



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

<b>Course Name</b>	<b>ALLIED CHEMISTRY – I</b>				
<b>Course Code</b>	<b>21UCHA31</b>	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	<b>ALLIED</b>	4	-	4	
<b>Nature of course:</b>	EMPLOYABILITY	<b>SKILL ORIENTED</b>	✓	ENTREPRENEURSHIP	
<b>Course Objectives:</b>					
The objective of this course is					
<ul style="list-style-type: none"> <li>• To make the students to understand the concepts behind the properties of various elements.</li> <li>• To enable the learners to determine the structure of various molecules.</li> <li>• To envision the students on various types interactions and reactions in compounds.</li> <li>• To highlight the importance of basic organic reactions.</li> <li>• To make learn about the bonding in molecules.</li> </ul>					
<b>Unit: I</b>	<b>Periodic Table and Atomic Properties</b>				<b>12</b>
Modern periodic table – salient features –Periodicity- Periodic properties – Causes of recurrence of properties- classification of elements as s, p, d and f-block elements – definitions of atomic volume ,atomic and ionic radii, ionization potential, electron affinity and electronegativity and their variations along periods and groups – variation of metallic characters - Factors affecting the periodic properties- Periodic table anomalies.					
<b>Unit: II</b>	<b>Chemical Bonding</b>				<b>12</b>
Ionic bond- Covalent bond- Fajan’s rule- V.B. Theory – Postulates of V.B Theory – Application to the formation of simple molecules like H <sub>2</sub> and O <sub>2</sub> – overlap of atomic orbitals – VSEPR theory- s-s, p-p and s-p overlap – principle of hybridization – sp, sp <sup>2</sup> and sp <sup>3</sup> hybridization – examples and geometry. Molecular orbital theory –MO diagram of H <sub>2</sub> , He <sub>2</sub> , N <sub>2</sub> , O <sub>2</sub> & F <sub>2</sub> molecules.					
<b>Unit: III</b>	<b>Organic Compounds- Detection, Estimation and Isomerism</b>				<b>12</b>
Empirical formula – molecular formula – structural formula – calculation of empirical formula and molecular formula from percentage composition - Detection of nitrogen and halogens in organic compounds –Nomenclature of straight chain – mono and poly functional organic compounds. Inductive effect, mesomeric effect, resonance effect and hyper conjugation. Stereoisomerism – Chiral centre, optical activity of compounds containing one or two chiral centres, R–S notation – diastereoisomerism – racemisation – resolution- Geometrical isomerism of Maleic and Fumaric acids – E–Z notation of geometrical isomers.					
<b>Unit: IV</b>	<b>Thermodynamics</b>				<b>12</b>
Importance of thermodynamics – terms used in thermodynamics – open and closed systems, state functions and path functions, extensive and intensive properties, reversible and irreversible processes- Statement and mathematical form of first law of thermodynamics – heat capacity at constant volume and pressure, relation between Cp and Cv. Statement of second law of thermodynamics – entropy - entropy as a thermodynamic function – dependence of entropy on variables of the system (T and P alone)- Physical significance of entropy – Gibb’s free energy and its significance.					
<b>Unit: V</b>	<b>Electrolytes and Electrochemistry</b>				<b>12</b>
Arrhenius theory of electrolytes – strong electrolytes – weak electrolytes – Ostwald’s dilution law and its applications – ionic product of water and its application - solubility product. pH – definition – simple calculation of pH from molarity of acids and bases – buffer solution –					

