tern	No. of Questions to be answered	4		3		2	1
CIA I & II		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

	Distribution of Marks with K Level CIA I & CIA II									
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Mar ks with out choic e)	Consolidate of %		
	K1	2	2	-	-	4	8			
	K2	2	4	10	10	26	52	60		
CIA	K3	-	-	10	10	20	40	40		
I	K4	-	-	-	-	-	-	-		
-	Marks	4	6	20	20	50	100	100		
	K1	2	2	-	-	4	8			
	K2	2	4	10	10	26	52	60		
CIA	K3	-	-	10	-	10	20	20		
II	K4	-	-	-	10	10	20	20		
	Marks	4	6	20	20	50	100	100		

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

**K3**- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summ	Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)									
			MC	Qs	Short An	swers	Section C	Section D		
S.No	COs	K - Level	No. of	K –	No. of	K –	(Either /	(Open		
			Questions	Level	Question	Level	or Choice)	Choice)		
1	CO1	Up to K2	2	K1,K2	1	K1	2 (K2&K2)	1(K2)		
2	CO2	Up to K3	2	K1&K2	1	K1	2 (K3&K3)	1(K3)		
3	CO3	Up to K3	2	K1&K2	1	K2	2 (K3&K3)	1(K3)		
4	CO4	Up to K4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)		
5	CO5	Up to K4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)		
No. of	Questions	s to be Asked	10		5		10	5		
No	No.of Questions to be answered		10		5		5	3		
Marks for each question		1		2		5	10			
Total Marks for each section		10		10		25	30			
	(Figu	res in parenthe	esis denotes, o	questions s	hould be aske	ed with th	e given K leve	el)		

	Distribution of Marks with K Level									
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %			
K1	5	4	-	-	9	7.5	33			
K2	5	6	10	10	31	25.83	55			
K3	-	-	40	20	60	50	50			
K4	-	-	-	20	20	16.67	17			
Marks	10	10	50	50	120	100	100			
	NB: Higher level of performance of the students is to be assessed by attempting higher level									
of K lev	els.									

Section	A (Mu	ultiple Cho	ice Questions)
		Juestions	(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section	B (Sho	ort Answei	rs)
Answe	r All Q	uestions	(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section	C (Eit	her/Or Ty	pe)
Answe	r All Q	uestions	(5  x 5 = 25  marks)
Q.No	CO	K Level	Questions
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
			ormance of the students is to be assessed by attempting higher
level of			<u></u>
		en Choice	
	-	Three ques	
Q.No	CO	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

