

**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS),****MADURAI – 625 004****B.SC PHYSICS CURRICULUM***(For the students admitted from the academic year 2023-2024 onwards)*

Course Code	Title of the Course	Hrs	Credits	Maximum Marks		
				Int	Ext	Total
THIRD SEMESTER						
Part – I	Tamil / Alternative course					
23UTAGT31	தமிழக வரலாறும் பண்பாடும்	6	3	25	75	100
Part – II	English					
23UENGE31	GENERAL ENGLISH - III	6	3	25	75	100
Part - III	Core courses					
23UPHCC31	GENERAL MECHANICS AND CLASSICAL MECHANICS	5	5	25	75	100
23UPHCP31	PHYSICS PRACTICAL 3	3	3	25	75	100
Part - III	Elective / Allied courses					
23UCHEA31	CHEMISTRY FOR PHYSICAL SCIENCES - I	4	3	25	75	100
23UCHEP31	CHEMISTRY FOR PHYSICAL SCIENCES PRACTICAL - 1	2	2	25	75	100
Part - IV	Skill Based courses					
23UPHSC31	COMMUNICATION PHYSICS	1	1	25	75	100
23UPHSC32	MEDICAL INSTRUMENTATION	2	2	25	75	100
Part - IV	Mandatory course					
23UEVSG41	ENVIRONMENTAL STUDIES	1	-	-	-	-
Total		30	22	200	600	800
FOURTH SEMESTER						
Part – I	Tamil / Alternative course					
23UTAGT41	தமிழும் அறிவியலும்	6	3	25	75	100
Part – II	English					
23UENGE41	GENERAL ENGLISH - IV	6	3	25	75	100
Part - III	Core courses					
23UPHCC41	OPTICS AND SPECTROSCOPY	5	5	25	75	100
23UPHCP41	PHYSICS PRACTICAL 4	3	3	25	75	100
Part - III	Elective Allied courses					
23UCHEA41	CHEMISTRY FOR PHYSICAL SCIENCES -II	4	3	25	75	100
23UCHEP41	CHEMISTRY FOR PHYSICAL SCIENCES PRACTICAL - II	2	2	25	75	100
Part - IV	Skill Based courses					
23UPHSC41	MATERIALS SCIENCE	2	2	25	75	100
23UPHSC42	LASERS AND FIBER OPTICS	1	1	25	75	100
Part - IV	Mandatory course					
23UEVSG41	ENVIRONMENTAL STUDIES	1	2	25	75	100
Total		30	24	225	675	900

**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)****RESEARCH CENTRE OF PHYSICS****FOR THOSE WHO JOINED IN 2023-2024 AND AFTER**

<b>Course Name</b>	CHEMISTRY FOR PHYSICAL SCIENCES - I			
<b>Course Code</b>	23UCHEA31	<b>L</b>	<b>P</b>	<b>C</b>
<b>Category</b>	GENERIC ELECTIVE	<b>4</b>	<b>-</b>	<b>3</b>

**COURSE OBJECTIVES:****This course aims to provide knowledge on the**

- basics of atomic orbitals, chemical bonds, hybridization
- concepts of thermodynamics and its applications.
- concepts of nuclear chemistry
- importance of chemical industries
- Qualitative and analytical methods.

<b>UNIT - I Chemical Bonding and Nuclear Chemistry</b>	<b>12</b>
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Chemical Bonding: Molecular Orbital Theory-bonding, antibonding and non-bonding orbitals. Molecular orbital diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties.

Nuclear Chemistry: Fundamental particles - Isotopes, Isobars, Isotones and Isomers-Differences between chemical reactions and nuclear reactions - group displacement law. Nuclear binding energy - mass defect - calculations. Nuclear fission and nuclear fusion - differences – Stellar energy. Applications of radioisotopes – carbon dating and medicinal applications.

<b>UNIT - II Industrial Chemistry</b>	<b>12</b>
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Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas, producer gas, CNG, LPG and oil gas (manufacturing details not required). Silicones: Synthesis, properties and uses of silicones. Fertilizers: Urea, ammonium sulphate, potassium nitrate, NPK fertilizer, superphosphate, triple Superphosphate.

<b>UNIT - III Fundamental Concepts in Organic Chemistry</b>	<b>12</b>
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Hybridization: Orbital overlap, hybridization and geometry of CH<sub>4</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>2</sub> and C<sub>6</sub>H<sub>6</sub>. Electronic effects: Inductive effect and consequences on K<sub>a</sub> and K<sub>b</sub> of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric- examples.

Reaction mechanisms: Types of reactions–aromaticity (Huckel's rule) – aromatic electrophilic substitution; nitration, halogenation, Friedel- Craft's alkylation and acylation. Heterocyclic compounds: Preparation, properties of pyrrole and pyridine.

**UNIT - IV Thermodynamics and Phase Equilibria****12**

Thermodynamics: Types of systems, reversible and irreversible processes, isothermal and adiabatic processes and spontaneous processes. Statements of first law and second law of thermodynamics. Carnot's cycle and efficiency of heat engine. Entropy and its significance. Free energy change and its importance (no derivation).

