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**

Candidate should have passed the Higher Secondary Examination conducted by the 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

### 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 Examinations: Note: Duration- 3 hours Part –A

Ten multiple choice questions	10 x01	= 10 Marks
No Unit shall be omitted: not more than two questions from	n 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** 

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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** 

Two tests and their average		 15 marks
Project		 10 marks
	Total	25 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				
PFO1.	Enhance the students to nurture the requirements of industries/laboratories related to				
	chemistry including pharmaceutical/analytical chemistry.				
PFO2.	Enable the students to demonstrate information literacy skills for acquiring				
I EO2.	knowledge of chemistry, as a chemist/researcher and also as a life-long learner.				
	Develop the students to communicate effectively the scientific and research				
PEO3:	information in both written and oral formats, to both professional scientists and to				
	the public.				
PFO4.	Collaborate with Industry and Alumni to explore the new avenues in respective				
I EO4.	domains and raise the employability ratio.				
PEO5.	Adhere towards the ethical and environmental sustainability to create morally				
TEOS.	upright and empowered citizens to face industry/ institution.				
DEOG	Nurture environmental awareness and develop communal harmony in respective of				
TEU0:	national integration.				

PO NO	PROGRAMME OUTCOMES (POs)	
At the end	of the programme, the students will be able to	
PO – 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
PO – 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**



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

<b>Course Code</b>	Title of the Course	Hrs	Credits	Maxii	Maximum Marks	
				Int	Ext	Total
FIRST SEMESTER						
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			I	
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 SEMESTER						
Part – I	Tamil / Alternative Course					
21UTAG31	காப்பிய இலக்கியமும்	6	3	25	75	100
	உரைநடையும்	0	5	23	15	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
2111CHCD2	Major Chemistry Practical – II	2				
210CHCP2	(Volumetric Analysis)	Z	-	-	-	-
Part III	Allied Course					
21UMCA32	Alliad Mathematica I/					100
/	Allied Microbiology I:	6	4	25	75	100
21UMBA32	Fundamentals of Microbiology					
	Fundamentals of Microbiology					
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
	Major Chemistry Practical – II	2	2	40	60	100
210CHCP2	(Volumetric Analysis)	Z	Z	40		
Part III	Allied Course					
21UMCA43	Allied Mathematics – II /			25	75	100
/	Allied Microbiology – II: Applied	6	4			
21UMBA42	Microbiology					
Part IV	Non-Major Elective Course					
21UCHN41	Water Treatment	2	2	25	75	100
Part V	Extension Activities					
21UEAG40-	NSS, NCC, YRC		1	40	60	100
21UEAG49		-	1	40	00	100
	Total	30	23	230	570	800

	FIFTH SEMESTER					
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
	Major Chemistry Practical – IV					
21UCHCP4	(Gravimetric Analysis and Organic	3	-	-	-	-
	Preparation)					
21UCHCP5	(Organic Analysis and Estimation)	3	-	-	-	-
Part III	Core Elective					
21UCHE51	Analytical Chemistry					
21UCHE52	Nuclear, Industrial Chemistry &					
	Metallic State	5	5	25	75	100
21UCHE53	Supramolecular Chemistry	5	5	23	15	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 SEMESTI	ER		-		
Part - III	Core Courses					
21UCHC61	Physical Chemistry – III	6	6	25	75	100
	Major Chemistry Practical – IV			5 40		
21UCHCP4	(Gravimetric Analysis and Organic	3	5		60	100
	Preparation)					
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	~	5	25	75	100
21UCHE63	Fuel Chemistry	3	3	25	/5	100
21UCHE64	Nano Chemistry					
21UCHE65	Clinical and Medicinal Chemistry	~	~	25	75	100
21UCHE66	Applied Electrochemistry	3	3	25	/5	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								
Category	Core		4	-	4				
Nature of cours	se: EMPLOYABILITY ✓ SKILL ORIENTED	ENTREPRENE	URS	HIP	$\checkmark$				
<b>Course Object</b>	ives:								
<ul> <li>To Recall the structure of atom and also know the various model of an atom for the structure of the atoms.</li> <li>To Remember the basics of periodic table and atomic properties to relate their principles</li> <li>To Compare the types of bonds to relate their relations between them.</li> <li>To Perform the chemical bonding and VSEPR theory and their applications to find the geometry of molecules.</li> <li>To Determine the various concepts on Acids and Bases and also know the positions of hydrogen and its properties.</li> <li>Unit: I STRUCTURE OF ATOM 12</li> <li>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 – Heisenberg's uncertainty principle – Quantum numbers – Pauli's exclusion</li> </ul>									
principle – Auf	bau principle – Hund's rule – electronic configuration	on of atoms.		10					
Unit: II PE	RIODIC TABLE AND ATOMIC PROPERTIES	) Formation of along	nta I	12 Ioria					
and vertical rel electron affinit elements on the	ationship. Atomic properties- Size of atom- Atom y- Electronegativity- Different scales- Diagonal basis of their electronic configuration- (further extern	nic Volumes - Ion relationship- Cl ension of periodic t	isatio assifi able).	n ene	rgy- n of				
Unit: III CH	IEMICAL BONDING			12					
Cause of chemi limitations – Fa geometry of mo $SF_6$ , $H_2O$ ) –Mo nuclear diatom magnetic prope <b>Unit: IV</b> AC	ical bonding – octet rule – ionic bond – covalent boly ijan's rule – VSEPR theory and its limitations – approblecules (NH <sub>3</sub> and H <sub>2</sub> O) – hybridization – sp, sp <sup>2</sup> , blecular Orbital theory – LCAO method – MO diag 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> , rty and bond order <b>CIDS AND BASES</b>	ond – valence bon plication of VSEPI sp <sup>3</sup> , sp <sup>3</sup> d <sup>2</sup> and (Be gram for homo nuc , CO and HF – de	d app R theo $F_2$ , B lear a etermine	roach ory to $Cl_3$ , ( and he inatio	- its find CH <sub>4</sub> , etero n of				
Arrhenius con	cept-Lowry Bronsted –Lewis concepts-Lux Flo	ood solvent syste	m co	oncep	ts -				
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.									
Hydrogen: Pos	sition of hydrogen in periodic table – resemblance	of hydrogen with	alkali	meta	ıls –				
resemblance wi – manufacture – hydrogen – Ison properties, uses estimation by p	<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 hydrogen – Isotopic effect – hydrides – classification – examples. <b>Ozone:</b> Commercial preparation, properties, uses, structure. <b>Hydrogen peroxide:</b> Manufacture – properties – structure and uses – estimation by permanganometric and iodimetric method – strength of hydrogen peroxide.								

	Total Lecture Hour	rs 60 Hrs
Books f	for Study:	
1. B.R	. Puri, L.R.Sharma & K.C. Kalia, Principles of Inorganic Chemistry Milest	one Publisher
31 <sup>st</sup>	edition, New Delhi 2013	
Books f	for References:	
1. Put	i. Sharma & Kalia, <b>Principles of Inorganic Chemistry</b> Milestone publisher	& distributor.
Ne	w Delhi 2009.	· · · · · · · ,
2. R.	D Madan S.Chand, Modern Inorganic Chemistry band Co.Ltd. New Delhi 20	12.
3 ID	Lee Wiley India Concise Inorganic Chemistry 5 <sup>th</sup> Edition New Delhi 2009	
Weh R	PSources.	•
1. https://	//bit.lv/3tu7P32	
2. https://	//bit.ly/2Qev0Ac	
3. https:	//bit.ly/3bRnjs6	
4. https:	//bit.ly/30R8dww	
Course	Outcomes	K Level
On the	completion of the course the student will be able to	
CO1.	Recall the general characteristics of sub atomic particles of an atom and	IIIm to K21
	periodicity	
COL	Discuss the long form periodic table, types of chemical bonds and concept of	
CO2:	Acids and Bases.	
<b>CO</b> 2.	Prepare the hydrogen, ozone and hydrogen peroxide and compute the	[U., 4, 1/2]
CO3:	properties with alkali metals	
COA	Examine the Quantum model of an atom and VSEPR theory to find the	
CO4:	geometry of molecules	
CO5.	Apply various types of bonds and quantum model of atom for the geometry	
005:	of molecules	

# 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>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
ш	<b>CHEMICAL BONDING</b> 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. <b>Ozone</b> : Commercial preparation, properties, uses, structure. <b>Hydrogen peroxide</b> : 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)									
Inte rnal Cos			Sectio	on A	Sectio	n B	Section C	Section D		
	Cos	K Level	MC No. of. Questions	Qs K – Level	Short Ai No. of. Questio ns	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		
Question Pattern		No. of Questions to be answered	4		3		2	2		
CIA I & II	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			
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)									
			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)	(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	f Question	s to be Asked	10		5		10	5		
No.of Questions to be answered		10		5		5	3			
Ma	rks for eac	h question	1		2		5	10		
Total	Marks for	each section	10		10		25	30		
	(Figures	in parenthesi	is denotes. a	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	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 of K levels.

Section	A (Mu	ultiple 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  x  5 = 25  marks)
Q.No	CO	K Level	Questions
16) a	CO1	K2	
16) b	COl	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	<u>CO5</u>	K3	
NB: Hi	gher le	vel of perf	ormance of the students is to be assessed by attempting higher
level of	K leve		
Section	D (Op	en Choice	
Answei	r Any T	Three ques	tions (3x10=30 marks)
<b>Q.No</b>		K Level	Questions
21		K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	005	К4	

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



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

Course Name	MAJAOR CH (Inorganic Se	HEMISTRY Pl mi Micro – Qu	RACTICAL – I alitative Analysis)				
Course Code	21UCHCP1				L	Р	С
Category	Core				-	2	-
Nature of cours	se: EMPLOYA	BILITY 🗸 SK	XILL ORIENTED ✓	ENTREPREN	EUR	SHIP	✓
Course Object	ives:		I				
To Recall t	he basic propert	ies of salt mixtu	ures.				
To Reminis	scence the anion	ic and cationic	species in the salt mix	tures.			
To Apply the second secon	he concept of an	nionic and cation	nic species in semi mic	ro qualitative ar	nalysis	•	
• To Execute the confirmation test for the anions and cations present in the salt mixtures.							
To Constru	ct four radicals	with correct pro	ocedure during analysis	s of the salt mixt	ures.		
Duration o	f examination:	3hrs	wa aniana af which a				
Ana micro meth	lysis of a mixtu	ire containing t	wo anions of which of	ie is an interferi	ng in	sem1-	
micro mem	ou two cations						
Anions:							
Ca	rbonate, sulpha	te, nitrate, fluor	ide, chloride, bromide,	iodide, oxalate,			
Bo	orate, phosphate	and chromate.					
Cations: L	ead, bismuth, c	opper, cadmiun	n, antimony, iron (II an	d III), aluminiur	n,		
N	Magnesium and	ammonium.	Joan, mekei, Jarium, e	aleium,			
		Distrib	ution of marks				30
		Max	marks: 100			_	20
Internal	: 40 marks	20 1	<b>X</b> 7'	External : 6	0 mai	:ks	
Laborator	y	: 30 marks	Vivo voce	: 10 mar	KS		
Observatio	on note book	· 10 marks	Record note book	· 10 mar	ke		
Observatio	on note book	. TO marks	Four radicals with	: 10 mar	ks		
			correct procedure				
			1				
Total		· 40 marks	Total	· 60 mar	ks		
Total		. 40 marks	Total	. 00 mai	Kð		
				Total Lectu	re Ho	urs	30 Hrs
Books for Stu	dy:						
<b>1.</b> Dr. V. V	. Ramanujam,	Inorganic Se	mimicro Qualitative	Analysis, Nati	onal	Publis	hing
Company, 3	Brd edition, Che	nnai, 1974.					
Books for Ref	erences:						
<b>1.</b> Vogel, Text	book of Qualit	ative Analysis	including Semi Micro	Methods, Long	man S	Sc & T	ech,
2008.							

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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>	os://www.youtube.com/watch?v=BK7rf4XE4f8	
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	
<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	[Up to K4]
	mixtures	

# 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	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:	(M	echanics, Properties	of 1	Matter, Heat a	nd So	ound)				
Course Code	21UPHA11					L	Р	С			
Category	Allied					4	-	4			
Nature of cours	e: EMPLOYABILITY	✓ §	SKILL ORIENTED	$\checkmark$	ENTREPRENI	EURS	HIP				
Course Objecti	ves:	•									
The learners will	l be able:										
1. To recol	1. To recollect Newton's law of motion										
2. To understand the elasticity property and types of modulus											
3. To unde	stand the viscosity and ap	ppli	cation of Bernoulli's t	hec	orem						
4. To recol	ect Kinetic theory of gase	es									
5. To under	stand the concepts of S.H	I.M									
Unit: I Me	chanics						13				
Torque – Angu	lar momentum –Momen	t o	f Inertia –Perpendicu	lar	and Parallel a	xes t	heore	m -			
Kepler's laws o	f planetary motion - New	wto	n's laws of gravitatio	n—l	Mass and densi	ty of	Ear	th –			
Boy's method for	or G–Compound pendulu	ım-l	Expression for period-	Ex	periment to find	l "g"					
Unit: II Elasticity											
Stress and Strain - Elasticity-Different moduli of Elasticity-Poisson's ratio-Bending of beams-											
Expression for bending moment-Determination of Young's modulus by uniform and non uniform											
bending-Torsion-Expression for couple per unit twist-Work done in twisting - Torsional											
oscillations of a body - Workdone in twisting- Rigidity modulus by torsion pendulum											
Unit: IIIViscosity11											
Coefficient of v	iscosity -Derivation of Po	oise	uille's formula - coef	fici	ent of viscosity	of a	liquio	l by			
Poiseuille's me	thod – Equation of co	ontii	nuity-Bernoulli's theo	orer	n-derivation-A	pplic	ations	s of			
Bernoulli's theo	rem (Venturimeter and Pi	itot	tube).								
Unit: IV Hea	t de la constante de la consta						12				
Kinetic theory of	f gases – Mean free path -	- T	ransport phenomena –	- Ex	pression for the	e coef	ficier	t of			
Diffusion, visc	osity and thermal condu	ucti	ivity - Degrees of	fre	edom – Boltzi	man's	s law	of			
equipartition of	energy – calculation of Υ	ſf	or mono atomic and d	iato	omic gases - Th	ermo	dynar	nics			
- First and sec	ond laws of thermodynar	mic	s (statement only) –	Ent	tropy – change	of e	ntrop	y in			
Carnot's cycle -	Change of entropy in cor	nve	rsion of ice into strean	n							
Unit: V Sou	nd						12				
Simple harmoni	c motion - Composition	of	two S.H.M's of equa	al t	ime periods at	right	angle	es –			
Stationary wave	es – Properties of statio	onar	y waves – Melde's o	exp	eriment for the	e freq	uency	/ of			
electrically main	tained tuning fork (Trans	sver	rse and Longitudinal n	nod	es) - Ultrasonic	s - P	roduc	tion			
-Piezoelectric n	-Piezoelectric method - Detection - Kundt's tube and Piezoelectric - Properties - Applications										
Total Lecture Hours 60 Hrs											
Books for Study:											
1. R.Murugesan, Mechanics, Properties of Matter and Sound, Madurai, first											
edition,July	2016.[B.Sc.AncillaryPhys	sics									
J *	Jnit–I: 1.1, 2.1–2.7, 2.13-2	2.15	5, 3.1-3.5								
J *	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. R	2. RMurugeshan, Thermal Physics, Madurai, First edition July, 2016. (B.Sc., Ancillary Physics)							
	* Unit–IV: 6.1, 6.3-6.7, 6.9-6.11, 7.4-7.7							
Books	Books for References:							
1. S.L	1. S.L.Kakani, C.Hemarajani, S.Kakani, Mechanics, IIIedition, VivaBooks Ltd, NewDelhi, 2011.							
2. Ha	lidayResnic,JearlWalker, <b>PrinciplesofPhysics</b> ,9 <sup>th</sup> Edition,WileyIndia Pvt.Ltd, New	Delhi,						
2012.								
3. D.S	S.Mathur, Mechanics, S.ChandandCo., NewDelhi, 2008							
4. Bri	jlaland N.Subramanyam, <b>Propertiesofmatter</b> ,S.ChandandCo., New Delhi,2004							
5. Bri	jlalandN.Subramanyam,HeatandThermodynamics, S.Chandand Co, New Delhi,	2004.						
Web F	Resources:							
1. <u>h</u>	ttps://latestcontents.com/bsc-physics-mechanics-notes/							
2. <u>w</u>	ww.khanacademy.org/science/physics/elasticity/surface_tension							
3. <u>h</u>	ttps://www.askiitians.com/revision-notes/physics/kinetic-theory-of-gases/							
4. <u>https://www.askiitians.com/revision-notes/physics/thermodynamics/</u>								
Cours	e Outcomes	K Level						
After	successful 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						
	change of entropy in conversion of ice to steam, applications of Ultrasonic							
	Waves							
004	Analyze parallel and perpendicular axis theorem, Boy's method for G,	77.4						
CO4:	determine and analyze uniform and non-uniform bending, Poiseuille's	K4						
	Iormula to find the coefficient viscosity of liquid							
CO7	Analyze the change of entropy in Carnot's cycle, Kundt's tube and Piezo	TZ A						
005:	electric method for the production of Ultrasonic waves, Melde's experiment	K4						
	for the frequency of tuning fork							

# CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	<b>PO 6</b>
CO 1	3	2	2	2	2	2
CO 2	3	2	1	2	2	2
CO 3	3	2	2	2	2	2
<b>CO 4</b>	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	MechanicsTorque – Angular momentum –Moment of Inertia –Perpendicularand Parallel axes theorem - Kepler'slawsofplanetarymotion-Newton'slawsofgravitation–MassanddensityofEarth–Boy'smethod 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 waves –Properties 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 nal CO		К-	Unit	Section A		Secti	on B	Secti (Eith Cho	on C er or bice)	Section D (Open Choice)		
	COs	Le 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	
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		
Que	Question	No Que to ansy	o. of estions o be wered	4		3		2	2	2	2	
Pattern CIA I & II	Marks for each question		1		2		5 1		0			
		T Mar e sec	otal ks for ach ction	4		6		1	0	2	0	

	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	6.7	50					
	K2	2	4	10	10	26	43.3	50					
СТА	K3			10	20	30	50.0	50					
	K4							-					
1	Marks	4	6	20	30	60	100	100					
	K1	2	2			4	6.7	167					
	K2	2	4			6	10.0	10.7					
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

Summa	Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)											
S No	COs	K - Level	Unit	MC	Qs	Short A	answers	Secti (Eithe Cho	on C er / or bice)	Section D (Open Choice)		
5.1 10.				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	II	2	K1 & K2	1	K1	2	K3 & K3	1	К3	
3	CO1 - CO5	K1 to K4	III	2	K1 & K2	1	K2	2	K3 & K3	1	К3	
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 Questions to be Asked		10		5		1	0		5			
No. of Questions to be answered		10		5		5		3				
Mar	ks for ea	ach quest	ion	1		2		4	5 10		10	
Total I	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.

	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	12	17					
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 lev	els.				-							

Section	Section A (Multiple Choice 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	K4						
19) b	CO4	K4						
20) a	CO5	K4						
20) b	CO5	K4						
NB: Hi	gher le	vel of perf	ormance of the students is to be assessed by attempting higher					
level of	'K leve	ls						
Section	D (Op	en Choice						
Answei	r Any T	Three ques	tions (3x10=30 marks)					
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	ALLIED PHYSICS PRACTICAL - I										
Course Code	21UPHAP1					L	Р	С			
Category	Allied					-	2	-			
Nature of cours	se:EMPLOYABILITY	✓ SKILI	ORIENTED	$\checkmark$	ENTREPREN	EURS	HIP				
Course Objectives:											
The learners will be able:											
1. To gain know	vledge about the experim	ents based	d on Optics, Ele	ctric	ity and Electron	nics					
2. To demonstra	ate modulus of elasticity										
3. To understan	d the bending of beam, f	orward an	d reverse biasin	g, fr	requency respon	nce					
4. To understan	d current conduction in e	electrical c	ircuits.								
5. To learn abou	5. To learn about transistor amplifier, oscillator and Operational amplifier.										
LIST OF EXPERIMENTS (Any Fourteen Experiments)											
1 Uniform bending- (Pin & Microscope)											
2. Torsion Pendulum			- Determinati	on c	of Rigidity modu	ılus an	d M.I	[			
3. Thermal cond	ductivity of Bad conduct	or	- Lee's disc								
4. Sonometer			- Verification of laws								
5. Calibration o	f low range Voltmeter		- Potentiometer								
6. Carey Foster	Bridge		- Resistance & resistivity of a wire.								
7. Spectrometer	•		- Refractive indexof a Prism								
8Mirror Galva	nometer		- Voltage and current sensitiveness								
9.LCR – Series	resonance		- Determination of L & Q factor								
10.Air wedge			- Thickness of a wire								
11.Grating N by	y $\lambda$ Normal incidence		- Spectrometer	•							
12.Single stage	transistor amplifier		- CE mode								
13.Hartley oscil	llator		- Determinatio	n of	frequency						
14.Logic gates -	– NAND and NOR		- Using Discrete Components.								
15.Zener diode - Forward & Reverse Characteristic											
16.OP AMP			- Adder and Su	ıbtra	actor						
				Tota	al Practical Ho	urs	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. https://nptel.ac.in/courses/115/105/115105110/
- 3. https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn\_LgLofRX7n8z4tHYK

Course	e Outcomes	K Level			
On successful 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	V A			
CO4:	Foster bridge and characteristics of Zener diode	<b>N4</b>			
CO5:	Construct Amplifier and Oscillator	K4			

# CO & PO Mapping:

COS	<b>PO 1</b>	PO 2	<b>PO 3</b>	PO 4	PO 5	PO 6
CO 1	3	2	3	3	3	2
CO 2	2	2	2	2	5	2
CO 3	3	3	3	3	3	3
<b>CO 4</b>	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		
	2. Torsion Pendulum - Determination of Rigidity modulus and		
	M.I		
	3. Thermal conductivity of Bad conductor - Lee's disc		
I	4. Sonometer - Verification of laws	30	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	T	р	С
Course Coue		L 0	1	C 0
Category		2	-	2
Nature of cours	e: EMPLOYABILITY 🗸 SKILL ORIENTED 🖌 ENTREPREN	NEUF	RSHIP	
<b>Course Object</b>	ives:			
• To Recall t	he basic properties of soap and detergents and also ingredients on too	th pas	stes.	
• To Remem	ber the preparations of hair care products.			
To Compar	e the consumer products with their compositions.			
• To Execute	the composition and physical properties of milk products.			
To Determine	ne the adulterants in food materials and first aid and antidots for pois	oned	person	IS.
Unit: I CO	SMETICS I		0	)6
Dental Preparat	ions: Tooth pastes- ingredients, their characteristics and functions.	Mou	th was	shes
(Composition o	nly). Soap and Detergents: Manufacture of Soap and Detergents. Cle	ansing	g actio	n of
Soap. Problems	of Detergents as waste water in water resources.			
Unit: II CO	SMETICS II			)6
Hair care prepar	rations: shampoo; different types and formulations, Moisturizing crea	ms, p	ertum	es,
Lip sticks, shav	ing creams, after snave preparations. (Composition and applications i	or the	above	e).
Consumer Dred	INSUMER PRODUCTS	lana T		Nov.
Consumer Prod	lich Cum Ink Chalk groups	lene f	sans, v	wax
Unite IV SU	CAD			6
Dint: IV SU	UAN	nrar	aratio	n of
alcohol from m	olasses-preparation of absolute alcohol-manufacture of wine beer n	- prep nethvl	ated s	nirit
– power alcoho		lictifyi	ateu s	pin
Unit: V FO	OD ADULTERATION		0	)6
Food adulterat	<b>ion</b> - Contamination of wheat, rice, dhal, milk, butter, with clay, sa	nd. st	one. w	ater
and toxic chen	nicals (e.g., Kasseri dhal with mentanil vellow). Food poisons:	natura	al pois	sons
(alkaloids, neph	rotoxins), pesticides (DDT, BHC, Follidol), chemical poisons (KCN	J). Fi	rst aid	and
Antidotes for po	bisoned persons.	,		
	Total Lecture	Hours	s <b>30</b>	Hrs
<b>Books for Stud</b>	y:			
1. Sharma, B.	K., Industrial Chemistry, Meerut: GOEL Publishing House, 1st Edition	on, 20	08.	
<b>2.</b> Poucher, W	A. Perfumes, Cosmetics and soaps, Vol. III, Modern Cosmetics. Sin	nons,	J.V.	
Chemistry	and the beauty business, 2018.			
<b>3.</b> K.S. Ranga 1975.	ppa and K.T Acharya, Indian Dairy products, Asia Publishing House	, New	Delhi	,
4. Chopra H.k	K, Panesar, P.S, "Food Chemistry" Narosa Publishing House, New De	elhi, 2	010.	
<b>Books for Refe</b>	rence:			
1. R.V.Shreve Mumbai.	, Industrial Chemical Process, Tata McGraw Hill publishing compan	y, 200	)5,	
2. Mohan Mal	hotra, Latest Cottage Industries, 20th Edition Edn, Vishal publishers,	, 1980	, Mee	rut.
<b>5.</b> Robert Jeni	ness and S. Patom, Principles of dairy chemistry, Wiley, New York.			