# **Summative Examinations - Question Paper – Format**



# MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

urse Code21UCHE66LPtegoryCORE ELECTIVE5-ure of course:EMPLOYABILITY $\checkmark$ SKILL ORIENTED $\checkmark$ ENTREPRENURSHIPurse Objectives: $\checkmark$ SKILL ORIENTED $\checkmark$ ENTREPRENURSHIParse Objectives:To Recall the basic concept of electrochemical cells and electrodesTo Remember the electrolytes and determine of activity coefficients of electrolytesTo Interpret the electrodes and energy conservationTo Perform the basic components of electroplating and metal finishingTo Determine the electrochemical properties on corrosion scienceit: IELECTROMOTIVE FORCEIf and Equilibrium constant (K) of a cell reaction - Nernst equation - concentration cells without transference - electrolyte concentration cells without	C 5 ✓
ure of course:       EMPLOYABILITY       ✓       SKILL ORIENTED       ✓       ENTREPRENURSHIP         urse Objectives:       To Recall the basic concept of electrochemical cells and electrodes       To Remember the electrolytes and determine of activity coefficients of electrolytes         To Interpret the electrodes and energy conservation       To Perform the basic components of electroplating and metal finishing         To Determine the electrochemical properties on corrosion science       15         It: I       ELECTROMOTIVE FORCE       15         IF and Equilibrium constant (K) of a cell reaction - Nernst equation - concentration cells without transference - electrolyte concentration cells without       15	-
urse Objectives:         To Recall the basic concept of electrochemical cells and electrodes         To Remember the electrolytes and determine of activity coefficients of electrolytes         To Interpret the electrodes and energy conservation         To Perform the basic components of electroplating and metal finishing         To Determine the electrochemical properties on corrosion science         it: I       ELECTROMOTIVE FORCE         IF and Equilibrium constant (K) of a cell reaction - Nernst equation - concentration cells without transference - electrolyte concentration cells without	<ul> <li>✓</li> </ul>
To Recall the basic concept of electrochemical cells and electrodes         To Remember the electrolytes and determine of activity coefficients of electrolytes         To Interpret the electrodes and energy conservation         To Perform the basic components of electroplating and metal finishing         To Determine the electrochemical properties on corrosion science         it: I       ELECTROMOTIVE FORCE         IF and Equilibrium constant (K) of a cell reaction - Nernst equation - concentration cells without transference - electrolyte concentration cells without	
To Remember the electrolytes and determine of activity coefficients of electrolytes         To Interpret the electrodes and energy conservation         To Perform the basic components of electroplating and metal finishing         To Determine the electrochemical properties on corrosion science         it: I       ELECTROMOTIVE FORCE         IF and Equilibrium constant (K) of a cell reaction - Nernst equation - concentration cells without transference - electrolyte concentration cells without	
To Interpret the electrodes and energy conservation         To Perform the basic components of electroplating and metal finishing         To Determine the electrochemical properties on corrosion science         it: I       ELECTROMOTIVE FORCE         IF and Equilibrium constant (K) of a cell reaction - Nernst equation - concentration cells without transference - electrolyte concentration cells without	
To Perform the basic components of electroplating and metal finishing         To Determine the electrochemical properties on corrosion science         it: I       ELECTROMOTIVE FORCE         IF and Equilibrium constant (K) of a cell reaction - Nernst equation - concentration cells without transference - electrolyte concentration cells without	
To Determine the electrochemical properties on corrosion scienceit: IELECTROMOTIVE FORCE15IF and Equilibrium constant (K) of a cell reaction - Nernst equation - concentration cells without transference - electrolyte concentration cells	
it: I       ELECTROMOTIVE FORCE       15         IF and Equilibrium constant (K) of a cell reaction - Nernst equation - concentration cells without transference - electrolyte	
IF and Equilibrium constant (K) of a cell reaction - Nernst equation - concentration concentration cells without transference - electrolyte concentration cells without	
ctrode concentration cells without transference - electrolyte concentration cells wi	5
nsference - concentration cells with transference - liquid junction potential (ELJP), electronic e electronic	rolyt
centrations cells with salt bridge - application of EMF measurements.	
it: II ELECTROLYTES, ELECTRODES AND ENERGY CONSERVATION 15	5
ctrolytes – Determination of activity coefficients of electrolyte - determination of tran	-
nber - determination of pH of a solution using hydrogen electrode, quine hydrone electrode	-
ss electrode - potentiometric titrations. Energy Conservation: principals of energy conservation	
ctrochemical energy conservation - thermodynamic reversibility - Gibb <sup>*</sup> s equation.	LIOII
it: III   ELCTROPLATING AND FUEL CELLS   15	5
ctroplating – definition – factors affecting electroplating – components of electroplating pr	-
vorking process of electroplating – basic applications of electroplating – pocket plates	
tered plates - vented and sealed maintenance free designs – fuel cells -introduction, types o	
ls, advantages - photo electrochemical cells.	1 100
it: IV ENDUSTRIAL METAL FINISHING 15	5
roduction - objectives of electroplating - characteristics of electrodeposit and factors - co	-
ctroplating - alkaline and acid bath - chromium electroplating - zinc electroplating - gold pla	
dizing and electroforming.	
it: V CORROSION SCIENCE 15	5
roduction - types of corrosion - theories of corrosion - mechanism of corrosion - dry corros	-
ctrochemical corrosion - types - passivity - factors influencing rate of corrosion - nature of r	
vironment - phorbaix diagram - corrosion control techniques - inhibitors - cathodic prote	
thods - corrosion monitoring techniques.	
Total Lecture Hours 75 H	Irs
oks for Study:	
B.R. Puri, L.R. Sharma, Madan. S Pathaniya and B.S. Lark, Graduate of physical Chemistry	
(Volume II), Vishal Publishing Co.	
Bard & Faulkner, Electrochemical Methods: Fundamentals and Applications, Second edition	
oks for References:	۱.