Conditions for spontaneity in terms of entropy and Gibbs free energy. Relationship between Gibbs free energy and entropy.

Phase Equilibria: Phase rule - definition of terms in it. Applications of phase rule to water system. Two component system - Reduced phase rule and its application to a simple eutectic system (Pb-Ag).

**UNIT - V Analytical Chemistry****12**

Introduction to qualitative and quantitative analysis. Principles of volumetric analysis. Separation and Purification techniques – extraction, distillation and crystallization.

Chromatography: principle and application of column, paper and thin layer chromatography.

**Total Lecture Hours****60****BOOKS FOR STUDY:**

- V.Veeraiyan, Text book of Ancillary Chemistry; High mount publishing house, Chennai, first edition, 2009.
- S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006.
- S.ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, NewDelhi, twenty third edition, 2012.
- P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.

**BOOKS FOR REFERENCES:**

- P.L.Soni, MohanKaty, Textbook of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007.
- B.R.Puri, L.R.Sharma, M.S.Pathania, TextbookPhysical Chemistry; Vishal Publishing Co., New Delhi, forty seventh edition, 2018.
- B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.

**WEB RESOURCES:**

- ❖ <https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-cy36/>
- ❖ [https://onlinecourses.nptel.ac.in/noc23\\_me76/preview](https://onlinecourses.nptel.ac.in/noc23_me76/preview)
- ❖ [https://onlinecourses.nptel.ac.in/noc20\\_cy18/preview](https://onlinecourses.nptel.ac.in/noc20_cy18/preview)

Nature of Course	EMPLOYABILITY	✓	SKILL ORIENTED		ENTREPRENEURSHIP	
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL	✓ GLOBAL
Changes Made in the Course	Percentage of Change	✓	No Changes Made		New Course	
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.						

COURSE OUTCOMES:								K LEVEL
After studying this course, the students will be able to:								
CO1	gain in-depth knowledge about the theories of chemical bonding, nuclear reactions and its applications.							K1 to K4
CO2	evaluate the efficiencies and uses of various fuels and fertilizers							K1 to K4
CO3	explain the type of hybridization, electronic effect and mechanism involved in the organic reactions.							K1 to K4
CO4	apply various thermodynamic principles, systems and phase rule.							K1 to K4
CO5	explain various methods to identify an appropriate method for the separation of chemical components							K1 to K4
MAPPING WITH PROGRAM OUTCOMES:								
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	S	S	S	S	S	S	S	M
CO2	M	S	S	S	M	S	S	M
CO3	S	S	S	M	S	S	S	M
CO4	S	S	S	S	S	S	S	M
CO5	S	M	S	S	S	S	S	M
S- STRONG			M – MEDIUM			L – LOW		
CO / PO MAPPING:								
COS		PSO1	PSO2	PSO3		PSO4	PSO5	
CO 1		3	3	3		3	3	
CO 2		3	3	3		3	3	
CO 3		3	3	3		3	3	
CO 4		3	3	3		3	3	
CO 5		3	3	3		3	3	
WEIGHTAGE		15	15	15		15	15	
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS		3.0	3.0	3.0		3.0	3.0	

**LESSON PLAN:**

UNIT	Chemistry For Physical Sciences - I	HRS	PEDAGOGY
I	Chemical Bonding: Molecular Orbital Theory-bonding, antibonding and non-bonding orbitals. Molecular orbital diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties.	6	Chalk & talk, ppt
I	Nuclear Chemistry: Fundamental particles - Isotopes, Isobars, Isotones and Isomers-Differences between chemical reactions and nuclear reactions - group displacement law. Nuclear binding energy - mass defect - calculations. Nuclear fission and nuclear fusion - differences – Stellar energy. Applications of radioisotopes – carbon dating and medicinal applications.	6	Chalk & talk, ppt
II	Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas, producer gas, CNG, LPG and oil gas (manufacturing details not required). Silicones: Synthesis, properties and uses of silicones.	6	Chalk & talk, ppt
II	Fertilizers: Urea, ammonium sulphate, potassium nitrate, NPK fertilizer, superphosphate, triple Superphosphate.	6	Chalk & talk, ppt
III	Hybridization: Orbital overlap, hybridization and geometry of CH <sub>4</sub> , C <sub>2</sub> H <sub>4</sub> , C <sub>2</sub> H <sub>2</sub> and C <sub>6</sub> H <sub>6</sub> . Electronic effects: Inductive effect and consequences on K <sub>a</sub> and K <sub>b</sub> of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric- examples.	6	Chalk & talk, ppt
III	Reaction mechanisms: Types of reactions–aromaticity (Huckel's rule) – aromatic electrophilic substitution; nitration, halogenation, Friedel-Craft's alkylation and acylation. Heterocyclic compounds: Preparation, properties of pyrrole and pyridine.	6	Chalk & talk, ppt
IV	Thermodynamics: Types of systems, reversible and irreversible processes, isothermal and adiabatic processes and spontaneous processes. Statements of first law and second law of thermodynamics. Carnot's cycle and efficiency of heat engine. Entropy and its significance. Free energy change and its importance (no derivation). Conditions for spontaneity in terms of entropy and Gibbs free energy. Relationship between Gibbs free energy and entropy.	6	Chalk & talk, ppt
IV	Phase Equilibria: Phase rule - definition of terms in it. Applications of phase rule to water system. Two component system - Reduced phase rule and its application to a simple eutectic system (Pb-Ag).	6	Chalk & talk, ppt
V	Introduction to qualitative and quantitative analysis. Principles of volumetric analysis. Separation and Purification techniques – extraction, distillation and crystallization. Chromatography: principle and application of column, paper and thin layer chromatography.	12	Chalk & talk, ppt