definition – theory of buffer action- application- Acid –base indicators – working range of indicators – choice of indicators. Commercial cells – primary and secondary cells – Weston cadmium cell – Lead storage cell – Electroplating - applications.	
<b>Total Lecture Hours</b>	<b>60 Hrs</b>
<b>Books for Study:</b>	
<ol style="list-style-type: none"> <li>1. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry Mile Stone Publisher 31<sup>st</sup> Edition, New Delhi.</li> <li>2. P.L. Soni, Text Book of Organic Chemistry, New Delhi.</li> </ol>	
<b>Books for References:</b>	
<ol style="list-style-type: none"> <li>1. R.D. Madan, S Chand, Modern Inorganic Chemistry band Co-Ltd., New Delhi.</li> <li>2. J.D. Lee, Wiley India, Concise Inorganic Chemistry 5<sup>th</sup> Edition, New Delhi.</li> <li>3. B.S Bahl and Arun Bahl S. Chand, Advanced Organic Chemistry.</li> <li>4. B. Mehta and M. Mehta, Organic Chemistry E.E. Edition, New Delhi.</li> <li>5. P.L. Soni and HM Chawla, Organic Chemistry 29<sup>th</sup> Edition, Sultan and Chand sons, New Delhi.</li> </ol>	
<b>Web Resources:</b>	
<a href="https://nptel.ac.in/courses/104/103/104103071/">https://nptel.ac.in/courses/104/103/104103071/</a> <a href="https://nptel.ac.in/courses/104/101/104101121/">https://nptel.ac.in/courses/104/101/104101121/</a>	
<b>Course Outcomes</b>	<b>K Level</b>
<b>CO1:</b> Outline the concepts behind the properties of all the elements.	<b>K2</b>
<b>CO2:</b> Describe the structure of many types of molecules.	<b>K2</b>
<b>CO3:</b> Interpret numerous types of interactions in compounds.	<b>K3</b>
<b>CO4:</b> Compare and contrast different types of reactions.	<b>K4</b>
<b>CO5:</b> Demonstrate various types of properties of molecules.	<b>K3</b>

**CO & PO Mapping:**

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

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

**LESSON PLAN**

Unit	Course Name	Hrs	Pedagogy
I	Modern periodic table – salient features –Periodicity- Periodic properties – Causes of recurrence of properties- classification of elements as s, p, d and f-block elements	3	Chalk & talk
	Variation of atomic volume ,atomic and ionic radii, ionization potential, electron affinity and electronegativity along period and groups – variation of metallic characters <b>Self Study Topic:</b> Factors affecting the periodic properties-Periodic table anomalies..	9	Chalk & talk , Ppt,
II	Ionic bond- Covalent bond- Fajan’s rule- V.B. Theory – Postulates of V.B Theory – Application to the formation of simple molecules like H <sub>2</sub> and O <sub>2</sub> – overlap of atomic orbitals – VSEPR theory	6	Chalk & talk, videos
	s-s, p-p and s-p overlap – principle of hybridization – sp, sp <sup>2</sup> and sp <sup>3</sup> hybridization – examples and geometry. Molecular orbital theory –MO diagram of H <sub>2</sub> , He <sub>2</sub> , N <sub>2</sub> , O <sub>2</sub> & F <sub>2</sub> molecules.	6	Chalk & talk
III	Empirical formula – molecular formula – structural formula – calculation of empirical formula and molecular formula from percentage composition - Detection of nitrogen and halogens in organic compounds –Nomenclature of straight chain – mono and poly functional organic compounds. Inductive effect, mesomeric effect, resonance effect and hyper conjugation. Stereoisomerism – Chiral centre, optical activity of compounds containing one or two chiral centres, R–S notation – diastereoisomerism – racemisation – resolution-- E–Z notation of geometrical isomers. <b>Self Study topic:</b> Geometrical isomerism of Maleic and Fumaric acids	12	Ppt, Chalk & talk
IV	Importance of thermodynamics – terms used in thermodynamics – open and closed systems, state functions and path functions, extensive and intensive properties, reversible and irreversible processes- Statement and mathematical form of first law of thermodynamics – heat capacity at constant volume and pressure, relation between Cp and Cv.	6	video, Chalk & talk,
	Statement of second law of thermodynamics – entropy - entropy as a thermodynamic function – dependence of entropy on variables of the system (T and P alone)- Physical significance of entropy – Gibb’s free energy and its significance.	6	Ppt, video, demonstration with models
V	Arrhenius theory of electrolytes – strong electrolytes – weak electrolytes – Ostwald’s dilution law and its applications – ionic product of water and its application - solubility product. pH – definition – simple calculation of pH from molarity of acids and bases – buffer solution – definition – theory of buffer action- application- Acid –base indicators – working range of indicators – choice of indicators. Commercial cells – primary and secondary cells – Weston cadmium cell – Lead storage cell – Electroplating - applications.	12	Assignments and Seminar

