B.Sc., CHEMISTRY

Syllabus

Program Code: UCH

2018 - Onwards

MANNAR THIRUMALAI NAICKER COLLEGE

(AUTONOMOUS)

Re-accredited with "A" Grade by NAAC

PASUMALAI, MADURAI – 625 004

Qualification 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 Chemistry as one of the subjects in Higher Secondary Education.

Duration of the Course

The students shall undergo the prescribed B.Sc(Chemistry) course of study for a period of three academic years (six semesters).

Subject of Study

Part I: Tamil
Part II: English
Part III:
1. Core Subjects
2. Allied Subjects
3. Electives

Part IV :
1. Non Major Electives
2. Skill Based Subjects
3. Environmental Studies
4. Value Education

Part V :
Extension activities

The scheme of Examination

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

Pattern of the questions paper for the continuous Internal Assessment

(For Part I, Part II, Part III , NME & Skilled Paper in Part IV)

The components for continuous internal assessment are:

Part –A
Six multiple choice questions (answer all) 6 x01= 06 Marks
Part –B
Two questions (‘either …. or ‘type) 2 x 07=14 Marks
Part –C
One question out of two 1 x 10 =10 Marks

Total 30 Marks

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 each unit.)
Part –B
Five Paragraph questions (‘either …. or ‘type) 5 x 07 = 35 Marks
(One question from each Unit)
Part –C
Three Essay questions out of five 3 x 10 =30 Marks
(One question from each Unit)

Total 75 Marks

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

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

Part –A

(Answer is not less than 150 words)

Four questions (‘either …. or ‘type) 4 x 05=20 Marks

Part –B

(Answer is not less than 400 words)

One question (‘either …. or ‘type) 1 x 10=10 Marks

Total 30 Marks

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

Part –A

(Answer is not less than 150 words)

Five questions (either or type) 5 x 06 =30 Marks

(One question from each Unit)

Part –B

(Answer is not less than 400 words)

Three questions out of Five 3 x 15 = 45 Marks
each unit (One question from each Unit)

Total 75 Marks

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.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO's)

PEO1: Proficiency in Chemistry: To enhance the students to nurture the requirements of industries/laboratories related to chemistry including pharmaceutical/analytical chemistry.

PEO2: Professional Growth: To enable the students to demonstrate information literacy skills for acquiring knowledge of chemistry, as a chemist/researcher and also as a life-long learner.

PEO3: Analytical Skills: To develop the students to communicate effectively the scientific and research information in both written and oral formats, to both professional scientists and to the public.

PROGRAMME OUTCOMES (PO's) of CHEMISTRY:

PO1: The stable basis in chemical principles and higher level of understanding in each of the chemistry sub-disciplines such as organic, inorganic, physical, and analytical as well as fundamental principles of biotechnology, mathematics and physics have been developed.

PO2: Developing the working acquaintance of chemical instrumentation and laboratory techniques and be able to use of skills to design and conduct independent work.

PO3: An understanding of current ethical issues in chemistry and be able to apply ethical principles in industries / research laboratories.

PO4: Acquaintance with the applications of computers in chemistry: Modeling and simulation of chemical phenomena.

PO5: Communicate outcomes of work to chemists and non-chemists, including respect for the tradition of careful citation of prior contributions.

PROGRAMME SPECIFIC OUTCOMES

PSO1: To ability to employ critical thinking and efficient problem-solving skills in the areas of analytical, inorganic, organic, and physical chemistry.

PSO2: To demonstrate proficiency in writing and speaking about chemistry topics in a clear and concise manner to both chemists and non-chemists according to professional standards

PSO3: To conceptualize and apply the ideas of chemical sciences in the areas of organic synthesis, synthesis of materials, corrosion inhibition, environment sustainability etc.

PSO4: To demonstrate proficiency in the use of appropriate instrumentation to collect and record data from chemical experiments

DEPARTMENT OF CHEMISTRY
(For those who joined in 2018 and after)

COURSE PATTERN

Study Component	I Sem	II Sem	III Sem	IV Sem	V Sem	VI Sem	Total Hours	Total Credit	No. of course	Total marks
Part – I Tamil	6(3)	6(3)	6(3)	6(3)			24	12	4	400
Part –II English	6(3)	6(3)	6(3)	6(3)			24	12	4	400
Part –III										
Core subjects	4(4) 2(0)	4(4) 2(2)	4(4) 2(0)	4(4) 2(2)	5(5) 5(5) 3(0) 3(0) 2(0)	5(5) 5(5) 3(6) 3(5) 2(4)	60	55	13	1300
Core Elective					4(4)	4(4)	8	8	2	200
Allied Physics	4(4) 2(0)	4(3) 2(1)	4(4) 2(0)	4(3) 2(1)			24	16	6	600
Allied Mathematics			4(4)	4(4)	6(4)	6(4)	20	16	4	400
Part-IV										
Skill Based Subjects	2(2) 2(2)	2(2) 2(2)			2(2)	2(2)	12	12	6	600
Environment studies / value education	2(2)	2(2)					4	4	2	200
Non-Major Elective			2(2)	2(2)			4	4	2	200
Part V										
Extension Activities				0(1)			0	1	1	100
Total	**30 (20)**	**30 (22)**	**30 (20)**	**30 (23)**	**30 (20)**	**30 (35)**	**180**	**140**	**44**	**4400**

SEMESTER – I							
Subject Code	**Title of the Paper**	**No. of Courses**	**Hours/ Week**	**Credits**	**Maximum Marks**		
					Int	**Ext**	**Tot**
18UTAG11	**Part-I: Tamil** தற்கால கவிதையும் உரைநடையும்	1	6	3	25	75	100
18UENG11	**English-II:** Exploring Language Through Literature-I	1	6	3	25	75	100
	Part-III Core Subject						
18UCHC11	Inorganic Chemistry -I	1	4	4	25	75	100
~~18UCHCP1~~	Major Chemistry Practical – I (Inorganic semi micro Qualitative analysis)	-	2	-	-	-	-
	Part-III Allied Subject						
18UPHA11	Allied Physics – I (Mechanics, Properties of matter and Relativity)	1	4	4	25	75	100
~~18UPHAP1~~	Allied Physics Practical-I		2	-	-	-	-
	Part-IV Skill Subject						
18UCHS11	Sugar Technology	1	2	2	25	75	100
18UCHS12	Perfume Chemistry	1	2	2	25	75	100
	Part-IV Mandatory Subject						
18UEVG11	Environmental Studies	1	2	2	25	75	100
	TOTAL	**7**	**30**	**20**	**175**	**525**	**700**

SEMESTER – II

Subject Code	Title of the Paper	No. of Courses	Hours/Week	Credits	Maximum Marks		
					Int	Ext	Total
18UTAG21	**Part I:Tamil** பக்தி இலக்கியமும் நாடகமும்	1	6	3	25	75	100
18UENG21	**Part II : English** Exploring Language Through Literature-II	1	6	3	25	75	100
	Part-III Core Subject						
18UCHC21	Organic Chemistry-I	1	4	4	25	75	100
18UCHCP1	Major Chemistry Practical – I (Inorganic semi micro Qualitative analysis)	1	2	2	40	60	100
	Part-III Allied Subject						
18UPHA21	Allied Physics –II	1	4	3	25	75	100
18UPHAP1	(Thermal Physics and Sound) Allied Physics Practical – I	1	2	1	40	60	100
	Part-IV Skill Subject						
18UCHS21	Leather Technology	1	2	2	25	75	100
18UCHS22	Paper and Pulp Technology	1	2	2	25	75	100
18UVLG21	**Part –IV Mandatory Subject** Value Education	1	2	2	25	75	100
	Total	**9**	**30**	**22**	**255**	**645**	**900**

SEMESTER –III							
Subject Code	**Title of the Paper**	**No. of Courses**	**Hours /Week**	**Credits**	**Maximum Marks**		
					Int	**Ext**	**Total**
18UTAG31	**Part –I Tamil** காப்பிய இலக்கியமும் சிறுகதையும்	1	6	3	25	75	100
18UENG31	**Part –II English Subject** Exploring Language Through Literature-III	1	6	3	25	75	100
	Part-III Core Subject						
18UCHC31	Physical Chemistry-I	1	4	4	25	75	100
~~18UCHCP2~~	Volumetric Analysis Practical	-	2	-	-	-	-
	Part-III Allied Subject						
18UMCA32	Allied Mathematics-I	1	4	4	25	75	100
18UPHA31	Allied Physics – III (Electricity and Electronics)	1	4	4	25	75	100
~~18UPHAP2~~	Allied Physics Practical – II	-	2	0	-	-	-
	Part-IV Non Major Elective						
18UCHN31	Waste Water Treatment	1	2	2	25	75	100
	Total	**6**	**30**	**20**	**150**	**450**	**600**

SEMESTER IV							
Subject Code	**Title of the Paper**	**No. of Courses**	**Hours /Week**	**Credits**	**Maximum Marks**		
					Int	**Ext**	**Total**
18UTAG41	**Part –I Tamil** பழந்தமிழ் இலக்கியமும் புதினமும்	1	6	3	25	75	100
18UENG41	**Part –II English Subject** Exploring Language Through Literature-IV	1	6	3	25	75	100
	Part-III Core Subject						
18UCHC41	Inorganic Chemistry - II	1	4	4	25	75	100
18UCHCP2	Volumetric Analysis Practical	1	2	2	40	60	100
	Part-III Allied Subject						
18UMCA42	Allied Mathematics – II	1	4	4	25	75	100
18UPHA41	Allied Physics - IV (Optics, Spectroscopy and Modern Physics)	1	4	3	25	75	100
18UPHAP2	Allied Physics Practical -II	1	2	1	40	60	100
	Part IV -Non Major Elective						
18UCHN41	Polymer Chemistry	1	2	2	25	75	100
18UEAG40 - 18UEAG49	**Part V- Extension Activities**	1	0	1	100	-	100
	Total	**9**	**30**	**23**	**355**	**645**	**900**

SEMESTER – V							
Subject Code	**Title of the Paper**	**No. of Courses**	**Hours /Week**	**Credits**	**Maximum Marks**		
					Int	**Ext**	**Total**
18UCHC51	**Part-III Core Subject** Organic Chemistry-II	1	5	5	25	75	100
18UCHC52	Physical Chemistry-II	1	5	5	25	75	100
18UCHCP3	Physical Chemistry experiments (Practical)		3	0			
18UCHCP4 18UCHCP5	Gravimetric Analysis and Organic Preparation (Practical) Organic Analysis and Estimation (Practical)		3 2	0 0			
18UMCA52	**Part-III Allied Subject** Allied Mathematics – III	1	6	4	25	75	100
18UCHE51 18UCHE52 18UCHE53	**Part- III Core Elective Inorganic and Analytical Chemistry** Bioinorganic Chemistry Clinical and Medicinal Chemistry	1	4	4	25	75	100
18UCHS51	**Part-IV Skill Subject** Drug Chemistry	1	2	2	25	75	100
	Total	**5**	**30**	**20**	**125**	**375**	**500**

SEMESTER – VI							
Subject Code	**Title of the Paper**	**No. of Courses**	**Hours /Week**	**Credits**	**Maximum Marks**		
					Int	**Ext**	**Total**
	Part-III Core Subject						
18UCHC61	Organic Chemistry-III	1	5	5	25	75	100
18UCHC62	Physical Chemistry-III	1	5	5	25	75	100
18UCHCP3	Physical Chemistry experiments (Practical)	1	3	6	40	60	100
18UCHCP4	Gravimetric Analysis and Organic Preparation	1	3	5	40	60	100
18UCHCP5	(Practical) Organic Analysis and Estimation (Practical)	1	2	4	40	60	100
	Part-III Allied Subject						
18UMCA62	Allied Mathematics – IV	1	6	4	25	75	100
	Part- III Core Elective						
18UCHE61	**Applied Chemistry**	1	4	4	25	75	100
18UCHE62	Nanochemistry						
18UCHE63	Fundamentals of Computer and Green Chemistry						
	Part-IV Skill Subject						
18UCHS61	Macromolecular Chemistry	1	2	2	25	75	100
	Total	**8**	**30**	**35**	**245**	**555**	**800**


FIRST SEMESTER

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Class	**: B.Sc (Chemistry)**	**Part III**	**: Core**
Semester	**: I**	**Hours**	**: 04**
Subject Code	**: 18UCHC11**	**Credits**	**: 04**

Inorganic Chemistry-I

Course Outcome:

CO1: To understand the basic concept of structure of atom and chemical bonding
CO2: To gain the basic knowledge about periodic table and nuclear chemistry
CO3: To understand about hydrogen, water and Hydrogen peroxide

Unit-I
Structure of atom:

An outline of constituents of atom (elementary idea) – 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 – Aubau principle – Hund's rule – electronic configuration of atoms.