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 Either or Choice	Section C Either or Choice
			MCQs			
			No. of Questions	K - Level		
CI AI	CO1	K1 – K4	2	K1	2 (K2,K2)	2(K3,K3)
	CO2	K1 – K4	2	K2	2(K3,K3)	2(K4,K4)
CI AII	CO3	K1 – K4	2	K1	2(K2,K2)	2(K3,K3)
	CO4	K1 – K4	2	K2	2(K3,K3)	2(K4,K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II							
	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	2	3.57	25
	K2	2	10	-	12	21.43	
	K3	-	10	16	26	46.43	46.43
	K4	-	-	16	16	28.57	28.57
	Marks	4	20	32	56	100	100
CIA II	K1	2	-	-	2	3.57	25
	K2	2	10	-	12	21.43	
	K3	-	10	16	26	46.43	46.43
	K4	-	-	16	16	28.57	28.57
	Marks	4	20	32	56	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	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K – LEVEL
			No. of Questions	K – Level		
1	CO1	K1 – K4	2	K1&K2	2 (K2)	2 (K3)
2	CO2	K1 – K4	2	K1&K2	2 (K3)	2 (K4)
3	CO3	K1 – K4	2	K1&K2	2 (K2)	2 (K3)
4	CO4	K1 – K4	2	K1&K2	2 (K3)	2 (K4)
5	CO5	K1 – K4	2	K1&K2	2 (K4)	2 (K3)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(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 (Either or Choice)	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	5	3.57	21.43
K2	5	20	-	25	17.86	20
K3	-	20	48	68	48.57	48.57
K4	-	10	32	42	30	30
Marks	10	50	80	140	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 – Format

Q. No.	Unit	CO	K-level		
Answer ALL the questions			PART – A		(10 x 1 = 10 Marks)
1.	Unit - I	CO1	K1		
				a)	b)
				c)	d)
2.	Unit - I	CO1	K2		
				a)	b)
				c)	d)
3.	Unit - II	CO2	K1		
				a)	b)
				c)	d)
4.	Unit - II	CO2	K2		
				a)	b)
				c)	d)
5.	Unit - III	CO3	K1		
				a)	b)
				c)	d)
6.	Unit - III	CO3	K2		
				a)	b)
				c)	d)
7.	Unit - IV	CO4	K1		
				a)	b)
				c)	d)
8.	Unit - IV	CO4	K2		
				a)	b)
				c)	d)
9.	Unit - V	CO5	K1		
				a)	b)
				c)	d)
10.	Unit - V	CO5	K2		
				a)	b)
				c)	d)



Answer ALL the questions				PART – B	(5 x 5 = 25 Marks)
11. a)	Unit - I	CO1	K2	OR	
11. b)	Unit - I	CO1	K2		
12. a)	Unit - II	CO2	K3	OR	
12. b)	Unit - II	CO2	K3		
13. a)	Unit - III	CO3	K2	OR	
13. b)	Unit - III	CO3	K2		
14. a)	Unit - IV	CO4	K3	OR	
14. b)	Unit - IV	CO4	K3		
15. a)	Unit - V	CO5	K4	OR	
15. b)	Unit - V	CO5	K4		

Answer ALL the questions				PART – C	(5 x 8 = 40 Marks)
16. a)	Unit - I	CO1	K3		
OR					
16. b)	Unit - I	CO1	K3		
17. a)	Unit - II	CO2	K4		
OR					
17. b)	Unit - II	CO2	K4		
18. a)	Unit - III	CO3	K3		
OR					
18. b)	Unit - III	CO3	K3		
19. a)	Unit - IV	CO4	K4		
OR					
19. b)	Unit - IV	CO4	K4		
20. a)	Unit - V	CO5	K3		
OR					
20. b)	Unit - V	CO5	K3		

**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)****RESEARCH CENTRE OF PHYSICS****FOR THOSE WHO JOINED IN 2023-2024 AND AFTER**

<b>Course Name</b>	CHEMISTRY PRACTICAL FOR PHYSICAL SCIENCES - I			
<b>Course Code</b>	23UCHEP31	<b>L</b>	<b>P</b>	<b>C</b>
<b>Category</b>	GENERIC ELECTIVE	-	2	2