- 1. Fritz Scholz, Electroanalytical Methods Guide to Experiments and Applications, 2<sup>nd</sup> Ed, Springer-Verlag Berlin Heidelberg 2010.
- 2. Joseph Wang, Analytical Electrochemistry, third edition 2006, John Wiley & Sons.

#### Web Resources:

- 1. https://youtu.be/rHMZ1Dpk5Fc
- 2. https://youtu.be/fHfv41HmIK0
- 3. https://youtu.be/BECSYfYhJGk
- 4. https://youtu.be/fM8hwkW8bIw
- 5. https://youtu.be/tJj-ilJTo6Y
- 6. https://youtu.be/uHoKGy704jk
- 7. https://youtu.be/4swtYzEbl64
- 8. https://youtu.be/q9c3-8CE\_ro **C**-----

Cours	e Outcomes	K Level						
On th	On the completion of the course the student will be able to							
<b>CO1:</b>	Remember the basic concepts of electrochemical cells and electrodes	[Up to K2]						
<b>CO2:</b>	Discuss the electrolytes, electrodes and energy conservation	[Up to K3]						
<b>CO3:</b>	Interpret the knowledge of electroplating and fuel cells	[Up to K3]						
<b>CO4:</b>	Examine the objective and characteristics of metal finishing	[Up to K4]						
CO5:	Analyze the electrochemical properties on corrosion science	[Up to K4]						

#### CO & PO Mapping:

Course Outcomes	Programme Outcomes (POs)						
(COs)	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	PO 4	<b>PO 5</b>	<b>PO 6</b>	
CO 1	3	1	2	3	1	2	
CO 2	1	3	1	1	2	3	
CO 3	2	2	3	2	3	3	
CO 4	3	1	2	2	1	2	
CO5	1	3	2	3	2	1	
Weightage	10	10	10	11	9	11	

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

V I .....

#### LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	<b>ELECTROMOTIC FORCE</b> EMF and Equilibrium constant (K) of a cell reaction - Nernst equation - concentration cells - electrode concentration cells without transference - electrolyte concentration cells without transference - concentration cells with transference - liquid junction potential (ELJP), electrolyte concentrations cells with salt bridge - application of EMF measurements.	15	Chalk, Talk & Power point
II	ELECTROLYTES,ELECTRODESANDENERGYCONSERVATIONElectrolytes - Determination of activity coefficients of electrolyte -determination of transport number - determination of pH of a solutionusing hydrogen electrode, quine hydrone electrode and glass electrode -potentiometric titrations. Energy Conservation: principals of energyconservation - electrochemical energy conservation - thermodynamicreversibility - Gibb"s equation.	15	Chalk, Talk & Power point
III	<b>ELECTROPLATING AND FUEL CELLS</b> Electroplating – definition – factors affecting electroplating – components of electroplating process – working process of electroplating – basic applications of electroplating – pocket plates and sintered plates - vented and sealed maintenance free designs – fuel cells - introduction, types of fuel cells, advantages - photo electrochemical cells.	15	Chalk, Talk & Power point
IV	<b>INDUSTRIAL METAL FINISHING</b> Introduction - objectives of electroplating - characteristics of electrodeposit and factors - copper electroplating - alkaline and acid bath - chromium electroplating - zinc electroplating - gold plating - anodizing and electroforming.	15	Chalk, Talk & Power point
V	<b>CORROSION SCIENCE</b> Introduction - types of corrosion - theories of corrosion - mechanism of corrosion - dry corrosion - electrochemical corrosion - types - passivity - factors influencing rate of corrosion - nature of metal, environment - phorbaix diagram - corrosion control techniques - inhibitors - cathodic protection methods - corrosion monitoring techniques.	15	Chalk, Talk & Power point