Web R	Resources:	
1. <u>httr</u>	os://bit.ly/3rVPCex	
2. <u>httr</u>	os://bit.ly/38OFF18	
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]
cor	Understand the concepts of manufacture of soaps, detergents, hair care and	
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]
<b>CO5:</b>	Construct the characteristics and understand the consumer products	[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	
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
П	<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
III	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	<b>SUGAR</b> 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:			1				
To Reco	llect the green environment and basic definition for green chemistry.							
• To Reme	ember the twelve principles of green chemistry and examples.							
To Com	pare the concept of yield and its calculation on atom economy.							
To Exec	ute the concept of selectivity, types of selectivity and reactions using gr	een so	olvent	s.				
To Deter	• To Determine the basic concepts in designing green synthesis and choice of starting materials.							
Unit: I INT	TRODUCTION			6				
Definition for G	reen Chemistry, Need for Green Chemistry- Goals of Green Chemistry	– Ob	stacle	s and				
Advantages of 0	Green chemistry, Progress of Green Chemistry- Twelve principles of C	Green	Chen	nistry				
and Examples.				·				
Unit: II YII	ELD AND ATOM ECONOMY			6				
Concept of Yie	ld and its calculation, Atom economy – Definition, Calculation of At	om e	conor	ny in				
rearrangement,	addition, substitution and elimination reactions.			•				
Unit: III SEI	LECTIVITY IN GREEN CHEMISTRY			6				
Concept of sel	ereoselectivities,		vities,					
Reactions using	Green solvents - Super critical CO <sub>2</sub> - Cleaner technology with CO	D <sub>2</sub> .Ion	ic liq	uids-				
Friedel-crafts re	action, halogenation & Diels- Alder reaction. and water.							
Unit: IV SO	LVENT FREE REACTIONS			6				
Organic synthes	is in solid state-Thermal reactions, rearrangements & photochemical rea	action	s. Mo	de of				
supplying energ	y-microwave and ultrasonic-Advantages of MW techniques. Reaction	s like	oxida	ation,				
reduction & rear	rangements.							
Unit: V DE	SIGNING OF GREEN SYNTHESIS			5				
Basic concepts	in designing Green synthesis - choice of starting materials, reagents, ca	atalys	ts-cat	alytic				
approach in gree	en chemistry and solvents with suitable examples.							
	Total Lecture He	ours	30	Hrs				
<b>Books for Stud</b>	y:							
1. V. Kumar, "A	In Introduction to Green Chemistry" Vishal publishing Co. Reprint Edit	tion 2	010					
2. Rashmi Sang	hi, M.M Srivastava "Green Chemistry" Fourth Reprint - 2009							
<b>Books for Refe</b>	rences:							
1. V.K. Ahluw	valia and M.R. Kidwai, New Trends in Green Chemistry, Anamalaya Pu	ıblish	ers, 2	005.				
2. P.T. Anasta	is, and J.K. Warner: Green Chemistry - Theory and Practical, Oxford U	Jnive	rsity I	Press,				
1998.								
Web Resources								
1. <u>https://www.</u>	youtube.com/watch?v=PUisOKB6sgA							
2. <u>https://www.</u>	youtube.com/watch?v=qNHW-Pi9c9g							
Course Outcon			k Lev	/el				
Un the comple	tion of the course the student will be able to		т 4	1701				
COI: List out	the twelve principles of Green Chemistry.	ון	<b>p to</b>	K2]				
		-						
Academic (	Council Meeting Held On 29.04.2021	Р	age 21	Ĺ.				

<b>CO2:</b>	Understand the need for green chemistry and goals of Green Chemistry.	[Up to K3]
CO3:	Apply Green Chemistry principles to organic synthesis.	[Up to K3]
CO4:	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]
	designing green synthesis	

# CO & PO Mapping:

<b>Course Outcomes</b>	Programme Outcomes (POs)							
(COs)	PO 1	<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
II	<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
ш	<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 CHE	MISTRY	- I				
Course Code	21UCHC21				L	Р	С
Category	Core				4	-	4
Nature of course	EMPLOYABILI	TY 🗸	SKILL ORIENTED	ENTREPRE	ENEUR	SHIP	✓
Course Object	ves:	•					
<ul> <li>To Recall the definition of hydrocarbons and classification of organic compounds.</li> <li>To Understand the preparation, properties of hydrocarbons, alcohols, ethers, aldehydes, ketones and carboxylic acids.</li> <li>To Classify the isomerism and determine the concept of stereoisomerisms.</li> <li>To Execute the concept of geometrical and optical isomerism.</li> </ul>							
• 10 Constr polysaccha	ides	on and	properties of mono	osaccharides, dis	saccha	ades	and
Unit: I HY	DROCARBONS					1	12
Hydrocarbons – Introduction – Definition and Classifications. Alkanes – Nomenclature - General methods of preparation and Chemical properties. Alkenes – Nomenclature – General methods of preparation – chemical properties – Electrophilic additions – Addition of hydrogen halide – Markownikov's rule – Antimarkovinkov's addition – Addition of H2SO4, H2O, Halogen – 							
Unit: IIIALDEHYDES, KETONES AND CARBOXYLIC ACIDS12Aldehydes 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 – Physical properties – Chemical reactions and uses of Carboxylic acids.I2Unit: IVSTEREO ISOMERISM12Geometrical isomerism: Definition – geometrical isomerism of maleic and fumaric acids – aldoximes and ketoximes – 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 Ca	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. https://www.youtube.com/watch?v=\_vq9T0htW0Y
- 3. <u>https://courses.lumenlearning.com/chemistryformajors/chapter/aldehydes-ketones-</u> carboxylic-acids-and-esters-2/
- 4. https://www.youtube.com/watch?v=JxK5rZxbyQY

K Level

On th	On the 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 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	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 ISOMERISM Geometrical isomerism: Definition – geometrical isomerism of maleic and fumaric acids – aldoximes and ketoximes – determination of configuration of geometric isomers – E, Z notations – stereo chemistry of addition of bromine to double bond. <b>Optical isomerism</b> : 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	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	Α	Section	n B	Section	Section			
Inte	Cos	K Level	MCQ	5	Short Ans	swers	Section C	Section D			
rnal	005	IL LOVOI	No. of.	<u>K</u> -	No. of.	K -	Either or	Open Chains			
			Questions	Level	Questions	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			
Question Pattern CIA I & II		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			

		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	6.67	67
	K2	2	4	10	20	36	60	07
СІА	K3	-	-	10	10	20	33.33	33
	K4	-	-	-	-	-	-	-
-	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	)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)	(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	<b>K</b> 1	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	Question	s to be Asked	10		5		10	5		
No.of Questions to be answered		10		5		5	3			
Ma	rks for eac	h question	1		2		5	10		
Total	Marks for	each section	10		10		25	30		
	(Figures	in parenthes	is denotes, qı	estions 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	22				
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	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)
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 Answer	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	
NB: Hi	gher le	vel of perf	ormance of the students is to be assessed by attempting higher
level of	K leve	ls	
Section	D (Op	en Choice	
Answei	r Any T	Three ques	tions (3x10=30 marks)
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 CH (Inorganic S	EMIST	'RY PI cro – C	RACTICAL – I Qualitative Analysis)					
Course Code	21UCHCP1						L	P	С
Category	Core						-	2	2
Nature of Course:	EMPLOYAB	ILITY	✓ SI	KILL ORIENTED	~	ENTREPRE	NEU	RSHI	> ✓
<b>Course Objecti</b>	ves:								
• Recall the b	asic properties	of salt 1	nixture	2 <b>S</b> .					
• Reminiscen	ce the anionic	and cati	onic sp	ecies in the salt mixtu	ares.				
• Apply the c	oncept of anior	nic and o	cationic	species in semi mici	ro qua	litative analys	sis.		
• Execute the	confirmation t	est for t	he anio	ns and cations preser	nt in th	ne salt mixture	es.		
Construct for	our radicals wit	th correc	et proce	dure during analysis	of the	salt mixtures	•		
Duration o	f examination	: 3hrs							
Ana	lysis of a mix	ture con	taining	two anions of which	h one	is an interfer	ing i	n semi	i-
micro methe	od two cations								
Anions:									
Ca	rbonate, sulpha	ate, nitra	te, fluo	ride, chloride, bromi	de, ioc	dide, oxalate,			
Bo	rate, phosphate	e and chi	romate.						
Cationa I	and historyth			m antimany ince (II	and T	II) aluminium	_		
Cations: L	ead, dismuth, (	copper, o		m, anumony, iron (m	and I	II), aluminium	1,		
	Informum, Zind	, manga	inese, c	odali, nickel, darium	, calci	um,			
N	agnesium and	ammoi	num. Dictri	ibution of monks					30
			<u>Disti</u>	av marks• 100					
Internal	: 40 marks		1710		1	External : 60	) ma	rks	
Laboratory		: 30 r	narks	Vivo voce		10 mark	S mu		
Performan	ce				•	10			
Observatio	n note book	: 10 r	narks	Record note book	:	10 mark	s		
				Four radicals with	- ·	40 mark	TS S		
				correct procedure	, .	10 111411			
				· · · · · · · · · · · · · · · · · · ·					
Total		· 40 r	narks	Total		60 mark	~c		
10101		. 401	iidi K5	Total	•				30
						Total Lec	ture	Hours	6   Hrs
<b>Books for Stu</b>	dv:								
1. Dr. V. V. Ra	manujam, Ino	rganic S	emimi	cro Qualitative Analy	ysis, N	National Publi	shing	g Co	mpany
3rd edition, Che	nnai, 1974.	C			, ,		·		1 2
<b>Books for Ref</b>	erences:								
1. Vogel, Text 2008.	book of Quali	tative A	Analysis	s including Semi Mi	icro N	Aethods, Long	gman	Sc &	Tech
Web Resource	es:								
	~	<b></b>		4					
Academic	Council Meetin	g Held (	Jn 29.04	4.2021				Page 3	31

1. <u>htt</u> 2. <u>htt</u> 3. <u>htt</u> 4. <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">https://www.youtube.com/watch?v=T3hi</a> xEpaDg         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	e 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 O	utcomes (PC	)s)						
(COs)	PO 1	<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
	<b>Duration of examination</b> : 3hrs Analysis of a mixture containing two anions of which one is an interfering in semi-micro method two cations		
Ι	Anions: Carbonate, sulphate, nitrate, fluoride, chloride, bromide, iodide, oxalate, Borate, phosphate and chromate.	30	Practical
	<b>Cations:</b> Lead, bismuth, copper, cadmium, antimony, iron (II and III), aluminium, Chromium, zinc, manganese, cobalt, nickel, barium, calcium, Magnesium and ammonium.		

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-II: (Electricity, Electronics, Optics and Mod	lern l	Physi	cs)					
Course Code	21UPHA21	L	Р	С					
Category	Allied	4	-	3					
Nature of cours	e: EMPLOYABILITY 🖌 SKILL ORIENTED 🖌 ENTREPRENE	URS	HIP						
Course Object	ives:								
The learners will	ll be able:								
<ol> <li>To understand the laws of electricity</li> <li>To recollect different types of diodes and transistors</li> </ol>									
2. To reconect t	interent types of diodes and transistors								
1 To understand	d the various types of lenses prism aberrations interference and diffr	action	<b>.</b>						
5 To understand	d and apply the basic concepts of laser	action	1						
Jinit: I Fla	atricity		12						
Capacitors Ex	circuy	vitor		s of					
energy on shari	ag of charges between two capacitors. Kirchoff's laws Application	of Kii	- LUS chho	ff'e					
laws to Wheats	tone's network – Carey Eoster Bridge – Measurement of resistance	- Pri	ncinle	-11 s					
Potentiometer -	Calibration of ammeter and voltmeter(low range only)	1 1 1	neipi	5 01					
I otentionieter	ctronics		12						
Transistor –We	orking of n-n-n transistor- Characteristics(CE mode only) -Comm	ion -	Emi	itter					
transistor ampli	fier – Frequency response - Hartley oscillator – Modulation – Types of	Mod	lulatio	on -					
OPAMP and it	s characteristics – OPAMP as adder and subtractor – Logic circuit	its –	Bool	ean					
algebra – De M	organ's theorem – OR, AND, NOR, NOT, NAND gates	•••	2001	••••					
Unit: III Geo	ometrical Optics		12						
Deviation produ	uced by thin lens – Focal length of two thin lenses in and out of contac	t - R	efract	tion					
through a thin p	prism – Dispersion – Dispersive power – Combination of thin prisms	to pro	oduce	(a)					
Deviation with	but dispersion and (b) Dispersion without deviation – Direct vision s	pectro	oscop	e –					
Chromatic aber	ration in lenses – Spherical aberration in lenses – Theory of primary a	and se	econd	lary					
rainbows.				-					
Unit: IV Phy	vsical Optics		12						
Interference in	thin films - air wedge - Newton's rings (reflected beam only) - Det	ermi	natior	n of					
wavelength – ]	Diffraction - Theory of plane transmission grating (normal incid	ence	only	) –					
Experiment to d	letermine wavelengths - Double refraction – Nicol prism – Construction	on, ac	ction	and					
uses – Quarter	wave plate (QWP) - Half wave plate (HWP) - Optical activity -	Biot'	s law	∕s −					
Specific rotator	y power - Laurent's Half shade polarimeter - Determination of spe	ecific	rotat	ory					
power									
Unit: V Las	ers		12						
Introduction of	Lasers-Spontaneous and stimulated emission-Population Inversion-Ein	nstein	's A	and					
B coefficients-	derivation. Types of lasers-Nd:YAG,CO <sub>2</sub> ,Semiconductor lasers-I	ndust	trial	and					
Medical Applic	ations.		<u> </u>						
	Total Lecture Hou	irs	60 H	rs					
Books for Stud	y:								
<b>1.</b> R. M	Iurugesan, Electricity and Electronics, Madurai, First Edition, July 20	)16.							

	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 <b>2</b> B Murragehen Onting Spectroscopy and Modern Physics Medurai First I	Edition					
<b>2.</b> K.Murugeshan, Optics Spectroscopy and Modern Physics, Madural, First Edition, July 2016							
	July 2010. Unit $111112117122124$						
	Unit $-$ III . 1.1-1.3,1.3-1.11,1.13,1.17,1.23,1.24 Unit $-$ IV $\cdot$ 2.1.2.2.2.4.2.6.2.0.2.10.3.1.3.2.3.4.3.5.3.10						
	3 P Mani A Tayt hook of Engineering Physics 12 <sup>th</sup> edition Dhanam Publica	tions					
	Chennai	uions,					
	Unit $-V : 71 - 745$						
Books	for References:						
1. Kak	caniand Bhandari Sultan <b>Optics and Spectroscopy</b> . Chand and Sons New						
Delhi.	2004.						
2.Briil	aland Subramanyam. A Text book of Optics. S. Chandand Co. New Delhi. 2004.						
3. B.K	Sharma, Spectroscopy, GOEL Publishing House, Meerut, 2006.						
4. Nar	ayanamoorthyandNagarathinam, Electricity and Magnetism, National Publishi	ng Co,					
Web R	desources:	<u> </u>					
1. htt	tps://www.youtube.com/watch?v=ML7HcZo6IaE						
2. https://www.khanacademy.org/science/physics/light-waves/introduction-to-light-							
3. waves/v/polarization-of-light-linear-and-circular							
<b>3.</b> <u>wa</u>	ves/v/polarization-of-light-linear-and-circular						
3. wa Course	ves/v/polarization-of-light-linear-and-circular e Outcomes	K Level					
3. wa Course After s	e Outcomes uccessful completion of the course, the student is expected to	K Level					
3. wa Course After s	e Outcomes uccessful completion of the course, the student is expected to Remember principle of capacitors, Kirchhoff's laws, forward and reverse bias,	K Level					
3. wa Course After st CO1:	e Outcomes uccessful completion of the course, the student is expected to Remember principle of capacitors, Kirchhoff's laws, forward and reverse bias, frequency response, modulation, focal length, dispersive power, cordinal	K Level					
3. wa Course After s CO1:	e Outcomes uccessful completion of the course, the student is expected to Remember principle of capacitors, Kirchhoff's laws, forward and reverse bias, frequency response, modulation, focal length, dispersive power, cordinal points, double refraction, Biot's law, Principals of Laser.	K Level					
3. wa Course After so CO1:	e Outcomes uccessful completion of the course, the student is expected to Remember principle of capacitors, Kirchhoff's laws, forward and reverse bias, frequency response, modulation, focal length, dispersive power, cordinal points, double refraction, Biot's law, Principals of Laser. Understand energy of a capacitor, principle of potentiometer, diode	K Level					
3. wa Course After so CO1: CO2:		K Level K2 K3					
3. wa Course After s CO1: CO2:	e Outcomes uccessful completion of the course, the student is expected to Remember principle of capacitors, Kirchhoff's laws, forward and reverse bias, frequency response, modulation, focal length, dispersive power, cordinal points, double refraction, Biot's law, Principals of Laser. Understand energy of a capacitor, principle of potentiometer, diode characteristics, working of npn transistor, logic circuits, basics of types of laser.	K Level K2 K3					
3. wa Course After so CO1: CO2:	e Outcomes uccessful completion of the course, the student is expected to Remember principle of capacitors, Kirchhoff's laws, forward and reverse bias, frequency response, modulation, focal length, dispersive power, cordinal points, double refraction, Biot's law, Principals of Laser. Understand energy of a capacitor, principle of potentiometer, diode characteristics, working of npn transistor, logic circuits, basics of types of laser. Apply Kirchhoff's laws, Boolean algebra, Refraction through a prism,	K Level K2 K3 K3					
3. wa Course After s CO1: CO2: CO3:	e Outcomes uccessful completion of the course, the student is expected to Remember principle of capacitors, Kirchhoff's laws, forward and reverse bias, frequency response, modulation, focal length, dispersive power, cordinal points, double refraction, Biot's law, Principals of Laser. Understand energy of a capacitor, principle of potentiometer, diode characteristics, working of npn transistor, logic circuits, basics of types of laser. Apply Kirchhoff's laws, Boolean algebra, Refraction through a prism, Einstein's coefficients	K Level K2 K3 K3					
3. wa Course After s CO1: CO2: CO3:	ves/v/polarization-of-light-linear-and-circulare Outcomesuccessful completion of the course, the student is expected toRemember principle of capacitors, Kirchhoff's laws, forward and reverse bias, frequency response, modulation, focal length, dispersive power, cordinal points, double refraction, Biot's law, Principals of Laser.Understand energy of a capacitor, principle of potentiometer, diode characteristics, working of npn transistor, logic circuits, basics of types of laser.Apply Kirchhoff's laws, Boolean algebra, Refraction through a prism, Einstein's coefficientsCalibration of ammeter and voltmeter, OP AMP as an adder and subtractor,	K Level K2 K3 K3					
3. wa Course After s CO1: CO2: CO3: CO4:	ves/v/polarization-of-light-linear-and-circular         e Outcomes         uccessful completion of the course, the student is expected to         Remember principle of capacitors, Kirchhoff's laws, forward and reverse bias, frequency response, modulation, focal length, dispersive power, cordinal points, double refraction, Biot's law, Principals of Laser.         Understand energy of a capacitor, principle of potentiometer, diode characteristics, working of npn transistor, logic circuits, basics of types of laser.         Apply Kirchhoff's laws, Boolean algebra, Refraction through a prism, Einstein's coefficients         Calibration of ammeter and voltmeter, OP AMP as an adder and subtractor, logic gates, deviation without dispersion ,dispersion without deviation, Q.W.P,	K Level K2 K3 K3 K4					
3. wa Course After s CO1: CO2: CO3: CO4:	ves/v/polarization-of-light-linear-and-circular     e Outcomes     uccessful completion of the course, the student is expected to     Remember principle of capacitors, Kirchhoff's laws, forward and reverse bias,     frequency response, modulation, focal length, dispersive power, cordinal     points, double refraction, Biot's law, Principals of Laser.     Understand energy of a capacitor, principle of potentiometer, diode     characteristics, working of npn transistor, logic circuits, basics of types of     laser.     Apply Kirchhoff's laws, Boolean algebra, Refraction through a prism,     Einstein's coefficients     Calibration of ammeter and voltmeter, OP AMP as an adder and subtractor,     logic gates, deviation without dispersion ,dispersion without deviation, Q.W.P,     H.W.P, Applications of lacer.	K Level K2 K3 K3 K4					
3. wa Course After si CO1: CO2: CO3: CO4:	e Outcomes uccessful completion of the course, the student is expected to Remember principle of capacitors, Kirchhoff's laws, forward and reverse bias, frequency response, modulation, focal length, dispersive power, cordinal points, double refraction, Biot's law, Principals of Laser. Understand energy of a capacitor, principle of potentiometer, diode characteristics, working of npn transistor, logic circuits, basics of types of laser. Apply Kirchhoff's laws, Boolean algebra, Refraction through a prism, Einstein's coefficients Calibration of ammeter and voltmeter, OP AMP as an adder and subtractor, logic gates, deviation without dispersion ,dispersion without deviation, Q.W.P, H.W.P, Applications of lacer. Examine parallel plate capacitor, Cary Foster bridge, transistor characteristics	K Level K2 K3 K3 K4					
3. wa Course After s CO1: CO2: CO3: CO4: CO5:	<ul> <li>ves/v/polarization-of-light-linear-and-circular</li> <li>Outcomes</li> <li>uccessful completion of the course, the student is expected to</li> <li>Remember principle of capacitors, Kirchhoff's laws, forward and reverse bias, frequency response, modulation, focal length, dispersive power, cordinal points, double refraction, Biot's law, Principals of Laser.</li> <li>Understand energy of a capacitor, principle of potentiometer, diode characteristics, working of npn transistor, logic circuits, basics of types of laser.</li> <li>Apply Kirchhoff's laws, Boolean algebra, Refraction through a prism, Einstein's coefficients</li> <li>Calibration of ammeter and voltmeter, OP AMP as an adder and subtractor, logic gates, deviation without dispersion ,dispersion without deviation, Q.W.P, H.W.P, Applications of lacer.</li> <li>Examine parallel plate capacitor, Cary Foster bridge, transistor characteristics CE mode, frequency of Hartley oscillator, Specific rotatory power,</li> </ul>	K Level K2 K3 K3 K4 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 – 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
II	Electronics 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
III	<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	<b>Lasers</b> 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 Manning - K Levels with Course Outcomes (COs)												
		K	Articula	Sectio	Section A Section B			Secti (Eith Cho	on C er or bice)	Section D (Open Choice)		
Inte rnal	COs	- Le	Unit	MCO	Qs	Short Ar	swers	No.		No.		
That		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		
Question Pattern CIA I & II		No. of Questions to be answered		4		3		2		2	2	
		Marks for each		1		2		5		1	0	
		T Mar e sec	otal ks for ach ction	4		6		10		2	0	

	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	6.7	50					
	K2	2	4	10	10	26	43.3	50					
CIA	K3			10	20	30	50.0	50					
	K4							-					
1	Marks	4	6	20	30	60	100	100					
	K1	2	2			4	6.7	167					
	K2	2	4			6	10.0	10.7					
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

<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	Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)										
S.No. CO	COa	К-	I mit	MO	)Qs	Sh Ans	ort wers	Section C (Either / or Choice)		Section D (Open Choice)	
		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	П	2	K1 & K2	1	K1	2	K3 & K3	1	К3
3	CO1 - CO5	K1 to K4	ш	2	K1 & K2	1	K2	2	K3 & K3	1	К3
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 Questions to be Asked		10		5		1	0		5		
No. of Questions to be answered		10		5		5		3			
Marl	ks for ea	ach ques	tion	1		2			5		10
Total N	Marks fo	or each s	ection	10		10		2	5		30

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	12	17			
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 lev	els.									