**COURSE OBJECTIVES:****This course aims to provide knowledge on the**

- Basics of preparation of solutions.
- Neutralisation reactions
- Basis of redox reactions
- principles of indicators
- practical experience of volumetric analysis

**VOLUMETRIC ANALYSIS**

1. Estimation of sodium hydroxide using standard sodium carbonate.
2. Estimation of hydrochloric acid using standard oxalic acid.
3. Estimation of ferrous sulphate using standard Mohr's salt.
4. Estimation of oxalic acid using standard ferrous sulphate.
5. Estimation of potassium permanganate using standard sodium hydroxide.
6. Estimation of magnesium using EDTA.
7. Estimation of ferrous ion using diphenyl amine as indicator.

**Total Lecture Hours****30****BOOKS FOR REFERENCES:**

- V.Venkateswaran, R.Veerasingam, A.R.Kulandaivelu, Basic Principles of Practical Chemistry; Sultan Chand & sons, Second edition, 1997.

**WEB RESOURCES:**

- ❖ <https://archive.nptel.ac.in/courses/104/106/104106121/>

Nature of Course	EMPLOYABILITY				SKILL ORIENTED		✓	ENTREPRENEURSHIP				
Curriculum Relevance	LOCAL			REGIONAL			NATIONAL		✓	GLOBAL		
Changes Made in the Course	Percentage of Change			20	No Changes Made				New Course			
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.												

COURSE OUTCOMES:									K LEVEL		
After studying this course, the students will be able to:											
CO1	gain an understanding of the use of standard flask and volumetric pipettes, burette.								K1 to K4		
CO2	design, carry out, record and interpret the results of volumetric titration.								K1 to K4		
CO3	apply their skill in the analysis of water/hardness.								K1 to K4		
CO4	analyze the chemical constituents in allied chemical products								K1 to K4		
CO5	estimate the amount of metals, acid and alkali in water bodies.								K1 to K4		
MAPPING WITH PROGRAM OUTCOMES:											
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	S	S	S	S	S	S	M			
CO2	M	S	S	S	M	S	S	M			
CO3	S	S	S	M	S	S	S	M			
CO4	S	S	S	S	S	S	S	M			
CO5	S	M	S	S	S	S	S	M			
3 - STRONG			2 – MEDIUM					1 - LOW			
CO / PO MAPPING:											
COS		PSO1		PSO2		PSO3		PSO4		PSO5	
CO 1		3		3		3		3		3	
CO 2		3		3		3		3		3	
CO 3		3		3		3		3		3	
CO 4		3		3		3		3		3	
CO 5		3		3		3		3		3	
WEITAGE		15		15		15		15		15	
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS		3.0		3.0		3.0		3.0		3.0	

**LESSON PLAN:**

UNIT	CHEMISTRY PRACTICAL FOR PHYSICAL SCIENCES - I	HRS	PEDAGOGY
<b>QUALITATIVE INORGANIC ANALYSIS</b>			
	<b>Theory on Volumetric analysis</b>	<b>5</b>	<b>Chalk &amp; talk</b>
	<b>Experiments</b>	<b>25</b>	<b>Demonstration and training</b>

**METHOD OF EVALUATION:**

Continuous Internal Assessment	End Semester Examination	Total
25	75	100

Internal Assessment : Observation & attendance -10 mark

Model examination - 15 mark

**Total CIA - 25 mark**

**Model examination should be conducted for 30 mark and it has to be converted to 15 mark**

<b>Learning Outcome Based Education &amp; Assessment (LOBE)</b> <b>Formative Examination - Blue Print</b> <b>Articulation Mapping – K Levels with Course Outcomes (COs)</b>				
Internal	Cos	K Level	No. of. Questions	K - Level
CIA-I	CO1 - CO5	K1 – K4	1 Question for Each Student	K1 – K4
<b>Question Pattern CIA - I</b>		No. of Questions to be asked	1 Question for Each Student	
		No. of Questions to be answered	1	
		Marks for each question	30	
		Total Marks for each section	30	

<b>Distribution of Marks with COs &amp; K Level for Correction of CIA I</b>				
	<b>COs</b>	<b>Distribution of the work of the experiment</b>	<b>K - Level</b>	<b>MARKS</b>
<b>CIA I</b>	<b>CO1</b>	Aim and apparatus	<b>K1</b>	<b>2.0</b>
	<b>CO3</b>	Short Procedure	<b>K2</b>	<b>10.0</b>
	<b>CO2</b>	Tabulation	<b>K4</b>	<b>8.0</b>
	<b>CO4</b>	Experiment & calculation	<b>K3</b>	<b>5.0</b>
	<b>CO5</b>	Result (nil) (1 mark will be reduced for each 2% deviation) minimum mark 1	<b>K1</b>	<b>5.0</b>
	<b>Total Marks</b>			<b>30</b>