Course Designed by: **Ms. N. Lakshmi Kruthika**, Assistant Professor of Chemistry

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CIA	CO1	K2	2	K1,K2	2	K1,K2	2	2
	CO2	K2	2	K1,K2	1	K2	2	1
CIA II	CO3	K3	2	K1,K2	1	K2	2	2
	CO4	K4	2	K1,K2	2	K3,K4	2	1
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 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 %
CIA I	K1	2	2	10	10	24	40	100
	K2	2	4	10	20	36	60	
	K3							
	K4							
	Marks	4	6	20	30	60	100	100
CIA II	K1	2				2	3	2
	K2	2	2			4	6	3
	K3		2	10	20	32	53	27
	K4		2	10	10	22	33	18
	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)								
S. No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K2	2	K1, K2	1	K1	2 (K1&K1)	1 (K2)
2	CO2	Upto K2	2	K1, K2	1	K2	2 (K2&K2)	1 (K2)
3	CO3	Upto K3	2	K1, K2	1	K2	2 (K3&K3)	1 (K3)
4	CO4	Upto K4	2	K1, K2	1	K3	2 (K3&K3)	1 (K4)
5	CO5	Upto K3	2	K1, K2	1	K2	2 (K2&K2)	1(K3)
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
<b>(Figures in parenthesis denotes, questions should be asked with the given K level)</b>								

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	2	10		17	14.66	<b>57</b>
K2	5	6	20	20	51	42.5	
K3		2	20	20	42	35	<b>35</b>
K4				10	10	8.33	<b>8</b>
Marks	10	10	50	50	120	100	<b>100</b>
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.</b>							

### Summative Examinations - Question Paper – Format

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



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

<b>Course Name</b>	<b>ALLIED CHEMISTRY – II</b>				
<b>Course Code</b>	<b>21UCHA41</b>	<b>L</b>	<b>P</b>	<b>C</b>	
<b>Category</b>	<b>ALLIED</b>	4	-	3	
<b>Nature of course:</b>	EMPLOYABILITY	<b>SKILL ORIENTED</b>	✓	ENTREPRENEURSHIP	
<b>Course Objectives:</b>					
The Objective of the course is					
<ul style="list-style-type: none"> <li>• To make students learn about the feasibility and rate of reactions occurring in all three mediums.</li> <li>• To make learners understand the electrochemical, catalytic and thermodynamic transformations.</li> <li>• To impart knowledge on various chemical processes and their applications in daily life.</li> <li>• To educate the students on significance of physical chemistry.</li> <li>• To enhance the knowledge on many day to day applications of chemistry.</li> </ul>					
<b>Unit: I</b>	<b>Coordination Compounds</b>				<b>12</b>
Coordination compounds –Coordination complexes and complex ions- Coordination number – ligands- Werner’s theory –Nomenclature- Effective Atomic Number (EAN) –Factors affecting stability of complex ion- isomerism of coordination complexes- VB theory and crystal field theories of octahedral, tetrahedral and square planar complexes- magnetic properties. Chelation and its industrial applications.					
<b>Unit: II</b>	<b>ORGANIC REACTIONS</b>				<b>12</b>
Nucleophiles – Electrophiles: definition- types and examples - specific reactions involving these species - Substitution reactions- Mechanism of aliphatic substitution $S_N1$ , $S_N2$ illustration with examples – differences; Addition reactions – Markonikov’s and anti- Markonikov’s rule; Elimination reactions- Saytzeff and Hoffmann rule; rearrangement and polymerization reactions.					
<b>Unit: III</b>	<b>Reaction Kinetics</b>				<b>12</b>
<p><b>Adsorption:</b> Definition – differences between adsorption and absorption – adsorbate, adsorbent – types of adsorption – factors influencing adsorption- Adsorption isotherm – Langmuir isotherm (no derivation statement only) – adsorption of gases on solid surface.</p> <p><b>Catalysis:</b> Definition – characteristics - types – acid- base catalysis – surface catalysed reactions – definition and examples – auto catalyst – catalytic poisoning – promoters- Enzyme catalysis enzyme catalysis.</p> <p><b>Chemical Kinetics:</b> Reaction rate –order and molecularity of a reaction – zero order – first order. First order rate equation and half-life period – derivation-units- Examples of first order reactions – second order reactions – Carbon dating.</p>					
<b>Unit: IV</b>	<b>Polymers</b>				<b>12</b>
<p>Definition – Classification of polymers – properties of polymers – addition and condensation polymerization reactions with examples – natural rubber – isoprene unit –vulcanization of rubber- preparation and applications of polystyrene, urea – formaldehyde resin, Teflon and buna – S - rubber.</p> <p>Amino Acids and Proteins, Classification, Synthesis, properties of amino acids- Polypeptides, Proteins- structure- Classification and biological functions.</p>					