Unit – II
Periodic table and atomic properties:

Modern periodic table – salient features – classification and characterization of s, p, d and f blocks elements – periodicity – cause – atomic properties – atomic radii and ionic radii – their periodic trends – ionization energy – factors determining ionization energy – periodic trends – electron affinity – periodic trends – electron negativity - factors determining electro negativity and their periodic trends – application of electro negativities

Unit-III
Chemical bonding

Cause of chemical bonding – octet rule – ionic bond – covalent bond – valence bond approach- its limitations – Fajan's rule – VSEPR theory – application of VSEPR theory to find geometry of molecules – hybridization – sp, sp^2, sp^3, sp^3d^2 and (BeF_2,BCl_3,CH_4,SF_6,H_20)- Molecular Orbital theory – LCAO method – MO diagram for homo nuclear and hetero nuclear diatomic molecules – H_2, He_2, Li_2, Be_2,C_2, N_2,O_2, F_2,CO and HF – determination of magnetic property and bond order

Unit IV

Nuclear Chemistry:

a. Composition of nucleus – Packing fraction and stability of nucleus – binding energy and stability of nucleus.
b. Nuclear models: Nuclear shell model, nuclear liquid drop model.
c. Nuclear fission – controlled release of fission energy – Nuclear reactors – Thermal Reactors – Fast breeder reactors – Disposal of radioactive waste from nuclear reactors – plutonium bomb
d. Nuclear fusion – Nuclear fusion in sun's atmosphere, stellar energy-Hydrogen bomb
e. Radioactivity – definition – characteristics of Radiations – Radioactive tracer and their Applications – Carbon Dating.

Unit V

a) **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) **Water:**

Hardness of water – types of hardness – removal of hardness – industrial implications of hardness in water – estimation by EDTA method – units of hardness of water

c) **Hydrogen peroxide:**

Manufacture – properties – structure and uses – estimation by permanagano metric and iodimetric method – strength of hydrogen peroxide

Text Book:

1. B.R. Puri, L.R.Sharma & K.C. Kalia, **Principles of Inorganic Chemistry** Milestone Publisher 31st edition, New Delhi (2011-12)

References:

1. Puri, Sharma & Kalia, **Principles of Inorganic Chemistry** Milestone publisher & distributor, New Delhi (2009)
2. R.D Madan S.Chand, **Modern Inorganic Chemistry** band Co.Ltd, New Delhi (2012)
3. JD.Lee, Wiley India, **Concise Inorganic Chemistry** 5th Edition, New Delhi (2009)

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
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Class	**: B.Sc (Chemistry)**	**Part III**	**: Core**
Semester	**: I & II**	**Hours**	**: 02**
Subject Code	**: 18UCHCP1**	**Credits**	**: -**

Inorganic Semi micro Qualitative analysis - Lab

Course Outcomes

CO1: To know about the identification of anions.
CO2: To understand the basic idea of identification of lotions.
CO3: To have an idea about how to confirm the acid & basic radicals.

Duration of examination: 3hrs

Analysis of a mixture containing two anions of which one is an interfering in semi-micro method two cations

Anions:

Carbonate, sulphate, nitrate, fluoride, chloride, bromide, iodide, oxalate, Borate, phosphate, arsenite, arsenate and chromate.

Cations: Lead, bismuth, copper, cadmium, antimony, iron (II and III), aluminium, Chromium, zinc, manganese, cobalt, nickel, barium, strontium, calcium, Magnesium and ammonium.

Distribution of marks

Max marks: 100

Internal : 40 marks **External : 60 marks**

Laboratory Performance	:	30 marks	Vivo voce	:	10 marks
Observation note book	:	10 marks	Record note book	:	10 marks
			Four radicals with correct procedure	:	40 marks
Total	:	40 marks	Total	:	60 marks

MANNAR THIRUMALAI NAICKER COLLEGE(Autonomous)
DEPARTMENT OF B.Sc CHEMISTRY
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Class : B.Sc (Chemistry) **Part III : Allied**
Semester : I **Hours : 4**
Subject Code :18UPHA11 **Credits : 4**

ALLIED PHYSICS– I
Mechanics, Properties of Matter and Relativity

Course Outcomes:

CO1: To understand the basics concepts of physics in everyday life.
CO2: To differentiate the three states of matter.
CO3: To understand all the phenomena are relative in nature.
CO4: To develop the skill in the area of properties of Matter.

Unit: I

Basic forces in nature – Central forces – Conservative – Non conservative force - Friction –

Work – Work done by the variation force – Energy – Expression for kinetic energy – Expression for potential energy – Power – Newton's laws of motion – Collision – elastic and Inelastic collision.

Unit: II

Kepler's laws of planetary motion- Newton's laws of gravitation – Mass and density of Earth – Boy's method for G – Compound pendulum - Expression for period - Experiment to find "g" - Variation of g with latitude, altitude and depth – Artificial Satellites.

Unit: III

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 – Rigidity modulus by torsion pendulum.

Unit: IV

Viscosity - Derivation of Poiseuille's formula (analytical method) - Poiseuille's method for

determining coefficient of viscosity of a liquid – Equation of continuity - Bernoulli's thorem

– derivation – Applications of Bernoulli's thorem (Venturimeter and Pitot tube).

Unit: V

Frames of reference – Inertial frames and non- Inertial frames -Galilean transformations –Michelson- Morley experiment – Interpretation of results – Postulates of special theory of Relativity – Lorentz transformation equations – Length contraction – Time dilation – Addition of velocities– Variation of mass with velocity – Mass –energy equation

Text Book:

1. R.Murugesan **Mechanics, Properties of Matter and Sound**, Madurai first edition, June2016. [B.Sc. Ancillary Physics]

    a. Unit – I : Page No 1-9, 11-15
    b. Unit – II : Page No 46 – 58
    c. Unit – III : Page No64 – 77
    d. Unit – IV : Page No 83 – 93

2. R. Murugesan **Mechanics and Relativity, Properties of matter**, practical physics, Madurai, first edition , august 2006 [B.Sc Major Physics].
    a. Unit –V: Page No 17-22, 30-32, 36-46, 48-56
    Unit – I : Page No: 109, 90, 91

Reference Books:

1. S.L. Kakani, C.Hemarajani, S.Kakani**, Mechanics**, III edition ,Viva Books Ltd,New Delhi,2011.

2. Haliday Resnic, Jearl Walker, **Principles of Physics**, 9th Edition , Wiley India Pvt. Ltd, New Delhi,2012.

3. D.S.Mathur, **Mechanics**, S.Chand and Co., New Delhi,2008

4. Brijlal and N.Subramanyam, **Properties of matter**, S.Chand and Co., New Delhi,2004

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DEPARTMENT OF B.Sc CHEMISTRY
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Class : B.Sc (Chemistry) **Part III : Allied**
Semester : I& II **Hours : 02**
Subject Code :18UPHAP1 **Credits : -**

ALLIED PHYSICS PRACTICAL - I

Course Outcomes:

CO1: To create the practical knowledge in basic physics experiments.
CO2: To understand the bending of beam, compound pendulum and torsion pendulum.
CO3: To understand current conduction in electrical circuits.
CO4: To create skill in doing the experiment individually.

LIST OF EXPERIMENTS

Any 14 Experiments:

1. Non –Uniform bending – Optic lever
2. Uniform bending - (Pin & Microscope)
3. Compound Pendulum - Determination "g"
4. Torsion Pendulum –Determination of M.I
5. Thermal conductivity of Bad conductor - Lee's disc
6. Melde's String – Frequency of tunning fork
7. Sonometer - Verification of laws
8. Calibration of low range Voltmeter – Potentiometer
9. Calibration of Ammeter – Potentiometer
10. Resistance and resistivity – Potentiometer
11. Comparison of Capacitances – Spot Galvanometer method.
12. Comparison of emf's - Spot Galvanometer method.
13. Carey Foster Bridge – Resistance & resistivity of a wire.
14. Spectrometer – Refractive indexof a Prism
15. Torsion Pendulum -Determination of Rigidity modulus
16. Co-efficient of Viscosity – Stoke's method.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF B.Sc CHEMISTRY
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Class	**: B.Sc (Chemistry)**	**Part IV**	**: Skill**
Semester	**: I**	**Hours**	**: 02**
Subject Code	**: 18UCHS11**	**Credits**	**: 02**

SUGAR TECHNOLOGY

Course Outcomes

CO1 To understand the essentials of sugar industries in India, Extraction of juice concentration-separation of crystals and testing and estimation of sugar.
CO2 To about how to sugar recovered from molasses.
CO3 To develop a knowledge in the manufacture of sucrube from Beat-root.

Unit I

Sugar industry in India-Sugar cane and sugar beet-manufacture of canesugar.

Unit II

Extraction of juice-concentration-separation of crystals-recovery of glucose from molasses-defection.

Unit III

Sulphitation and carbonation process- Double sulphitation process-double carbonation Process.

Unit IV

Testing and estimation of sugar

Unit V

Preparation of begasse-use of begasse for the manufacture of paper and electricity-preparation of alcohol from molasses-preparation of absolute alcohol-manufacture of wine,beer,methylated spirit – power alcohol-estimination of number of hydroxyl groups.

Visit to a industry and submission of report.For industrial visit/Assignment = 5 Marks (Internal)

Text Book:

BK Sharma, **Industrial chemistry including chemical engineering** - Goel publishing house- 13th Revised and enlarged edition, New Delhi (2009)

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Class	**: B.Sc (Chemistry)**	**Part IV**	**: Skill**
Semester	**: I**	**Hours**	**: 02**
Subject Code	**: 18UCHS12**	**Credits**	**: 02**

PERFUME CHEMISTRY

Course Outcomes

CO1: To acquire a knowledge in the role of vehicle, fricative, Esters for the synthesis of perfumes.
CO2: To know about the role of alcohols, ketenes', and Ionone's in the manufacture of perfumes.
CO3: To understand about the nature perfumes.