Course Designed by: Dr. K. Muthupandi & Dr. R. Satheesh

	Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)										
				Section A MCQs		Section B Short Answers		Section			
Inte rnal	Cos	K Level	No. of. Question	K – Level	No. of. Questions	K - Level	Section C Either or Choice	D Open Choice			
CI	CO1	Up to K2	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)			
AI	CO2	Up to K3	2	K1 & K2	2	K2 & K2	2 (K3&K3)	1(K3)			
CI	CO3	Up to K3	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)			
AII	CO4	Up to K4	2	K1 & K2	2	K2 & K2	2 (K3&K3)	1(K4)			
		No. of Questions to be asked	4		3		4	2			
-	estion tern	No. of Questions to be answered	4		3		2	1			
CIA	I & II	Marks for each question	1		2		5	10			
		Total Marks for each section	4		6		10	10			

	Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Mark s withou t choice)	Consolidate of %	
	K1	2	2	-	-	4	8	60	
	K2	2	4	10	10	26	52	00	
CIA	K3	-	-	10	10	20	40	40	
I	K4	-	-	-	-	-	-	-	
-	Marks	4	6	20	20	50	100	100	
	K1	2	2	-	-	4	8		
	K2	2	4	10	10	26	52	60	
CIA	K3	-	-	10	-	10	20	20	
II	K4	-	-	-	10	10	20	20	
	Marks	4	6	20	20	50	100	100	

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summ	Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
			MCQs		Short An	swers	Section C	Section D	
S.No	COs	K - Level	No. of	K –	No. of	K –	(Either / or	(Open	
			Questions	Level	Question	Level	Choice)	Choice)	
1	CO1	Up to K2	2	K1,K2	1	K1	2 (K2&K2)	1(K2)	
2	CO2	Up to K3	2	K1&K2	1	K1	2 (K3&K3)	1(K3)	
3	<b>CO3</b>	Up to K3	2	K1&K2	1	K2	2 (K3&K3)	1(K3)	
4	CO4	Up to K4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)	
5	CO5	Up to K4	2	K1&K2	1	K2	2 (K3&K3)	1(K4)	
No. of	Questions	s to be Asked	10		5		10	5	
No	No.of Questions to be answered		10		5		5	3	
Marks for each question		1		2		5	10		
Total Marks for each section		10		10		25	30		
	(Figures in parenthesis denotes, questions should be asked with the given K level)								

	Distribution of Marks with K Level								
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %		
K1	5	4	-	-	9	7.5	33		
K2	5	6	10	10	31	25.83	55		
K3	-	-	40	20	60	50	50		
K4	-	-	-	20	20	16.67	17		
Marks	10	10	50	50	120	100	100		
NB: Hig of K lev	·	erformance o	f the students	s is to be asse	essed by a	ttempting	higher level		

Section	A (Mu	Itiple Cho	ice Questions)
Answei	r All Q	uestions	(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section	B (Sho	ort Answei	rs)
Answei	r All Q	uestions	(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section	C (Eit	her/Or Ty	pe)
Answei	r All Q	uestions	(5  x 5 = 25  marks)
Q.No	CO	K Level	Questions
16) a	CO1	K2	
16) b	CO1	K2	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K3	
20) b	CO5	K3	
			formance of the students is to be assessed by attempting higher
level of			
		en Choice	
		Three ques	
Q.No	CO	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

# **Summative Examinations - Question Paper – Format**



# MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS) DEPARTMENT OF CHEMISTRY (For those who joined in 2021-2022 and after)