<b>Unit: V</b>	<b>Photochemistry</b>	<b>12</b>
<p>Comparison of thermal and photochemical reactions – definition of photochemical reactions – laws of photochemistry – Grotthus-Draper law- Quantum efficiency – reasons for low and high quantum yields with examples.</p> <p>Consequences of light absorption by atoms and molecules- Jablonski diagram – fluorescence – phosphorescence – photosensitization- chemiluminescence–bioluminescence- Applications of photochemistry.</p>		
		<b>Total Lecture Hours</b>
		<b>60 Hrs</b>
<b>Books for Study:</b>		
<ol style="list-style-type: none"> <li>1. Arun Bahl, B.S Bahl &amp; G.D. Tuli, Essentials of Physical Chemistry, S.Chand and Co, New Delhi, 2014.</li> <li>2. B.R. Puri, L.R. Sharma and S.Pathania, Principles of Physical Chemistry, Shoban Lal Nagin chand and Co, 47<sup>th</sup> edition, 2017.</li> </ol>		
<b>Books for References:</b>		
<ol style="list-style-type: none"> <li>1. Polymer Science, Vasant R. Gowariker, N. V. Viswanathan, Jayadev Sreedhar, New Age International, 1986.</li> <li>2. P.W. Atkins, Physical Chemistry, 7<sup>th</sup> edition, Oxford university press, 2001.</li> </ol>		
<b>Web Resources:</b>		
<a href="https://nptel.ac.in/courses/104/106/104106107/">https://nptel.ac.in/courses/104/106/104106107/</a>		
<b>Course Outcomes</b>		<b>K Level</b>
<b>CO1:</b>	Describe the feasibility and rate of reactions occurring in solids, solutions and gases.	<b>K2</b>
<b>CO2:</b>	Explain the electrochemical, catalytic and thermodynamic transformations and can illustrate their scope to wider areas.	<b>K2</b>
<b>CO3:</b>	Interpret various chemical processes taking place in all the three phases.	<b>K3</b>
<b>CO4:</b>	Analyze the significances of various compounds in daily life.	<b>K4</b>
<b>CO5:</b>	Implement the applications of physical chemistry	<b>K3</b>