Section	A (Mu	ltiple 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			
16) b			
17) a			
17) b			
18) a			
18) b			
19) a			
19) b			
20) a			
20) b			
NB: Hi	gher le	vel of perf	ormance of the students is to be assessed by attempting higher
level of	K leve	ls	
Section	D (Op	en Choice	
Answei	$\frac{r \text{ Any '}}{CO}$	Three ques	tions (3x10=30 marks)
<b>Q.No</b>	CO	K Level	Questions
21			
22			
23			
24			
25			

# **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	P	С	
Category	Allied					-	2	1	
Nature of cours	se: EMPLOYABILITY	🗸 🗸	<b>KILL ORIENTED</b>	✓	ENTREPREN	EURS	HIP		
Course Object	ives:	J - L							
The learners wi	ll be able:								
1. To gain knowledge about the experiments based on Optics, Electricity and Electronics									
2. To demonstra	ate modulus of elasticity								
3. To understan	d the bending of beam, f	orwa	rd and reverse biasing	g, fre	equency respon	nce			
4. To understan	d current conduction in e	electr	ical circuits.						
5. To learn about	5. To learn about transistor amplifier, oscillator and Operational amplifier								
	LIST OF EXPERIMENTS (Any Fourteen Experiments)								
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 la	aws				
5. Calibration o	of low range Voltmeter		- Potentiomete	er					
6. Carey Foster	Bridge		- Resistance &	z res	sistivity of a w	ire.			
7. Spectrometer	ſ		- Refractive in	Idex	of a Prism				
8Mirror Galva	nometer		- Voltage and	curi	rent sensitiven	ess			
9.LCR – Series	resonance		- Determination	n of	f L & Q factor				
10.Air wedge			- Thickness of	a w	rire				
11.Grating N by	y $\lambda$ Normal incidence		- Spectrometer						
12.Single stage	transistor amplifier		- CE mode						
13.Hartley oscillator - Determination of frequency									
14.Logic gates	– NAND and NOR		- Using Discret	te C	Components.				
15.Zener diode - Forward & Reverse Characteristics									
16.OP AMP			- Adder and Sul	btra	ctor				
			]	lota	al Practical Ho	ours	30 H	rs	
<b>Books for Stud</b>	<b>1x</b> 7•								

#### 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	Course Outcomes					
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	V A				
CO4:	Foster bridge and characteristics of Zener diode	<b>K4</b>				
<b>CO5:</b>	Construct Amplifier and Oscillator	K4				

### CO & PO Mapping:

COS	<b>PO 1</b>	PO 2	PO 3	PO 4	<b>PO 5</b>	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
<b>CO 4</b>	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 Code 21UCHS21 I							L	Р	С	
Category		Skill 2					-	2		
Nature of c	ourse:		EMPLOYABILITY		SKILL ORIENTED	✓	ENTREPREN	EURS	SHIP	✓
<ul> <li>Course Office</li> <li>To Rec</li> <li>To Ren</li> <li>To Class</li> <li>To Exe</li> <li>To Dete</li> </ul>	ojectiv ollect nembe ssify th cute th ermine	ves: the er the he sp ne ty e the	composition of milk a e major milk products pecial milk and fermer opes of milk products a e composition of milk	nd p and nted and proo	processing of milk l its estimation. l milk products on their its applications. ducts and their physical	ingre prop	edients erties.			
Unit: I	CON Milk prote colou	MP( a – d eins, ur, c	DSITION OF MILK lefinition – general co carbohydrate,vitamin dour, acidity, specific	mpo 1s a , gra	osition of milk – consti and minerals – physica avity, viscosity and con	tuents al pro iducti	s of milk – lipids perties of milk - vity.	_	6	
Unit: II	PRO Micr chem paste Temp	<ul> <li><b>ROCESSING OF MILK</b></li> <li>A destruction of microorganisms in milk – physico – hemical changes taking place in milk due to processing – boiling, asteurization – types of pasteurization –Vacuum pasteurization – Ultra High</li> <li>Cemperature Pasteurization</li> </ul>								
Unit: III	MAJ Creat gravi creat Ghee	<b>MAJOR MILK PRODUCTS</b> 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.							6	
Unit: IV	SPE Stand diagr milk	SPECIAL MILK Standardised milk – definition – merits – reconstituted milk –definition – flow diagram of manufacture – Homogenised milk – flavoured milk –condensed milk – definition composition and nutritive value							6	
Unit: V	milk – definition composition and nutritive value.FERMENTED AND OTHER MILK PRODUCTSFermentation 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.6Visit to a pasteurization factory / Milk product company and submission of									
						Tota	al Lecture Hour	s	30 H	rs
Books for 1. Jaya & Co 2. Baga	Shree Shree ompan vathi S	l <b>y:</b> Gh ny L Sune	osh, Fundamental Cor td, 2013. dari. K, Applied Chem	ncep	ots of Applied Chemist y, 1st Edition. Chennai	ry. 1s : MJF	st Edition. New 1 P Publishers, 200	Delhi 6.	i: S.Cl	nand
1. Wong	g,N.P.	Jen	ces: ness,R. Keenay,M.& 1	Mat	rh,E.H, Fundamentals	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. https://www.youtube.com/watch?v=uYhbekSGMZY
- 3. <u>https://www.youtube.com/watch?v=oHCntgYIJbE</u>
- 4. https://nptel.ac.in/courses/126/105/126105013/

K Level

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

#### 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	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	me	D	YE CHEMISTRY							
Course Co	ode	21	UCHS22					L	Р	С
Category		Sł	xill			2 -				
Nature of c	Nature of course:EMPLOYABILITYSKILL ORIENTED✓ENTREPRENEU							EURS	SHIP	$\checkmark$
Course Ob	ojecti	ves	•							1
• To Rec	all the		onstitution of colour ar	nd dy	yes.					
• To Clas	ssify i	the	ayes and demonstration	on of	t its various types.	tha	ir applications			
<ul> <li>To Con</li> <li>To Eve</li> </ul>	npare cute t	tini the	synthesis and application	ions	of quinonoid dyes incl	ndi	ng vat dves base	d		
To Like     To Dete	ermin	ne tl	be requirement of a pix	ymer	and applications and	the	ir uses	u		
10 200	СН	EN	IISTRY AND THEO	RY	OF COLOURS		n 4505.			
TT . • 4 . T	Cole	our	and Constitution – Re	elatio	onship of Colour obser	ved	to wavelength		06	
Unit: I	of 1	igh	t absorbed – Terms u	ised	in Colour Chemistry	_	Chromophores,		UO	
	Aux	coc	hromes, Bathochromes	s shi	ft, Hypsochromic shift	•				
	DIR	REC	CT AND DISPERSE	DYI	ES					
Unit. II	Dire	oot	or substantivo duos n	aard	ant duas ust duas In	arai	n or doveloped		06	
<b>Unit: II</b> Direct or substantive dyes, mordent dyes, vat dyes, Ingrain or developed dyes. Disperse dyes, supply dyes, reactive dyes, oil and spirit soluble dye									00	
	dyes, Disperse dyes, sulphur dyes, reactive dyes, oil and spirit soluble dye, food, dry and cosmetic dyes, (Definition, applications and examples only).									
	NIT	<b>R</b>	<b>DGENOUS, TRIPH</b>	ÈNY	L, AZO AND PH	Γ <b>H</b> A	ALEIN DYES			
	Classification according to chemical structure: a) Nitro and Nitroso dyes.									
Unit: III	b) Tripheyl methane dye -malachite green, crystal violet and its								06	
	applications. c) Azo dyes –, methyl orange, and congo red. d) Phthalein dye_ phenolphthalein and fluorescein (Definition applications and									
	exai	mp	les only)	mu	Definition,	ap	pheations and			
	AZ	IN	E, OXÁCINE AND T	RIA	ZINE DYES					
Unit. IV									06	
	Azi	ne,	Oxazine and Triazi	ne ]	Dyes – Synthesis an	nd a	applications of		00	
	quir	non	oid dyes including vat	dye	s based on anthraquino	ne.				
	PIG	ΓM.	ENTS AND THEIR A	APP Tu	LICATIONS	***	nia niamanta			
Unit: V	Apr	uir dic	ations and their uses in	- Iy 1 nai	ints – Applications of	orga dve	s in other areas		06	
	-m	edi	cine, cosmetics, food a	ind t	Deverages.	uye	s in other areas			
Total Lecture Hours									30 H	rs
Books for	Stuc	dy:								
1. Gurdeep	R.C	hat	wal, Synthetic Dyes –	Him	alaya Publishing Hous	se, 2	2016.			
Books for	Refe	ere	nces:							
1. B. S. Ba	hl an	d A	run Bahl, Advanced C	)rgai	nic Chemistry, 2012.	4 -	0 C D 11'	•	201	0
2. P.L.SON	1 and	H.I V V	VI. Chawla, Text book	0I ( totr	rganic Chemistry, Sul	tan	& Sons Publicat	10ns	, 2019 2019	9. shina
3. K.S.Tev	3. K.S.Tewari, N.K.Vishnol & S.N. Mehrotra, A Text book of Organic Chemistry, Vikas Publishing									

House, 1976.

Web I	Resources:					
1. <u>httr</u>	os://www.youtube.com/watch?v=a6Lw7Dzwvqo					
2. <u>httr</u>	os://www.youtube.com/watch?v=sLcT7P-ZS4E					
3. <u>httr</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					
CO1:	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]				
CO3:	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 beverages.	[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>	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		
CO 4	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
III	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)

PHYSICAL CHEMISTRY - I Course Name **Course Code 21UCHC31** Р С L 4 Core 4 Category Nature of course: EMPLOYABILITY  $\checkmark$ SKILL ORIENTED **ENTREPRENURSHIP Course Objectives:** To Recall the characteristics of ideal and real gases and deviations of real gases from ideal behaviour. To Remember the law of distribution of velocities and characteristics of colloids. • To Compare the classification of adsorption and catalysis. • To Perform the purification of colloids and comparison between order and molecularity of a • reaction To Determine the effect of temperature on various velocities and applications of colloids, adsorption and catalysis. **GASEOUS STATE** Unit: I 12 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. Unit: II COLLOIDAL STATE 12

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.

#### Unit: 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

#### Unit: 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.

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Unit:	V CHEMICAL	KINETICS	12					
Introd	uction – Rate of Re	eaction - Rate law and Rate constant - Order and Mole	cularity of a					
reactio	reaction. Derivation of rate equation and half-life period for first order- examples- Catalytic							
Decon	nposition of hydrog	gen peroxide - Decomposition of Dinitrogen pentox	ide. Pseudo					
unimo	lecular reaction - De	erivation of rate equation and half-life period. examples-	inversion of					
cane s	ugar and hydrolysis o	of ester by acid. second, third and zero order reactions - exa	amples – rate					
equati	on - half period (no	derivation required). Methods for the determination of the	ne order of a					
reaction	on. Influence of tem	nperature on the rate of reaction - Arrhenius rate equa	tion and its					
signifi	cance. Collision The	ory of Reaction Rate and its limitations.						
		Total Lecture Hou	rs 60 Hrs					
Books	for Study:							
5. Ar	un Bahl, B. S Bahl	& G.D. Tuli, Essentials of Physical Chemistry, S.Chand a	nd Co, New					
De	elhi, 2014.							
Books	for References:							
4. Gil	bert. W. Castellan, Pl	hysical Chemistry, Narosa Publishing house, third edition 19	985.					
5. P.V	V. Atkins, Physical C	hemistry, 7th edition, Oxford university press, 2001.						
6. S.K	K. Dogra and S. Dog	ra, Physical Chemistry Through Problems, New age inter	national, 4th					
edition	n 1996.							
7. B.F	R. Puri, L.R. Sharma	and S.Pathania, Principles of Physical Chemistry, Shoba	n Lal Nagin					
Chand	and Co, 47 <sup>th</sup> edition	, 2017.						
8. S.H	I. Maron and J.B. L	ando, Fundamentals of Physical Chemistry, Macmillan 1	imited, New					
York,	1966.							
Web 1	Resources:							
1. <u>http</u>	s://youtu.be/u3BWeog	gwNN4						
2. <u>http</u>	<u>s://youtu.be/fctkOV_v</u>	wdWI						
3. <u>http</u>	s://youtu.be/UIVJ4Jk	<u>qial</u>						
4. <u>http</u>	<u>s://youtu.be/B_fg6ED</u>	<u>NFd4</u>						
5. <u>nup</u>	<u>s://youtu.de/wormig</u>	NIIVIKg	<b>K</b> L ovel					
Cours On th	e Outcomes	course the student will be able to	K Level					
	Pocall the postulate	course the student will be able to	[Un to K2]					
CO1	Discuss the gaseou	s state and types of adsorptions	[Up to K2]					
$\begin{array}{c} CO2. \\ CO3. \end{array}$	2: Discuss the gaseous state and types of adsorptions [Up to K3] 3: Enumerate the properties of gaseous state, colloids, adsorption and catalysis [Up to K3]							
CO3.	<b>5:</b> Enumerate the properties of gaseous state, colloids, adsorption and catalysis [Up to K3] <b>4:</b> Examine the characteristics of adsorption and catalysis [Up to K4]							
	Apply the order and molecularity of the reaction and derivation of order of							
<b>CO5</b> :	CO5: [Apply the order and molecularity of the reaction and derivation of order of [Up to K4]]							
CO	CO & PO Mapping:							
(	Course Outcomes	Programme Outcomes (POs)						

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

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#### 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
П	<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	CHEMICAL KINETICS 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 Manning – K Levels with Course Outcomes (COs)										
Inte rnal			Sectio	Section A		Section B		Section D			
	Cos	K Level	MC No. of. Questions	Qs K – Level	Short Ans No. of. Questions	wers 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)			
Question Pattern		No. of Questions to be asked	4		3		4	3			
		No. of Questions to be answered	4		3		2	2			
	1 & 11	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 ChoiceSection B (ShortSection C 		Total Marks	% of (Marks without choice)	Consolidate of %					
	K1	2	2	-	-	4	6.67				
	K2	2	4	10	20	36	60	67			
СІ	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			
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

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

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 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 parenthesis denotes, questions should be asked with 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 Laval										
	Distribution of Marks with K Level									
K	Section A (Multiple Choice	Section B (Short	Section C (Either/ or	Section D ( Open	Total Marks	% of (Marks without	Consolidated			
Level	Questions)	Questions)	Choice)	Choice)	1 <b>1111 K</b> 5	choice)	70			
K1	5	4	-	-	9	7.5	22			
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	NB: Higher level of performance of the students is to be assessed by attempting higher level									
of K lev	of K levels.									

Section	A (Mu	ultiple 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 (She	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	
NB: Hi	gher le	vel of perf	ormance of the students is to be assessed by attempting higher
level of	K leve	ls	
Section	D (Op	en Choice	
Answe	r Any 'l	l'hree ques	tions (3x10=30 marks)
Q.No	CO	K Level	Questions
21	COI	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	К4	

# **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						
<b>Course Code</b>	21UCHC32	L	Р	С			
Category	Core	4	-	4			
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 silicones – types of silicates – zeolites.

Unit: III p – Block Elements – II

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**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

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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.						
Unit: VCOORDINATION COMPOUNDS – II12						
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.						
Total Lecture Hours     60 Hrs						
Books for Study:						
5. B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, Vishal Publishing Co.						
Jalandhar, Delhi, 2018.						
Books for Reference:						
4. J. E. Huheey, E. A. Kieter and R. L. Keiter, Inorganic Chemistry, 4th ed., Harper Collins, New						
York, 1993.						
5. F. A. Cotton, G. Wilkinson, C. Murillo and M. Bochman, Advanced Inorganic Chemistry,6th ed.						
John Wiley, New York, 1999.						
6. T. Moeller, Inorganic Chemistry: A Modern Introduction, Wiley, New York, 1990.						
7. R. D Madan S.Chand, Modern Inorganic Chemistry band Co.Ltd, New Delhi 2012.						
Web Resources:						
1. https://youtu.be/1uJk4K irP8						
2. https://youtu.be/xQJOfAKgSOY						
3. https://youtu.be/xMjJxjhJWj4						
Course Outcomes: K Level						
On the completion of the course the student will be able to						
CO1: Relate the general characteristics of s-block, p-block elements. [Up to K2]						
Understand the concepts of important compounds of s-, p- block and naming						
the coordination compounds.						
CO3: Compare the isomerism of coordination compounds. [Up to K3]						
Con Correlate the diagonal relationship and anomalous properties of each group						
CO4:   elements   [Up to K4]						
<b>CO5:</b> Construct the EAN rule, VBT, CFT on the basis of coordination compounds. <b>[Up to K4]</b>						

### 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	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	<b>INORGANIC CHEMISTRY – II</b>	Hrs	Mode
Ι	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	p – BLOCK ELEMENTS – II 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.	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

	<ul> <li>isomerism in coordination compounds: structural isomerism – linkage isomerism, coordination position isomerism, ionization isomerism, hydrate isomerism - stereo isomerism – geometrical isomerism, optical isomerism.</li> <li>COORDINATION COMPOUNDS – II</li> <li>Valence bond theory – shortcomings of valence bond theory –</li> </ul>		
V	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

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print									
	Articulation Mapping – K Levels with Course Outcomes (COs)								
Inte rnal		K Level	Section A		Section B		Section C	Section D	
			MCQs		Short Answers				
	Cos		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	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	
Question Pattern		No. of Questions to be answered	4		3		2	2	
CIA I	I & I	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 I	K3	-	-	10	10	20	33.33	33
	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.

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	K – Level	No. of Question	K – Level	(Either / or Choice)	(Open Choice)
1	CO1	Up to K2	<u>s</u>	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 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	22	
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 (Multiple Choice Questions)							
Answer All Questions(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	COl	K2					
16) b	<u>CO1</u>	K2					
17) a	<u>CO2</u>	K3					
17) b	<u>CO2</u>	K3					
18) a	<u>CO3</u>	K3					
18) b	<u>CO3</u>	K3					
19) a	<u>CO4</u>	K3					
19) b	<u>CO4</u>	K3					
20) a	<u>CO5</u>	K3					
20) b	<u>CO5</u>	K3					
NB: Hi	gher le	vel of perf	ormance of the students is to be assessed by attempting higher				
level of K levels							
Section D (Open Choice)							
Answei	$\frac{r \text{ Any } 1}{CO}$	Inree ques	uons (3x10=30 marks)				
<b>Q.No</b>	$\frac{0}{0}$	K Level	Questions				
21		K2 K2					
22	<u>CO2</u>	K3 K2					
25	<u>CO3</u>	K3					
24	<u>CO4</u>	K4					
25	005	K4					

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


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

Course Na	ourse Name Major Chemistry Practical – II (Volumetric Analysis)														
Course Co	de 21	1U	CHO	CP2	J								L	Р	C
Category	C	ore	e Pra	actica	l								-	2	-
Nature of co	ourse:	I	EMP	LOY	ABIL	ITY	$\checkmark$	,	SKILL ORIENTE	D	ENTI	REPRE	NURS	HIP	
Course Ob	jectives	s:									1				
• To 1	recollect	t th	ne the	eory o	of lab	oratory	safet	<b>y</b> 1	measures and stre	ength of	f soluti	ons.			
• To 1	rememb	ber i	the e	estima	tion	of acidir	netry	i a	and alkalimetry and hard	nd redo	x titrat	ions.			
<ul> <li>To compare the concept of thration based on redox and hardness of water.</li> <li>To execute the concept of permanganometry and dichrometry.</li> </ul>															
<ul> <li>To determine the estimation of volumetric analysis.</li> </ul>															
UNIT	Theor	<b>.</b> y 0	of Vo	lume	etric 1	Analysi	s and	II	List of Experime	nts		9	1 0	Hrs	5
T	Theory Solution	y o ons	of $V_{\alpha}$	olume Norm:	etric ality	Analysı: Molarit	s and tv M	1. 10	Laboratory Safet	y Meas	sures:	Streng	th of		6
I	and ch	nem	nicals	s - Sa	fety a	aspects	iy, 10	10	hanty. Handling	or app	uratus,	51033	wares	U	
II	List of	f E	xper	imen	ts									24	
	I. Acid														
	1. Esti	Stimation of Na <sub>2</sub> CO <sub>3</sub>													
	2. Esti	Estimation of NaOH / KOH													
	3. Esti	ima	tion	of ox	alic a	cid.									
	II. Red	dox	. Titr	ation	8										
	a. Pern	mar	ngan	ometi	у										
	1. I	Est	timat	ion o	f ferr	ous ion									
	2. I	Est	timat	ion o	f oxa	lic acid									
	3. I	Est	timat	ion o	f calc	ium (dii	rect n	ne	ethod)						
	b. Dich	hro	meti	y											
	1. I	Est	timat	ion o	f ferr	ous ion									
	2. I	Est	timat	ion o	f ferr	ic ion us	sing e	ex	ternal indicator						
	V. ED	7. EDTA Titration													
	1. Estimation of Hardness of water using EDTA.														
	<u>Distrik</u>	but	tion	of ma	arks										
	Distribution of marksMax marks: 100Internal : 40 marksExternal : 60									Ex					

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 ma	rks
For Volumetric Estimation ELess than 2%	if the 6 Err	e student have or - 3	0 marks			
For Volumetric Estimation E Less than 2% 2-3% Error	if the 5 Err	e student have or - 3 - 2	0 marks 5 marks			
For Volumetric Estimation E Less than 2% 2-3% Error 3-4% Error	if the	e student have or - 3 - 2 - 2	0 marks 5 marks 0 marks			

10 marks

### **Books for Study:**

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

Greater than 5% -

#### **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.

### Web Resources:

1. https://youtu.be/xQDQNghs5dc

2. https://youtu.be/AdbK86BnXN8

3. https://youtu.be/dmnElKapQ00

	K Level						
On the completion of the course the student will be able to							
<b>CO1:</b> Discuss the theory of safety measure	s in chemistry laboratory.	[Up to K2]					
<b>CO2:</b> Understand the quantitative analysis	in practical chemistry.	[Up to K3]					
<b>CO3:</b> Apply the theory on quantitative titra	tion methods.	[Up to K3]					
<b>CO4:</b> Analyze the titrated values in tabular	format.	[Up to K4]					
<b>CO5:</b> Construct the estimated value of the	given compounds.	[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	PO 5	<b>PO 6</b>				
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	AI	LIED MATHEMATICS	- I						
Course Co	de	21	UMCA32			L	Р	С		
Category		AL	LIED			6	-	4		
Nature of	course	:	EMPLOYBILITY	SKILL ORIENTED	ENTREP	REN	JRS	HIP		
COURSE	OBJE	CTI	VES:							
• To	famil	liariz	e with the concepts of the	ory of equations						
• To	devel	lop s	kills in solving equations							
<ul> <li>To teach trigonometry and Expressing Trigonometric functions</li> <li>To develop the skills in expending Trigonometric functions</li> </ul>										
• To develop the skills in expanding Trigonometric functions.										
Io apply and prove trigonometric identities.      Theory of Equations: Formation of Equations. Polation between the roots and										
Unit: I Coefficients										
Unit: II	Reci	proc	al Equations - Transforma	tion of Equations			1	8 hrs		
	App	roxi	mate solutions of Numerica	al Equations: Newton's Me	ethod - Hori	ner's				
Unit: III	Method - Cardan's method									
	Trig	onoi	netry: Applications of Den	noivre's Theorem - Expres	sion for sin	$n\theta$ ,				
Unit: IV	cos r	n <i>θ</i> a	and $\tan n \theta$ - Expression of	$\sin^n \theta$ and $\cos^n \theta$ - Expansion	nsion of sin	$\theta$ ,	1	8 hrs		
	$\cos \theta$ and $\tan \theta$ in powers of $\theta$ .									
Unit: V	Unit: V       Hyperbolic Functions – Inverse Hyperbolic Functions       1							8 hrs		
Total Lecture Hours     90										
Books for	Stud	y:								
Text Book	: Dr. S Gam	S. Ai ma i	rumugam and A.Thangapar Publishing House, Palayam	ndi Isaac, <b>Ancillary Math</b> akottai, 2007.	ematics Pa	per I,	Nev	N		
Unit II.	Chap	ter 1	· Sections 1.3 & 1.4							
Unit III:	Chap	ter 1	: Sections 1.5 (1), 1.5 (2) a	& 1.5 (3).						
Unit IV:	Chap	oter 4	4: Sections 4.1, 4.2, 4.3							
Unit V:	Chap	ter 5	5: Sections 5.1, 5.2							
Books for	Refe	renc	æ:							
1. T. K . M Printers 2. T. K . M Printers 3. Dr. S. A 2003.	<ol> <li>T. K. Manickavashagam Pillai and S.Narayanan, Algebra – Volume I, S.Viswanathan Printers Publishers Pvt. Ltd, Chennai, 2007.</li> <li>T. K. Manickavashagam Pillai and S.Narayanan, Trigonometry, S.Viswanathan Printers Publishers Pvt. Ltd, Chennai, 2011.</li> <li>Dr. S. Arumugam and Isaac, Classical Algebra, New Gamma Publishing House, Palayamkottai, 2003</li> </ol>									
Web Reso	ources	5:								
1. <u>htt</u>	tps://s ation	sites. -bet	google.com/a/iitjeemathe ween-roots-and-coefficier	matics.com/www/conte/q nts-of-any-polynomial-eq	uadratic-e uation	quatio	ons/1	12-		
2. <u>ht</u>	t <b>ps://</b> 0	onlir	ecourses.swayam2.ac.in/	cec21_ma0//preview						

Course	e 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					
CO4:	Recognize the relationship between $\sin \theta$ , $\cos \theta$ and $\tan \theta$ .	K3					
CO5:	Understand the ideas about the Hyperbolic functions and Inverse Hyperbolic Functions	K3					

### CO & PO Mappings:

COS	PO 1	PO 2	PO 3	<b>PO 4</b>	<b>PO 5</b>	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
CO 4	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)										
		Articulation	Formative Manning –	Examinati K Levels v	ion - Blue Pr vith Course (	int Jutcomes (	$(\mathbf{COs})$				
			Sectio	on A	Sectio	on B		Section			
Internal	Cos	K L ovol	МС	Qs	Short A	nswers	Section C	D			
Internar	COS	K Level	No. of. Questions	K - Level	No. of. Questions	K - Level	Choice	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)			
	Que	No. of stions to be asked	4		3		4	3			
Question Pattern CIA I &	Ques	No. of stions to be nswered	4		3		2	2			
II	Mar	ks for each uestion	1		2		5	10			
	Tota eac	l Marks for ch section	4		6		10	20			

		Dist	ribution of 1	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	1	2	-	-	3	5	17
	K2	3	4	-	-	7	11.67	17
СТА	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	17
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	2s	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. of Questions to be answered		10		5		5	3				
Marks for each question		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)			