<b>Course Name</b>	PO	LYMER								
Course Code	210	JCHS61						L	Р	C
Category	SKILL							2	-	2
Nature of cour	se: E	MPLOY	ABILITY	$\checkmark$	SKILL ORIENTED	$\checkmark$	ENTREPRE	NURS	HIP	$\checkmark$
Course Object	ives:						·			
• To Recall t	he co	ncept of p	olymeriza	tior	n and its classification a	and	stereochemist	ry		
• To Remem	ber th	e types of	f polymeri	zati	ions and its techniques					
					ature and its associated	l pro	operties			
					thods of polymers					
<ul> <li>To Analyze</li> </ul>										
			PT OF PC						06	
					Repeat unit - degree of					
					- Nomenclature of st		o regular po	lymers	- C	hai
					- Ionic polymerization	l <b>.</b>			00	-
			YMERIZ				Zieglen Notte	4 . 1	06	
					dination polymerization		-	-		
•	-Nai		tornoto RI	lock	z and Cratt Volumeriz					
	suche				and Graft Polymeriz	atio	n. Polymeriza	cion c	Chine	luc
	<u> </u>	nsion and	emulsion	pol	lymerization.	atio	n. Polymeriza			•
Unit: III GI	LASS	nsion and TRANS	emulsion	pol EMI	lymerization. PERATURE		•		06	)
Unit: III GI Glass transition	LASS n tem	nsion and TRANS	emulsion ITION TE and its as	pol EMI ssoc	lymerization. PERATURE ciated properties- i) M	lech	anical Proper	ties ii)	06 The	i rma
Unit: III GI Glass transition Stability- iii)	LASS n tem	nsion and TRANS	emulsion ITION TE and its as	pol EMI ssoc	lymerization. PERATURE	lech	anical Proper	ties ii)	06 The	i rma
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Course	e Outcomes	K Level
On th	e completion of the course the student will be able to	
CO1:	Ability to understand the concept of polymers and types of polymerizations	[Up to K2]
<b>CO2:</b>	Discuss the types of polymerizations and glass transition temperature	[Up to K3]
CO3:	Interpret the associated properties of glass transition temperature and molecular weight of polymers	[Up to K3]
CO4:	Examine the two types of average molecular weight methods	[Up to K4]
CO5:	Analyze the polymers and its applications.	[Up to K4]

# CO & PO Mapping:

Course Outcomes	Programme Outcomes (POs)							
(COs)	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	PO 4	<b>PO 5</b>	PO 6		
CO 1	3	1	2	3	1	2		
CO 2	1	3	1	1	2	3		
CO 3	2	2	3	2	3	3		
CO 4	3	1	2	2	1	2		
CO5	1	3	2	3	2	1		
Weightage	10	10	10	11	9	11		

\*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

### LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	<b>BASIC CONCEPT OF POLYMERS</b> Definition – Polymerization - Monomer - Repeat unit - degree of polymerization - Classification of polymers - Stereochemistry of polymer - Nomenclature of stereo regular polymers - Chain polymerization, free radical polymerization - Ionic polymerization.	06	Chalk, Talk & Power point
II	<b>TYPES OF POLYMERIZATIONS</b> Different Types of Polymerizations - Coordination polymerization - Ziegler Natta catalyst And Co-Polymerization -Random, Alternate, Block and Graft Polymerization. Polymerization techniques; bulk, solution, suspension and emulsion polymerization.	06	Chalk, Talk & Power point
ш	<b>GLASS TRANSITION TEMPERATURE</b> Glass transition temperature and its associated properties- i) Mechanical Properties ii) Thermal Stability- iii) Flame Resistance iv) Chemical Resistance v) Degradability vi) Electrical Conductivity.	06	Chalk, Talk & Power point
IV	<b>DETERMINATION OF MOLECULAR WEIGHT METHODS</b> Molecular Weight of Polymers-Number Average and Weight Average Molecular Weight Methods. Number Average Molecular Weight Methods-1. Osmometry (Vapour) 2. Viscometry. Weight Average Molecular Weight Methods-1. Light scattering 2. Ultra- centrifugation	06	Chalk, Talk & Power point
V	<b>TYPES OF POLYMERS AND POLYMER DEGRADATION</b> Synthetic resins and plastics - Manufacture and applications of polyethylene, PVC, Teflon, poly styrene, polymethylmethacrylate, poly urethane, phenol – formaldehyde resins, urea- formaldehyde resins and epoxy polymers.	06	Chalk, Talk & Power point

Course Designed by: Dr. R. Satheesh & Dr. A.J. Sunija