Unit I

Introduction – Esters, Alcohols, Ketones, Ionones, Aldehyde

Unit II

Diphenyl Compounds – Production of natural perfumes – flower perfumes

Unit III

Jasmine – Lily, Orange blossom, - Rose – fruit flavours

Unit IV

Artificial flavours – Natural Flavours – Distinction between these two. Preparation and

uses of vanillin and coumarin

Unit V

Banana Compounds – Grape Compounds, apple compounds and pine apple

compounds (Demonstration of Jasmine Perfume)

Visit to a industry and submission of report. For industrial visit/Assignment = 5 Marks (Internal)

Text Book:

BK Sharma, **Industrial chemistry including chemical engineering** - Goel publishing house- 13th Revised and enlarged edition, New Delhi (2009)

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Class	**: B.Sc (Chemistry)**	**Part IV**	**: Mandatory**
Semester	**: I**	**Hours**	**: 02**
Sub code	**:18UEVG11**	**Credits**	**: 02**

ENVIRONMENTAL STUDIES

COURSE OUTCOMES		
CO1: To gain knowledge on the importance of environmental education and ecosystem. **CO2:**To acquire knowledge about environmental pollution- sources, effects and control measures of environmental pollution **CO3**: To understand the various energy sources, exploitation and need of alternate energy resources. Disaster management To acquire knowledge with respect to biodiversity, its threats and its conservation and appreciate the concept of interdependence **CO4:** To make the student to understand the various pollution problems control mechanisms.		
UNIT I	**:**	**Environment and Earth:** Environment – Meaning – Definition - Components of Environment – Types of Environment. Interference of man with the Environment. Need for Environmental Education. Earth – Formation and Evolution of Earth– Structure of Earth and its components – Atmosphere, Lithosphere, Hydrosphere and Biosphere. **Natural Resources:** Renewable Resources and Non-Renewable Resources. Natural Resources and Associated Problems. Use and Exploitation of Forest, Water, Mineral, Food, Land and Energy Resources.
UNIT II	**:**	**Ecology and Ecosystems:** Ecology – Meaning - Definition – Scope – Objectives – Subdivisions of Ecology. **Ecosystem**–Concept - Structure - Functions – Energy Flow – Food Chain and Food Web – Examples of Ecosystems (Forest, Grassland, Desert, Aquatic).
UNIT III	**:**	**Biodiversity:** Definition – Biodiversity at Global, National and Local Level. Values of Biodiversity – Threats to Biodiversity – Conservation of Biodiversity. **Biodiversity of India:** Biogeographical Distribution – Hotspots of Indian Biodiversity – National Biodiversity Conservation Board and Its functions. Endangered and Endemic Species of India
UNIT IV	**:**	**Pollution Issues:** Definition – Causes – Effects and Control Measures of Air, Water, Soil, Marine, Noise, Thermal and Nuclear Pollutions. **Global Issues:** Global Warming and Ozone Layer Depletion. Future plans of Global Environmental Protection Organisations.
UNIT V	**:**	**Sustainable Development:**Key aspects of Sustainable Development – Strategies for Sustainable Development - Agriculture – Organic farming – Irrigation – Water Harvesting – Water Recycling – Cyber Waste and Management. **Disaster Management:**Meaning – Types of Disasters - Flood and Drought – Earth quake and Tsunami – Landslides and Avalanches – Cyclones and Hurricanes – Preventions and Consequences. Management of Disasters -

Text Book:

Study Material for **Environmental Studies**, Mannar Thirumalai Naicker College, Pasumalai, Madurai – 625 004.

Reference Books:

1. Study Material for **Environmental Studies**, Publications Division, Madurai Kamaraj University, Madurai – 625 021.
2. R.C. Sharma and Gurbir Sangha,**Environmental Studies**, Kalyani Publishers, 1, Mahalakshmi Street, T.Nagar, Chennai – 600 017.
3. Radha,**Environmental Studiesfor Undergraduate Courses of all Branches of Higher Education, (Based on UGC Syllabus),** Prasanna Publishers & Distributors, Old No. 20, Krishnappa Street, (Near Santhosh Mahal), Chepak, Chennai – 600 005.
4. S.N.Tripathy and Sunakar Panda,**Fundamentals of Environmental Studies**, Vrinda Publications (P) Ltd. B-5, Ashish Complex, (opp. To Ahicon Public School), MayurVihar, Phase-1, Delhi– 110 091.
5. G.Rajah,**Environmental Studies** for All UG Courses, (Based on UGC Syllabus), Margham Publications, 24, Rameswaram Road, T.Nagar, Chennai – 600 017.


SECOND SEMESTER

MANNAR THIRUMALAI NAICKER COLLEGE(Autonomous)
DEPARTMENT OF B.Sc CHEMISTRY
(For those who joined in 2018-2019 and after)

Class	**: B.Sc (Chemistry)**	**Part III**	**: Core**
Semester	**: II**	**Hours**	**: 04**
Subject Code	**: 18UCHC21**	**Credits**	**: 04**

Organic Chemistry-I

Course Outcomes

CO1 To have the basic idea of carbohydrates, dyes and alcohols
CO2 To understand about the organic compounds and its classification and stereo isomerism.
CO3 To learn about preparation and uses of ethers, thin alcohols & thin ethers.

Unit – I

a) Carbohydrates : 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: Preparation, properties, constitution and configuration of sucrose.
c) Poly saccharides: A general study of starch and cellulose – uses of cellulose in industries

Unit II

Dyes: Definition – theory of colour and constitution – classification of dyes according to
structure and their mode of applications.

(i) Azo dyes: Preparation and uses of methyl orange, congo-red and bismark brown
(ii) Triphenyl methane dyes: preparation and uses of malachite green, rosaniline and crystal violet
(iii) Phthalein dyes: Preparation and uses of phenolphthalein, fluorescein and eosin
(iv) Vat dyes: preparation and uses of Indigo

Unit III

a. Organic compounds and classification – Alkanes – Nomenclature - General methods of preparation and Chemical properties.
b. Alkenes – Nomenclature – General methods of preparation – chemical properties – Electrophilic additions – Addition of hydrogen halide – Markownikov's rule – Antimarkovinkov's addition – Addition of H_2SO_4,H_2O, Halogen – Hydroboration – oxidation – ozonolysis – hydroxylation – polymerisation.

Unit IV

a) 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.

b) Ethers: Mechanism of Williamson's synthesis, mechanism of cleavage by HX, estimation of methoxy group by Zeisel method. Application of crown ethers.

c) Thioalcohols and thioethers: Preparation and properties of sulphonal and mustdard gas.

Unit – V

Stereo isomerisms

a) 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:

(i) Optical activity – specific rotation – definition of optical isomerism – elements of symmetry

(ii) Optical isomerism of compounds containing asymmetric carbon atom – racemistation and resolution of racemic mixtures – Walden inversion – asymmetric synthesis – chirality – specifications of absolute configuration by R and S notations.

iii) Optical activity of compounds without asymmetric carbon atoms, allenes, spiranes and bi phenyl compounds.

Text Book:

P.L Soni, Text Book of **Organic Chemistry** New Delhi (2008)

References:

1. B.S Bahl and Arun Bahl S.Chand, **Advanced Organic Chemistry** Co Ltd, New Delhi (2012)
2. B-Mehta and M.Mehta, **Organic Chemistry** E.E Edition, New Delhi (2010)
3. P.L Soni and H.M Chawla, **Organic Chemistry**, 29th Edition, Sultan Chand and sons, New Delhi, (2007)

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Class : B.Sc (Chemistry) **Part III : Core**
Semester : I & II **Hours : 02**
Subject Code : 18UCHCP1 **Credits : 02**

Inorganic Semi micro Qualitative analysis – Lab

Course Outcomes
CO1 To know about the identification of anions.
CO2 To understand the basic idea of identification of lotions.
CO3 To have an idea about how to confirm the acid & basic radicals

Duration of examination: 3hrs

Analysis of a mixture containing two anions of which one is an interfering ion semi-micro method two cations

Anions:

Carbonate, sulphate, nitrate, fluoride, chloride, bromide, iodide, oxalate, Borate, phosphate, arsenite, arsenate and chromate.

Cations: Lead, bismuth, copper, cadmium, antimony, iron (II and III), aluminium, Chromium, zinc, manganese, cobalt, nickel, barium, strontium, calcium, Magnesium and ammonium.

Distribution of marks

Max marks: 100

Internal : 40 marks **External : 60 marks**

Laboratory Performance	:	30 marks	Vivo voce	:	10 marks
Observation note book	:	10 marks	Record note book	:	10 marks
			Four radicals with correct procedure	:	40 marks
Total	:	40 marks	Total	:	60 marks

MANNAR THIRUMALAI NAICKER COLLEGE(Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Class : B.Sc (Chemistry) **Part III : Allied**
Semester : II **Hours : 4**
Subject Code :18UPHA21 **Credits : 3**

ALLIED PHYSICS– II
Thermal Physics and Sound

Course Outcomes:

CO1: To create the knowledge in heat conduction.
CO2: To understand the thermal physics concepts.
CO3: To understand production and propagation of sound.
CO4: To develop the skill in the area of Thermal Physics and Sound.

Unit – I:

Radiation – Stefan's law – Determination of Stefan's constant by filament heating method – Solar constant – Water flow Pyroheliometer – Temperature of the sun – Solar spectrum – Energy distribution in black body spectrum – Planck's law(no derivation) .

Unit – II:

Kinetic theory of gases – Mean free path – Transport phenomena – Expression for the coefficient of Diffusion, viscocity and thermal conductivity – Degree of freedom – Boltzman's law of equipartition of energy – calculation of γ for mono atomic and diatomic gases.

Unit – III:

Thermodynamics – Zeroth law (statement only) - First, second and third laws of thermodynamics (statement only) – Entropy – change of entropy in Carnot's cycle – Change of entropy in conversion of ice into stream – Joule Kelvin effect – super conductivity.

Unit – IV:

Simple harmonic motion – Composition of two S.H.M's in a straight line - Composition of two S.H.M'sof equal time periods at right angles – stationary waves – Properties of stationary waves – Melde's experiment for the frequency of electrically maintained tuning fork (transverse and longitudinal modes).

Unit – V:

Acoustics of buildings – Requirements of good auditorium – Ultrasonics – Production – piezo electric method – Detection – Kundt's tube and piezo electric properties and application – Determination of velocity of ultrasonic waves in a liquid (ultrasonic diffracton).

Text Books:

1. R. Murugesan, **Thermal Physics**, Chennai, First Edition, June 2012. [B.Sc., Ancillary Physics]

Unit – I: 5.1 – 5.10.
Unit – II: 6.1 – 6.7, 6.9 – 6.11.
Unit – III: 7.5 – 7.7, 8.1, 8.5.

2. R. Murugesan, Mechnics, Properties of Matter and Sound, Thermal Physics, Practical – I, Chennai, First Edition, July, 2016.

Unit – IV: 6.1- 6.3,6.7 – 6.9.
Unit – V: 6.11 - 6.12.

Reference Books:

1. Brijlal and N. Subramanyam, **Heat and Thermodynamics**, S.Chand and Co, New Delhi, 2004.
2. Ubald Raj and Jose Robin, **Ancillary physics**, Vol.II, Indra Publications, Bhopal,2002.
3. D.Halidary, Resnick and J.Walker, **Fundamental of Physics**, 6th Edition, New Delhi, 2012.
4. R. Murugesan, **Heat and Thermodynamics**, S. Chand and Co, New Delhi, 2004.
5. Brijlal and N.Subramanyam, **A text book of Sound**, II Revised Edition,Vikas publishing Pvt. Ltd, New Delhi,1995.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Class : B.Sc (Chemistry) **Part III : Allied**
Semester : I& II **Hours : 02**
Subject Code : 18UPHAP1 **Credits : 01**

ALLIED PHYSICS PRACTICAL – I

Course Outcomes:

CO1: To create the practical knowledge in basic physics experiments.
CO2: To understand the bending of beam, compound pendulum and torsion pendulum.
CO3: To understand current conduction in electrical circuits.
CO4:To create skill in doing the experiment individually.