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

Section	Section A (Multiple Choice 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	B (Shor	rt Answers)				
Answer	All Qu	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 Type	e)			
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	<u>K4</u>				
18) a	CO3	K3				
18) b	CO3	K3				
19) a	CO4	<u>K3</u>				
19) b	CO4	K3				
20) a	CO5	<u>K3</u>				
20) b	<u>CO5</u>	<u>K3</u>				
NB: Hig	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 Th	nree questic	0ns (3x10=30 marks)			
Q.No		K Level	Questions			
21		K3				
22	<u>CO2</u>	K4				
23	<u>CO3</u>	K3				
24	<u>CO4</u>	K3				
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	FUNDAMENTALS OF MICROBIOLOGY										
Course Code	21UMBA32	L	Р	С							
Category	ALLIED MICROBIOLOGY - I	6	-	4							
Nature of cours	Nature of course:EMPLOYABILITYSKILL ORIENTED✓ENTREPRENURSHIP										
Course Objectives:											
To understand history of microbiology towards modern microbiology.											
To study	y the basic morphology structure, classification and biological a	ind e	cono	mic							
importan	nce of bacteria.										
$\succ$ To interp	in the normanalature and elegatification of Viruses										
$\blacktriangleright$ To expla	athe students to explore knowledge about the Algae and Protozoa										
Unit. I DF	VELOPMENT OF MICROBIOLOGV AND MICROSCOPV		19	2							
Definition and s	cope of Microbiology History & development of Microbiology Gene	ral n	rincir	, val							
and Binominal r	oomenclature of Microorganism, Microscope- Principles, Working, M	echar	nism	and							
Application - Si	mple and Compound microscope.	centar	115111	unu							
Unit: II BA	CTERIOLOGY		18	3							
General characte	eristics of Bacteria-Classification, Ultra Structure- Gram positive and	Gram									
negative cell wa	ll, Reproduction, Biological and Economic importance of Bacillus, R	hizobi	ium,								
E.coli and Vibri	0.										
Unit: III MY	COLOGY		18	3							
General characte	eristics of Fungi- Classification, Ultra structure, Reproduction, Biolog	ical a	nd								
Economic impor	rtance of Saccharomyces, Aspergillus, Agaricus, Penicillium.										
Unit: IV VI	ROLOGY		18	3							
General characte	eristics of Viruses-Classification, Ultra Structure, Reproduction of Pla	nt vir	us –								
(TMV, CMV); A	Animal virus-(Pox and Adeno); Bacterial virus (T4 and lambda) - Ant	iviral	agen	t.							
Unit: V PH	YCOLOGY AND PARASITOLOGY		18	\$							
General characte	eristics of Algae – Classification, Ultra structure, Reproduction, Biolo	gical	and								
Economic impo	rtance of <i>Chlorella</i> , <i>Spirulina</i> , <i>Chlamydomonas</i> , Protozoa - Classifica	tion,	Ultra								
structure, Repro	duction of Entamoeba histolytica, Plasmodium.		00.11								
Deales for Stud	I otal Lecture Ho	urs	90 H	rs							
books for Stud	y:										
1. Prescott L	M., Harley J.P & Klein D.A. Microbiology, 6/e, McGraw Hill Publi	shers,	200	6.							
2. Pelczar M	I.J., Chan E.C.S. & Kreig N.R. Microbiology, Tata McGraw Hill Pub	lishin	g Co	•,							
Ltd., New Delhi, 1993.											
Books for reference:											
1. Ananthanarayanan R & Jayaram Panicker, C.K., <b>Textbook of Microbiology</b> , Orient											
Longman, 2005. 2 Madigan Michael T. Martinka, John M. Dereker, Derek V. Charle, Derek D. D.											
2. Madigan, Michael T., Martinko., John M., Dunlap., Paul V., Clark., David P., Brock's <b>Biology of Microorganisms</b> Clobal Ed. Baarson Publications, 2015											
Biology of Microorganisms Global Ed. Pearson Publications, 2015.											
Fagle Wor	ks Cliffs N I Prentice Hall 1986	a, Jul	Ľu.								
Web Resources	Ko emili 19.0. 1100000 1100, 1700.										
	··										

1. http	1. https://www.britannica.com/science/microbiology					
2. <u>http</u>	s://www.brainkart.com/article/Ultrastructure-of-a-Bacterial-cell_32841/					
3. http	s://www.toppr.com/guides/biology/biological-classification/kingdom-fungi/					
4. http	s://www.toppr.com/guides/biology/plant-kingdom/algae/					
5. <u>http</u>	s://www.sciencedirect.com/topics/immunology-and-microbiology/virus-classi	<u>fication</u>				
Course	e Outcomes	K Level				
On Suc	cessful 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				
CO3:	O3: Illustrate about the Fungi classification, Structure and reproduction. Up to K4					
<u>co</u> 4.	Differentiate the different types of Virus structure, classification and					
UU4:	Up to K4					
<b>CO5:</b>	Identify the structural organization of Algae and Protozoa.	Up to K3				

### CO & PO Mapping:

CO's	PO 1	<b>PO 2</b>	PO 3	PO 4	PO 5	PO 6
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
II	<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
III	<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										
	Articulation Mapping – K Levels with Course Outcomes (COs)										
				Section	on A	Sectior	n B	Section C	Section D		
Inter	C	5	K Level	MC	Qs	Short Ans	swers	Either or	Onen		
nal			K Level	No. of. Questions	K - Level	No. of. Questions	K - Level	Choice	Choice		
	CO	)1	Up to K2	2	K1& K2	1	K2	2(K2&K2)	1(K2)		
	CO2		Up to K3	2	K1 &K2	2	K2	2(K3&K3)	2(K3&K3)		
CIA	CC	)3	Up to K4	2	K1&K2	1	K2	2(K2&K2)	1(K4)		
II	CO4		Up to K4	2	K1&K2	2	K2	2(K3&K3)	2(K4&K4)		
Ouestion		No. of Questions to be asked No. of Questions to be answered		4		3		4	3		
				4		3		2	2		
Patter CIA I	rn &	N ead	Marks for ch question	1		2		5	10		
II		То	otal Marks for each section	4		6		10	20		

	Distribution of Marks with K Level CIA I & CIA II											
	K Level	Section ASection BSection B(Multiple(ShortChoiceAnswerQuestions)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				
СІА	K3	-	-	10	20	30	50	50				
I	K4	-	-	-	-	-	-	-				
-	Marks	4	6	20	30	60	100	100				
	K1	2	2	-	-	4	6.66	22				
СТА	K2	2	4	10	-	16	26.66	55				
II	K3	-	-	10	-	10	16.66	17				
	K4	-	-	-	30	30	50	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

Sum	Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes								
				(COs)	)				
			Sectio	on A	Section	n B	Section C	Section D	
S No	Cos	K - Lovol	(MC	Qs) (Short Ans		swers)	(Fither / or	(Open	
5.110	0.05	K - Level	No. of	<b>K</b> –	No. of	K –	(Entited 7 of Choice)	(Open Choice)	
			Questions	Level	Question	Level	Choice)	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	stions to be							
	Ask	ked	10		5		10	5	
No.	of Ques	stions to be	10		5		5	3	
answered		10		3		5	3		
Marks for each question			1		2		5	10	
Total Marks for each		10		10		25	30		
	sect	ion	10		10		23		
	(Figures in parenthesis denotes questions should be asked with 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	-	-	-	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	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.											

Summative Examinations -	Question Paper – Forma	t
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Section	n A (M	ultiple Cho	Dice Questions)
Answ	er All (	Juestions	(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	<b>K</b> 1	
2	CO1	K2	
3	CO2	<b>K</b> 1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section	n B (Sh	ort Answe	rs)
Answe	er All Q	uestions	(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section	n C (Ei	ther/Or Ty	/pe)
Answe	er 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	K2	
20) b	CO5	K2	
NB: H	igher le	evel of perf	formance of the students is to be assessed by attempting higher level
of K le	evels		
Section	n D (Op	pen Choice	)
Answe	er Any '	Three ques	stions (3x10=30 marks)
Q.No	CO	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K4	
25	CO5	K3	



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

Course	Course Name BASIC CONCEPTS IN CHEMISTRY									
Course	e Code	21	UCHN31				L	Р	С	
Catego	ory	N	on Major Elective				2	-	2	
Nature	of cours	e:	EMPLOYABILITY	SKILL ORIENTED	$\checkmark$	ENTREPREN	URS	SHIP		
Course	e Objecti	ve	:							
• To	recall the	e at	oms and molecules and b	asic properties of both	met	als and non-me	tals.			
• To	remembe	er t	ne basics of pure substand	ce and mixtures, fuels a	and	catalysts.				
• To	• To compare the homogeneous and heterogeneous mixtures and types of catalysts.									
• To	• To perform the properties of states of matter and separation process.									
• To	determin	e tl	ne various concepts on at	oms, molecules, fuels a	ind	catalysis.				
Unit: I	MA	T	TER					06		
Atoms	and Mo	lec	ules – atom – molecule	- subatomic particles	of	atom – structu	re of	ator	n –	
valence	e electron	s –	valency - Bohr's model	of an atom – states of	mat	ter – solid, liqui	d and	l gase	es –	
evapora	ation									
Unit: I	I PU	RE	SUBSTANCE AND M	IXTURES				06		
Pure Su	ubstance	– N	lixtures – Homogeneous	and Heterogeneous mi	ixtu	res – solution –	true	solut	ion,	
colloid	al and su	spe	ension. Separation proces	s of mixtures – evapo	ratio	on, centrifugation	on, se	epara	ing	
funnel,	sublimat	ior	, simple distillation – dif	ference between pure s	ubs	tance and mixtu	res.			
Unit: I	Unit: III METALS AND NON-METALS 06									
Metals	- physic	al	properties of Metals – H	ardness, lustrous, mall	eab	ility, ductility, c	condu	iction	ı of	
heat an	d electri	city	v and sonorous. Non – N	Ietals – exceptional ca	ases	of metals and	non-	meta	ls –	
ionic b	ond.									
Unit: I	V FU	EL	S					06		
Fuels -	- Definit	ior	– classification - Solie	d, liquid and gases, p	oetro	oleum, refining	- d	iffere	nce	
betwee	n petrol a	Ind	diesel.							
Unit: V	/ CA	TA	LYSIS					06		
Catalys	st: defini	tio	n, homogeneous and h	eterogeneous catalysis	s (d	efinitions and	exar	nples	) –	
catalyti	c poisons	s, c	atalytic promoters, enzyn	ne catalysts.						
					Tot	al Lecture Hou	rs	30 H	rs	
Books	for Stud	y:								
1. Ran	nesh Kap	001	, R S Chopra, Sunita Bl	nagat, Fundamental Ch	nem	istry, R. Chand	& C	Co., N	lew	
Delhi, 2	2018.									
Books	for Refe	rer	ces:							
1. Ani	l Kumar	То	mar and Pallabi B. Toma	r, Basics of Chemistry	, Pe	gasus Encyclop	edia	Libr	ary,	
New D	elhi, 201	8								
Web R	lesources	3:								
1. shorturl.at/gIKP6										
Course Outcomes     K Level								el		
On the	e comple	tio	n of the course the stude	ent will be able to						
<b>CO1:</b>	Ability	to 1	emember the basic conce	pts of atoms, molecule	s, fi	uels, catalysis.	[U	p to ]	K2]	
<b>CO2:</b>	Discuss	the	e composition of the solut	tions and mixtures and	type	e of catalysts.	[U	p to ]	K3]	

<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>	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	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
III	<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 cours	e: EMPLOYABILITY	SKILL ORIENTED	ENTREPREN	URSI	HIP	$\checkmark$	
Course Objecti	ves:						
• To recall the	general characteristics of an	romatic compounds and re	action mechani	sms.			
• To remember	r the basics of aromatic com	pounds and polynuclear c	compounds.				
• To compare	the preparation, properties of	of ortho, para, meta directi	ng and aromatic	com	poun	ds.	
• To perform the mechanism of reactions and effects of substituents.							
To determin	e the various concepts on mo	echanisms and polynuclea	r compounds.				
Unit: I AR	<b>DMATIC COMPOUNDS</b>	-I		<u> </u>	12		
Introduction – C	eneral characteristics of ar	omatic compounds – Arc	maticity and H	uckel	's rul	e –	
Structure of ber	zene – Mechanism of arom	natic electrophilic substitu	tion (Halogenat	tion, i	nitrati	ion,	
sulphonation an	I Friedel – Crafts reactions.	Directive influence of su	bstituents based	on e	lectro	onic	
effects (ortho/pa	ra/meta directing) –Di-sub	stituted benzenes – Steri	z nindrance – r	viecna	anism	1 01	
Init: II AD	MATIC COMPOLINDS		zyne mechanisi	ns.	12		
Aromatic aldeb	vdes: Mechanism of Can	– II nizzaro Perkins Claisen	Knoevenagel	react	ion	and	
Renzoin condet	sation – Preparation and	properties of cinnamalde	hvde and vani	llin	Phen		
ketones: Phloro	actetophenone – preparatio	on – Houben – Hosch sy	nthesis Pheno	ls: Ad	cidity	one of	
phenols – effect	of substituents on the acidit	v of phenol – mechanism	of Kolbe's react	tion.	erarey	01	
I AR	OMATIC HYDROCARBO	ONS, HALOGEN, NITR	O AND AMIN	0	10		
Conit: III CO	MPOUNDS				12		
Aromatic Hydro	carbons: Preparation, prop	perties and uses of tolue	ne xylene and	mesi	tylen	e –	
Aromatic halog	en compounds: preparation	n, Properties and uses o	f bromobenzen	e and	l ber	izyl	
bromide- React	vity of aryl halides, disti	inction between nuclear	and side chair	n hai	ogena	ited	
amino compour	day <b>Propagation by raduation</b>	n of nitro compounds and	from ablorabor	ies. F	ATOIII Ef	auc foot	
of substituents	on the basic character of a	aromatic amines Comp	arison between	alinh	- EL	and	
aromatic amines	- Preparation of aniline s	ulphanilic acid nitroanili	nes and phenyle	enedia	mine		
Preparation and	synthetic applications of bei	nzene diazonium chloride.	nes une phenyr	mean		/5	
Unit: IV AR	DMATIC ACIDS				12		
Effect of subst	tuents on acidic characte	er. Monocarboxylic acids	preparation,	prope	erties	of	
salicylic acid an	d anthranilic acid. Dicarb	oxylic acids: preparation,	, properties of	phtha	lic a	cid,	
phenylacetic acid, mandelic acid, cinnamic acid & coumarin. Aromatic Sulphonic acids:							
preparation, properties and uses of benzene sulphonic acid and saccharin.							
Unit: V         POLY NUCLEAR HYDROCARBONS AND THEIR DERIVATIVES         12							
Isolated system	ns: Preparation and pr	operties of diphenyl,	benzidine di	pheni	c a	cid,	
diphenylmethan	, triphenylmethane and stil	Ibene. Condensed systems	: Preparation p	ropert	ies, u	ises	
and structure	of Naphthalene, Naphthy	ylamines, Naphthols, N	aphthaquinones	, ant	hrace	ene,	
anthraquinone, alizarin and phenanthrene.							

	Total Lecture Hou	rs 60 Hrs						
Books	for Study:							
1. Soni	. P.L and Chawla. H.M, Textbook of Organic Chemistry, S. Chand & Sons	, 2007, New						
Delhi.	Delhi.							
Books	for References:							
1. Jain	. M.K, and Sharma. S.C, Modern Organic Chemistry, 4 <sup>th</sup> Edition, Vishal Pul	blishing Co.,						
2016, J	alandhar.							
2. Aru	n Bahl and Bahl. B.S, A Textbook of Organic Chemistry, S. Chand & Co.,	, 2012, New						
Delhi.								
3. Jerr	y March, Advanced Organic Chemistry, 4 <sup>th</sup> Edition, John Wiley and Sons, 1992	, New York.						
4. S.H	. Pine, Organic Chemistry, 5 <sup>th</sup> Edition, McGraw Hill International Edition, Cher	nistry Series,						
1987, ľ	New York.							
5. Moi	rison. R.T and Boyd. R.N, Organic Chemistry, 6 <sup>th</sup> Edition, Printice-Hall of Indi	a Ltd., 1992,						
New D	elhi.							
Web R	lesources:							
1. <u>https</u>	://youtu.be/IVbuBY0YMu4							
2. <u>https</u>	://youtu.be/Ywgkw4vK01s							
3. <u>https</u>	://youtu.be/lxe0swwcca0							
4. <u>https</u>	://youtu.be/AllzmE_r/NY							
S. <u>Ittps</u>	A Outcomes	K L ovol						
On th	e completion of the course the student will be able to	K Level						
On th	Recall the general characteristics of aromatic compounds and discuss the							
CO1:	reaction	[Up to K2]						
	Prepare the aromatic compounds like aromatic hydrocarbons, halogen							
CO2:	amino, substituted	[Up to K3]						
COL	Examine the effect of substituents on acidic/basic character of aromatic	[Um 4- 172]						
CO3:	compounds.							
CO4:	Interpret the directive influence of substituent on electronic effects and	[I]n to K4]						
004:	properties of aromatic compounds.							
C05.	Integrate the reaction mechanism of aromatic compounds and formulate in	[Un to K4]						
005.	the synthetic applications.							

# CO & PO Mapping:

Course Outcomes	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	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	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
Π	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,Naphthaquinone, alizarin and phenanthrene.	12	Chalk, Talk & Power point

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

	Learning Outcome Based Education & Assessment (LOBE)									
	Articulation Mapping – K Levels with Course Outcomes (COs)									
			Sectio	on A	Section	n B	Section C	Section D		
Inte	Cos	K Level	MC	Qs	Short An	swers	Either or	Open		
rnal			No. of.	K–	No. of.	K -	Choice	Choice		
			Questions	Level	Questions	Level				
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)		
Question Pattern		No. of Questions to be asked	4		3		4	3		
		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			
СІА	K2	2	4	10	20	36	60	67		
	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)										
			MCQs		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)	(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	Question	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	Total Marks for each section10102530							30		
	(Figures	in noronthosi	is donatos a	unstions s	hould be as	zod with	the given K	lovol)		

(Figures in parentnesis 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	22				
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	A (Mult	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	rt 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	
NB: Hig	her lev	el of perfo	rmance of the students is to be assessed by attempting higher
level of l	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	
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	PHYSICAL CHEMISTRY – II			
Course Code	21UCHC42	L	Р	С
Category	Core	4	-	4
Nature of course:	EMPLOYABILITY & SKILL ORIENTED & ENTREPRI	ENUR	SHIP	$\checkmark$
<b>Course Objective</b>	es:			
• To recall t	he basic thermodynamic laws and gibbs phase rule.			
• To remem	ber the symmetry operations, absorption, emission and vibrational	spect	ra.	
<ul> <li>To Compa</li> </ul>	are the relationship between Kp and Kc, two component system and	l grou	p table	es.
• To execute	e the group multiplication tables and phase rules.			
To Determ	nine the Le-chatelier principle, distillation, Condon principle and p	oint g	roups.	
Unit: I CHE	MICAL EQUILIBRIUM		12	
The law of mass	action- Thermodynamic treatment of law of mass action, Relation	onship	betwe	een
Kp and Kc. Appli	ication of Law of mass action to Homogeneous system- Dissociat	ion of	PCl <sub>5</sub> a	and
N <sub>2</sub> O <sub>4</sub> . Applicatio	on of Law of mass action to Heterogeneous system -Calcium	carbo	nate. 1	Le-
Chatelier Principl	e-Formation of Ammonia – Haber's process.			
Unit: II PHA	SE RULE		12	
Gibbs phase rule	- Definition of terms involved - Derivation of Gibb's phase rule -	- appl	ication	of
phase rule to one	component system -water system. Two component system-simple	eutec	tic-Pb-	Ag
system. Compour	nd formation-Congruent melting point-Zn-Mg system, Incongruent	melt	ing poi	nt-
Na <sub>2</sub> SO <sub>4</sub> -H <sub>2</sub> O sys	tem. Liquid system - partially miscible liquid system-phenol	-wate	r syste	em.
Completely misci	ble system-Alcohol-water system Completely immiscible system-	oenzei	ne –wa	ter
system – Theory	of fractional distillation - steam distillation.			
Unit: III GRO	OUP THEORY		12	
Molecular symmetry	etry elements and symmetry operations - operations - productio	n of s	symme	try
operations - prop	perties of a group – classes and sub groups – groups multiplicati	on tal	ole - 0	$\mathbb{C}_{2v}$ .
Point groups – Cl	assification of molecules into point groups $-C_{2v}$ , $C_{3v}$ , $C_{2h}$ , $D_{2h}$ , $D_{6h}$	and T	Γ <sub>d</sub> .	
Unit: IV SPEC	CTROSCOPY – I		12	
Introduction – Ab	osorption and Emission spectra (Elementary ideas)-Electromagnetic	c radia	ation w	vith
relative intensitie	es in each region. Molecular spectra – Types of molecular spec	etra. F	Rotatio	nal
spectra of diatom	ic molecules – Rigid rotator – selection rule-determination of mo	ment	of ine	rtia
and bond length	n. UV Visible spectroscopy - Types of electronic transitions	s – 7	Fransit	ion
probability-Chron	nophore and Auxochrome concepts Absorption and In	tensit	y sh	ifts
(Bathochromic, 1	hypsochromic, hyperchromic and hypochromic shifts). Theory	of	electro	nic
spectroscopyFr	anck and Condon principle - Applications of UV – Visible spectra.			
Unit: V SPEC	CTROSCOPY – II		12	
Vibrational spect	ra – IR spectra of diatomic molecules – Hooke's law – simple har	monic	c oscill	ator
(no derivation) for	orce constant – selection rule – Vibrational energy level diagram	– Ap	plicati	ons-
force constant det	ermination and calculation of zero-point energy. Modes of vibration	on in p	olyato	mic
molecules $-CO_2$	and $H_2O$ molecules. Raman spectra — Quantum theory of Rama	n effe	ct– Sto	okes
and Anti - Stoke	es lines – experimental study – Comparison between IR and R	aman	spect	ra –
Applications of R	aman spectra – Kotational-vibrational Raman spectra of a diatomic	mole	cule.	
	Total Lecture	Hour	S   6U .	Hrs

### **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, 7<sup>th</sup> 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. <u>https://youtu.be/lrosz8N-9tA</u>
- 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	e Outcomes:	K Level				
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>	<b>PO 2</b>	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	PHYSICAL CHEMISTRY – II	Hrs	Mode
I	<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
ш	<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)											
	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				
rnal	0.05		No. of.	<u>K</u> –	No. of.	K -	Choice	Choice				
	~ ~ 1		Questions	Level	Questions	Level						
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	<b>CO3</b>	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	4									
		Questions to			3		4	3				
		be asked										
		No. of										
Que	stion	Questions to	4		3		2	2				
Pat	tern	be answered										
CIA I & II		Marks for	1		2		5	10				
		each question	1		2		5	10				
		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)	3 Section C (Either / Or s) Choice) Section D (Open Choice) Total Mark		Total Marks	% of (Marks without choice)	Consolidate of %				
	K1	2	2	-	-	4	6.67	67				
	K2	2	4	10	20	36	60	07				
СІА	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	30				
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										
S. No	COs	K - Level	Outcomes (COs)MCQsShort AnswersNo. ofK -QuestionsLevelQuestionLevel				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	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 Questi Askee	ons to be 1	10		5		10	5			
No.of Questions to be answered		10		5		5	3				
Marks for each question		1		2		5	10				
Total N	Marks for e	each section	10		10		25	30			
	(Figures	in parenthe	esis denotes. (	questions 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	22				
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	gher level of p els.	erformance o	of the students	s is to be asso	essed by a	attempting	higher level				

Section A	(Multi	iple Choice	e Questions)
Answer A	All Que	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 B	(Short	Answers)	
Answer A	All Que	stions	(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	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	
NB: High	er leve	l of perfor	mance of the students is to be assessed by attempting higher
level of K	levels	~	
Section D	(Open	Choice)	
Answer A	Any Th	ree questio	ons (3x10=30 marks)
Q. No	CO	K Level	Questions
21		K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
07	007	17.4	

# **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	21UCHCP2				L	Р	С			
Category	Core Practical-22									
Nature of course	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>										
UNIT The	eory of Volumetric Analysis	and	List of Experiments				Hrs			
I The Sol	cory of Volumetric Analysis utions – Normality, Molarit chemicals – Safety aspects	and y, Mo	Laboratory Safety Measolality. Handling of appa	ures: St tratus, g	rengtł lassw	n of ares	6			
II Lis	t of Experiments						24			
I. Acidimetry a	nd Alkalimetry									
1. Estimation of	Na <sub>2</sub> CO <sub>3</sub>									
2. Estimation of	NaOH / KOH									
3. Estimation of	oxalic acid.									
II. Redox Titrat	ions									
a. Permanganor	netry									
1. Estimatio	n of ferrous ion									
2. Estimatio	n of oxalic acid									
3. Estimatio	n of calcium (direct method)									
b. Dichrometry										
1. Estimatio	n of ferrous ion									
2. Estimatio	n of ferric ion using external	indica	itor							
V. EDTA Titration										
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 th	e 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>	Understand the qualitative and quantitative analysis in practical chemistry.	[Up to K3]				
CO3:	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:

<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	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		
Π	<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>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 Name Allied Mathematics – II (B.Sc., Chemistry)							
Course Co	de 2	1UMCA43			L	Р	C
Category	A	llied			6	-	4
Nature of	Course	EMPLOYBILITY	SKILL ORIENTED	ENTREPR	ENUI	RSHI	P
COURSE	OBJE	CTIVES:		_			
• To t	underst	and mathematical models	used in Operations Resear	ch			
• 10 a	apply tr	ese techniques constructive	vely to make effective busing the providence of the second s	lness decisions	S Dragra	mmir	10
• 100 Prol	blem	the notions about Mathen	natical formulation and Sc	iving Linear r	logia		ıg
• To (	evaluate	e game theory and linear p	problems.				
• To (	develop	mathematical skills to an	alyze and solve network m	odels.			
	Mathe	matical Formulation of a	a LPP: General form of a	a LPP – Sum	matio	n	
Unit: I	notati	on – Matrix form – Cano	nical form – Standard for	m - Solution	of LP	P 23	3 hrs
	by Gr	phical Method - The Sim	plex Method		D '		
Unit. II	Trans	portation Problems: Mati	hematical Formulation of	TP - Initial	Basi		) hua
Unit: II	Appro	eximation method - Optim	um solution of TP (MODI	Method)	vogel	S 10	5 mrs
	Assig	ment Problems: Mathem	natical formulation of Ass	ignment Prob	lems	_	
Unit: III	Soluti	on to Assignment Probler	ms	8		1	5 hrs
	Game	s and Strategies: Introdu	iction – Two person zer	o sum game	– Th	e	
Unit: IV	Maxir	nin – Minimax Principle	- Saddle point – Games w	ithout saddle	point	-   10	6 hrs
	Graph	ic Solution of 2 x n and m	n x 2 Games – Dominance	Property Shortoot	David	_	
Unit: V	Proble	ork Flow Problems – Min	limal Spanning Tree Probl	em – Snortes	t Rout	e   18	8 hrs
	11000		ſ	<b>Fotal Lecture</b>	Hour	s 90	) hrs
<b>Books for</b>	Study:						
Text Book	1: Dr.	S. Arumugam and A.Tha	angapandi Isaac, <b>Topics in</b>	<b>Operations</b>	Resea	rch	
	Li	near Programming, New	v Gamma Publishers Pvt. I	Ltd, Palayamk	ottai,		
Toyt Dool	T11	unelveli, March 2015.	Ion Mohan Anonations D	accorde 17 <sup>th</sup>	Editia	-	
Text Book	2: Kai Sul	ill Swarup, P.K. Gupla, M tan Chand and Sons, New	Delbi 2014	esearch, 17	Eanno	n,	
	Sui	tan Chand and Sons, 140w	Denn, 2014.				
Unit I :	Тех	t Book 1: Chapter 3 – Sec	ctions: 3.2, 3.4, 3.5				
Unit II : Text Book 1: Chapter 4 – Section: 4.1							
Unit III :Text Book 1: Chapter 5 – Sections: 5.1 & 5.2							
Unit IV : Text Book 2: Chapter $17 -$ Sections: $17.1 - 17.7$ .							
Unit V : Pooles for	Defer	<u>it Book 2: Chapter 24 – Se</u>	ections: 24.2, 24.3 & 24.4.				
DOOKS IOF	Keler						
1. Rat	hindra ]	2. Sen, <b>Operations Resea</b>	irch Algorithms and App	lications, PH	I, EEE	,	
2 Sha	rma I k	, 2010. C. Onerations Research	: Problems and Solutions	Laxmi Publi	cation	S.	
Thi	rd Editi	on , 2009.		, <b>L</b> uxiiii i uUli	cuton	.,	

Web I	Resources:	
1. <u>htt</u>	os://nptel.ac.in/courses/111/107/111107128/	
2. <u>htt</u>	os://onlinecourses.swayam2.ac.in/cec20_ma10/preview_	
Course	e Outcomes:	K Level
After	the completion of the course, Students will be able to	
CO1.	Develop the notions about Mathematical formulation and Solving Linear	K A
COI.	Programming Problem.	N4
CO2.	Acquire the knowledge about the view of transportation and assignment	K3
02.	problems.	K5
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	K3
0.05:	optimization problems.	KJ

### 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)										
Tett		Articul	Sec M	tion A COs	Short A	on B	Section C	Section			
Inte rnal (	Cos	K Level	No. of. Questio ns	K - Level	No. of. Questions	K - Level	Either or Choice	D Open Choice			
CI	CO1	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)			
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	3			
		No. of Questions to be answered	4		3		2	2			
		Marks for each 1 question			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			
СІА	K3	-	-	20	20	40	66.67	66.67			
	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	MC	Qs	Short An	swers	Section C	Section D			
S.No	COs	K- Laval	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.	of Questio	ons to be	10		5		10	5			
	Askec	1	10		5		10	5			
No.	of Questio	ons to be	10		5		5	3			
	answere	ed	10		5		5	3			
Marks for each question			1		2		5	10			
Total Marks for each		10		10		25	30				
section			10		10		25	30			
	(Figures in parenthesis denotes, questions should be asked with the given K level)										

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

K I be the section A (Multiple ChoiceSection B (Short Answer Questions)Section C (Either/or Choice)Section D (Open Choice)Total (Marks Marks% of (Marks without choice)K154-97.516.67K2566-119.1716.67K3-40307058.3358.33K410105050120100100NB: Higher level of performance of the students is to be assert by strengting higher level	Distribution of Marks with K Level										
K1       5       4       -       -       9       7.5       16.67         K2       5       6       -       -       11       9.17       16.67         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       K </td <td>K Level</td> <td>Section A (Multiple Choice Questions)</td> <td>Section B (Short Answer Questions)</td> <td>Section C (Either/ or Choice)</td> <td>Section D ( Open Choice)</td> <td>Total Marks</td> <td>% of (Marks without choice)</td> <td>Consolidated %</td>	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 %			
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       K	K1	5	4	-	-	9	7.5	16.67			
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       50       50       120       100       100	K2	5	6	-	-	11	9.17	10.07			
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         50         50         120         100         100	K3	-	-	40	30	70	58.33	58.33			
Marks10105050120100100NB: Higher level of performance of the students is to be assessed by attempting higher levelof K levels	K4	-	-	10	20	30	25	25			
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels	Marks	10	10	50	50	120	100	100			
OF N JEVEIS.											
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)								
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	K3									
16) b	CO1	K3									
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	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	K leve	ls									
Section	D (Op	en Choice									
Answei	r Any T	Three ques	tions (3x10=30 marks)								
<b>Q.No</b>	$\frac{CO}{CO1}$	K Level	Questions								
21		K4									
22	CO2	K3									
25	CO3	K.5									
24	CO4	K4									
23	005	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	APPLIED MICRO	BIO	LOGY					
Course Code	21UMBA42	21UMBA42						С
Category	ALLIED MICROB	[OL	OGY - II			6	-	4
Nature of course	EMPLOYABILITY	✓	SKILL ORIENTED	$\checkmark$	ENTREPREN	URS	HIP	$\checkmark$
Course Objectives:         > To provide information regarding biofertilizers and their significance.         > To gain the Knowledge about microbes present in environments         > To learn to isolate industrially important organisms         > To understand the key concepts in food microbiology         > To acquire various basic concepts of medical microbiology         Unit: I       Agricultural microbiology         Soil - general properties - Soil microflora and its importance. Microbial transformation of Carbon, Nitrogen and phosphorus. Beneficial microorganisms in agriculture: Bacterial biofertilizer - Rhizobium, Bacterial insecticides - Bacillus thuringiensis.         Unit: II       Environmental microbiology         I8         Microbes in air - Microbial assessment of air quality - Microbes in water - Microbial assessment								
production of biogas.Unit: IIIIndustrial microbiology18Industrially important microorganisms - Bioreactors / Fermenter, components of typical fermenter - applications -microbial production of Industrial products - Ethanol, Penicillin and witemin P12								
Unit: IV Food	microbiology						18	
Important microoFactors that inMicroorganismsUnit: VMediNormal micro flImportant human	organisms in food (ba fluence microbial g as food - SCP, edible ical microbiology ora of the human boo diseases -Typhoid, H	row mus ly- epa	ia, molds and yeasts) th in food - Intri hrooms. Probiotics ar role of normal flora- titis, Aspergillosis & I	. So nsic nd th – be Mala	urces of food c factors -extri eir benefits. eneficial and ha aria.	ontan insic rmful	ninati facto 18 effe	on. ors. cts.
				10	ial Lecture HO	urs	70 H	18
<ol> <li>1. Satyanarayana</li> <li>2. Willey J, Sand education, 201</li> <li>3. Crueger W and Edition. Panim</li> <li>Books For Refer</li> <li>1. Joseph C Dani publications, C</li> <li>2. Mitchell R. In Cliffs, New Je</li> </ol>	U. <b>Biotechnology</b> , 12 man K AND Wood D 9. d Crueger A. <b>Biotechr</b> na Publishing Compan rence: el. <b>Environmental as</b> Chennai, 1999. <b>troduction to Enviro</b> rsey, 1974.	2 <sup>th</sup> E , Pr nolo y, N pec	Edition, Books and All rescott's Microbiolog gy: A textbook of Ind New Delhi, 2000. ts of Microbiology, 1 ental Microbiology, F	ied y. 1 dust <sup>st</sup> ed Print	Pvt. Ltd, 2019. 1 <sup>th</sup> Edition. McC <b>rial Microbiolo</b> ition, Bright Su ice Hall. Inc., E	Graw Ogy, 2 n nglev	Hill Ind	

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.
- SubbaRao N.S. Soil Microbiology, 4<sup>th</sup> edition, Oxford and BH Publishing Co. Pvt. Ltd., New Delhi, 2004.

Web Reso 1. <u>http://w</u> 2. <u>http://w</u>	ources: ww.swayam.gov.in/ ww.nptel.ac.in/	
3. <u>https://v</u>	www.sciencedirect.com/food-microbiology	
COURSE	OUTCOME	K Level
On succes	ssful 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
<b>CO4:</b>	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	<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	3	3	3	2	2
CO 2	3	3	3	3	3	2
CO 3	3	3	3	3	3	1
<b>CO 4</b>	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	Medical microbiology - 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

### **LESSON PLAN**

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 A Section B Section C Section D MCQs **Short Answers** Internal Cos **K** Level Open Either or No. of. No. of. К-Choice Choice K - Level Questions Questions Level CO1 Up to K2 K1& K2 **K2** 2(K2&K2) 1(K2) 2 1 CIA I **CO2** Up to K3 2 K1 & K2 2 K2 2(K3&K3) 2(K2&K3) 2 CO3 Up to K4 K1 & K2 1 K2 2(K2&K2) 1(K4) 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 Questions to 4 3 2 2 Ouestion be answered Pattern CIA I & II Marks for 1 2 5 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				
СІА	K3	-	-	10	10	20	33.33	33				
	K4	-	-	-	-	-	-	-				
-	Marks	4	6	20	30	60	100	100				
	K1	2	-	-	-	2	3.33	34				
CIA	K2	2	6	10	-	18	30	34				
II	K3	-	-	10	10	20	33.33	33				
	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)										
			MC	Qs	Short An	swers	Section C	Section		
S.	COa	V Lovel	Noof	V	No of	V	(Eithor / or	D		
No	COS	K - Level		<u>K</u> –			(Enther / or	(Open		
			Questions	Level	Question	Level	Choice)	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	ons to be	10		5		10	5		
	Aske	d	10		3		10	3		
No.	of Questi	ons to be	10		5		5	3		
answered		10		3		5	5			
Marks for each question			1		2		5	10		
Total Marks for each			10		10		25	30		
section			10		10		23	30		
	(Figures	in parenthe	esis denotes, o	questions sl	hould be ask	ed with t	he 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	-	-	-	5	4.16	12			
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.

Section	A (Mu	ltiple 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 Answer	·s)
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	COI	K1	
16) b	<u>CO1</u>	K1	
17) a	<u>CO2</u>	K3	
17) b	<u>CO2</u>	K3	
18) a	<u>CO3</u>	K3	
18) b	<u>CO3</u>	K3	
19) a	<u>CO4</u>	K4	
19) b	<u>CO4</u>	K4	
20) a	<u>CO5</u>	K2	
20) b	<u>CO5</u>	K2	
NB: Hi	gher le	vel of perf	ormance of the students is to be assessed by attempting higher
level of	K leve		
Section	D (Op	en Choice	) tiona (210, 20
Answei	$\frac{1}{CO}$	Inree ques	uons (3x10=30 marks)
<b>Q. NO</b>	$\frac{CO}{CO^1}$	K Level	Questions
21	$\frac{CO1}{CO2}$	<u>Γ</u> <u>Γ</u>	
22	$\frac{CO2}{CO2}$	KJ V4	
23	$\frac{CO3}{CO4}$	<u></u> Κ4 <i>V</i>	
24	CO4	N4 V2	
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	WATER TREATMENT										
Course Code	21UCHN41	21UCHN41									
Category	Non Major Elective			2	-	2					
Nature of cours	e: EMPLOYABILITY	SKILL ORIENTED	ENTREPREN	URS	HIP	✓					
<b>Course Objecti</b>	ves:										
• To Recall the hardness of water, boiling, boiler feed water and desalination.											
To Rememb	er the estimation of hardne	ss of water, chlorination an	d membrane teo	chniqu	ies.						
To Compare	the ultraviolet treatment, i	nternal and external condit	ioning and osmo	osis.							
• To Perform	the break point chlorination	n, difference in types of dis	tillation.								
To Determin	e the water quality standar	ds, priming, foaming and i	on exchange pro	ocess.							
Unit: I HA	RDNESS OF WATER		C 1		06						
Introduction - T	pes of impurities present i	n water - Hardness of wate	r - Estimation o	f h	ardne	ss					
by EDTA metho	d - Domestic water treatme	ent - water quality standard	s.								
Unit: II STI	<b>CRILIZATION METHOL</b>	DS			06						
Sterilization - B	oiling - Ozone gas treatment	nt - Ultraviolet treatment -	Chlorination –	Break	p	oint					
chlorination.	0 0				1						
Unit: III BO	ILER TROUBLES				06						
Boiler feed wa	er - Scale and sludge for	ormation - Comparison o	f sludge and s	scale	- Bo	oiler					
corrosion - Rem	oval of carbon dioxide and	d dissolved oxygen – Caus	stic embrittleme	nt - F	rimir	1g -					
Foaming - Requ	irements of boiler feed wat	er				-					
Unit: IV WA	TER CONDITIONING				06						
Internal condition	oning - Colloidal condition	ning - Phosphate condition	ning - Calgon	condi	tionir	ng -					
Carbonate cond	tioning. External conditio	ning - Demineralization p	rocess - Regen	eratio	n of	ion					
exchangers - Ad	vantages and disadvantage	es of ion exchange process	- Difference be	tween	inter	rnal					
conditioning and	external conditioning.										
Unit: V DE	SALINATION				06						
Desalination -	Reverse osmosis – Electr	odialysis – Thermal disti	llation – Solar	disti	llatio	n –					
Membrane Tech	nologies.										
		То	tal Lecture Ho	urs	30 H	rs					
Books for Stud	Y <b>•</b>										
1. Nicholas P. C	Cheremisinoff, Handbook	of water and wastewater tr	eatment technol	logies	, Bos	ston					
Oxford Auck	land Johannesburg Melbou	rne, New Delhi, 2002									
<b>Books for Refe</b>	rences:										
1. B.K.Sharma,	Industrial Chemistry, Goel	publishing House, Meerut	, 2003, New De	lhi.							
2. R.V.Shreve, Industrial Chemical Process, Tata McGraw Hill publishing company, 2005,											
Mumbai.											
Web Resources	•										
1. https://youtu.l	e/ByCMhI2yi2M										
2. https://youtu.l	e/XKNDXrlBnLM										
3. <u>https://youtu.k</u>	e/aGoUGUAAeuA										
4. <u>nttps://youtu.l</u>	e/ZAKHJS_Q9WE			T	Lar						
Course Outcon					Lev	ei					

Academic Council Meeting Held On 17.05.2022

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On th	e 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]
CO3:	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>	<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	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	STERILIZATION METHODSSterilization - 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 ENTREPREN	URSH	HIP	✓
Course Objecti	ves:			
• To Recall the Muscore. • To Remember of the Muscore of the Mus	e characteristics of alicyclic compounds, conformational analysis and er the free radicals and molecular rearrangements. the heterocyclic compounds, alkaloids and terpenes. the structure and classifications of proteins and nucleic acids. the terprinciples and applications of spectroscopy. <b>ICYCLIC COMPOUNDS, CONFORMATIONAL ANALYSIS,</b> / <b>ETONE AND MUSCONE</b> ounds: General methods of preparation and properties of cycle theory and its modification. Conformational Analysis: Differ and conformation- Fisher- Saw horse and Newman Projection I analysis of ethane, n-butane 1,2- dichloroethane, cycle d cyclohexane. Civetone and Muscone any one method of (no Structural elucidation) <b>DLECULAR REARRANGEMENT AND FREE RADICALS</b> rrangements: Detailed mechanisms of the following: pinacol tius, benzil-benzilic acid, claisen, benzidine, Fries and Wag s. Free radicals: Definition – preparation and reactions of sh radicals – Reaction and Mechanism of Sand Meyer reaction dofmann-Loeffler reaction – chain reactions – photochemical ns isomerization. <b>TEROCYCLIC COMPOUNDS</b> ompounds: Introduction and definition, Preparation and basic ine, quinoline and isoquinoline. Alkaloids: Definition – occ alkaloids – general methods for determining the structure o alkaloids – general methods for determining the structure o f alkaloids – structural elucidation – conline, piperine and nicoti lassification, occurrence and isolation – general properties – is ls of determining structure. Properties, Structure of citral and ter <b>OTEINS AND NUCLEIC ACIDS</b> nition – Classification of Amino Acids – Zwitter ion – Pe of proteins – colour reactions of proteins – primary, secondary, ucture of proteins (an elementary idea only). Nucleic acids: of Nucleic acids – nucleosides – nucleotides – difference betwee s – RNA and DNA general structure – Basic structure of DNA	Cive Cive Cive Cive Cive Cive Cive Cive	tone i tone i tone i affin betw nulat ne i thesis aloid tions i tions tions tions i ti tions i tions i tions i tions i tio i to i to tio i to t to i t	and is - een e - and s - een e - and s - one, /ein and erg s of and s - le - and and erg s of and s - le - and and and erg s of and s - le - and and and erg s of and s - le - and and and erg s of and s - le - and and erg s of and and and erg s of and and and erg s of and and and and and and and and
Unit: V PR	INCIPLES AND APPLICATIONS OF SPECTROSCOPY		18	_
UV: Introduct	ion- Type of electronic transition - absorption law bathochron	mic s	hift a	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.

#### Total Lecture Hours90 Hrs

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

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, 4<sup>th</sup> 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 CO5: [Up to K4] the synthetic applications.

<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	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	<b>HETEROCYCLIC COMPOUNDS</b> 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	<b>PROTEINS AND NUCLEIC ACIDS</b> Proteins: 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

	Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print										
	Articulation Mapping – K Levels with Course Outcomes (COs)										
Inte	Cas	<b>V</b> L aval	MCQ	)s	Short Ans	swers	Section C	Section D			
rnal	COS	K 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			
Question Pattern CIA 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		
СТА	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.

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	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	<b>CO4</b>	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 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		
	(Figu	res in parenthe	esis denotes, q	uestions sh	ould be aske	ed with th	ne 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	22			
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 (Multiple Choice 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 (She	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					
NB: Hi	gher le	vel of perf	ormance of the students is to be assessed by attempting higher				
level of	K leve	ls					
Section	D (Op	en Choice					
Answei	r Any T	Three ques	tions (3x10=30 marks)				
Q.No	CO	K Level	Questions				
21	COI	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 CHEMISTRY EXPERIMENTS)							
<b>Course Code</b>	21UCHCP3	L	Р	С			
Category	Core	-	6	5			
Nature of cours	e: EMPLOYABILITY 🗸 SKILL ORIENTED 🖌 ENTREPREN	NURS	HIP	✓			
<b>Course Object</b>	ives:						
• 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.					
Lis	t of Experiments						
I. Determ	ination of Molecular weight by						
a) Transition Te	emperature method – Sodium thiosulphate pentahydrate						
b) Rast Macro r	nethod – Naphthalene as Solvent						
II. Phase d	iagram involving						
a) Simple eutec	tic b) Compound formation						
III. Critical	solution temperature (CST)						
Determination of	of CST of phenol – water system						
IV. Potentie	ometric titrations						
(a) HCl Vs NaC	$OH \qquad (b) K_2 Cr_2 O_7 Vs FeSO_4.$						
V. Partitio	n Coefficient experiments:						
Study of the eq	uilibrium constant for the reaction						
$\text{KI+I}_2 \leftrightarrow \text{KI}_3$							
By determining	the partition Co-efficient of I2 between water an CCl4						
Determination of	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).							
Distribution of Marks (Max. marks – 100)							

	Duration of examination: 6 hrs						
Regular Test in the Cl	ass	: 30 Marks					
Observation note bool	k	: 10 Marks					
Total		: 40 Marks					
Viva voce		 : 10 marks					
Record Note book		: 10 marks					
For completion of the	experiment	: 20 marks					
Graph	-	: 2 marks					
Calculation		: 5 marks					
Tabulation		: 3 marks					
Result		: 10 marks					
Total		 : 60 marks					
		 Total Lastuma H	011mg 45 Hmg				
Pooles for Study		Total Lecture H	ours 45 mrs				
Thomas. A.O an Publication, 1976.	d Mani, Textbook	of Practical Chemistry, 4 <sup>th</sup> Revised Edit	ion, Scientific				
<b>Books for Reference</b>	:						
<b>1.</b> J. E. Huheev, E. A	Kieter and R. L.	Keiter, Inorganic Chemistry, 4th ed., Harper	Collins, New				
York 1993		,g, ,,	,				
<b>2.</b> F. A. Cotton, G. W	ilkinson. C. Murillo	o and M. Bochman, Advanced Inorganic Che	mistry.6th ed				
John Wiley New Yor	k 1999		j,,				
<b>3</b> . T Moeller Inorgan	n, 1777. nic Chemistry <sup>.</sup> A M	odern Introduction Wiley New York 1990					
<b>4.</b> R. D Madan S.Cha	nd. Modern Inorgar	nic Chemistry band Co.Ltd. New Delhi 2012.					
Web Resources:	8						
1. https://youtu.be/2	VzEpsEZOYo						
2. https://youtu.be/X	wm98B3gLPw						
3. https://youtu.be/K	D7amFclq4s						
<b>Course Outcomes:</b>			K Level				
On the completion of	of the course the st	udent will be able to	•				
CO1: Determination	n of molecular weig	ht by Transition Temperature method and	[Up to K2]				
CO2: Involvement of phase diagram and CST.							
<b>CO3:</b> Analyze the r	elative strength of a	cids by hydrolysis of ester.	[Up to K3]				
<b>CO4:</b> Interpret the e	quilibrium constan	t for the reaction	[Up to K4]				
<b>CO5:</b> Determine the	e cell constant and c	conductivity titration between as acid and a	[Un to K4]				

#### **Programme Outcomes (POs) Course Outcomes** (COs) **PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 CO 1 CO 2 CO 3 CO 4** CO5 Weightage

#### 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 A AND ORGANIC PREPARATION)	NAL	YSIS					
Course Code	21UCHCP4	L	Р	С				
Category	Core	-	3	-				
Nature of cours	e: EMPLOYABILITY 🖌 SKILL ORIENTED 🖌 ENTREPREN	NURS	SHIP	$\checkmark$				
Course Objecti	ves:							
To learn	the concept of gravimetric analysis and organic preparation							
• To analy	• To analyze the estimation of lead, calcium, copper and nickel							
• To study the organic preparation methods								
• To under	• To understand the various organic preparation methods							
• To interp	pret the gravimetric analysis and organic preparation							
Lis	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> </ul> <b>Preparation</b> ration trobenzene from nitrobenzene tic acid from phenol mination: p-bromo acetanilide from acetanilide trolysis : Aromatic acid from (a) an ester (b) an amide dation: Benzoic acid from benzaldehyde. zoylation: (a) Amine (b) phenols. tylation : (a) Amine (b) phenols							
Regular Test in Observation not	Distribution of Marks (Max.marks – 100)         Duration of examination: 6 hrs         Int: 40         the Class       : 30 Marks         e book       : 10 Marks							
Total	 : 40 Marks 							

Volume VI – Science Syllabus / 2023 - 2024 Record Note Book - 10 Marks Viva Voce - 10 Marks Ext: 60 **Gravimetric Estimation (30 Marks) Organic preparation (10 Marks)** Procedure 2 Marks Procedure - 10 Marks Crude sample 6 Marks Estimation - 20 Marks Recrystallised sample -2 Marks Less than 2 % Error – 20 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. [Up to K4] CO5:

<b>Course Outcomes</b>	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	
CO 4	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)