Summative Examination: Duly completed Record: 15 mark

End Semester Exam: 60 marks

<b>Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)</b>			
<b>COs</b>	<b>K - Level</b>	<b>No. of Questions</b>	<b>K – Level</b>
<b>CO1 - CO5</b>	<b>K1 – K4</b>	<b>1 Question for Each Student</b>	<b>K1 – K4</b>
No. of Questions to be Asked		<b>1 Question for Each Student</b>	
No. of Questions to be answered		<b>1</b>	
Marks for each question		<b>60</b>	
Total Marks for each section		<b>60</b>	
<b>(Figures in parenthesis denotes, questions should be asked with the given K level)</b>			

<b>Distribution of Marks with COs &amp; K Level for Correction of CIA I</b>				
	<b>COs</b>	<b>Distribution of the work of the experiment</b>	<b>K - Level</b>	<b>MARKS</b>
<b>CIA I</b>	<b>CO1</b>	Aim and apparatus	<b>K1</b>	<b>4.0</b>
	<b>CO3</b>	Short Procedure	<b>K2</b>	<b>20.0</b>
	<b>CO2</b>	Tabulation	<b>K4</b>	<b>16.0</b>
	<b>CO4</b>	Experiment & calculation	<b>K3</b>	<b>10.0</b>
	<b>CO5</b>	Result (nil) (2 mark will be reduced for each 2% deviation) minimum mark 2)	<b>K1</b>	<b>10.0</b>
	<b>Total Marks</b>			<b>60</b>



<b>Course Name</b>	CHEMISTRY FOR PHYSICAL SCIENCES – II			
<b>Course Code</b>	23UCHEA41	L	P	C
<b>Category</b>	GENERIC ELECTIVE	4	-	3

**COURSE OBJECTIVES:**

This course aims to provide knowledge on the

- Co-ordination Chemistry and Water Technology
- Carbohydrates and Amino acids
- basics and applications of electrochemistry
- basics and applications of kinetics and catalysis
- Various photochemical phenomenon

**UNIT - I Co-ordination Chemistry and Water Technology 12**

Co-ordination Chemistry: Definition of terms-IUPAC Nomenclature - Werner's theory - EAN rule - Pauling's theory – Postulates - Applications to  $[\text{Ni}(\text{CO})_4]$ ,  $[\text{Ni}(\text{CN})_4]^{2-}$ ,  $[\text{Co}(\text{CN})_6]^{3-}$  - Chelation - Biological role of Haemoglobin and Chlorophyll (elementary idea) – Applications in qualitative and quantitative analysis.

Water Technology: Hardness of water, determination of hardness of water using EDTA method, zeolite method-Purification techniques- BOD, COD.

**UNIT - II Carbohydrates and Amino acids 12**

Carbohydrates: Classification, preparation and properties of glucose, fructose and sucrose. Discussion of open chain ring structures of glucose and fructose. Glucose –fructose interconversion. Properties of starch and cellulose.

Amino acids: Classification - preparation and properties of alanine, preparation of dipeptides using Bergmann method. RNA and DNA (elementary idea only).

**UNIT - III Electrochemistry 12**

Galvanic cells –Three electrode system (basic idea)- Standard hydrogen electrode - calomel electrode - standard electrode potentials -electrochemical series. Strong and weak electrolytes - ionic product of water -pH, pKa, pKb. Conductometric titrations - pH determination by colorimetric method – buffer solutions and its biological applications - electroplating - Nickel and chrome plating – Batteries –Li ion, Na ion, LiS - Types of cells -fuel cells- corrosion and its prevention.

**UNIT - IV Kinetics and Catalysis****12**

Order and molecularity. Integrated rate expression for I and II (2A → Products) order reactions. Pseudo first order reaction, methods of determining order of a reaction – Half-life period – Catalysis - homogeneous and heterogeneous, catalyst used in Contact and Haber's processes. Concept of energy of activation and Arrhenius equation.

**UNIT - V Photochemistry****12**

Grothus-Draper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield - Hydrogen-chloride reaction. Phosphorescence, fluorescence, chemiluminescence and photosensitization and photosynthesis (definition with examples).

**Total Lecture Hours****60****BOOKS FOR STUDY:**

- V.Veeraiyan, Text book of Ancillary Chemistry; High mount publishing house, Chennai, first edition, 2009.
- S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006.
- S.ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, New Delhi, twenty third edition, 2012.

**BOOKS FOR REFERENCES:**

- P.L.Soni, MohanKaty, Textbook of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007.
- B.R.Puri, L.R.Sharma, M.S.Pathania, Textbook Physical Chemistry; Vishal Publishing Co., New Delhi, forty seventh edition, 2018.
- B.K, Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.

**WEB RESOURCES:**

- ❖ [https://onlinecourses.nptel.ac.in/noc19\\_cy19/preview](https://onlinecourses.nptel.ac.in/noc19_cy19/preview)
- ❖ <https://archive.nptel.ac.in/courses/103/102/103102012/>

Nature of Course	EMPLOYABILITY	✓	SKILL ORIENTED		ENTREPRENEURSHIP	
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL	✓ GLOBAL
Changes Made in the Course	Percentage of Change	✓	No Changes Made		New Course	
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.						