LIST OF EXPERIMENTS

Any 14 Experiments:

1. Non –Uniform bending – Optic lever
2. Uniform bending - (Pin & Microscope)
3. Compound Pendulum - Determination "g"
4. Torsion Pendulum –Determination of M.I
5. Thermal conductivity of Bad conductor - Lee's disc
6. Melde's String – Frequency of tunning fork
7. Sonometer - Verification of laws
8. Calibration of low range Voltmeter – Potentiometer
9. Calibration of Ammeter – Potentiometer
10. Resistance and resistivity – Potentiometer
11. Comparison of Capacitances – Spot Galvanometer method.
12. Comparison of emf's - Spot Galvanometer method.
13. Carey Foster Bridge – Resistance & resistivity of a wire.
14. Spectrometer – Refractive indexof a Prism
15. Torsion Pendulum -Determination of Rigidity modulus
16. Co-efficient of Viscosity – Stoke's method.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Class	**: B.Sc (Chemistry)**	**Part IV**	**: Skill**
Semester	**: II**	**Hours**	**: 02**
Subject Code	**: 18UCHS21**	**Credits**	**: 02**

LEATHER TECHNOLOGY

Course Outcomes

CO1 To acquire skill in semi-micro inorganic qualitative analysis
CO2 To have a knowledge in beam house process and history of tanning industry in India. CO3 To have an idea about the vegetable tanning, synthetic tanning and chrome tanning.

Unit I

History of tanning industry in India-conventional tanning process-animal skin – Structure and Composition

Unit II

Manufacture of leather, preparation of hides for tanning,use of various inorganic and organic chemicals for tanning process.

Unit III

Beam house process - soaking liming-deliming, deharing and bating.

Unit IV

Vegetable tanning-type of tanning for soles-belting and heavy leather – vegetable tans –

catechol - pyrogalloltans

Unit V

Vegetable tanning -synthetic tanning chrome tanning, oil tanning, finishing the leather-

pollution problems caused by tanneries and its control. Treatment of tannery effluents by primary, secondary and tertiary processes-use of reverse osmosis system for the treatment of polluted water.

Visit to a industry and submission of report. For industrial visit/Assignment = 5 marks(Internal)

Text Book:

1. BK Sharma**, Industrial chemistry including chemical engineering**, Goel Publishing house - 13th Revised and enlarged edition, New Delhi (2009)

Reference Books:

1. F.N.Howes, **Vegetable Tanning materials**, Butterworth London (1953)
2. K.H.Gustavson, **Chemistry of Tanning of processes**, Academic press, New York (1950)
3. K.T.Sarkar, **Theory and Practice of Leather Manufacturing**, Indian Leather Technology Association.
4. S.S.Dutta, **Principles of Leather Manufacturing**, Indian Leather Technology Association.
5. A.C.Orthmann, **Tanning processes**, Foreign Publication.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Class	**: B.Sc (Chemistry)**	**Part IV**	**: Skill**
Semester	**: II**	**Hours**	**: 02**
Subject Code	**: 18UCHS22**	**Credits**	**: 02**

PAPER AND PULP TECHNOLOGY

Course Outcomes

CO1: To learn about introduction and manufacture of pulp and raw materials used for the preparation of pulp.
CO2: To have an idea of manufacture of paper and its uses.
CO3: To know about the various paper industries in India.

Unit I

Introduction-manufacture of pulp, various raw materials used for the preparation of pulp.

Unit II

Preparation of kraft pulp, sulphite pulp, soda pulp and rag pulp.

Unit III

Various process: beating, refining, filling, sizing and colouring.

Unit IV

Manufacture of paper-calendaring uses.

Unit V

Various paper industries in India-clean technologies in agro based industries - ecological problems of Indian pulp and paper industry.

Visit to a industry and submission of report.For industrial visit/Assignment = 5Marks (Internal)

Text Book:

BK Sharma, **Industrial chemistry including chemical engineering**, Goel publishing house- 13th Revised and enlarged edition, New Delhi (2009)

Reference Books:

1. R.G.MacDonold, **Pulp and Paper manufacture**, McGraw Hill (1969)
2. J.P.Casey, **Pulp and Paper Chemistry Technology**, Wiley interscience (1983)
3. P.Bajpai and P.K.Bajpai, **Biotechnology in the Pulp and paper industry**, PIRA international (1998)

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF B.Sc CHEMISTRY
(For those who joined in 2018-2019 and after)

Class	**: B.Sc (Chemistry)**	**Part IV**	**: Mandatory**
Semester	**: II**	**Hours**	**: 02**
Sub code	**:18UVLG21**	**Credits**	**: 02**

VALUE EDUCATION

COURSE OUTCOMES

CO1: Clarifying the meaning and concept of value - value education.

CO2: To inspire **students** to develop their personality and social **values** based on the principles of human **values.**

CO3: Developing sense of Love, Peace and Brotherhood at Local, national and international levels.

CO4: To enable the students to understand the social realities and to inculcate an essential value system towards building a health society

UNIT I	:	**Values and The Individual:** Values – Meaning – Definition – Importance – Classification of Values, Value Education – Meaning – Need for Value Education. Values and the Individual – Self-Discipline – Meaning – Tips to Improve Self-Discipline. Self-Confidence – Meaning - Tips to Improve Self-Confidence. Empathy – Meaning – Role of Empathy in motivating Values. Compassion – Role of Compassion in motivating Values. Forgiveness – Meaning - Role of Forgiveness in motivating Values. Honesty – Meaning – Role of Honesty in motivating Values. Courage – Meaning – Role of Courage in motivating Values.
UNIT II	:	**Religions and Communal Harmony:** Religions – Meaning **–** Major Religions in India - Hinduism – Values in Hinduism. Christianity – Values in Christianity. Islam – Values in Islam. Buddhism – Values in Buddhism. Jainism – Values in Jainism. Sikhism – Values in Sikhism. Need for Religious Harmony in India. Caste System in India – Need for Communal Harmony in India. Social Justice – Meaning – Factors Responsible for Social Justice.
UNIT III	:	**Society and Social Issues:** Society – Meaning – Values in Indian Society. Democracy – Meaning – Values in Indian Democracy. Secularism – Meaning – Values in Indian Secularism. Socialism – meaning – Values in Socialism. Social Issues – Alcoholism – Drugs – Poverty – Unemployment.

UNIT IV	:	**Human Rights and Marginalised People:** Human Rights – Meaning – Problem of Violation of Human Rights in India – Authorities available under the Protection of Human Rights Act in India. Marginalised People like Women, Children, Dalits, Minorities, Physically Challenged – Concept – Rights – Challenges. Transgender – Meaning – Issues.
UNIT V	:	**Social Institutions in Value Formation:** Social Institutions – Meaning – Important Social Institutions. Family – Meaning – Role of Families in Value Formation. Role of Press & Mass Media in Value Formation – Role of Social Activists – Meaning Contribution to Society – Challenges.

Text Book:

Text Module for **Value Education**, Mannar Thirumalai Naicker College, Pasumalai, Madurai – 625 004

Reference Books:

1. Text Module for **Value Education**, Publications Division, Madurai Kamaraj University, Madurai – 625 021.
2. N.S.Raghunathan, **Value Education**, Margham Publications, 24, Rameswaram Road, T.Ngar, Chennai – 600 017.
3. Dr.P.Saravanan, and P.Andichamy, **Value Education**, Merit India Publications, (Educational Publishers), 5, Pudumandapam, Madurai-625001.


THIRD SEMESTER

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018 and after)

Programme : UG **Part III : Core**
Semester : III **Hours per week: 04**
Subject Code : 18UCHC31 **Credit :04**

PHYSICAL CHEMISTRY – I

Course Outcomes:

CO1: To study the essentials of gaseous state and colloidal state of matter
CO2: To have the basic idea of chemical kinetics
CO3: To know about the adsorption & catalysis
CO4: To study the kinetics of chemical equation in various fields.

Unit -1: Gaseous State

a. Postulates of kinetic theory gases – Derivation of ideal gas laws from the expression on the basis of kinetic theory of gases – Deviations – Vander Wall's equation – Reduced equation of state – Law of corresponding states compressibility factor for gases – Boyle and inversion temperatures of gases.

b. Maxwell – Boltzmann law of distribution of velocities (Derivation not necessary) graphical representation – Effect of temperature on various velocities – Experimental verification of Maxwell's law.

c. Mean free path – Viscosity of gases – Collision number – Brownian movement and determination of Avogadro number – Loschmidt number – Principle of equipartition of energy.

Unit -2: Colloidal State

a. Colloidal State of matter – Various types – Classification
b. Sols – Dialysis – Electro osmosis – Electrophoresis – Stability of colloids – Protective action – Hardy – Schulze law - Gold number
c. Emulsion – Types of emulsions – Emulsifier with examples
d. Gels – Classification – Preparation and applications of colloids

Unit -3: Adsorption

Adsorption: Definition of various terms – Adsorption of gases on solids characteristics of adsorption of gases on solids – Physisorption and chemisorption– Factors influencing adsorption – adsorption isotherm – BET (Elementary idea only) – Applications of adsorption

Unit-4: Catalysis

Catalysis: Definition – Characteristics – Theories of catalysis – Promoters - Poisons – Enzyme Catalysis – Mechanism – Michaleis Menten equation - acid base catalysis - Autocatalysis – Application of catalysis.

Unit -5: Chemical Kinetics

a. Introduction – Rate of reaction – Rate law and Rate constant – Order and molecualrity of a reaction. Reaction of first and pseudo unimolecular reaction Catalytic decomposition of hydrogen peroxide – Decomposition of dinitrogen pentoxide. Inversion of cane sugar and hydrolysis of ester by acid.

b. Second, third and Zero order reactions – examples – rate equation – half period (no derivation required)

c. Influence of temperature on the rate of reaction – Arrhenius rate equation and its significance – Measurement of parameters. Theory of reaction rates - Bimolecular collision theory – Unimolecular reactions – Lindemann hypothesis – Absolute Reaction Rate theory.

d. Influence of ionic strength on reaction rate – primary and secondary salt effect – kinetics of fast reactions – Relaxation method.

Text Books

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

Unit- 1: Page No's – 387-456

Unit -2: Page No's – 890-928

Unit-3: Page No's – 928-945

Unit -4: Page No's – 863-890

Unit -5: Page No's - 808-863

Reference Books

1. Gilbert.W. Castellan.W, Physical Chemistry, Narosa publishing house, third edition 1985.
2. Atkins. P.W, Physical Chemistry, 7th edition, Oxford university press, 2001.
3. Dogra. S.K and Dogra.S, Physical Chemistry Through Problems, New age international, 4th edition 1996.
4. Puri. B.R, Sharma. L.R and Pathania. S, Principles of Physical Chemistry, Shoban Lal Nagin chand and Co, 47th edition, 2017.
5. Maron. S.H and Lando. J.B, Fundamentals of Physical Chemistry, Macmillan limited, 1966, New York.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018 and after)

Programme : UG | **Part III : Core**
Semester : IV | **Hours per week: 02**
Subject Code : 18UCHCP2 | **Credit : -**

Volumetric Analysis Practical

(A double titration involving the making up of the solution to be estimated and the preparation of a primary standard.)