**CO & PO Mapping:**

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

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



**LESSON PLAN**

Unit	Course Name	Hrs	Pedagogy
I	Coordination compounds –Coordination complexes and complex ions- Coordination number – ligands- Werner’s theory – Nomenclature- Effective Atomic Number (EAN) –Factors affecting stability of complex ion- isomerism of coordination complexes	6	Chalk & talk
	VB theory and crystal field theories of octahedral, tetrahedral and square planar complexes- magnetic properties. Chelation and its industrial applications.	6	Chalk & talk, powerpoint
II	Nucleophiles – Electrophiles: definition- types and examples - specific reactions involving these species - Substitution reactions- Mechanism of aliphatic substitution $S_N1$ , $S_N2$ illustration with examples – differences; Addition reactions – Markonikov’s and anti- Markonikov’s rule; Elimination reactions- Saytzeff and Hoffmann rule; rearrangement and polymerization reactions.	12	Chalk & talk
III	Adsorption: Definition – differences between adsorption and absorption – adsorbate, adsorbent – types of adsorption – factors influencing adsorption- Adsorption isotherm – Langmuir isotherm (no derivation statement only) – adsorption of gases on solid surface.	4	Chalk & talk
	Catalysis: Definition – characteristics - types – acid- base catalysis – surface catalysed reactions – definition and examples – auto catalyst – catalytic poisoning – promoters- Enzyme catalysis enzyme catalysis Michaelis and Menton mechanism – Line weaver-Burk plot – Significance of $K_m$ .	4	Chalk & talk, ppt, videos
	Chemical Kinetics: Reaction rate –order and molecularity of a reaction – zero order – first order. First order rate equation and half-life period – derivation-units- Examples of first order reactions – second order reactions – <b>Self study Topic:</b> Carbon dating.	4	Chalk & talk
IV	Definition – Classification of polymers – properties of polymers – addition and condensation polymerization reactions with examples – natural rubber – isoprene unit –vulcanization of rubber- preparation and applications of polystyrene, urea – formaldehyde resin, Teflon and buna – S - rubber.	12	Chalk & talk, ppt
V	Comparison of thermal and photochemical reactions – definition of photochemical reactions – laws of photochemistry – Grothius-Draper law- Quantum efficiency – reasons for low and high quantum yields with examples. Consequences of light absorption by atoms and molecules- Jablonski diagram – fluorescence – phosphorescence – photosensitization- chemiluminescence–bioluminescence- Applications of photochemistry.	12	Assignments and Seminar

Course Designed by: **Ms. N. Lakshmi Kruthika**, Assistant Professor of Chemistry

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CIA	CO1	K2	2	K1, K2	2	K1,K2	2	2
	CO2	K2	2	K1,K2	1	K2	2	1
CIA II	CO3	K3	2	K1,K2	1	K2	2	2
	CO4	K4	2	K1,K2	2	K3,K4	2	1
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 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 %
CIA I	K1	2	2	10	10	24	40	100
	K2	2	4	10	20	36	60	
	K3							
	K4							
	Marks	<b>4</b>	<b>6</b>	<b>20</b>	<b>30</b>	<b>60</b>	<b>100</b>	<b>100</b>
CIA II	K1	2				2	3.33	10
	K2	2	2			4	6.66	
	K3		2	10	20	32	53.33	53
	K4		2	10	10	22	36.66	37
	Marks	<b>4</b>	<b>6</b>	<b>20</b>	<b>30</b>	<b>60</b>	<b>100</b>	<b>100</b>

**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	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Upto K2	2	K1, K2	1	K1	2 (K1&K1)	1 (K2)
2	CO2	Upto K2	2	K1, K2	1	K2	2 (K2&K2)	1 (K2)
3	CO3	Upto K3	2	K1, K2	1	K2	2 (K3&K3)	1 (K3)
4	CO4	Upto K4	2	K1, K2	1	K3	2 (K3&K3)	1 (K4)
5	CO5	Upto K3	2	K1, K2	1	K2	2 (K2&K2)	1(K3)
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
<b>(Figures in parenthesis denotes, questions should be asked with the given K level)</b>								

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	2	10		17	11.66	<b>54</b>
K2	5	6	20	20	51	42.5	
K3		2	20	20	42	35	<b>35</b>
K4				10	10	8.33	<b>8</b>
Marks	<b>10</b>	<b>10</b>	<b>50</b>	<b>50</b>	<b>120</b>	<b>100</b>	<b>100</b>
<b>NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.</b>							