Course Name	Course Name MAJOR CHEMISTRY PRACTICAL – V (ORGANIC ANALYSIS AND ESTIMATION)								
Course Code	21UCHCP5	5				L	Р	С	
Category	Core					-	3	-	
Nature of cours	e: EMPLOY	ABILITY	$\checkmark$	SKILL ORIENTED	✓ ENTREPRI	ENURS	SHIP	$\checkmark$	
Course Objecti	ives:			1					
To learn	• To learn the analysis of an organic compound containing one or two functional groups.								
To analy	• To analyze the concept of confirmation of the prepared one or two functional organic								
compour	nds								
To study	v estimation of	f phenol, ar	nilin	ne and glucose					
• To under	rstand the var	ious functio	ona	al groups of organic con	ipounds				
• 10 inter	pret organic a	nalysis and	est	timation of organic com	pounds				
LIS L Organic Ana	lvsis	ents							
Analysis by the p compound and nucl <b>II. ORGANIC</b> 1. Estimati 2. Estimati 3. Estimati	<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> <li><b>II. ORGANIC ESTIMATION</b> <ol> <li>Estimation of phenol</li> <li>Estimation of aniline</li> <li>Estimation of glucose</li> </ol> </li> </ul>								
		Distribu	tio	on of Marks (Max. mar	ks – 100)				
		Durat	ion	n of examination: 6 hrs					
Regular Test in Observation not	the Class te book	: 30 Marks : 10 Marks							
Total		: 40 Marks	-						
Organic estima	ntion (30 Mar	rks)		Organ	ic analysis (30 I	Marks	)		
Record Note -	10 marks			Viva Voce	-	- 10 m	arks		
Procedure -	5 marks		Preliminary reaction - 2 marks						
Estimation -	15 marks			Elements prese	ent -	- 4 marks			
Less than 3% E	rror - 15 Mar	ks		Aliphatic or ar	omatic -	3 mar	ks		
3-4% Error – 13 Marks Saturated / Unsaturated - 3 marks									

		Volume VI – Science Syllabus /	2023 - 2024			
	4-5% Error – 10 Marks	Functional group - 0	5 marks			
	Greater than 5% - 8 Marks	Derivative - 2	2 marks			
		Total Lecture	Hours 45 Hrs			
Books	for Reference:					
3. Th	omas. A.O and Mani, Textbook o	of Practical Chemistry, 4 <sup>th</sup> Revised Ed	ition, Scientific			
Public	ation, 1976.					
4. N.S	S. Gnana pragasam and G. Ramam	urthy, Organic Chemistry Lab Manual	, Viswanath. S.			
Printer	rs & Publishers Pvt. Ltd., 2010, Chen	inai.				
Web R	lesources:					
1. http	s://youtu.be/1uJk4K_irP8					
2. <u>http</u>	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				
<u>CO1</u> .	Relate and classify between organic	e analysis and estimation of organic	IIIn to K21			
COI	compounds					
<b>CO2:</b>	Estimate the phenol, aniline and glu	icose	[Up to K3]			
CO3:	Analyze the one or two functional g	groups of organic compounds	[Up to K3]			
<b>CO4:</b>	Interpret the organic analysis and es	stimation of organic compounds	[Up to K4]			
CO5:	Distinguish between analysis and es	stimation of one or two functional groups	[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	List of Experiments	Hrs	Mode
Ι	<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         <ul> <li>Estimation of phenol</li> <li>Estimation of glucose</li> </ul> </li> </ul>	45	Practical

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 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 Objectives:								
• To Recall th	• To Recall the 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 th	e photocatalytic reactor and photocatalytic calorimeter.							
To Analyze	theory of chromatographic technique and applications.							
Unit: I PR	INCIPLES OF GRAVIMETRIC ANALYSIS		15					
Introduction to	gravimetric analysis - precipitation methods - conditions for I	precip	itatio	n -				
supersaturation	and precipitate formation - the purity of the precipitate: co-precip	oitatic	n - 1	post				
precipitation -	solubility product and precipitation - precipitation from homogene	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) - mi	nimization of errors: calibration of apparatus, analysis of standard sar	nples,	runr	ing				
a blank determi	nation and independent analysis - absolute and relative error - typ	bes of	erro	rs -				
correction of de	terminate errors and indeterminate errors - precision and accuracy:	defini	ition	and				
difference - cal	culation of mean - median and standard deviation - F-test, t- test	t and	Q-te	st -				
confidence limit	: - method of least squares - significant figures - rounding off the valu	es.						
Unit: III TH	ERMO ANALYTICAL AND ELECTRO ANALYTICAL METH	ODS	15					
Thermo Analy	tical Methods: Thermogravimetric analysis (TGA): principle - ther	mal a	nalys	is –				
derivative them	mo gravimetry (DTG) - factors affecting thermogram - TGA	instr	umer	it -				
applications of t	hermo gravimetry - differential thermal analysis (DTA), DTA instru	ment-	DTA	A of				
calcium oxalate	e monohydrate. Electro Analytical Methods: Electrogravimetry	- ele	ectrol	ytic				
separation of n	netals - polarography - principles and applications - amperometr	ic tit	ratior	1S -				
principles and a	pplications.							
Unit: IV INS	STRUMENTAL METHODS OF ANALYSIS		15					
Principle, instru	imentation and applications of fluorimetry - nephelometry - flame	phot	ometi	су -				
atomic absorptio	on spectrophotometry - photocatalytic reactor and photoelectric colori	meter	•					
Unit: V CH	ROMATOGRAPHY		15					
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 Chron	hatography – Column Chromatography – Thin layer Chromatogr	aphy	– Pa	per				
Chromatograph	Chromatography – Ion exchange Chromatography – Applications of each technique.							
I otal Lecture Hours         75 Hrs           Books for Study:         75 Hrs								
BOOKS for Stud	y:							
1. R. Gopalan, I	P.S. Subramanian, K. Rengarajan, Elements of Analytical Chemistry,	Sulta	n 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. https://youtu.be/ck0qEruFy\_o

Course	Course Outcomes					
On the	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]				
CO3:	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:

<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	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	PRINCIPLES OF GRAVIMETRIC ANALYSIS 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
Π	<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 ANALYSISPrinciple, instrumentation and applications of fluorimetry -nephelometry -flamephotometry -atomicabsorptionspectrophotometry -photocatalyticreactorandphotocelectric	15	Chalk, Talk & Power point

	colorimeter.		
	CHROMATOGRAPHY		
	History, Classification, definition of terms, principles, basic theory of		
	chromatographic technique and sample handling. Band broadening and	15	Chalk, Talk & Power point
	column efficiency: Definition, plate theory and rate theory of		
V	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.		

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)									
Inte rnal C		K Level	Section A MCQs		Section B Short Answers		Section C	Section	
	Cos		No. of. Question s	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)	
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2	
		No. of Questions to be answered	4		3		2	1	
		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								
			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	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 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	in parenthesis	s denotes, qu	estions sl	ould 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	22		
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		
ND. Higher level of nonfermance of the students is to be accessed 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 (Multiple Choice 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	rt Answers	)		
Answer	All Qu	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 Questions(5 x 5 = 25 mark					
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	K levels				
Section 1	D (Ope	n Choice)			
Answer	Any Th	nree questi	ons (3x10=30 marks)		
Q. No	CO	K Level	Questions		
21	COl	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	SUPRAMOLECULAR CHEMISTRY					
Course Code	le 21UCHE53					
Category	CORE ELECTIVE					
Nature of cours	e: EMPLOYABILITY 🖌 SKILL ORIENTED 🖌 ENTREPR	RENURS	HIP	✓		
Course Objecti	ves:					
• To Recall th	e selectivity, kinetic and thermodynamic concepts					
To Rememb	per the ionic and dipole – dipole interactions and hydrogen bondin	g				
To Compare	e the host – guest method and cation binding					
• To Analyze	the anion and neutral binding and hydrogen binding interactions					
To Determin	ne the structure of zeolite and properties of coordination polymers					
Unit: I INT	<b>TRODUCTION TO SUPRAMOLECULAR CHEMISTRY</b>		15			
Introduction - se	electivity - the lock and key principle and induced-fit model - con	plement	arity -	· co-		
operativity and	the chelate effect - preorganisation - binding constants - kinetic a	nd therm	odyna	mic		
selectivity.			-			
Unit: II SU	PRAMOLECULAR INTERACTIONS		15			
Supramolecular	interactions: ionic and dipolar interactions - hydrogen bonding	$g - \pi$ -inte	ractio	ns -		
van der waals in	teractions - hydrophobic effects - supramolecular design.					
Unit: III HO	ST - GUEST CHEMISTRY AND CATION BINDING		15			
Host – Guest C	hemistry: Introduction - guests in solution - macrocyclic versus a	acyclic ho	osts - I	high		
dilution synthes	is - template synthesis. Cation Binding: Introduction, crown e	thers, lar	iat et	hers		
and cryptands -	spherands - hemispherands - cryptaspherands - heterocrowns -	heterocr	yptan	ds –		
calixarenes.						
Unit: IV AN	ION AND NEUTRAL BINDINGS		15			
Anion binding:	charged receptaors, electrostatic interactions, electrostatic,	hydroger	i bin	ding		
interactions, neu	atral receptors, Lewis-acid receptors and anticrowns - metal con	taining re	ecepto	ors -		
simultaneous ca	tion and anion receptors - neutral binding.					
Unit: V SO	LID STATE SUPRAMOLECULAR CHEMISTRY		15			
Introduction - z	zeolites: structure, composition, zeolites and catalysis - clathra	tes - ure	a/thio	urea		
clathrates - tri	mesic acid clathrates - hydroquinone and Dianin"s compou	nd - coo	ordina	tion		
polymers: metal	organic frameworks and properties of coordination polymers.					
	Total Lecture	Hours	75 H	rs		
<b>Books for Stud</b>	y:					
1. Jonathan W.	Steed, David R. Turner and Karl J. Wallace, Core Concepts in Su	pramolec	ular			
Chemistry ar	nd Nanochemistry, Johny Wiley & Sons, Ltd., 2007,					
<b>Books for Refe</b>	rences:					
1. Katsuhiko	Ariga, Toyoki Kunitake, Supramolecular Chemistry – F	undamen	tals	and		
Applications	, Advanced Textbook, Original Japanese edition published by	/ Iwanan	ni Sh	oten		
Publishers, T	Okyo, https://doi.org/10.1007/b137036, Springer-Verlag Berlin H	eidelberg	g 2006	Ó		
Web Resources	3:					
1. https://youtu	u.be/dsJzRxnz2Qg					
2. https://youtu	u.be/YbeRLkhYZM0					
Course	e Outcomes	K Level				
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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]				
CO3:	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:

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

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)										
Inte rnal			Secti M(	ion A CQs	Sec Short	tion B Answers	Section C	Section			
	Cos	K Level	No. of. Questions	K – Level	No. of. Ques tions	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	<b>CO3</b>	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)			
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2			
		No. of Questions to be answered	4		3		2	1			
		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.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes										
	(COs)									
			MC	Qs	Short A	iswers	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 Questions to be answered		be answered	10		5		5	3		
Marks for each question		1		2		5	10			
Total N	Aarks for e	each section	10		10		25	30		
(.	Figures i	n parenthesis	denotes, que	estions sho	uld be ask	ed with t	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	55		
K3	-	-	40	20	60	50	50		
K4	_	-	-	20	20	16.67	17		
Marks	10	10	50	50	120	100	100		
NR. Hic	pher level of n	erformance o	f the student	s is to be asse	essed by a	attemnting	higher level		

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

Section A	Section A (Multiple Choice 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 I	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 Type					
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 leve	el of perfoi	mance of the students is to be assessed by attempting higher				
level of h	<u> Levels</u>						
Section I	D (Ope	n Choice)					
Answer	Any Th	ree questi	ons (3x10=30 marks)				
<b>Q. No</b>		K Level	Questions				
21		K2 K2					
22	$CO_2$	K3 K2					
23	$CO_{4}$	KJ VA					
24	C04	<b>K</b> 4					
23	005	К4					

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



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

Course Name	<b>BIOINORGANIC CHEMISTRY</b>						
Course Code	21UCHE54	L	Р	С			
Category	CORE ELECTIVE						
Nature of cours	e: EMPLOYABILITY 🗸 SKILL ORIENTED 🖌 ENTREPREN	URSI	HIP	$\checkmark$			
Course Objecti	ves:						
• To Identify	the fundamentals of biomolecules and metals in biological systems an	d gen	eraliz	ze			
their structur	res						
• To Rememb	ber the structures of myoglobin & hemoglobin, copper & nitrogen enzy	ymes.					
To Compare	e the behavior of dioxygen bound to metals and role of metals in medi	cine					
• To Perform	the structure of the active site in myoglobin & hemoglobin						
To Determin	the metals containing proteins and enzymes and metal toxicity		1.7				
Unit: I ME	TALS IN BIOLOGY	• •	15	1 7			
Introduction – H	Essential Chemical Elements – Metals in Biological Systems – Biolo	gical	Meta	l lon			
Complexation –	- Electronic and Geometric Structures of Metals –Metals in Biolog	ical S	System	ms –			
Metals containin	ng proteins and enzymes.		1.5				
Unit: II FU	NDAMENTALS OF BIOMOLECULES	1	15				
Proteins – Amin	to Acid Building Blocks – Protein Structure – Protein Sequencing and						
Proteomics – Pr	otein Function, Enzymes, Classification of enzymes – Enzyme Kineti	cs –					
	OII.		15				
Unit: III   Mr	UGLUBIN AND HEMOGLUBIN	a na ila l		مانام م			
Myoglobin and	Hemoglobin: Structure of the Prosthetic Group – Mechanism for Rev	ersibi	e Bill Mat	ala			
Structure of th	a Active Site in Mucclohin and Hemoglohin Pinding of CO	to $\mathbf{M}$	weak	ais –			
Hemoglobin	e Active Site in Myoglobin and Hemoglobin – Binding of CO		yogn	JUIII,			
Unit: IV CO	PPER AND NITROCEN ENZYMES		15				
Copper Enzyme	Structure Function Discussion of Specific Enzym		15 uperc	vide			
Dismutase – H	emocyanin Enzyme Nitrogenase: Iron-Sulfur Clusters – Fe-Prote	ics. S	ructu	ire _			
Detailed Mecha	nistic Studies		.i uete	ne			
Unit: V RO	LE OF METALS IN MEDICINE		15				
Inorganic Medi	cinal Chemistry - Metal Toxicity and Homeostasis – Anti-cancer a	ents.	Cisr	latin			
and related com	pounds - Chelation therapy – Cancer treatment – Anti-arthritis drug	s - G	adoli	nium			
MRI Imaging A	gents.						
	Total Lecture Ho	urs	75 H	rs			
Books for Stud	y:						
1. Hussain Red	dy, K. Bioinorganic Chemistry, New Age International, 2003, New D	elhi.					
2. Malik. W.U.	2. Malik W U Tuli G D Madan R D Selected topics in Inorganic Chemistry 7 <sup>th</sup> Edition S						
Chand & Co., 2	003. New Delhi.		,				
<b>Books for Refe</b>	rences:						
1. Rosette M. F	Roat Malone, Bioinorganic Chemistry: A short course, Wiley – Intersc	eience	, Joh	n			
Wiley & Sons, I	Inc., 2002.						
2. Miessler. G.	L and Donald A. Tarr, Inorganic Chemistry, Pearson Publication, 200	2.					

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. https://youtu.be/2Xq-x1c8PZg

Course	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]					
<b>CO5:</b>	Determine the metals containing proteins and enzymes and metal toxicity	[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	METALS IN BIOLOGY Introduction – Essential Chemical Elements – Metals in Biological Systems – Biological Metal Ion Complexation – Electronic and Geometric Structures of Metals –Metals in Biological Systems – Metals containing proteins and enzymes.	15	Chalk, Talk & Power point
Ш	<b>FUNDAMENTALS OF BIOMOLECULES</b> Proteins – Amino Acid Building Blocks – Protein Structure – Protein Sequencing and Proteomics – Protein Function, Enzymes, Classification of enzymes – Enzyme Kinetics – Enzyme Inhibition.	15	Chalk, Talk & Power point
III	MYOGLOBIN AND HEMOGLOBIN Myoglobin and Hemoglobin: Structure of the Prosthetic Group – Mechanism for Reversible Binding of Dioxygen and Cooperativity of Oxygen Binding – Behavior of Dioxygen Bound to Metals – Structure of the Active Site in Myoglobin and Hemoglobin – Binding of CO to Myoglobin, 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	<b>ROLE OF METALS IN MEDICINE</b> Inorganic Medicinal Chemistry - Metal Toxicity and Homeostasis – Anti-cancer agents: Cisplatin and related compounds - Chelation therapy – Cancer treatment – Anti-arthritis drugs – Gadolinium MRI Imaging Agents.	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)									
Into	Cos		Section A MCOs		Section B Short Answers		Section C	Sectio		
rnal		K Level	No. of. Questions	K – Level	No. of. Questi ons	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		
Question Pattern CIA I & II		No. of Questions to be answered	4		3		2	1		
		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	Section B (Short Answer	Section C (Either / Or	Section D (Open Choice)	Total Marks	% of (Marks without	Consolidate of %			
	17.1	Questions)	Questions)	Choice)	, 	4	choice)				
	KI	2	2	-	-	4	8				
	K2	2	4	10	10	26	52	60			
СІА	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 Answers		Section C	Castier 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	Question	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 sho	ould be asl	<b>sed</b> 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	22			
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	Section A (Multiple Choice Questions)							
Answer	· All Qu	iestions	(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	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 Ty	pe)					
Answer	· All Qu	iestions	(5  x  5 = 25  marks)					
<b>Q. No</b>	CO	K Level	Questions					
16) a	COI	K2						
16) b	COI	K2						
1/) a	CO2	K3						
1/)b	CO2	K3						
18) a	CO3	K3 K2						
18) b	CO3	K3						
19) a	CO4	K3 K2						
19) b	CO4	K3 K2						
20) a	C05	K3 K2						
20) D		K.)	www.an.ac.of.the.students is to be assessed by attempting high an					
ND: HI	gner lev	ver of perio	ormance of the students is to be assessed by attempting higher					
Section	n ievel	on Choice)						
Answor	Security (Open Unoice)							
		K I ovol	Ouestions					
21	C01	K2	Questions					
21	$CO^{2}$	K3						
22	CO2	K3						
23	CO4	K4						
25	$CO^{-1}$	K4						
45	005	174						

# **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	URS	HIP	$\checkmark$			
Course Objecti	ves:						
• To Recall th	e concept of forensic science and criminology studies						
<ul> <li>To Remember the finger prints and classification and uses of finger prints</li> </ul>							
To Compare	e the concepts of arsons, explosives and ballistics						
• To Perform	the biological substances in the dead clinic symptom						
To Analyze	the crime through network documents						
Unit: I CR	IMINOLOGY AND FORENSIC SCIENCE		15				
Criminology – o	definition - nature and scope - types of crimes penology - Indian pena	al coc	le - Ir	ıdian			
evidence act - I	ndian criminal procedure code. Forensic science – definition - princip	ples a	nd us	es in			
crime investigat	ion.						
Unit: II FIN	GER PRINTS & TRACKS-TRACES		15				
Finger prints – J	patterns – classification - uses of finger print in crime investigation - o	direct	and I	atent			
prints - develop	ment by powders - other methods of development - transfer methods	of fin	ger p	rints.			
Tracks – Traces	- Foot prints - casting of foot prints - residue prints - walking patter	m - ti	re ma	irks -			
miscellaneous ti	aces & tracks - glass fracture - tool marks – paints – fibres.		1.5	,			
Unit: III BIC	DLOGICAL SUBSTANCES AND POISONS		15	1			
Blood – semen	1 - saliva - sweat - urine - hair - skin - DNA analysis. Poiso	ns -	types	and			
classification-di	agonosis of poisoning in the fiving and in the dead - chinical sympton	1 - po	st-me	ntem			
unite IV	SONS EVELOSIVES AND PALLISTICS		15				
Vint: IV AR	SUNS, EAPLUSIVES AND DALLISTICS	ahan	13	ation			
Fundational These and	la arson - nature of action of fire - drifts and air supply - burning	chara	acteri bo	sucs.			
Explosives – C	sification internal external and terminal ballistics small arms of	)SIOII accifi	- DU	and			
characteristics	- laboratory examination of barrel washing and detection of power	ler re	sidue	hy			
chemical tests	aboratory examination of barrer washing and detection of powe		Siduc	s Uy			
Unit V CY	BER CRIMES AND DOCUMENTS		15	í			
Cyber crimes -	crime through network Documents - Chemistry of paper and ink -	writii	$1\sigma$ na	ner -			
carbon paper –	chalk - adhesives - sealing waxes - different types of forged signati	ires -	simu	lated			
and traced for	peries -inherent signs of forgery models - writing of forged models	odels	- W1	iting			
deliberately mo	dified - use of ultraviolet rays - comparison of type written letters	- cou	nterfe	eit of			
currency and co	ins.						
	Total Lecture Ho	urs	75 H	rs			
<b>Books for Stud</b>	y:						
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	5:						

1. <u>http</u> 2. <u>http</u>	os://youtu.be/Wtwx_uOgOUc os://youtu.be/StcLHDM3Vng					
Course	Course Outcomes K Level					
On th	e completion of the course the student will be able to					
<b>CO1:</b>	Ability to understand the concept of forensic science	[Up to K2]				
<b>CO2:</b>	Discuss the criminological studies through finger prints	[Up to K3]				
<b>CO3:</b>	Interpret the classification of finger print and biological substances	[Up to K3]				
<b>CO4:</b>	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>	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	CRIMINOLOGY AND FORENSIC SCIENCE 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 &

	<ul> <li>Blood – semen – saliva – sweat – urine – hair – skin - DNA analysis.</li> <li>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.</li> </ul>		Power point
Ι	ARSONS, EXPLOSIVES AND BALLISTICSNatural fires and arson - nature of action of fire - drifts and air supply - burning characteristics. Explosives – definition – classification - composition and mechanism of explosion - bombs. Ballistics – classification - internal, external and terminal ballistics - small arms - 	15	Chalk, Talk & Power point
	CYBER CRIMES AND DOCUMENTSCyber crimes - crime through network Documents - Chemistry of paperand ink - writing paper - carbon paper - chalk - adhesives - sealingwaxes - different types of forged signatures - simulated and tracedforgeries -inherent signs of forgery models - writing of forged models -writing deliberately modified - use of ultraviolet rays - comparison oftype written letters - counterfeit of currency and coins.	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)									
			Secti	on A	Sec	tion B		Secti		
Inte			MC	Qs	Short	Answers	Section C	on D		
rnal	Cos	K Level	No. of. Questions	K – Level	No. of. Questi ons	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)		
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2		
		No. of Questions to be answered	4		3		2	1		
		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			
СІА	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 II	K3	-	-	10	-	10	20	20			
	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.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)										
			MCQs		Short Answers		Section C	Seation 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	Question	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 sl	ould 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	22					
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	A (Mult	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 I	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 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 leve	el of perfoi	rmance of the students is to be assessed by attempting higher
level of H	<b>K</b> levels		
Section I	D (Ope	n Choice)	
Answer	Any Th	ree questi	ons (3x10=30 marks)
Q. No	CO	K Level	Questions
21	COI	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 FOOD PROCESSING CHEMISTRY								
Course Code 21UCHE56	L	Р	С					
Category CORE ELECTIVE	5	-	5					
Nature of course: EMPLOYABILITY & SKILL ORIENTED & ENTREPREN	URSI	HIP	$\checkmark$					
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								
I o Determine the adulterants in food processing		15						
Unit: I INTRODUCTION TO FOOD PROCESSING		15 torio1	-					
mitoduction- importance of faw materials in food processing-properties of faw	v IIIa odina		-raw					
seeding chilling and freezing, elements of food processing; food safety food gual	ity c	, cui onvei	nient					
foods - unit operation - unit processing - common unit process: pasteurization sterilize	ation	drvi	nσ					
separation, evaporation, refrigeration, freezing.	ution,	aryn	16,					
Unit: II FRUITS AND VEGETABLES PROCESSING		15						
Introduction - properties of fruits and vegetables - Deterioration reactions in fruits	and v	veget	able:					
changes in enzymes, chemical changes, nutritional quality changes, physical chan	ges, l	oiolo	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, dough	hs an	d bat	tters,					
extrusion, baking, frying, porridge-baked products- snack foods processing- n	nanuf	actur	e of					
beverages- coffee processing.								
Unit: IV FOOD ADDITIVES		15						
Introduction-chemistry of sweeteners: intense sweetuieners, bulk sweeteners - food c	colour	s: na	tural					
colours, synthetic colours - permitted levels of colourants - list of permitted colourar	nts - f	lavoi	iring					
agents-antioxidants: chemistry of antioxidants, type of antioxidants and uses:	ascor	b1C	acid,					
tocoperois, butylated nydroxyanisole (BHA), citric acid, Beta-carotene, lutein -	emu		ers -					
roousturi containing emunismens - types of emuisions - actualants, acetic acid, chine a malie acid, phoaphoric acid, tartaric acid	ciu, la	actic	aciu,					
Unit: V FOOD ADULTERATION		15						
Introduction - Legal Aspects of food adulteration and prevention - common food	d adu	ltera	nts -					
analysis of various food adulterants: analysis of adulterants in edible oils, ghee, coffe	e pow	vder.	chili					
powder, turmeric powder, meat and milk - harmful effect of the adulterants <b>Food Products</b> . Wheat								
and wheat products- classification of wheat - wheat flour - wheat products - milk and milk products -								
composition of milk - milk grades - some commercial milk products.								
Total Lecture Hou	ırs ′	75 H	rs					
Books for Study:								
1. Vikas Ahlluwalia, A text book of Food Processing Paragon International Publishers 2007.	s, Nev	w Del	lhi,					