Course Outcomes:
CO1: To develop skill in Acidimetric and alkalimetric analysis
CO2: To gain knowledge in redox, iodometry and dichrometry
CO3: To study about the argentimetry and EDTA titration
CO4: To determine the percentage of substance in Industry through volumetric analysis.

List of Experiments

I. Acidimetry and Alkalimetry

1. Estimation of Na_2CO_3
2. Estimation of NaOH / KOH
3. Estimation of oxalic acid.

II. Redox Titrations

a. Permanganometry

1. Estimation of ferrous ion
2. Estimation of oxalic acid
3. Estimation of calcium (direct method)

b. Dichrometry

1. Estimation of ferrous ion
2. Estimation of ferric ion using external indicator

III. Iodometry and Iodimetry

1. Estimation of potassium dichromate
2. Estimation of potassium permanganate
3. Estimation of copper

IV. Argentimetry

Estimation of Potassium Chloride

V. EDTA Titration

Estimation of Hardness of water using EDTA.

Distribution of Marks (Max.marks -100)

Duration of examinations: 3hrs

Int: 40

Class work	: 30 marks
Observation note book	: 10 marks
Total	: 40 marks

Ext: 60

Viva Voce	: 5 marks
Record Notebook	: 10 marks
Procedure writing	: 15 marks
Volumetric estimation	: 30 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

Text Book:

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

Reference Books:

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, 2009, New Delhi.

3. Dr. V. V. Ramanujam, Inorganic Semimicro Qualitative Analysis, National Publishing Company, 3rd edition, 1974, Chennai.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Programme	**: B.Sc., Chemistry**	**Part III**	**: Allied**
Semester	**: III**	**Hours per week**	**: 04**
Subject Code	**: 18UMCA32**	**Credit**	**: 04**

ALLIED MATHEMATICS – I

Course Outcomes:

CO1: To familiarize basic concepts of theory of equations.
CO2: To develop skills in solving equations.
CO3: To teach trigonometry and Expressing Trigonometric functions.
CO4: To develop skills in expanding Trigonometric functions.

Unit-I

Theory of Equations: Formation of Equations - Relation between the roots and coefficients.

Unit-II

Reciprocal Equations - Transformation of Equations.

Unit – III

Approximate solutions of Numerical Equations: Newton's Method - Homer's Method.

Unit - IV

Trigonometry: Applications of Demoivre's Theorem - Expression for $\sin n\theta$, $\cos n\theta$ and $\tan n\theta$.

Unit - V

Expression of $\sin^n\theta$ and $\cos^n\theta$ - Expansion of $\sin\theta$, $\cos\theta$ and $\tan\theta$ in powers of θ.

Text Book:

Dr. Arumugam. S and Thangapandi Isaac. A, **Ancillary Mathematics Paper I**, New Gamma Publishing House, 2007, Palayamkottai.

Unit I - Chapter 1: Sections: 1.1, 1.2
Unit II - Chapter 1: Sections: 1.3, 1.4
Unit III - Chapter 1: Section: 1.5
Unit IV - Chapter 4: Section: 4.1
Unit V - Chapter 4: Sections: 4.2,4.3

Reference Books:

1..ManickavashagamPillai. T.K and Narayanan. S, **Algebra – Volume I,** Viswanathan. S Printers Publishers Pvt. Ltd, 2007, Chennai.
2. ManickavashagamPillai.T.K and Narayanan.S, **Trigonometry,** Viswanathan.S Printers Publishers Pvt. Ltd, 2011, Chennai.
3. Dr.Arumugam.S and Isaac, **Classical Algebra**, New Gamma Publication House, 2003, Palayamkottai.

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2018-2019 and after)

Programme	**: B.Sc (Mathematics & Chemistry)**	**Part III**	**: Allied**
Semester	**: III**	**Hours per week**	**: 04**
Sub code	**: 18UPHA31**	**Credit**	**: 04**

ALLIED PHYSICS - III
ELECTRICITY AND ELECTRONICS

Course Outcomes

CO1: To enable the students to understand the basic concepts of electricity and electronics.
CO2: To understand the Gauss's law, Kirchhoff's laws and torque.
CO3: To study diodes and Binary number system.
CO4: To analyse the types of oscillator.

Unit I:

Gauss's law – Proof – Applications – Electric field due to a charged sphere – Field near a charged conducting cylinder - Coulomb's theorem – Electric potential – Relation between electric potential and electric field – Capacitors –Expression for C of a parallel plate, spherical (outer sphere earthed) and cylindrical capacitors – Energy of a charged capacitor – Loss of energy due to sharing of charges between two capacitors.

Unit II:

Kirchoff's laws – Application of Kirchhoff's laws to Wheatstone's network – Carey Foster's Bridge – Measurement of resistance and temperature coefficient of resistance – Principle of Potentiometer – Calibration of ammeter and voltmeter(low & high range) – Measurement of resistance using potentiometer.

Unit III:

Torque on a current loop – Mirror galvanometer, dead beat and ballistic galvanometers – Current and voltage sensitiveness using B.G – Experiments for charge sensitiveness – comparison of emf's and comparison of capacitors.

Electro motive force generated in a coil rotating in a uniform magnetic field – RMS and Mean values – LCR circuit -Series and parallel resonant circuits.

Unit IV:

Junction Diodes – Forward and reverse bias – Diode characteristics – Types of diodes (LED and Zener)-Bridge rectifier using Pi filter – Transistor – Characteristics(CE mode only) – Single transistor(CE) amplifier Frequency response - Hartley oscillator – OPAMP and its characteristics – OPAMP as adder and subtractor.

Unit V:

Decimal number system - Binary number system – Binary to decimal and decimal to binary conversions – Addition and subtraction of binary numbers – Logic circuits – Boolean algebra – Postulates and theorems of Boolean Algebra – De Morgan's theorem – OR, AND, NOT, NOR and NAND gates –NOR and NAND gates as universal building blocks - EX-OR gates.

Text Book:

1. Murugesan.R**, Electricity and Electronics**, S.Chand and Co, First Edition, June 2012, New Delhi.
   Unit – I : 1.1 – 1.19
   Unit – II : 2.1 – 2.10
   Unit – III : 3.1 – 3.10, 3.11 – 3.16
   Unit – IV : 4.1 – 4.18, 4.24, 4.25
   Unit – V : 5.1 – 5.18

Reference Books:

1. Narayanamoorthy and Nagarathinam, **Electricity and Magnetism,** National Publishing Co, 1997

2. Sehgal, Chopra and Sehgal, **Electricity and Magnetism**,- Sultan chand and Sons, 1998, New Delhi.

3. Murugesan.R, **Electricity and Electromagnetism**, S.Chand and Co, 2004, New Delhi.

4. Brijlal and Subramaniyam, **Electricity & Magnetism**, S.Chand and Co, 20th revised edition, 2007.

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2018-2019 and after)

Programme	**: B.Sc (Mathematics & Chemistry)**	**Part III**	**: Allied**
Semester	**: III & IV**	**Hours per week**	**: 02**
Sub code	**: 18UPHAP2**	**Credit**	**: -**

ALLIED PHYSICS PRACTICAL – II

Course Outcomes
CO1: To develop experimental knowledge by handling various apparatus
CO2: To know the various components and its important
CO3: To know the circuit connections an functioning of experiments.
CO4: To create interest to develop oscillatory circuit.

Any 14 experiments.

1. Mirror Galvanometer - Voltage and current sensitiveness
2. LCR – Series resonance - Determination of L & Q factor
3. Air wedge - Thickness of a wire
4. Dispersive power of a prism – Spectrometer
5. Grating N and λ by Normal incidence – Spectrometer
6. Newton's rings - Determination of radius of curvature
7. Bridge rectifier - Pi filter
8. Transistor characteristics - CE mode
9. Single stage transistor amplifier
10. Hartley oscillator
11. Logic gates – AND, OR, NOT - Truth table verification Using Discrete Components.
12. Logic gates – NAND, NOR - Truth table verification Using Discrete Components.
13. Zener diode characteristics and break down voltage
14. OP AMP as an adder and subtractor
15. Comparison of capacitances - Desauty's method using headphone
16. LCR – Parallel resonance.

MANNAR THIRUMALAI NAICKER COLLEGE(Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018 and after)

Programme	**: UG**	**Part IV**	**: NME**
Semester	**: III**	**Hours per week**	**: 02**
Subject Code	**: 18UCHN31**	**Credit**	**: 02**

WASTE WATER TREATMENT

Course Outcomes:
CO1: To understand about the soft water and hard water.
CO2: To know about the various external conditional methods.
CO3: To discern on the treatment of boiler feed water.
CO4: It is useful to analyse water and become an analyst.

Unit I

Introduction - Types of impurities present in water - Hardness of water - Estimation of hardness by EDTA method - Domestic water treatment - water quality standards.

Unit II

Sterilization - Boiling - Ozone gas treatment - Ultraviolet treatment - Chlorination – Break point chlorination.

Unit III

Boiler feed water - Scale and sludge formation - Comparison of sludge and scale - Boiler corrosion - Removal of carbon dioxide and dissolved oxygen.

Unit IV

Caustic embrittlement - Priming - Foaming - Requirements of boiler feed water - Internal conditioning - Colloidal conditioning - Phosphate conditioning - Calgon conditioning - Carbonate conditioning.

Unit V

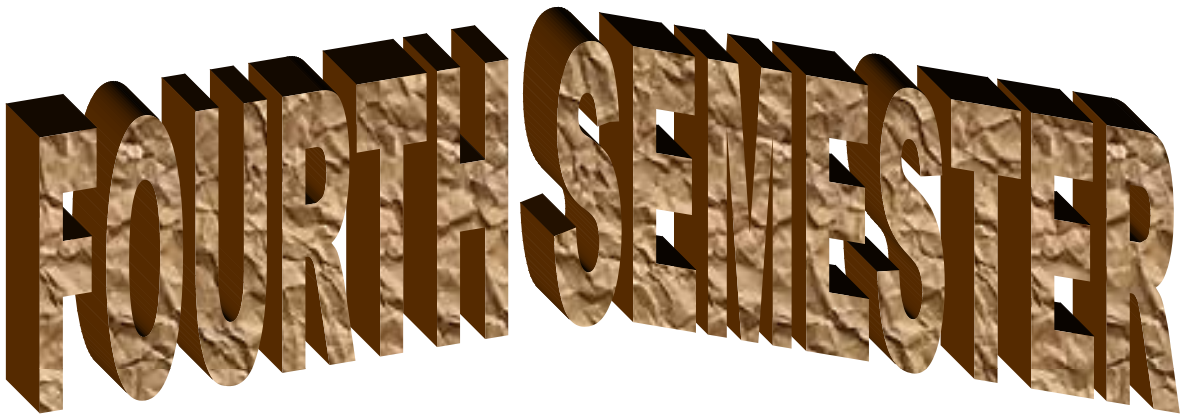
External conditioning - Demineralization process - Regeneration of ion exchangers - Advantages and disadvantages of ion exchange process - Desalination - Reverse osmosis - Difference between internal conditioning and external conditioning.

Text Book:

1. Sivakumar.R, Jeyaprakasam.R & Sivakumar.N, "Engineering Chemistry" TATA McGRAW-Hill Pvt Ltd, (2012), New Delhi.

References Books:

1. B.K.Sharma "Engineering chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).
2. Sivasankar.B "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, (2008), New Delhi.
3. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi.