COURSE OUTCOMES:										K LEVEL	
After studying this course, the students will be able to:											
CO1	write the IUPAC name for complex, different theories to explain the bonding in coordination compounds and water technology									K1 to K4	
CO2	explain the preparation and property of carbohydrate, amino acids and nucleic acids.									K1 to K4	
CO3	apply/demonstrate the electrochemistry principles in corrosion, electroplating and fuel cells.									K1 to K4	
CO4	identify the reaction rate, order for chemical reaction and explain the purpose of a catalyst.									K1 to K4	
CO5	outline the various type of photochemical process.									K1 to K4	
MAPPING WITH PROGRAM OUTCOMES:											
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	S	S	S	S	S	S	M	S	S	
CO2	M	S	S	S	M	S	S	M	M	S	
CO3	S	S	S	M	S	S	S	M	S	S	
CO4	S	S	S	S	S	S	S	M	S	S	
CO5	S	M	S	S	S	S	S	M	S	M	
3 - STRONG			2 – MEDIUM					1 - LOW			
CO / PO MAPPING:											
COS		PSO1		PSO2		PSO3		PSO4		PSO5	
CO 1		3		3		3		3		3	
CO 2		3		3		3		3		3	
CO 3		3		3		3		3		3	
CO 4		3		3		3		3		3	
CO 5		3		3		3		3		3	
WEITAGE		15		15		15		15		15	
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS		3.0		3.0		3.0		3.0		3.0	
LESSON PLAN:											
UNIT	CHEMISTRY FOR PHYSICAL SCIENCES – II							HRS	PEDAGOGY		
I	Co-ordination Chemistry: Definition of terms-IUPAC Nomenclature - Werner'stheory - EAN rule - Pauling's theory – Postulates - Applications to [Ni(CO)4], [Ni(CN)4]2-,[Co(CN)6]3- Chelation - Biological role of Haemoglobin and Chlorophyll (elementary idea) – Applications in qualitative and quantitative analysis.  Water Technology: Hardness of water, determination of hardness of							12	Chalk & Talk, ppt		



	water using EDTA method, zeolite method-Purification techniques-BOD, COD.		
<b>II</b>	<p>Carbohydrates: Classification, preparation and properties of glucose, fructose and sucrose. Discussion of open chain ring structures of glucose and fructose. Glucose –fructose interconversion. Properties of starch and cellulose.</p> <p>Amino acids: Classification - preparation and properties of alanine, preparation of dipeptides using Bergmann method. RNA and DNA (elementary idea only).</p>	<b>12</b>	<b>Chalk &amp; Talk, ppt</b>
<b>III</b>	Galvanic cells –Three electrode system (basic idea)- Standard hydrogen electrode - calomel electrode - standard electrode potentials - electrochemical series. Strong and weak electrolytes - ionic product of water -pH, pKa, pKb. Conductometric titrations - pH determination by colorimetric method – buffer solutions and its biological applications - electroplating - Nickel and chrome plating – Batteries –Li ion, Na ion, LiS - Types of cells -fuel cells-corrosion and its prevention.	<b>12</b>	<b>Group discussion</b>
<b>IV</b>	Order and molecularity. Integrated rate expression for I and II (2A → Products) order reactions. Pseudo first order reaction, methods of determining order of a reaction – Half-life period – Catalysis - homogeneous and heterogeneous, catalyst used in Contact and Haber's processes. Concept of energy of activation and Arrhenius equation.	<b>12</b>	<b>Chalk &amp; Talk, ppt</b>
<b>V</b>	Grothus-Draper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield - Hydrogen-chloride reaction. Phosphorescence, fluorescence, chemiluminescence and photosensitization and photosynthesis (definition with examples).	<b>12</b>	<b>Chalk &amp; Talk, ppt</b>

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 Either or Choice	Section C Either or Choice
			MCQs			
			No. of Questions	K - Level		
CI AI	CO1	K1 – K4	2	K1	2 (K2,K2)	2(K3,K3)
	CO2	K1 – K4	2	K2	2(K3,K3)	2(K4,K4)
CI AII	CO3	K1 – K4	2	K1	2(K2,K2)	2(K3,K3)
	CO4	K1 – K4	2	K2	2(K3,K3)	2(K4,K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II							
	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	2	3.57	25
	K2	2	10	-	12	21.43	
	K3	-	10	16	26	46.43	46.43
	K4	-	-	16	16	28.57	28.57
	Marks	4	20	32	56	100	100
CIA II	K1	2	-	-	2	3.57	25
	K2	2	10	-	12	21.43	
	K3	-	10	16	26	46.43	46.43
	K4	-	-	16	16	28.57	28.57
	Marks	4	20	32	56	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.**