**Summative Examinations - Question Paper – Format**

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



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

<b>Course Name</b>	<b>ALLIED CHEMISTRY PRACTICAL</b>			
<b>Course Code</b>	<b>21UCHAP1</b>	<b>L</b>	<b>P</b>	<b>C</b>
<b>Category</b>	<b>ALLIED</b>	<b>-</b>	<b>2</b>	<b>1</b>
<b>Nature of course:</b>	EMPLOYABILITY	<b>SKILL ORIENTED</b>	✓	ENTREPRENURSHIP
<b>COURSE OBJECTIVES:</b>				
The objective of this course is to make students obtain skill in				
<ol style="list-style-type: none"> <li>1. Titrimetric analysis.</li> <li>2. Quantitative estimation of substances.</li> <li>3. Reproducible results.</li> <li>4. Identification of the functional groups present in organic molecules.</li> <li>5. Qualitative analysis of organic compounds.</li> </ol>				
<b>Part - I</b>	<b>VOLUMETRIC ANALYSIS</b> <b>1. Estimation of Sodium Hydroxide</b> ( $\text{Na}_2\text{CO}_3 \times \text{HCl} \times \text{NaOH}$ ) <b>2. Estimation of Hydrochloric Acid</b> ( $\text{H}_2\text{C}_2\text{O}_4 \times \text{NaOH} \times \text{HCl}$ ) <b>3. Estimation of Oxalic Acid</b> ( $\text{FeSO}_4 \times \text{KMnO}_4 \times \text{H}_2\text{C}_2\text{O}_4$ ) <b>4. Estimation of FAS</b> ( $\text{FeSO}_4 \times \text{KMnO}_4 \times \text{FAS}$ ) <b>5. Estimation of Ferrous Sulphate</b> ( $\text{H}_2\text{C}_2\text{O}_4 \times \text{KMnO}_4 \times \text{FeSO}_4$ ) <b>6. Estimation of <math>\text{KMnO}_4</math></b> ( $\text{K}_2\text{Cr}_2\text{O}_7 \times \text{FAS} \times \text{KMnO}_4$ ) <b>7. Estimation of Sodium Hydroxide</b> ( $\text{KMnO}_4 \times \text{H}_2\text{C}_2\text{O}_4 \times \text{NaOH}$ ) <b>8. Estimation of Iodine</b> ( $\text{KMnO}_4 \times \text{Thio} \times \text{Iodine}$ )			<b>30</b>
<b>Part - II</b>	<b>SYSTEMATIC ORGANIC QUALITATIVE ANALYSIS</b> A study of reactions of the following organic compounds: <ol style="list-style-type: none"> <li>1. Carbohydrate</li> <li>2. Amide</li> <li>3. Aldehyde</li> <li>4. Ketone</li> <li>5. Monocarboxylic acid</li> <li>6. Dicarboxylic acid</li> <li>7. Amine</li> <li>8. Phenol</li> <li>9. Nitro compound</li> </ol> The students may be trained to perform the specific reaction like test for element (nitrogen only), Aliphatic or aromatic, saturated or unsaturated, colour reaction, functional group present and record their observation.			<b>30</b>

		<b>Total Practical Hours</b>	<b>60</b>
<b>Books for Study: Material Given</b>			
<b>Book for Reference:</b>			
1. Practical Chemistry , Dr. O.P Pandey, D. N Bajpai, Dr. S. Giri, S Chand & Co Ltd			
<b>COURSE OUTCOME</b>			<b>K Level</b>
After completion of this course, the students will be able to			
<b>CO1:</b>	Develop skill in titrimetric analysis.		<b>K1</b>
<b>CO2:</b>	Interpret the redox reactions.		<b>K2</b>
<b>CO3:</b>	identify the functional groups present		<b>K3</b>
<b>CO4:</b>	distinguish properties of functional groups of same element		<b>K4</b>
<b>CO5:</b>	defend their results using confirmatory test		<b>K4</b>

**CO & PO Mapping:**

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

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

**LESSON PLAN**

<b>Unit</b>	<b>SUBJECT NAME</b>	<b>Hrs</b>	<b>Mode</b>
Part - I	Volumetric analysis	30	Practical – lab experiments practical
Part - II	Systematic organic Analysis	30	

Course Designed by: **Ms. N. Lakshmi Kruthika**, Assistant Professor of Chemistry