FOURTH SEMESTER

MANNAR THIRUMALAI NAICKER COLLEGE(Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018 and after)

Programme	**: UG**	**Part III**	**: Core**
Semester	**: IV**	**Hours per week**	**: 04**
Subject Code	**: 18UCHC41**	**Credit**	**: 04**

INORGANIC CHEMISTRY-II

Course Outcomes:
CO1: To gain the basic knowledge of metallurgy.
CO2: To understand the essentials of co-ordination compounds.
CO3: To learn about the general discussion of p-block elements.
CO4: Metallurgy unit is applicable to go Industry for students.

Unit - 1 - Metallurgy

Occurrence of metals – minerals – ores - types of ores – various steps involved in metallurgy- concentration of ore : physical and chemical methods - calcination - roasting -reduction methods - smelting, alumino-thermic, air and electrolytic methods - refining methods : cupellation, electrolytic, zone refining and vapour phase method - Extraction of Vanadium, Molybdenum and Tungsten from their ore.

Unit – 2 - p - Block Elements – I (Group III A, IV A & V A elements)

General characteristics : Electronicconfiguration, metallic character, oxidation states, - allotropy, oxidation states and catenation Preparation, properties ,structure and uses of Diborane, Borazine- allotropes of carbon – detailed study of Carbides and Silicates – Preparation, properties and uses of Silicones, Carborundum, Stannous chloride, Red Lead and White Lead.- Nitrides: classification - preparation, properties and uses of microcosmic salt, Graham's salt and tartar emetic.

Unit – 3- p - Block Elements – II (Group VI A &VII A elements)

General characteristics : Electronic configuration, metallic and non-metallic character, atomicity, polymorphism, catenation and oxidation states – Anomalous behavior of oxygen - preparation, properties and uses of Caro's acid and Marshall's acid — isolation of fluorine by modern method bleaching powder : its manufacture (Modern method) and estimation of available chlorine in bleaching powder – relative strengths of oxoacids of the halogens - electropositive character of Iodine – Interhalogens & Pseudohalogens

Unit –4 - Coordination Chemistry – I

Double salts and coordination compounds – terminology: coordination sphere, coordination number, ligand and its types – nomenclature - Isomerism: structural isomerism and stereo isomerism - stability: thermodynamic and kinetic stability - factors affecting the stability of metal complexes – Experimental determination of composition of complexes by Job's method – Chelates:classification – chelate effect and application of the formation of chelated complexes in analytical chemistry.

Unit – 5 - Coordination Chemistry – II

Werner's coordination theory: postulates and experiment evidence - Sidgwick's concept: EAN rule – applications and limitations - Valence Bond Theory: assumptions and illustration to 4 and 6- coordination ions - hybridization and geometry - limitations - Crystal Field Theory: salient features - orbital splitting as applied to octahedral, tetrahedral and square planar complexes - CFSE and its calculation - spectrochemical series- magnetic moments and colour of transition metal complexes.

Text Books

1. Puri. B. R, Sharma. L. R, Kalia. K. C, Principles of Inorganic Chemistry, Shoban Lal Nagin Chand and Co., 2014, Delhi.

   Unit- 1: Page No's – 328 - 339.

   Unit -2: Page No's – 416 – 418, 432 – 434, 437-438, 443, 443, 452-455, 468-470,480-482, 486-487, 521-522, .

   Unit-3: Page No's – 536-538, 540-541, 559-560. 570-571, 585-586, 589-590, 591-603.

   Unit -4: Page No's – 743-772.

   Unit -5: Page No's – 773-786.

Reference Books

1. Huheey. J. E, Kieter. E. A and Keiter. R. L, Inorganic Chemistry, 4th ed., Harper Collins, 1993, New York.
2. Cotton. F. A, Wilkinson.G, Murillo.C and M. Bochman, Advanced Inorganic Chemistry, 6th ed., John Wiley, , 1999, New York.
3. Moeller.T, Inorganic Chemistry: A Modern Introduction, Wiley, 1990, New York.
4. Madan. R.D, S.Chand, **Modern Inorganic Chemistry** band Co.Ltd, 2012, New Delhi.

MANNAR THIRUMALAI NAICKER COLLEGE(Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018 and after)

Programme : UG	**Part III : Core**
Semester : IV	**Hours per week : 02**
Subject Code : 18UCHCP2	**Credit : 02**

Volumetric Analysis Practical

(A double titration involving the making up of the solution to be estimated and the preparation of a primary standard.)

Course Outcomes:
CO1: To develop skill in Acidimetric and alkalimetric analysis
CO2: To gain knowledge in redox, iodometry and dichrometry
CO3: To study about the argentimetry and EDTA titration
CO4: To determine the percentage of substance in Industry through Volumetric analysis.

List of Experiments

I. Acidimetry and Alkalimetry

1. Estimation of Na_2CO_3
2. Estimation of NaOH / KOH
3. Estimation of oxalic acid.

II. Redox Titrations

a. Permanganometry

1. Estimation of ferrous ion
2. Estimation of oxalic acid
3. Estimation of calcium (direct method)

b. Dichrometry

1. Estimation of ferrous ion
2. Estimation of ferric ion using external indicator

III. Iodometry and Iodimetry

1. Estimation of potassium dichromate
2. Estimation of potassium permanganate
3. Estimation of copper

IV. Argentimetry

Estimation of Potassium Chloride

V. EDTA Titration

Estimation of Hardness of water using EDTA.

Distribution of Marks (Max.marks -100)

Duration of examinations: 3hrs

Int: 40

Class work	: 30 marks
Observation note book	: 10 marks
Total	: 40 marks

Ext: 60

Viva Voce	: 5 marks
Record Notebook	: 10 marks
Procedure writing	: 15 marks
Volumetric estimation	: 30 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

Text Book:

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

Reference Books:

1. Jeyavathana Samuel, Chemistry Practical Book, G.G.Printers, 2012, Chennai.
2. Vickie.M.Williamson, M.Larry Peck, Lab manual for General Chemistry, Cengage Learning India Private Limited, 2009, New Delhi.
3. Dr. V. V. Ramanujam, Inorganic Semimicro Qualitative Analysis, National Publishing Company, 3rd edition, 1974, Chennai.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Programme	**: B.Sc., Chemistry**	**Part III**	**: Allied**
Semester	**: IV**	**Hours per week**	**: 04**
Subject Code	**: 18UMCA42**	**Credit**	**: 04**

ALLIED MATHEMATICS – II

Course Outcomes:

CO1: To familiarize Vector differentiation.
CO2: To introduce basic statistical concepts of interpolation.
CO3: To familiarize the concepts on attributes and index numbers.
CO4: To develop skills in finding various Index numbers.

Unit – I

Vector differentiation: Vector algebra – Differentiation of Vectors– Gradient.

Unit –II

Divergence and Curl- Solenoidalvectors - Irrotational vectors.

Unit-III

Interpolation: Newton's Formula (Problems only) - Lagrange's Formula (Problems only).

Unit – IV

Theory of Attributes: Introduction - Attributes.

Unit- V

Index Numbers- Aggregate Method- Average of Price Relatives Method - Weighted Index Number - Laspeyre's, Paasche's and Fisher's Index Number –Weighted Average of Price Relative Method: The Time reversal test – The factor reversal tests – The commodity reversal tests.

Text Books:

1. Arumugan.S and Thangapandi Isaac.A, **Analytical Geometry 3D and Vector Calculus**, New Gamma Publishing House, 2014, Palayamkottai.
2. Arumugam.S and Thangapandi Isaac.A, **Statistics**, New Gamma Publishing House, 2009, Palayamkottai.

Unit I – Text book 1	Chapter 5 – Sections: 5.0 – 5.3
Unit II – Text book 1	Chapter 5 – Section: 5.4
Unit III –Text book 2	Chapter 7 – Sections: 7.2, 7.3
Unit IV –Text book 2	Chapter 8 – Sections:8.0, 8.1
Unit V – Text book 2	Chapter 9 – Section: 9.1

Reference books:

1. Manicavasagam Pillai and Natarajan, **Analytical Geometry of three Dimensions andVector Calculus,** S.Viswanathan Printers and Publishers Pvt. Ltd, Reprint 2001, Chennai.
2. Gupta. . S.C, Kapoor. V.K, **Elements of Mathematical Statistics,** Sultan Chand &Sons
   Publications, 2001, New Delhi.
3. Pillai. R.S.N and Bagavathi, **Practical Statistics**, S.Chand & Company Pvt Ltd, Reprint 2010, New Delhi.

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2018-2019 and after)

Programme	**: B.Sc (Mathematics & Chemistry)**	**Part III**	**: Allied**
Semester	**: IV**	**Hours per week**	**: 04**
Sub code	**: 18UPHA41**	**Credit**	**: 03**

ALLIED PHYSICS - IV
OPTICS, SPECTROSCOPY AND MODERN PHYSICS

Course Outcomes

CO1: To understand the basic concepts in optics.
CO2: To understand the properties of light like reflection, refraction, interference, diffraction and polarization
CO3: To study the infrared spectroscopy, Raman effect, Doppler Effect and fiber optic communication system.
CO4: To evaluate theory of relativity.

Unit I:

Deviation produced by thin lens – Focal length of two thin lenses in and out of contact – Cardinal points – 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.

Unit II:

Photography – Photographic camera – Depth of focus – Photographic film.
Interference in thin films – air wedge – Newton's rings (reflected beam only) – Determination of wavelength.

Unit III:

Double refraction – Nicol prism – Construction, action and uses – Quarter wave plate (QWP) – Half wave plate (HWP) – Optical activity – Biot's laws – Specific rotatory power – Half shade polarimeter – Determination of specific rotatory power – Fibre optics – Light propagation in fibres – Fibre optic communication system - Advantages.

Unit IV:

Infra red radiations – Sources, properties and uses – Ultraviolet radiations – Sources, properties and uses – Planck's quantum theory – Raman effect – Experimental study of Raman effect(simple theory) - Quantum theory of Raman effect – Applications – Photo electricity – Laws of photo electricity – Photo electric cells – Types(Photo emissive, Photoconductive and Photovoltaic cells) and their uses – Applications of photo electric cells.

Unit V:

Michelson–Moreley experiment – Significance of the negative results – Postulates of special theory of relativity – Lorentz transformation equations - Length contraction – Time dilation – Variation of mass with velocity – Mass energy equivalence.

Text Book:

1. Murugesan.R, **Optics, Spectroscopy and Modern Physics,** S.Chand and Company Ltd, 2010, New Delhi.

   Unit – I : 1.1 – 1.24

   Unit – II : 2.1 – 2.10

   Unit – III : 3.1 – 3.21

   Unit – IV : 4.1 – 4.14

   Unit – V : 5.1 – 5.11

Reference Books:

1. Kakani and Bhandari Sultan, **Optics and Spectroscopy,** Chand and Sons, 2004, New Delhi.
2. Brijlal and Subramanyam, **A Text book of Optics,** S.Chand and Co, 2004, New Delhi.
3. B.K.Sharma, **Spectroscopy**, GOEL Publishing House, 2006, Meerut.
4. R.Murugesan and Kiruthiga Sivaprasath, **Modern Physics**, S.Chand and Co, Sixteenth Edition, 2012, New Delhi.

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF PHYSICS
(For those who joined in 2018-2019 and after)

Programme	**: B.Sc (Mathematics & Chemistry)**	**Part III**	**: Allied**
Semester	**: III & IV**	**Hours per week**	**: 02**
Sub code	**: 18UPHAP2**	**Credit**	**: 01**

ALLIED PHYSICS PRACTICAL – II

Course Outcomes
CO1: To develop experimental knowledge by handling various apparatus
CO2: To know the various components and its important
CO3: To know the circuit connections an functioning of experiments.
CO4: To create interest to develop oscillatory circuit.