2. A text 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 Edition, Woodland						
Publishing Ltd, Cambridge, England, 2002.						
2. Avantina Sharma, Text Book of Food Science and Technology, International Book, Distributing						
Co, Lucknow, UP, 2006.						
3. Sivasankar, Food Processing and Preservation, Prentice Hall of India Pvt. Ltd., New Delhi. 3 <sup>rd</sup>						
Printing, 2005.						
4. Peter Zeuthen and Leif Bogh-Sorenson, Food Preservation Techniques, Woodland Publishing						
Ltd., Cambridge, England, 200						
Web Resources:						
1. <u>https://youtu.be/naauUbo4Ick</u>						
2. <u>https://youtu.be/WRYoGiOobqU</u>						
3. <u>https://youtu.be/AMJYn3hgv3o</u>						
4. <u>https://youtu.be/a4aKLHCLyD8</u>						
Course Outcomes K Level						
On the completion of the course the student will be able to						
CO1:Ability to understand the raw materials in food processing[Up to K2]						
<b>CO2:</b> Discuss the various elements of food processing and properties fruits and						
vegetables						
CO3:Interpret the study of small-scale food processing[Up to K3]						
CO4: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	<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>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 Section	on B	Section C	Section D				
Inte rnal	Cos	K Level	No. of. Questio ns	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 & 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				
Question Pattern CIA I & II		No. of Questions to be answered	4		3		2	1				
		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 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	f Question	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, au	estions sh	ould 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	22					
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	Section A (Multiple Choice 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 (She	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						
NB: Hi	gher le	vel of perf	ormance of the students is to be assessed by attempting higher					
level of	level of K levels							
Section D (Open Choice)								
Answe	r Any 'l	l'hree ques	tions (3x10=30 marks)					
Q.No	CO	K Level	Questions					
21	COI	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 21UCH	IS51			L	Р	С			
Category SKILL				2	-	2			
Nature of course: <b>EMP</b>	LOYABILITY	✓ SKILL ORIENTED	✓ ENTREPREN	URS	HIP	✓			
Course Objectives:									
• To Identify the different systems of medicines and its drug actions									
• To Remember the ba	asic of anaestheti	cs and chemotherapy							
• To Interpret the thera	apeutic function	of synthetic drugs							
• To Understand about	t the antibiotics a	and indole derivatives							
• To Determine the va	rious synthetic d	rugs, gaseous anaesthetics	s, chemotherapy an	d its u	ises				
Unit: I INTRODU	CTION TO TH	E DIFFERENT SYSTEN	MS OF MEDICIN	E	06				
Different systems of n	nedicine: Ayurv	veda, Siddha, Homeopath	hy and Allopathy	– H	listor	y of			
medicinal chemistry – c	discovery of dru	gs – Introduction. Analge	esics and Antipyre	tics –	- Nar	cotic			
analgesics - Morphine	and derivative	s. Total synthetic analg	esics pethidine a	nd m	ethad	lone.			
Antipyretic analgesics –	salicylic acid de	rivatives, Indole derivative	es and p-amino phe	enol d	eriva	tives			
(Medicinal uses and stru	cture only). Ant	ibiotics – Definition, Pen	icillin – Tetracycli	ne (A	urom	iycin			
& Terramycin) – Streptor	mycin and Chlor	omycetin – drug action an	d uses.						
Unit: II ANAESTH	ETICS				06				
Gaseous anaesthetics -	- Vinyl ether -	- Cyclopropane – Halo	hydrocarbons –	Chlo	rofor	m –			
Haloethane- Trichloro e	ethylene – Intrav	venous anaesthetics – Th	iopentone – Local	anae	stheti	ics –			
Cocaine and its derivativ	ves. (Therapeutic	use only)							
Unit: III ANTIBIOT	TICS AND ANT	IMALARIALS			06				
Sulpha drugs – Sulphadi	iazine, prontosil	and prontosil-S. Antimala	rials – quinine and	its de	erivat	ives.			
Arsenical drugs – Salvar	rsan – 606 – Neo	salvarsan.							
Unit: IV SYNTHET	IC DRUGS				06				
Synthetic drugs and its	therapeutic func	ction of paracetamol – As	spirin – naproxen	– An	oxyl	lin –			
ciprofloxacin – Ibuprofe	n.								
Visit to an Industry and	submission of R	eport. For industrial visit	/ Assignment = 5	mark	s inte	rnal)			
Contact District Industria	al Centre (DIC fo	or visits)							
Unit: V HORMON	ES AND VITAN	MINS			06				
Definition and Classific	cation Testoster	one, Progesterone, Thyro	xine, Vitamin C,	Struc	ture	only			
(Structural elucidation no	ot necessary)								
			Total Lecture Ho	urs	<b>30 H</b>	rs			
Books for Study:									
1. Jayashree Ghosh, A Textbook of Pharmaceutical Chemistry, S. Chand & Co., 1999, New Delhi.									
Books for References:									
1. Charles R. Craig and	Robert E. Stitze	l, Modern Pharmacology,	3 <sup>ra</sup> Edition, Little 1	Brown	n and	Со.,			
Boston, 1990.									
2. Corwin Hansch, Pete	er G. Sammer, J	ohn B. Taylor and Peter	D.K. Kennewell,	Comp	reher	nsive			
Medicinal Chemistry, Pe	ergmon Press, Gr	eat Britain, 1990.							
3. Bertram G. Katzung,	Basic and Clinic	cal Pharmocology, Lange	Medical Publicatio	ons, A	tos, 1	982,			

Califor	nia.					
Web R	lesources:					
1. <u>http</u>	1. https://youtu.be/IUxkcEoGkVg					
2. <u>http</u>	<u>s://youtu.be/pss_sm2zaek</u>					
3. <u>http</u>	<u>s://youtu.be/Z63xnlDNajE</u>					
4. <u>http</u>	<u>s://youtu.be/qaYBUz14B3w</u>	•				
Course	Course 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]				
core	Discuss various synthetic drugs, gaseous anaesthetics, chemotherapy and its	[Un to K2]				
CO2:	uses					
<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:

<b>Course Outcomes</b>	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		
<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				
	INTRODUCTION TO THE DIFFERENT SYSTEMS OF						
	MEDICINE						
	Different systems of medicine: Ayurveda, Siddha, Homeopathy and						
	Allopathy – History of medicinal chemistry – discovery of drugs –						
	Introduction. Analgesics and Antipyretics – Narcotic analgesics –		Chalk,				
Ι	Morphine and derivatives. Total synthetic analgesics pethidine and	06	Talk & Power				
	methadone. Antipyretic analgesics – salicylic acid derivatives, Indole		point				
	derivatives and p-amino phenol derivatives (Medicinal uses and						
	structure only). Antibiotics - Definition, Penicillin - Tetracycline						
	(Auromycin & Terramycin) –Streptomycin and Chloromycetin – drug						
	action and uses.						
	ANAESTHETICS						
	Gaseous anaesthetics – Vinyl ether – Cyclopropane – Halo						
II	hydrocarbons – Chloroform – Haloethane– Trichloro ethylene –	06	Talk & Power				
	Intravenous anaesthetics – Thiopentone – Local anaesthetics – Cocaine	point					
	and its derivatives. (Therapeutic use only)						
	ANTIBIOTICS AND ANTIMALARIALS		Chalk				
тт	Sulpha drugs – Sulphadiazine, prontosil and prontosil-S. Antimalarials –	06	Talk &				
111	quinine and its derivatives. Arsenical drugs - Salvarsan - 606 -	00	Power				
	Neosalvarsan.		ροπι				
	SYNTHETIC DRUGS						
	Synthetic drugs and its therapeutic function of paracetamol – Aspirin –						
	naproxen – Amoxyllin – ciprofloxacin – Ibuprofen.	0.6	Chalk, Talk &				
IV	Visit to an Industry and submission of Report. For industrial visit /	06	Power				
	Assignment = 5 marks internal) Contact District Industrial Centre (DIC		point				
	for visits)						
	HORMONES AND VITAMINS		Chalk,				
V	Definition and Classification Testosterone, Progesterone, Thyroxine,	06	Talk &				
	Vitamin C, Structure only (Structural elucidation not necessary)		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											
Course Code	21UCHC61	L	Р	С							
Category	Core	6	-	6							
Nature of cours	NURS	HIP	$\checkmark$								
Course Objectives:											
Category       Core       6       -       6         Nature of course:       EMPLOYABILITY       ✓ SKILL ORIENTED       ENTREPRENURSHIP       ✓         Course Objectives:       -       -       6       .       6       -       6											
dilution law –	Debye Huckel-Onsagar's equation for strong electrolytes (eleme	ntary (	reati	nent							
only) – Definit conductivity m	ion of transport number – determination by Hittorfs method - easurements- determination of solubility products of sparingly s	- Appl oluble	icatio salts	on of and							
conductometrie	c titrations – HCl Vs NaOH, CH <sub>3</sub> COOH Vs NaOH.										
Unit: V EL	ECTROCHEMISTRY – 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 Hours 90 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. https://youtu.be/BECSYfYhJGk
- 4. https://youtu.be/fM8hwkW8bIw
- 5. <u>https://youtu.be/tJj-ilJTo6Y</u>
- 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]				
CO3:	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:

<b>Course Outcomes</b>	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		
<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

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
II	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		point
	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,		
	CH3COOH Vs NaOH.		
	ELECTROCHEMISTRY – II		
	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		Chalk,
V	of electrodes - reference electrode (SHE, Calomel electrode, Ag-AgCl	18	Talk &
	electrode) Potentiometric titrations – HCl Vs NaOH and $K_2 Cr_2 O_7 \ Vs$		point
	FeSO <sub>4</sub> .		
	b) Commercial cells: Primary and secondary batteries - dry cell - lead		
	storage cell – fuel cell – Hydrogen-Oxygen fuel cell		

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 K -No. of. K – Level Que Questions Level stio ns **CO1** Up to K2 2 K1 & K2 K1 2 (K2&K2) 1(K2) 1 CI **CO2** Up to K3 2 K1 & K2 2 K2 2(K2 & K3) AI 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 1 2 5 10 question Total Marks for 4 6 10 20 each section

Volume VI – Science Syllabus / 2023 - 2024

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		
СІА	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.

Summative Examination – Blue Print Articulation Mapping – K Level with Course									
			MCOs		Short Answers		Section C		
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 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	f Question	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	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	
	Questions)	Questions)				choice)	
K1	5	4	-	-	9	7.5	22
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
NP: Higher level of norfermance 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 (Multiple Choice Questions)							
Answer All Questions(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 (She	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					
NB: Hi	gher le	vel of perf	ormance 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)							
Q.No		K Level	Questions				
21	COI	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 🖌 ENTREPREM	NURS	SHIP	$\checkmark$				
Course Objecti	ves:							
To learn	• 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>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> 2. Organic Preparation <ol> <li>Nitration             <ol> <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> <li>Acetylation : (a) Amine (b) phenols</li> </ol></li></ol>								
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 **Gravimetric Estimation (30 Marks) Organic preparation (10 Marks)** Procedure 2 Marks Procedure - 10 Marks Crude sample 6 Marks Estimation - 20 Marks Recrystallised sample -2 Marks Less than 2 % Error – 20 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, 4<sup>th</sup> 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 Relate and classify between gravimetric analysis and organic preparation [Up to K2] CO1: 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:

<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	

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 CHEMISTRY PRACTICAL – V (ORGANIC ANALYSIS AND ESTIMATION)								
Course Code	21UCHCP	1UCHCP5						C
Category	Core					-	3	5
Nature of cours	se: EMPLOY	ABILITY	<b>SKILL</b>	ORIENTED	✓ ENTREPH	RENURS	SHIP	✓
Course Object	ives:				· · ·			
To learn	the analysis	of an organic	compoun	d containing or	ne or two funct	ional gro	oups.	
• To analy	ze the conce	pt of confirma	ation of th	e prepared one	or two function	nal orga	nic	
compour	nds	futurel en:	السم مسط حا					
• To study	estimation c	rious function	line and g	lucose	nounde			
To under     To inter	nret organic a	analysis and e	stimation	of organic com	nounds			
Lis	t of Experim	ients	Stilliation	or organic con	ip o un us			
I. Organic Ana	lysis							
<ul> <li>by the p compound and nucl</li> <li>II. ORGANIC</li> <li>1. Estimati</li> <li>2. Estimati</li> <li>3. Estimati</li> </ul>	<ul> <li>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> <li>II. ORGANIC ESTIMATION <ol> <li>Estimation of phenol</li> <li>Estimation of aniline</li> <li>Estimation of glucose</li> </ol> </li> </ul>							
		Distributi	ion of Ma	<b>rks</b> (Max. mar	ks – 100)			
		Duratio	on of exam	ination: 6 hrs				
Regular Test in	the Class	: 30 Marks						
Observation not	te book	: 10 Marks						
Total		• 40 Marks						
Totur								
Organic estima	Organic estimation (30 Marks) Organic analysis (30 Marks)							
Record Note- 10 marksViva VoceProcedure- 5 marksPreliminary reactionEstimation- 15 marksElements presentLess than 3% Error – 15 MarksAliphatic or aromatic3-4% Error – 13 MarksSaturated / Unsaturated					action ent romatic saturated	- 10 ma - 2 mar - 4 mar - 3 mar - 3 mar	arks ks ks ks ks	

		Volume VI – Science Syllabus / 2	023 - 2024	
	4-5% Error – 10 Marks	Functional group - 6 i	narks	
	Greater than 5% - 8 Marks Derivative - 2 m			
		Total Lecture H	ours 45 Hrs	
Books	for Reference:			
1. Th	omas. A.O and Mani, Textbook of	of Practical Chemistry, 4 <sup>th</sup> Revised Editi	on, Scientific	
Pι	iblication, 1976.			
2. N.S	S. Gnana pragasam and G. Raman	nurthy, Organic Chemistry Lab Manual,	Viswanath. S.	
Printer	rs & Publishers Pvt. Ltd., 2010, Cher	nnai.		
Web R	lesources:			
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	lent will be able to		
CO1.	Relate and classify between organic	c analysis and estimation of organic	[Up to K2]	
COI.	compounds			
<b>CO2</b> :	Estimate the phenol, aniline and glu	lcose	[Up to K3]	
<b>CO3</b> :	Analyze the one or two functional	groups of organic compounds	[Up to K3]	
CO4:	Interpret the organic analysis and e	stimation of organic compounds	[Up to K4]	
CO5:	Distinguish between analysis and e of organic compounds	stimation of one or two functional groups	[Up to K4]	

## CO & PO Mapping:

Course Outcomes	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	
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
Ι	<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							
<b>Course Code</b>	210	1UCHPR1					С		
Category	Pro	Project				-	4		
Nature of cour	se:	EMPLOYABILITY	SKILL ORIENTED	ENTREPI	RENU	JRSH	HIP		

#### **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		)	
Pr	resentation		
Su	ıbmission	}	40
<b>External</b> F	Project Report Viva Voce	}	60
_			

**Total - 100** 

COUR	COURSE OUTCOMES						
On the successful completion of the course , the students will be able to							
<b>CO1:</b>	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	K3					
CO4:	survey	КJ					
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	PO 1	<b>PO 2</b>	<b>PO 3</b>	PO 4	<b>PO 5</b>	PO 6
CO 1	2	2	2	2	1	3
CO 2	1	2	2	1	2	3
CO 3	2	2	2	2	2	1
<b>CO 4</b>	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	ves:									
• To Recall th	To Recall the water treatment and quality analysis of water									
To Rememb	er 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	andards prescribed for Water Quality by WHO and other Indian st	andar	ds –	Sea						
Water as a sour	rce of Drinking Water – Electro dialysis method and Reverse osmos	sis me	ethod	for						
purifications of	water. Sewage Treatment: Municipal Waste Water - Sewage Treatm	nent –	Aero	obic						
and Anaerobic p	process – Miscellaneous Method of Sewage Treatment									
Unit: II INS	SECTICIDES, PESTICIDES AND PREPARATION OF CHEMIC	CALS	15							
Insecticides and	Pesticides: Definition – Classification – Inorganic pesticides: lead	arsena	ite, P	aris						
green, lime, sul	phur, hydrocyanic acid – Organic pesticides, natural, synthetic (DDT,	, Gam	maxe	ene)						
– Fungicides – r	epellants.									
Unit: III MA	ATCH AND SILICATE INDUSTRY		15							
Match Industry	: Pyrotechnics and explosives – Raw materials needed for materials	ch in	dustr	у —						
Manufacturing	process – Pyrotechniques – Coloured smokes. Silicate Industry: Cem	ient C	ilass	and						
Ceramics, Raw	materials and manufacture of Cement, Glass and Ceramics.		1.5							
Unit: IV PE	TROCHEMICALS AND LACQUER PAINT	6	15	1						
Petrochemicals:	Elementary study – Definition – Origin – Composition – Chemical	s from	n nat	ural						
gas, Petroleum,	Light Naphtha and Kerosene – Synthetic Gasoline. Paints and lacque	rs: Pi	gmen	ts –						
Paints – Ingredi	ents in Paints – Manufacture – Lacquers – Varnisnes.		15							
Unit: V FE	KTILIZEKS	ام مر ا	13	i a a l						
Definition – nu	ficial for plants – role of various elements in plants growth – natural	and (	chem	ical						
fortilizor fortiliz	or industry in India	mura	te-m	xeu						
	Ci industry in india. Total Lastura Ha		75 U	rc						
I otal Lecture Hours 75 Hrs										
DOORS TOT STUDY:										
1. Sharma. B.K, Industrial Chemistry including Chemical Engineering, Goel Publishing House – 13 <sup>th</sup> Revised and enlarged Edition, 2009, New Delhi.										
Books for References:										
1. Srilakshmi.	B, Food Science, 3rd Edition, New Age International Pvt. Ltd., Publi	shers,	2002	2.						
2. Jayashree C	Shosh, Fundamental concepts of Applied Chemistry, S. Chand & C	o., Pu	blish	ers,						
1998.										
3. Thanlamma	Jacob, Text Books of Applied Chemistry for Home Science and A	llied S	Scien	ces,						

Macmi	illan, 2000.			
Web F	Resources:			
1. <u>htt</u>	os://youtu.be/FY7z9ymxXFQ			
2. <u>htt</u>	os://youtu.be/cLZ_PQhOnDY			
Course Outcomes K Level				
On th	e completion of the course the student will be able to			
CO1.	Define insecticides, pesticides, petrochemicals and fertilizers and discuss	[Un to K2]		
COI.	their classification.			
CO2	Determine water quality, raw materials needed for match and silicate	[Un to K3]		
CO2.	industries.			
CO3.	Distinguish between water and sewage treatment and chemicals used between	[Un to K3]		
005:	petrochemicals and paints and lacquers.			
<b>CO4:</b>	Interpret the preparation of domestically useful chemical products.	[Up to K4]		
<b>CO5</b> :	Integrate the method of sewage treatment and fertilizer industries in India.	[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
	WATER AND SEWAGE TREATMENT		
Ι	Water Treatment: Water Quality Analysis - Chemical and Physical		
	Analysis of water - Quality Parameters - Standards prescribed for Water		Chalk, Talk &
	Quality by WHO and other Indian standards – Sea Water as a source of		
	Drinking Water - Electro dialysis method and Reverse osmosis method	15	Power
	for purifications of water. Sewage Treatment: Municipal Waste Water -		point
	Sewage Treatment – Aerobic and Anaerobic process – Miscellaneous		
	Method of Sewage Treatment		
	INSECTICIDES, PESTICIDES AND PREPARATION OF		
	CHEMICALS		
	Insecticides and Pesticides: Definition - Classification - Inorganic		Chalk, Talk &
II	pesticides: lead arsenate, Paris green, lime, sulphur, hydrocyanic acid -	15	Power
	Organic pesticides, natural, synthetic (DDT, Gammaxene) - Fungicides		point
	– repellants.		
	MATCH AND SILICATE INDUSTRY		
	Match Industry: Pyrotechnics and explosives - Raw materials needed		Chalk,
III	for match industry – Manufacturing process – Pyrotechniques –	15	Talk &
	Coloured smokes. Silicate Industry: Cement Glass and Ceramics, Raw	point	
	materials and manufacture of Cement, Glass and Ceramics.		
	PETROCHEMICALS AND LACQUER PAINT		
	Petrochemicals: Elementary study – Definition – Origin – Composition		Chalk,
IV	- Chemicals from natural gas, Petroleum, Light Naphtha and Kerosene -	15	Talk & Power
	Synthetic Gasoline. Paints and lacquers: Pigments – Paints – Ingredients		point
	in Paints – Manufacture – Lacquers – Varnishes.		
	FERTILIZERS		
	Definition - nutrients for plants - role of various elements in plants		Chalk,
V	growth - natural and chemical fertilizers-classification of chemical	15	Talk &
	fertilizers urea, super phosphate and potassium nitrate-mixed fertilizer-		point
	fertilizer industry in India.		

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)											
		K Level	Section A		Secti Short A	ion B	Section C	Section				
Inte rnal	Cos		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 CIA I & II		No. of Questions to be answered	4		3		2	1				
		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.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)										
			MCQ	)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)	(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	Question	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 d <mark>enotes, a</mark> u	estions 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	22				
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	iltiple 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 (She	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	
NB: Hi	gher le	vel of perf	ormance of the students is to be assessed by attempting higher
level of	K leve	ls	
Section	D (Op	en Choice	
Answe	r Any 'l	l'hree ques	tions (3x10=30 marks)
Q.No	CO	K Level	Questions
21	COI	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 SOIL AND AGRICULTURE CHEMISTRY					
Course Code	21UCHE62	L	Р	С	
Category	CORE ELECTIVE	5	-	5	
Nature of cours	e: EMPLOYABILITY 🗸 SKILL ORIENTED 🖌 ENTREPREN	URSI	HIP	$\checkmark$	
Course Object	ves:				
To Realize	he volume and composition of soil and its importance on agriculture				
To Rememb	er the properties of soil				
• To Discuss	he various types of micronutrients needed to the soil				
To Analyze	the chemical composition of biofertilizer and soil				
To Formula	te the methods of analyzing the soil and applying the fertilizers.				
Unit: I SO	IL COMPONENTS		15		
Definition - vol	ime, composition - uses - mineral soil - chemical ions - soil colloids -	imp	ortan	ce -	
nature - proper	ies of inorganic and organic soil colloid - general characteristics - p	orope	rties	and	
importance - typ	es - silicate clays - silicates - silicon oxygen tetrahedron.				
Unit: II SO	IL SALINITY AND ALKALINITY		15		
Saline and alka	ine soil - nature - classification - characteristics - formation of saline	e and	alka	line	
soil - effects - c	uality of irrigation water: introduction - criteria - irrigation water reso	ource	s - W	ater	
quality - classif	cation of water.				
Unit: III AN	ALYSIS OF SOIL		15		
i) Estimation of	Ca, Mg, K and nitrate				
11) Analysis of s	oluble salt.				
111) Analysis of	NPK in fertilizer.				
iv) Determination	on of soil pH and electrical conductivity.				
v) Estimation of	organic matter content of soil.		1.5		
Unit: IV VE	RMICOMPOSITING		15	C	
vermicomposti	ig: Economic implications - materials - preliminary treatment	- t	ypes	0I ·	
vermicompostin	g - requirements for vermicomposting. Eco-Friendly Farming Sys	stem:	orga	inic	
Imite V DI	<u>51 – Options.</u>		15		
Diefertilizeret	JERTILIZERS	t otre	13		
bioterunizers.	boni blota in sustainable agriculture - blourversity - management	onnli		3 - 1	
fertilizer in sol	d form - liquid fertilizer - nitrogenous fertilizer - types - nhosphat	appin tic fe	rtiliz	ere.	
forms - classific	ation- notassic fertilizers: Potassium sulphate: production - properties		TUIIZ	<b>CIS</b> .	
	Total Lecture Hou	Irs	75 H	rs	
Books for Stud	v:	115	///	15	
		•	0.6		
1. Shivanand T	blanur, Soil Chemistry, International Book Distributing Co., 1st edition	n, 20	06.		
(Unit I and I	Jundhook of Soil Fortilizer and Manue Acartics (India) and the		110		
2. P.K.Gupta, A	r manufolds of Soff, Fertilizer and Manure, Agrophos (India), 2 $r$ edition	on, 20	12.		
3 A K Mani	τν R Santhi and M Sellamuthu Δ Handbook of Laboratory Analysis ΔΙ	F			
Publication	N. Sanun and M. Senamuthu, A Handbook of Laboratory Analysis, Ar Coimbatore 2007 (Unit V	•ئـــ			
i ublicatioli,					

#### **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:

- 1. https://youtu.be/iaQjEDYyWKw
- 2. https://youtu.be/brKftIwoPjw
- 3. <u>https://youtu.be/xEvo9udghgw</u>
- 4. <u>https://youtu.be/oJCBVfr3Mxw</u> Course Outcomes

K	[ evel

On the	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 K2]						
CO2:	Discuss the soil salinity and alkalinity and formation of saline and alkaline soil	[Up to K3]						
CO3:	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	<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			
	SOIL COMPONENTS					
	Definition - volume, composition - uses - mineral soil - chemical ions -		Chalk,			
Ι	soil colloids - importance - nature - properties of inorganic and organic	15	Talk & Power			
	soil colloid - general characteristics - properties and importance - types -		point			
	silicate clays - silicates - silicon oxygen tetrahedron.					
	SOIL SALINITY AND ALKALINITY					
	Saline and alkaline soil - nature - classification - characteristics -		Chalk,			
II	formation of saline and alkaline soil - effects - quality of irrigation	15	Talk & Power			
	water: introduction - criteria - irrigation water resources - water quality -		point			
	classification of water.					
	ANALYSIS OF SOIL					
	i) Estimation of Ca, Mg, K and nitrate	15	~ ~			
	ii) Analysis of soluble salt.		Chalk, Talk & Power point			
	iii) Analysis of NPK in fertilizer.					
	iv) Determination of soil pH and electrical conductivity.					
	v) Estimation of organic matter content of soil.					
	VERMICOMPOSTING					
	Vermicomposting: Economic implications - materials - preliminary		Chalk,			
IV	treatment - types of vermicomposting - requirements for	15	Talk &			
	vermicomposting. Eco-Friendly Farming System: organic farming -		point			
	concept – options					
	BIOFERTILIZERS					
	Biofertilizers: Soil biota in sustainable agriculture - biodiversity -					
	management strategies - comparison of chemical fertilizer and		Chalk,			
V	biofertilizer. Methods of applying fertilizers - application of fertilizer in	15	Talk &			
	solid form - liquid fertilizer - nitrogenous fertilizer - types - phosphatic	ogenous fertilizer - types - phosphatic				
	fertilizers: forms - classification- potassic fertilizers: Potassium sulphate:					
	production – properties.					