<b>Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)</b>						
<b>S. No</b>	<b>COs</b>	<b>K - Level</b>	<b>Section A (MCQs)</b>		<b>Section B (Either / or Choice) With K - LEVEL</b>	<b>Section C (Either / or Choice) With K - LEVEL</b>
			<b>No. of Questions</b>	<b>K – Level</b>		
1	CO1	K1-K4	2	K1&K2	2 (K2)	2 (K3)
2	CO2	K1-K4	2	K1&K2	2 (K3)	2 (K4)
3	CO3	K1-K4	2	K1&K2	2 (K2)	2 (K3)
4	CO4	K1-K4	2	K1&K2	2 (K3)	2 (K4)
5	CO5	K1-K4	2	K1&K2	2 (K4)	2 (K3)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
<b>(Figures in parenthesis denotes, questions should be asked with the given K level)</b>						

<b>Distribution of Marks with K Level</b>						
<b>K Level</b>	<b>Section A (Multiple Choice Questions)</b>	<b>Section B (Either or Choice)</b>	<b>Section C (Either/ or Choice)</b>	<b>Total Marks</b>	<b>% of (Marks without choice)</b>	<b>Consolidated %</b>
<b>K1</b>	5	-	-	5	3.57	21.43
<b>K2</b>	5	20	-	25	17.86	
<b>K3</b>	-	20	48	68	48.57	48.57
<b>K4</b>	-	10	32	42	30	30
<b>Marks</b>	<b>10</b>	<b>50</b>	<b>80</b>	<b>140</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

Q. No.	Unit	CO	K-level		
Answer ALL the questions			PART – A	(10 x 1 = 10 Marks)	
1.	Unit - I	CO 1	K1		
				a)	b)
				c)	d)
2.	Unit - I	CO 1	K2		
				a)	b)
				c)	d)
3.	Unit - II	CO 2	K1		
				a)	b)
				c)	d)
4.	Unit - II	CO 2	K2		
				a)	b)
				c)	d)
5.	Unit - III	CO 3	K1		
				a)	b)
				c)	d)
6.	Unit - III	CO 3	K2		
				a)	b)
				c)	d)
7.	Unit - IV	CO 4	K1		
				a)	b)
				c)	d)
8.	Unit - IV	CO 4	K2		
				a)	b)
				c)	d)
9.	Unit - V	CO 5	K1		
				a)	b)
				c)	d)
10.	Unit - V	CO 5	K2		
				a)	b)
				c)	d)

Answer ALL the questions				PART – B	(5 x 5 = 25 Marks)
11. a)	Unit - I	CO 1	K2		
OR					
11. b)	Unit - I	CO 1	K2		
12. a)	Unit - II	CO 2	K3		
OR					
12. b)	Unit - II	CO 2	K3		
13. a)	Unit - III	CO 3	K2		
OR					
13. b)	Unit - III	CO 3	K2		
14. a)	Unit - IV	CO 4	K3		
OR					
14. b)	Unit - IV	CO 4	K3		
15. a)	Unit - V	CO 5	K4		
OR					
15. b)	Unit - V	CO 5	K4		

Answer ALL the questions				PART – C	(5 x 8 = 40 Marks)
16. a)	Unit - I	CO 1	K3		
OR					
16. b)	Unit - I	CO 1	K3		
17. a)	Unit - II	CO 2	K4		
OR					
17. b)	Unit - II	CO 2	K4		
18. a)	Unit - III	CO 3	K3		
OR					
18. b)	Unit - III	CO 3	K3		
			K4		
19. a)	Unit - IV	CO 4	K4		
OR					
19. b)	Unit - IV	CO 4	K4		
20. a)	Unit - V	CO 5	K3		
OR					
20. b)	Unit - V	CO 5	K3		

**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)****RESEARCH CENTRE OF PHYSICS****FOR THOSE WHO JOINED IN 2023-2024 AND AFTER**

<b>Course Name</b>	CHEMISTRY PRACTICAL FOR PHYSICAL SCIENCES - II			
<b>Course Code</b>	23UCHEP41	<b>L</b>	<b>P</b>	<b>C</b>
<b>Category</b>	GENERIC ELECTIVE	-	2	2

**COURSE OBJECTIVES:****This course aims to provide knowledge on the**

- identification of organic functional groups
- different types of organic compounds
- properties of organic compound.
- determination of elements in organic compounds.
- Confirmatory test of functional groups

**SYSTEMATIC ANALYSIS OF ORGANIC COMPOUNDS**

The analysis must be carried out as follows:

- (a) Functional group tests [phenol, acids (mono & di) aromatic primary amine, amides (mono & di), aldehyde and glucose].
- (b) Detection of elements (N, S, Halogens).
- (c) To distinguish between aliphatic and aromatic compounds.
- (d) To distinguish – Saturated and unsaturated compounds.

<b>Total Lecture Hours</b>	<b>30</b>
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**BOOKS FOR REFERENCES:**

- V.Venkateswaran, R.Veerasingam, A.R.Kulandaivelu, Basic Principles of Practical Chemistry; Sultan Chand & sons, Second edition, 1997.