Any 14 experiments.

1. Mirror Galvanometer - Voltage and current sensitiveness
2. LCR – Series resonance - Determination of L & Q factor
3. Air wedge - Thickness of a wire
4. Dispersive power of a prism – Spectrometer
5. Grating N and λ by Normal incidence – Spectrometer
6. Newton's rings - Determination of radius of curvature
7. Bridge rectifier - Pi filter
8. Transistor characteristics - CE mode
9. Single stage transistor amplifier
10. Hartley oscillator
11. Logic gates – AND, OR, NOT - Truth table verification Using Discrete Components.
12. Logic gates – NAND, NOR - Truth table verification Using Discrete Components.
13. Zener diode characteristics and break down voltage
14. OP AMP as an adder and subtractor
15. Comparison of capacitances - Desauty's method using headphone
16. LCR – Parallel resonance.

MANNAR THIRUMALAI NAICKER COLLEGE(Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018 and after)

Programme : UG **Part IV : NME**
Semester : IV **Hours per week: 02**
Subject Code : 18UCHN41 **Credit : 02**

POLYMER CHEMISTRY

Course Outcomes:
CO1: To realize about the Nomenclature of polymers.
CO2: To know the classification of polymers.
CO3: To study about the synthetic polymers.
CO4: To learn as good trainee in industrial level.

Unit I

Introduction-Functionality - Nomenclature of polymers- Tacticity - Classification of polymers -Thermoplastics and thermosetting resins.

Unit II

General purpose plastics-Engineering plastics - Addition and condensation polymerization – Vulcanization - Mechanism of vulcanization.

Unit III

Preparation, properties & uses of Poly Vinyl Chloride, Teflon, Lexan, Metlan, Perlon-U.

Unit IV

Preparation, properties & uses of Polyamides, Nylon-6, Nylon-66, Polyesters, Epoxy resins.

Unit V

Rubber -Introduction-Natural rubber-processing, uses and drawbacks of raw rubber - Synthetic rubber - Butyl rubber - GR 1- SBR - GR S - Compounding of rubber.

Text Book:

1. Arun Bahl and Bahl.B.S, Advanced Organic Chemistry, S.Chand & Company Ltd, 2010, New Delhi.
2. Dr.K.Ratinamuthu and Dr.R.Victoria, Ancillary Chemistry, R.Arun & Co., 2007, Madurai.
3. R.Sivakumar.R, Jeyaprakasam.R & Sivakumar.N, "Engineering Chemistry" TATA McGRAW-Hill Pvt Ltd, (2012), New Delhi.

References:

1. Sharma. B.K "Engineering chemistry" Krishna Prakasan Media (P) Ltd., (2001), Meerut.
2. Sivasankar.B "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, (2008), NewDelhi.
3. Jain.P.C and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co,(2002), New Delhi.


FIFTH SEMESTER

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Programme	**: UG**	**Part III**	**: Core**
Semester	**: V**	**Hours**	**: 05**
Subject Code	**: 18UCHC51**	**Credits**	**: 05**

ORGANIC CHEMISTRY –II

Course outcomes:

On successful completion of the course, the learners should be able to:

CO1: Recall the general characteristics of aromatic compounds and discuss the reaction mechanism of aromatic compounds. [K1 & K2]

CO2: Prepare the aromatic compounds like aromatic hydrocarbons, halogen, amino, substituted acids, isolated and condensed systems. [K3]

CO3: Examine the effect of substituents on acidic/basic character of aromatic compounds. [K4]

CO4: Interpret the directive influence of substituent on electronic effects and properties of aromatic compounds. [K5]

CO5: Integrate the reaction mechanism of aromatic compounds and formulate in the synthetic applications. [K6]

Unit-1: 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

Unit-2: 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.

Unit-3: 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

Unit-4: Aromatic Acids

Effect of substituent's on acidic character. **Substituted acids:** preparation, properties of salicyclic 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, saccharin, chloramine -T and dichloramine – T.

Unit -5: Poly Nuclear Hydrocarbons and Their Derivatives

Isolated systems: Preparation and properties of diphenyl, benzidine diphenic acid, diphenylmethane, triphenylmethane and stilbene. **Condensed systems:** Preparation properties, uses and structure of Naphthalene, Naphthylamines, Naphthols, Naphthaquinones, anthracene, anthraquinone, alizarin and phenanthrene.

Text Books

1. Soni. P.L and Chawla. H.M, Textbook of Organic Chemistry, S. Chand & Sons, 2007, New Delhi.

Reference Books

1. Jain. M.K, and Sharma. S.C, Modern Organic Chemistry, 4th Edition, Vishal Publishing Co., 2016, Jalandhar.
2. Arun Bahl and Bahl. B.S, A Textbook of Organic Chemistry, S. Chand & Co., 2012, New Delhi.
3. Jerry March, Advanced Organic Chemistry, 4th Edition, John Wiley and Sons, 1992, New York.
4. S.H. Pine, Organic Chemistry, 5th Edition, McGraw Hill International Edition, Chemistry Series, 1987, New York.
5. Morrison. R.T and Boyd. R.N, Organic Chemistry, 6th Edition, Printice-Hall of India Ltd., 1992, New Delhi.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Programme	**: B.Sc (Chemistry)**	**Part III**	**: Core**
Semester	**: V**	**Hours**	**: 05**
Subject Code	**: 18UCHC52**	**Credits**	**: 05**

PHYSICAL CHEMISTRY – II

Course outcomes:
On successful completion of course, Students will be able to:

CO1: Outline the basic principles and applications of chemistry in detail. [K1&K2]
CO2: Apply the concept of duality, spectroscopic techniques, symmetry aspects, theory of dilute solutions and phase equilibrium for chemical systems. [K3]
CO3: Analyze the concept of quantum theory, the physical properties of various equilibria and spectroscopic parameters. [K4]
CO4: Evaluate the practical utility of complicated problem-solving skill aspects. [K5]
CO5: Develop a strategy to acquire advanced knowledge in various analytical techniques. [K6]

Unit – 1: Quantum Mechanics

Particle and wave nature of electron de Broglie's theory – Equation – Davison – Germer experiment – photoelectric effect – Compton effect – Heisenberg's uncertainty principle – The Schrodinger wave equation (Derivation not required). Postulates of quantum theory – Eigen values and eigen function – signification of ψ and ψ^2 - quantum number – Zeeman effect.

Unit – II: Colligative Properties and Dilution Solution

Colligative properties – Relative lowering of vapor pressure, Depression of freezing point, Elevation of boiling point and osmotic pressure – Determination of molecular weight and K_f by Rast macro method. Phase Rule - definitions – Gibb's phase rule – one component system – water carbon dioxide and sulphur – polymorphism – two components system – reduced phase rule – simple eutectic system – Pb-Ag System – KI-water system – Partially miscible liquid system – CST – completely immiscible liquid system. **Distribution Law:** Mathematical formulation – experimental verification – condition under which the law is obeyed.

Unit – III: Group Theory

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 – $C_{2v,}$ $C_{3v,}$ $C_{2h,}$ $D_{2h,}$ $D_{3h,}$ $D_{4h,}$ $D_{6h,}$ T_d and $O_{h.}$

UNIT – IV: Spectroscopy – I

Introduction – electromagnetic radiation – different regions – absorption spectroscopy – molecular spectra – types of molecular spectra. Rotational spectra of diatomic molecules – Rigid rotator – selection rule-determination of moment of inertia and bond length – intensities of spectral line – effect of isotropic substitution – calculation of bond length. Vibrational spectra – IR spectra of diatomic molecules – Hooke's law – simple harmonic oscillator - force constant – selection rule – Vibrational energy level diagram – Anharmonic oscillator –force constant determination. Modes of vibration in polyatomic molecules – linear (CO_2) and nonlinear (H_2O)

UNIT – V: Spectroscopy – II

Raman spectra – Raman effect – stokes and anti stokes lines – quantum theory of Raman effect – experimental study – comparison between IR and Raman spectra – applications of Raman spectra. Electronic spectra – Franck and Condon principle – Nuclear magnetic resonance spectroscopy – principle, instrumentation – interpretation of NMR spectra – spectra of ethanol – Electron spin resonance spectroscopy – principle – difference between NMR and ESR- Hyperfine structure in ESR spectrum – selection rule – Hydrogen atom ESR spectrum.

Text Books

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

Reference Books

1. Gilbert W. Castellan, Physical Chemistry, 4th Edition, Narosa Publishing House, 2004, New Delhi.
2. Atkins. P.W, Physical Chemistry, 7th Edition, Oxford University, Press, 2001.
3. Dogra. S.K and Dogra. S, Physical Chemistry through Problems, 4th Edition, New Age International, 1996.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Programme	**: UG**	**Part III**	**: Core**
Semester	**: V&VI**	**Hours**	**: 03**
Subject Code	**: 18UCHCP3**	**Credits**	**: -**

PHYSICAL CHEMISTRY EXPERIMENTS (PRACTICAL)

Course outcomes:

On successful completion of the course, the learners should be able to:

CO1: Recall the molecular weight of chemical compounds and discuss the determination of molecular weight by various methods. [K1 & K2]

CO2: Determine the CST of phenol-water system, cell constant and conductivity titrations. [K3]

CO3: Inspect the phase diagram involving simple eutectic and compound formation. [K4]

CO4: Interpret the relative strength of acids by hydrolysis of ester [K5]

CO5: Predict the effect of impurity on CST of phenol-water system. [K6]

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 and effect of impurity on CST – Determination of Strength of NaCl.

IV. Potentiometric titrations

(a) HCl Vs NaOH (b) $K_2Cr_2O_7$ Vs $FeSO_4$.

V. Partition Coefficient experiments:

Study of the equilibrium constant for the reaction

$KI+I_2 \leftrightarrow KI_3$

By determining the partition Co-efficient of I_2 between water an CCl_4

Determination of 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).

Text Book

1. Thomas. A.O and Mani, Textbook of Practical Chemistry, 4th Revised Edition, Scientific Publication, 1976.

Distribution of Marks (Max. marks – 100)

Duration of examination: 6 hrs

Regular Test in the Class	: 30 Marks
Observation note book	: 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

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Programme	**: UG**	**Part III**	**: Core**
Semester	**: V&VI**	**Hours**	**: 03**
Subject Code	**: 18UCHCP4**	**Credits**	**: -**

GRAVIMETRIC ANALYSIS AND ORGANIC PREPARATION (PRACTICAL)

Course outcomes:

On successful completion of the course, the learners should be able to:

CO1: Relate and classify between gravimetric analysis and organic preparation [K1 & K2]

CO2: Estimate lead, barium, calcium, copper and nickel. [K3]

CO3: Analyze the various types of organic preparation. [K4]

CO4: Interpret the organic preparation like nitration, bromination, hydrolysis, oxidation, benzoylation and acetylation. [K5]

CO5: Assemble the analyzed and prepared organic compounds samples. [K6]

1. **Gravimetric Analysis**

    1. Estimation of lead as lead chromate
    2. Estimation of barium as barium chromate
    3. Estimation of calcium as calcium oxalate monohydrate
    4. Estimation of copper as cuprous thiocyanate
    5. Estimation of nickel as Ni DMG.

2. **Organic Preparation**
    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

Text Books

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.