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

	Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print											
		Articulation N	Section A		Section B		(COS) Section C	Section				
Inte rnal	Cos	K Level	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	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 CIA I & II		No. of Questions to be answered	4		3		2	1				
		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											
		Section A	Section B	Section C	Section		% of					
	K	(Multiple	(Short	(Either /	D	Total	(Marks	Consolidate				
	Level	Choice	Answer	Or	(Open	Marks	without	of %				
		Questions)	Questions)	Choice)	Choice)		choice)					
	K1	2	2	-	-	4	8					
СІА	K2	2	4	10	10	26	52	60				
	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)											
	CO		MCQs		Short Answers		Section C	Section D			
C N		K - Level	No. of	IZ.		IZ	Section C	Section D			
S.No	COs		Question	<b>N</b> –	No. of	К –	(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	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 Questi	ions to be	10		5		5	2			
answered		red	10		5		5	5			
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 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	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 (Multiple Choice Questions)								
Answei	Answer All Questions (10x1=10 mark							
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						
NB: Hi	gher le	vel of perf	ormance of the students is to be assessed by attempting higher					
level of	K leve	ls						
Section	D (Op	en Choice						
Answei	Answer Any Three questions(3x10=30 marks)							
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	URSI	HIP	$\checkmark$					
Course Objecti	ves:			I						
• To Recall th	e knowledge of fuel sources and its types									
• To Remember the types of solid fuels and its advantages and disadvantages										
• To Compare the knowledge of solid, liquid, gaseous and bio fuels										
• To Perform	• To Perform the petroleum and petrochemical fuels and its refining process									
To Determin	ne the manufacture of fuels and catalysts used in pet	roleum industry								
Unit: I EN	ERGY SOURCES			15						
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										
Unit: II SO	LID FUELS			15						
Natural - artificial - industrial solid fuels - Coal: formation - properties - classification - coking - non										
coking and pulv ultimate - advar	verisation of coal - role of sulphur and ash in coal ntages and disadvantages of solid fuels - fractional	- analysis of coal: distillation of co	prox al tar	imate - use	and es of					
coal tar-based cl	hemicals.									
Unit: III LIQ	OUID FUELS			15						
Petroleum and fractions - crack unleaded petrol petrochemicals	petrochemicals - refining of petroleum - compositions reference - catalytic cracking - advantages - or l - cetane rating - antidiesel knock agents - l - direct and indirect petrochemicals - catalysts used	ion and uses of r ctane rating - anti hydrocarbons from in petroleum indu	nain j knoc n pet stry.	petrol k age troleu	leum nts - im -					
Unit: IV GA	SEOUS FUELS	1		15						
Classification: producer gas - generation-adva	natural - artificial gaseous fuels - examples and semi water gas - LPG - manufacture - composition ntages and disadvantages.	l their importance on and uses - gob	e - w ar gas	vater 8 - bi	gas- ogas					
Unit: V BIC	) FUELS			15						
Definition - sou manufacture of	rces and classification: biodiesel - bioethanol - hy biodiesel - advantages of biofuels.	drogen fuel from	biom	ass -	uses					
	r	Fotal Lecture Ho	urs	75 H	rs					
Books for Stud	y:		I							
<ol> <li>B.K. Sharma, Industrial Chemistry, Goel Publishing House, 13th Edition, 2002.</li> <li>P.C. Jain &amp; Jain, Engineering Chemistry, Dhanpat Rai Publishing Company (P) LTD, 16th Edition, 2015.</li> </ol>										
Books for References:										
3. Andrey Gort June 2013, India	patovskiy, Fuel Chemistry and Technology, LAMB	ERT Academic Pu	blishi	ng, 6	th					

Web R	Web Resources:							
1. <u>http</u>	1. https://en.m.wikipedia.org/wiki/Biofuels							
2. <u>http</u>	2. https://www.studentenergy.org/topics/biofuels							
Course Outcomes K								
On the completion of the course the student will be able to								
<b>CO1:</b>	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]						
<b>CO5:</b>	Distinguish between pure substance and mixtures, various types of catalysts.	[Up to K4]						

# CO & PO Mapping:

<b>Course Outcomes</b>	Programme Outcomes (POs)								
(COs)	PO 1	<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			
<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
п	<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	<b>LIQUID FUELS</b> 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	<b>GASEOUS FUELS</b> 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

	Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)										
			Section A		Sec	tion B		Section			
Inte	~		MC	Qs	Short	Answers	Section C	D			
rnal	Cos	K Level	No. of. Questions	K – Level	No. of. Questi ons	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			
Question Pattern CIA I & II		No. of Questions to be answered	4		3		2	1			
		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 (Multip Level Choice Question		KSection ASection BK(Multiple(ShortLevelChoiceAnswerQuestions)Questions)		Section C (Either / Or Choice)	Section D Total (Open Marks Choice)		% of (Marks without choice)	Consolidate of %			
	K1	2	2	-	-	4	8					
СІА	K2	2	4	10	10	26	52	60				
	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.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)										
			MCQs		Short Answers		Section C			
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	f Question	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 sl	ould 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	22				
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	Section A (Multiple Choice Questions)					
Answer All Questions			(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 (She	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				
NB: Hi	gher le	vel of perf	ormance of the students is to be assessed by attempting higher			
level of	K leve	ls				
Section	D (Op	en Choice				
Answe	r Any 'l	l'hree ques	tions (3x10=30 marks)			
Q.No	CO	K Level	Questions			
21	COI	K2				
22	CO2	K3				
23	CO3	K3				
24	CO4	K4				
25	CO5	К4				

# **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	21UCHE64		L	Р	С			
Category	CORE ELECTIVE	CORE ELECTIVE						
Nature of cours	e: EMPLOYABILITY 🗸 SKILL ORIENTED 🖌	ENTREPREN	URSI	HIP	✓			
Course Objecti	ives:			I				
• To Understa	and the basic concept of nanomaterials and its types.							
• To Identify	the nanoparticles and its synthetic methods of nanomat	terials						
• To Analyze	the classical colloid theory of nanomaterials							
• To Perform	the optical characterization methods on prepared nano	materials						
To Determin	ne the application of nanomaterials and its environmen	tal safety measu	ires					
Unit: I IN	<b>FRODUCTION TO NANOCHEMISTRY</b>			15				
Nanomaterials	- Definition - Bulk materials and Nanochemi	stry; Basics N	anom	ateria	als -			
Types(0D,1D,2]	D,3D), compositions, and structures (nanowire, nan-	o rod, nanosph	ere, 1	nanoc	ube,			
nanoparticle)- I	properties of nanomaterials-Optical, mechanical, ma	agnetic,electrica	l and	the	rmal			
properties-Bond	ling in nanostructures (Graphene, fullerene, carbon nan	notubes).		15				
Unit: II NA	NOPARTICLES AND SYNTHESIS	portialas Dagis						
Tondown on	areach Rall milling Rottom up Chemical vanou	r deposition (C)	; syi	Chor	18 -			
reduction Sol g	el method. Microwaya and Sonochemical method	ii deposition (C	vD),	Cliel	incar			
Unit: III CA	PRON METAL AND METAL OXIDE NANOMA	TEDIALS		15				
Carbon based m	aterials: Preparation, properties and uses-carbon panot	tube (CNT) Gra	nhen		rhon			
black. Metal na	nomaterials: preparation, properties and uses of Au.	Mo nanopartic	les a	o, cu nd Ti	$O_2$ -			
nanomaterial.								
Unit: IV CH	ARACTERIZATION OF NANOSTRUCTURED N	MATERIALS		15				
Structural chara	cterization: Ultraviolet-Visible and DRS, Fourier Tra	nsform Infrared	Spec	trosc	opy,			
X-ray diffi	action, Scanning electron microscope (SEI	M), Transmiss	sion	elec	etron			
miscroscope(TE	EM). Nanomechanical Characterization – Thermogravit	metry analysis (	TGA	).				
Unit: V AP	PLICATIONS OF NANOMATERIALS			15				
Applications	of nanomaterials- Electronics, Biosen	nsors, Medio	cine	, So	olar			
cells, Wate	r treatment, Food, Fabric Industries,	Automobile	s, (	cera	mic			
industry, Ba	tteries and Fuel cells.							
	Tot	tal Lecture Hou	irs /	75 H	rs			
<b>Books for Stud</b>	y:							
1. M. A. Shah	, Tokeer Ahmad, Principles of Nanoscience and Nanot	echnology, Nar	osa P	ublisl	ning			
group, 2010	), ISBN-978-81-8487-072-5.							
2. N. Arumuga	am, Nanotechnology, Saras publication, 1 <sup>st</sup> edition, 201	16, ISBN-978-9	3-848	326-9	5-6.			
<b>Books for Refe</b>	rences:							
1. Charles P.	Poole, Frank. J. Owens, Introduction to nanotechn	ology, Wiley I	ndia					
Pvt.Ltd, 20	)19 reprint. ISBN-978-81-265-1099-3.							
2. M. A. Sha	ah and Tokeer Ahmad, Principles of Nanosci	ence and Nat	notec	hnol	ogy,			

Na	arosaPublishing House, 2nd Reprint, 2013.				
Web F	Resources:				
1. http	os://youtu.be/BLNwNkdRiTI				
2. http	ps://youtu.be/LbVg58LfvJc				
3. http	ps://youtu.be/evE08ycZfnM				
4. http	os://youtu.be/41zegz4APPs				
Course	Course Outcomes K Level				
On th	e completion of the course the student will be able to				
CO1:	Define nanomaterials and its types of nanomaterials	[Up to K2]			
<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]			
CO4:	Interpret the optical characterization of prepared nanomaterials	[Up to K4]			
CO5:	Distinguish the application of nanomaterials	[Up to K4]			

## CO & PO Mapping:

<b>Course Outcomes</b>	Programme Outcomes (POs)								
(COs)	<b>PO 1</b>	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 PL	AN

Unit	Course Name	Hrs	Pedagogy
Ι	Nanomaterials – Definition – Bulk materials and Nanochemistry; Basics Nanomaterials -Types(0D,1D,2D,3D), compositions, and structures (nanowire, nano rod, nanosphere, nanocube, nanoparticle)- properties of nanomaterials-Optical, mechanical, magnetic, electrical and thermal properties-Bonding in nanostructures (Graphene, fullerene, carbon nanotubes)	15	Chalk, Talk & Power point
П	Metal and semiconductor nanocrystals, Porous inorganic nanoparticles. Basic synthesis - Topdown approach-Ball milling, Bottom up- Chemical vapour deposition (CVD), Chemical reduction, Sol gel method- Microwave and Sonochemical method.	15	Chalk, Talk & Power point
III	Carbon based materials: Preparation, properties and uses-carbon nanotube (CNT), Graphene, Carbon black. Metal nanomaterials: preparation ,properties and uses of Au, Mo nanoparticles and $TiO_2$ - nanomaterial.	15	Chalk, Talk & Power point
IV	Structural characterization: Ultraviolet-Visible and DRS, Fourier Transform Infrared Spectroscopy, X-ray diffraction, Scanning electron microscope (SEM), Transmission electron miscroscope(TEM). Nanomechanical Characterization – Thermogravimetry analysis (TGA).	15	Chalk, Talk & Power point
V	Applications of nanomaterials- Electronics, Biosensors, Medicine, Solar cells, Water treatment, Food, Fabric Industries, Automobiles, ceramic industry, Batteries and Fuel cells.	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 rnal Co			Secti	ion A	Secti Short A	on B	Section C	Section		
	Cos	K Level	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	<b>CO4</b>	Up to K4	2	K1 & K2	2	K2 & K2	2 (K3&K3)	1(K4)		
Question Pattern		No. of Questions to be asked	4		3		4	2		
		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)	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		
Π	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.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)									
S.No		K - Level	MCQs		Short Answers		Section C	Section	
	COs		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	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 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 as	ked with	the given K le	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	22				
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	Section A (Multiple Choice Questions)					
Answer All Questions			(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 (She	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				
NB: Hi	gher le	vel of perf	ormance of the students is to be assessed by attempting higher			
level of	K leve	ls				
Section	D (Op	en Choice				
Answe	r Any 'l	l'hree ques	tions (3x10=30 marks)			
Q.No	CO	K Level	Questions			
21	COI	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 🖌 ENTREPRI	NURS	HIP	$\checkmark$						
Course Objectives:										
• To Recall the definitions of health, sterilization of surgical instrument and biochemical analysis.										
• To Rememb	er the concept of drugs and learn the manufacture of common drug	5.								
To Compare	the enzymes and its classification.									
• To Perform	the concept of blood volume, blood group and coagulation of blood	. 1	1							
• To Determin	the knowledge on heredity and recombinant DNA and its possible	e hazar	$\frac{1S}{15}$							
Definition of he	alth Sterilization of surgical instruments disinfectants antisenti	e and 9	13 Sanita	tion						
Biochemical and	alvsis of urine, serum and fecal matter. Treatment for specific pois	ons-aci	ls, all	calis.						
arsenic and mer	cury compounds.		, all	<b></b> ,						
Unit: II CO	MMON TESTING OF DRUGS		15							
Manufacture of	drugs (e.g. quinine, reserpine, atopside and d – tubocurarine) from	Indian	medi	cinal						
plants. Testing	of drugs: biological variation - screening and toxicity - Use of J	harmac	opeia	and						
therapeutic inde	x - Types of drugs and their modes of action – Depressant drugs	(special	refer	rence						
to sedatives and	d hypnotics) – Anticonvulsant drugs (sodium valproate, hydant	oins) –	Acti	ng at						
spinal cord alo	ne (glyceryl guaiacolate, diazepam). Cardiovascular drugs-nitrat	es, beta	ı blo	ckers						
(propranolol and	1 atenolol) and calcium channel blockers.		1.5							
Classification	ZYMES		15 [oobo	niam						
of enzyme action	n and Immobilization of enzymes. Applications of enzymes	AIP, N	iecha	msm						
Unit: IV BO	DY FLUID		15							
Blood volume.	blood groups, coagulation of blood. Plasma lipoproteins.	Blood	pres	ssure						
Arteriosclerosis	, diseases affecting red cells: Hyperchromic and hypochromi	anem	ia. B	lood						
transfusion. Blo	od sugar and diabetes.									
Unit: V BIC	DTECHNOLOGY		15							
Heredity, recor	nbinant DNA, Genetic engineering and its possible hazards	Gene	spli	cing,						
manufacture of	interferon and human insulin (Humulin), Drug manufacture based	l on fer	ment	ation						
(only antibiotics		_ T								
	Total Lecture I	lours	75 H	rs						
<b>Books for Stud</b>	y:									
1. Jayashree G	hosh, A Textbook of Pharmaceutical Chemistry, S. Chand & Co., N	lew Del	hi, 19	999.						
2. Rastogi. S.C	C, Biochemistry, Tata McGraw Hill Publishing Co., 1993.									
3. Ashutosh Ka	ar, Medicinal Chemistry, Wiley Eastern Ltd., 1993, New Delhi.									
BOOKS for Refe	rences: Natural and Symthetic Organic Medicinal Company to Estation 107	<u>.</u>								
1. Le Koy, $\mathbf{U}$ , $\mathbf{U}$	Natural and Synthetic Organic Medicinal Compounds, Ealemi, $197$ Hawk's Physiological Chemistry $14^{th}$ Edition. Tata McGraw 44	). 1 Duhl:	hing	Co						
2.0501, D.L, 1	nawk s rhystological Chennishy, 14 Eulitoli, 1ata McGraw Hl	I FUOIIS	sinng	C0.,						
1905.										

3. Kle	einer, O and Martin, J. Biochemistry, Prentice-Hall of India, 1974, New Delhi,				
Web R	Aesources:				
1. http	os://youtu.be/IUxkcEoGkVg				
2. http	ps://youtu.be/pss_sm2zaek				
3. http	os://youtu.be/Z63xnlDNajE				
4. http	os://youtu.be/qaYBUz14B3w				
Course	Course Outcomes     K Level				
On th	e completion of the course the student will be able to				
<b>CO1:</b>	Remember the basic definitions of clinical hygiene and biochemical analysis.	[Up to K2]			
cor.	Discuss the manufacture of common drugs from medicinal plants and type of	[Un to K3]			
C02.	drugs.				
CO3:	Interpret the knowledge of enzymes and its classification	[Up to K3]			
CO4	Examine the properties of blood volume, blood group and coagulation of	[]In to K/]			
CO4.	blood.				
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>	<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			
<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

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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
ш	<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

	Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)								
			Sectio	Section A		ion B		Sectio	
Inte rnal Cos K Level		K Level	MC No. of. Questions	Qs K – Level	Short A No. of. Question S	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		
Question Pattern CIA I & II		No. of Questions to be answered	4		3		2	1	
		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 to be Asked			10		5		10	5
No.of Questions to be		10		5		5	3	
answered		10		5		5	5	
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	22	
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 (Multiple Choice Questions)						
Answe	er All Q	Questions	(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				
NB: Hi	gher le	vel of perf	ormance of the students is to be assessed by attempting higher			
level of	K leve	ls				
Section	D (Op	en Choice	)			
Answei	r Any J	Three ques	tions (3x10=30 marks)			
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	APPLIED ELECTROCHEMISTRY											
Course Code	Course Code 21UCHE66 L P C											
Category	CORE ELECTIVE		5	-	5							
Nature of cours	e: EMPLOYABILITY 🗸 SKILL ORIENTED	✓ ENTREPREN	URS	HIP	$\checkmark$							
Course 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 f	inishing										
To Determin	the electrochemical properties on corrosion scient	nce		1.1.7								
Unit: I EL	ECTROMOTIVE FORCE			15								
EMF and Equi	librium constant (K) of a cell reaction - Nernst	equation - conce	ntrati	on ce	ells -							
electrode conc	entration cells without transference - electrol	yte concentration	cells	s wit	thout							
transference - c	concentration cells with transference - liquid junc	tion potential (EL	JP), e	electr	olyte							
concentrations c	cells with salt bridge - application of EMF measure	ments.										
Unit II FL	ECTROLVTES ELECTRODES AND ENERG	V CONSERVATI	ON	15								
Electrolytes –	Determination of activity coefficients of electro	vte - determination	$\frac{0}{0}$ of	tran	sport							
number - detern	ningtion of pH of a solution using hydrogen electronic	ode quine hydron	e elec	etrode	and							
glass electrode	- potentiometric titrations Energy Conservation n	rincipals of energy	cons	ervat	ion -							
electrochemical	energy conservation - thermodynamic reversibility	- Gibb's equation										
Unit: III EL	CTROPLATING AND FUEL CELLS			15								
Electroplating –	definition – factors affecting electroplating – con	nponents of electro	platir	ig pro	ocess							
– working prod	cess of electroplating – basic applications of el	ectroplating – poo	ket r	olates	and							
sintered plates -	vented and sealed maintenance free designs – fue	el cells -introductio	n, typ	bes of	fuel							
cells, advantage	s - photo electrochemical cells.		• -									
Unit: IV EN	DUSTRIAL METAL FINISHING			15								
Introduction - o	objectives of electroplating - characteristics of el	ectrodeposit and f	actors	- cc	opper							
electroplating -	alkaline and acid bath - chromium electroplating -	zinc electroplating	- gol	d plat	ing -							
anodizing and e	lectroforming.											
Unit: V CO	RROSION SCIENCE			15								
Introduction - ty	ypes of corrosion - theories of corrosion - mechan	ism of corrosion -	dry c	orros	ion -							
electrochemical	corrosion - types - passivity - factors influencing	rate of corrosion -	nature	e of n	netal,							
environment - j	phorbaix diagram - corrosion control techniques	- inhibitors - cath	odic	prote	ction							
methods - corro	sion monitoring techniques.											
		Total Lecture Ho	urs	75 H	rs							
<b>Books for Stud</b>	y:											
1. B.R. Puri, L.	1. B.R. Puri, L.R. Sharma, Madan. S Pathaniya and B.S. Lark, Graduate of physical Chemistry											
2. Bard & Faulk	visital Fuolishing Co.	Applications, Seco	nd ed	ition								
Books for Refe	rences:	rprications, 5000	110 00									

Academic Council Meeting Held On 20.04.2023

- 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

Course	Course Outcomes					
On the completion of the course the student will be able to						
CO1:	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]				
CO3:	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:

<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			
<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>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)												
			Secti	ion A	Secti	on B		Section					
Inte	Con	V Il	MO	CQs	Short A	nswers	Section C	D					
rnal <sup>Co</sup>	Cos	K Levei	No. of. Question s	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 & 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)					
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2					
		No. of Questions to be answered	4		3		2	1					
		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.

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 / 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	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 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,	questions s	hould be ask	ed with th	e 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	22					
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)
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 (She	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	
NB: Hi	gher le	vel of perf	ormance of the students is to be assessed by attempting higher
level of	K leve	ls	
Section	D (Op	en Choice	
Answe	r Any '	l'hree ques	tions (3x10=30 marks)
Q.No	CO	K Level	Questions
21	COI	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	

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

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

Course Name	POLYMER CHEMISTRY									
Course Code	L	Р	С							
Category	SKILL	2	-	2						
Nature of cours	e: EMPLOYABILITY 🗸 SKILL ORIENTED 🖌 ENTREPREN	URS	HIP	✓						
Course Objecti	ves:									
To Recall the concept of polymerization and its classification and stereochemistry										
• To Remember the types of polymerizations and its techniques										
To Compare	e the glass transition temperature and its associated properties									
To Determin	ne the molecular weight methods of polymers									
To Analyze	the polymers and its degradation									
Unit: I BA	SIC CONCEPT OF POLYMERS		06							
Definition – Pol	lymerization - Monomer - Repeat unit - degree of polymerization - C	lassif	icatio	n of						
polymers -Ster	eochemistry of polymer - Nomenclature of stereo regular poly	mers	- C	hain						
polymerization,	free radical polymerization - Ionic polymerization.									
Unit: II TY	PES OF POLYMERIZATIONS		06							
Different Types	of Polymerizations - Coordination polymerization - Ziegler Natta ca	talyst	And	Co-						
Polymerization	-Random, Alternate, Block and Graft Polymerization. Polymerizati	on te	chniq	ues;						
bulk, solution, s	uspension and emulsion polymerization.									
Unit: III GL	ASS TRANSITION TEMPERATURE	••	06	1						
Glass transition	temperature and its associated properties- i) Mechanical Properti	es 11)		rmal						
Stability- 111)	Flame Resistance IV) Chemical Resistance V) Degradability	V1)	Elect	rical						
Unit: IV DE	TEDMINATION OF MOLECULAD WEIGHT METHODS		06							
Molecular Weig	the of Polymers Number Average and Weight Average Molecular W	aight	Meth	ode						
Number Average	and of Polymens-Number Average and weight Average Molecular w	ergin	wieth	ous.						
Weight Average	Molecular Weight Methods-1. Light scattering 2. Ultra-centrifugation	n								
Unit. V TV	PES OF POLYMERS AND POLYMER DEGRADATION	11	06							
Synthetic resins	and plastics - Manufacture and applications of polyethylene PVC	' Tef	lon	nolv						
styrene, polyme	thylmethacrylate, poly urethane, phenol – formaldehyde resins, urea-	$\cdot$ form	aldel	ivde						
resins and epoxy	v polymers.	10111								
î .	Total Lecture Ho	urs	30 H	rs						
Books for Stud	y:									
1. R.V. Gowari	ker, Polymer Science, New Age International Publication, 2006.									
<b>Books for Refe</b>	rences:									
1. R.J. Young a	nd P.A. Powell, Introduction to Polymers, 3rd Edition, CRC Press, 19	91.								
2. A. Ravve, Pr	inciples of Polymer Chemistry, 3rd Edition, Springer, New York, 201	2.								
3. Fred W. Bill	meyer, Textbook of Polymer Science, 3rd Edition, John Wiley & Son	s, 200	7.							
Web Resources	S:									
1. https://yout	ı.be/jSNlmOwpxYg									
2. https://youtu	a.be/d8GMePE18SA									
				_						

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3. <u>http</u> 4. <u>http</u> 5. <u>http</u> 6. <u>http</u> 7. <u>http</u>	os://youtu.be/2KDPGQ4Gg_0 os://youtu.be/IagyR3ayOPA os://youtu.be/xacD9zJCqZ4 os://youtu.be/f7550UvWnLg os://youtu.be/OPJAvbF6xMs				
Course	Course Outcomes K Level				
On th	On the 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]			
<b>CO4:</b>	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:

<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
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	DETERMINATION OF MOLECULAR WEIGHT METHODS 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