**WEB RESOURCES:**

- ❖ <https://archive.nptel.ac.in/courses/104/106/104106121/>

Nature of Course	EMPLOYABILITY				SKILL ORIENTED		✓	ENTREPRENEURSHIP				
Curriculum Relevance	LOCAL			REGIONAL			NATIONAL		✓	GLOBAL		
Changes Made in the Course	Percentage of Change					No Changes Made			✓	New Course		
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.												

COURSE OUTCOMES:									K LEVEL		
After studying this course, the students will be able to:											
CO1	gain an understanding of the use of test tube and analysis.								K1 to K4		
CO2	design, carry out, record and interpret the results of qualitative analysis.								K1 to K4		
CO3	apply their skill in the qualitative analysis of organic compounds.								K1 to K4		
CO4	analyze the chemical constituents in allied chemical products								K1 to K4		
CO5	estimate the functional groups present in industrial effluents								K1 to K4		
MAPPING WITH PROGRAM OUTCOMES:											
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	S	S	S	S	S	S	M			
CO2	M	S	S	S	M	S	S	M			
CO3	S	S	S	M	S	S	S	M			
CO4	S	S	S	S	S	S	S	M			
CO5	S	M	S	S	S	S	S	M			
3 - STRONG			2 – MEDIUM					1 - LOW			
CO / PO MAPPING:											
COS		PSO1		PSO2		PSO3		PSO4		PSO5	
CO 1		3		3		3		3		3	
CO 2		3		3		3		3		3	
CO 3		3		3		3		3		3	
CO 4		3		3		3		3		3	
CO 5		3		3		3		3		3	
WEITAGE		15		15		15		15		15	
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTIO N TO POS		3.0		3.0		3.0		3.0		3.0	

**LESSON PLAN:**

UNIT	PHYSICAL CHEMISTRY PRACTICAL – I	HRS	PEDAGOGY
<b>QUALITATIVE INORGANIC ANALYSIS</b>			
	Organic Analysis Experiments	<b>25</b>	<b>Demonstration &amp; experiment</b>

**METHOD OF EVALUATION:**

Continuous Internal Assessment	End Semester Examination	Total
<b>25</b>	<b>75</b>	<b>100</b>

Internal Assessment : Observation & attendance -10 mark

Model examination - 15 mark

**Total CIA - 25 mark**

**Model examination should be conducted for 60 mark and it has to be converted to 15 mark**

<b>Learning Outcome Based Education &amp; Assessment (LOBE)</b> <b>Formative Examination - Blue Print</b> <b>Articulation Mapping – K Levels with Course Outcomes (COs)</b>				
Internal	Cos	K Level	No. of. Questions	K - Level
CIA-I	CO1 - CO5	K1 – K4	1 Question for Each Student	K1 – K4
<b>Question Pattern CIA - I</b>		No. of Questions to be asked	1 Question for Each Student	
		No. of Questions to be answered	<b>1</b>	
		Marks for each question	<b>60</b>	
		Total Marks for each section	<b>60</b>	

<b>Distribution of Marks with COs &amp; K Level for Correction of CIA I</b>				
	COs	Distribution of the work of the experiment	K - Level	MARKS
<b>CIA I</b>	CO3	Preliminary tests	K1	8
	CO2	Identification of aromaticity & saturation	K2	8
	CO4	Special Elements present	K4	4
	CO5	Functional Group confirmatory test	K3	10
	CO1	Procedure	K1	30
	<b>Total Marks</b>			<b>60</b>



**Summative Examination: Duly completed Record: 15 mark**

**End Semester Exam: 60 marks**

<b>Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)</b>			
<b>COs</b>	<b>K - Level</b>	<b>No. of Questions</b>	<b>K – Level</b>
<b>CO1 - CO5</b>	<b>K1 – K4</b>	<b>1 Question for Each Student</b>	<b>K1 – K4</b>
No. of Questions to be Asked		<b>1 Question for Each Student</b>	
No. of Questions to be answered		<b>1</b>	
Marks for each question		<b>60</b>	
Total Marks for each section		<b>60</b>	
<b>(Figures in parenthesis denotes, questions should be asked with the given K level)</b>			

<b>Distribution of Marks with COs &amp; K Level for Correction of Summative exam</b>				
	<b>COs</b>	<b>Distribution of the work of the experiment</b>	<b>K - Level</b>	<b>MARKS</b>
<b>CIA I</b>	<b>CO3</b>	Preliminary tests	<b>K1</b>	<b>8</b>
	<b>CO2</b>	Identification of aromaticity & saturation	<b>K2</b>	<b>8</b>
	<b>CO4</b>	Special Elements present	<b>K4</b>	<b>4</b>
	<b>CO5</b>	Functional Group confirmatory test	<b>K3</b>	<b>10</b>
	<b>CO1</b>	Procedure	<b>K1</b>	<b>30</b>
	<b>Total Marks</b>			<b>60</b>