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

Record Note Book - 10 Marks Viva Voce - 10 Marks Ext: 60

Organic preparation (10 Marks)

Procedure - 2 Marks
Crude sample - 6 Marks
Recrystallised sample - 2 Marks

Gravimetric Estimation (30 Marks)

Procedure - 10 Marks
Estimation - 20 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

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Programme : UG **Part III : Core**
Semester : V&VI **Hours : 02**
Subject Code : 18UCHCP5 **Credits : -**

ORGANIC ANALYSIS AND ESTIMATION (PRACTICAL)

Course outcomes:

On successful completion of the course, the learners should be able to:

CO1: State functional group and classify the organic compounds containing one or two functional groups. [K1 & K2]

CO2: Estimate the organic compound like phenol, aniline and glucose. [K3]

CO3: Distinguish between organic analysis and organic estimation. [K4]

CO4: Justify the conformation by the preparation of a solid derivative. [K5]

CO5: Assemble the analyzed and estimated given organic compounds. [K6]

I. Organic Analysis

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.

II. ORGANIC ESTIMATION

1. Estimation of phenol
2. Estimation of aniline
3. Estimation of glucose

Text Books

1. Thomas. A.O and Mani, Textbook of Practical Chemistry, 4th Revised Edition, Scientific Publication, 1976.
2. Gnanapragasam. N.S and Ramamurthy. G, Organic Chemistry Lab Manual, Viswanath.S Printers & Publishers Pvt. Ltd., 2010, Chennai.

Distribution of Marks (Max. marks – 100)

Duration of examination: 6 hrs

Regular Test in the Class : 30 Marks
Observation note book : 10 Marks

Total : 40 Marks

Organic estimation (30 Marks)

Record Note - 10 marks
Procedure - 5 marks
Estimation - 15 marks
Less than 3% Error – 15 Marks
3-4% Error – 13 Marks
4-5% Error – 10 Marks
Greater than 5% - 8 Marks

Organic analysis (30 Marks)

Viva Voce – 10 marks
Preliminary reaction - 2 marks
Elements present - 4 marks
Aliphatic or aromatic - 3 marks
Saturated / Unsaturated - 3 marks
Functional group - 6 marks
Derivative - 2 marks

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Class	**: B.Sc., Chemistry**	**Part III**	**: Allied**
Semester	**: V**	**Hours**	**: 06**
Subject Code	**: 18UMCA52**	**Credits**	**: 04**

ALLIED MATHEMATICS – III

Course Outcomes:
CO1: To develop the skills in Mathematical formulation and Solving of LPP.
CO2: To learn about different techniques on solving LPP
CO3: To solve specialized LPP like transportation and assignment problems.
CO4: To introduce about Network problems.

Unit-I:

Mathematical Formulation of a LPP: General form of a LPP – Summation notation – Matrix form – Canonical form – Standard form - Solution of LPP by Graphical Method.

Unit-II:

The Simplex Method – The Big M Method – Duality in LPP (Problems only).

Unit- III:

Transportation Problems: Mathematical Formulation of TP - Determining Initial Basic Feasible Solution (all methods) - Optimum solution of TP (MODI Method).

Unit -IV:

Assignment Problems: Mathematical formulation of Assignment Problems – Solution to Assignment Problems.

Unit -V:

Network Flow Problems – Minimal Spanning Tree Problem – Shortest Route Problems.

Text Books:

1. Dr. S. Arumugam & A.Thangapandi Isaac, **Topics in Operations Research – Linear Programming**, New Gamma Publishers Pvt. Ltd, Palayamkottai, Tirunelveli, March 2015.
2. Kanti Swarup, P.K. Gupta, Man Mohan, **Operations Research**, 17th Edition, Sultan Chand and Sons, New Delhi, 2014.

   Unit I: Text Book 1: Chapter 3 - Sections: 3.2, 3.4.

   Unit II: Text Book 1: Chapter 3 – Sections: 3.5, 3.6, 3.9.

   Unit III: Text Book 1: Chapter 4 – Section: 4.1

   Unit IV: Text Book 1: Chapter 5 – Sections: 5.1, 5.2

   Unit V: Text Book 2: Chapter 24 – Sections: 24.2, 24.3, 24.4.

Reference Books:

1. Rathindra P. Sen, **Operations Research Algorithms and Applications**, PHI, EEE, New Delhi, 2010.
2. R. Panneer Selvam, **Operations Research**, PHI, New Delhi, Second Edition, 2010.
3. S.Kalavathy, **Operations Research**, Vikas publishing house Pvt Ltd., New Delhi, 4th Edition, 2013.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Programme : UG **Part III : Elective**
Semester : V **Hours : 04**
Subject Code : 18UCHE51 **Credits : 04**

INORGANIC AND ANALYTICAL CHEMISTRY

Course outcomes:

On successful completion of the course, the learners should be able to:

CO1: Recall the general characteristics of acids & bases and solid state and discuss the various concepts and methods involved in it. [K1 & K2]

CO2: Determine the classification of solvents and role of alkali and alkaline earth metal in biological systems. [K3]

CO3: Examine the bio inorganic compounds on its structure and analytical methods of obtaining precipitate. [K4]

CO4: Interpret the biological functions and toxicity of elements and basic principles of common types of chromatography. [K5]

CO5: Integrate the types of crystals and point defects. [K6]

UNIT – I: Acids &Bases

Acids and bases – Arrhenius concept – Lowry Bronsted concept:- Conjugate acid – base pairs, relative strengths of acids and bases – Lux & Flood concept – limitations – Lewis concept – Levelling effect – Usanovich concept – hard and soft acids. Non aqueous solvents: Classification of solvents – Chemical reaction in liquid ammonia – Precipitation reaction – Acid – base reactions in liquid ammonia – Protolysis – Ammonolysis.

UNIT – II: Bio Inorganic Chemistry

Metalloporphyrins – Porphyrins – Chlorophyll – Vitamin B_{12}.Myoglobin and hemoglobin – Structure – their role in biological systems – Hill constant, cooperativity effect, Bohr effect, Explanation for cooperativity effect in hemoglobin. Role of alkali and alkaline earth metal ions in biological systems – Role of Na^+ and K^+ ions –sodium pump – Role of Mg^{2+} and Ca^{2+} ions. Biological functions and toxicity of elements – Cr, Cu, As and radioactive elements.

UNIT – III: Analytical Chemistry

Methods of obtaining the Precipitate – Condition – Choice of Precipitant – merits and demerits of Organic Precipitants – Types – Specific and selective precipitants Sequestering agents – theory of precipitation – Dendrites – Paneth – Fajans – Hahn – law – Co precipitation – post precipitation – precipitation from homogeneous solution. Precision – Accuracy – Absolute and relative error – Classification of errors

– Confidence Limit – Students Q-test –Rejection of experimental data – Sources and elimination of errors – Significant figures and computation.

UNIT – IV: Analysis of experimental results

Graphical method – Curve fitting – Method of least squares – Problems involving straight line graphs - Instrumental methods of Analysis - Beer – Lamberts Law – Principles of Colorimetric Analysis – Visual Colorimeter – Standard Series method – Balancing method – Estimation of Ni^{2+},Fe^{2+} - Basic principles of common types of Chromatography – Column Chromatography – Thin layer Chromatography – Paper Chromatography – Ion exchange Chromatography -Applications of each technique.

UNIT – V: Solid State

X-ray diffraction – Bragg's equation – Experimental method of determination of interplanar spacing – X-ray spectrophotometer – Debye Scherrer method. Types of Crystals – Ionic crystals – Analysis of NaCl, KCl, CsCl – determination of Avagadro number – Molecular crystals – Water and Ammonia – Covalent crystals – Diamond and Graphite – Metallic crystals – Metallic bond in metals, Conductors, Insulators and Semiconductors – Frankel and Schottky defects.

Text Books:

1. Puri. B.R, Sharma. L.R and Kalia. K.C, Principles of Inorganic Chemistry, ShobanLal Nagin Chand & Co., 1996, New Delhi.
2. Guldeep R. Chatwal and Shank K. Anand, Instrumental Methods of Chemical Analysis, Himalaya Publishing House, 2008, Mumbai.
3. SathyaPrakash, G.D. Tulil, S.K. Basu and R.D. Madan, A Textbook of Advanced Inorganic Chemistry, S. Chand & Co., 2014, New Delhi.

Reference Books:

1. Sharma. Y.R, Elementary Organic Spectroscopy, S. Chand & Co., 1990, New Delhi.
2. Huheey, J.E, Kieter. E.A and Keiter.R.L, Inorganic Chemistry, 4th Edition, Harper Collins, 1993, New York.
3. Cotton. F.A, Wilkinson. G, Murillo. C and Bochman. M, Advanced Inorganic Chemistry, 6th Edition, John Wiley, 1999, New York.
4. Gopalan. R, Analytical Chemistry, S. Chand & Co., 2004, New Delhi.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Programme : UG | **Part III : Core Elective**
Semester : V | **Hours : 04**
Subject Code: 18UCHE52 | **Credits : 04**

BIOINORGANIC CHEMISTRY

Course outcomes:

On successful completion of the course, the learners should be able to:

CO1: Identify the fundamentals of biomolecules and metals in biological systems and generalize their structures. [K1 & K2]

CO2: Estimate the structures of myoglobin & hemoglobin, copper & nitrogen enzymes. [K3]

CO3: Comment the behavior of dioxygen bound to metals and role of metals in medicine. [K4]

CO4: Interpret the structure of the active site in myoglobin & hemoglobin. [K5]

CO5: Integrate the metals containing proteins and enzymes and metal toxicity. [K6]

UNIT – I: 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.

UNIT – II: Fundamentals of Biomolecules

Proteins – Amino Acid Building Blocks – Protein Structure – Protein Sequencing and Proteomics – Protein Function, Enzymes, Classification of enzymes – Enzyme Kinetics – Enzyme Inhibition

UNIT – 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.

UNIT – 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.

UNIT – V: Role of Metals in Medicine

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.

Text Books:

1. Hussain Reddy. K, Bioinorganic Chemistry, New Age International, 2003, New Delhi.
2. Malik. W.U, Tuli. G.D, Madan. R.D, Selected topics in Inorganic Chemistry, 7th Edition, S. Chand & Co., 2003, New Delhi.

Reference Books:

1. Rosette M. Roat Malone, Bioinorganic Chemistry: A short course, Wiley – Interscience, John Wiley & Sons, Inc., 2002.
2. Miessler. G.L and Donald A. Tarr, Inorganic Chemistry, Pearson Publication, 2002.
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.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Programme : UG **Part III : Core Elective**
Semester : V **Hours : 04**
Subject Code : 18UCHE53 **Credits : 04**

CLINICAL AND MEDICINAL CHEMISTRY

Course outcomes:

On successful completion of the course, the learners should be able to:

CO1: Define health, drugs, enzymes and outline the clinical hygiene, manufacture of drugs and classification of enzymes. [K1 & K2]

CO2: Estimate the testing of drugs, coenzymes and biotechnology. [K3]

CO3: Examine the types of drugs and their modes of action and body fluid. [K4]

CO4: Interpret the disease affecting red cells and recombinant DNA, Genetic engineering and its possible hazards. [K5]

CO5: Formulate the treatment for specific poisons and drug manufacture based on fermentation. [K6]

UNIT – I: Clinical Hygiene and Biochemical Analysis

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.

UNIT – II: Common Drugs

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) – Narcotic analgesics (only morphine compounds) – Antipyretic analgesics (acetyl salicylic acid, p – amino – phenol derivatives) – Muscle relaxants.

i. Acting at neuromuscular junction (d – tubocurarine chloride).

ii. Acting at spinal cord alone (glyceryl guaiacolate, diazepam). Antibiotics (penicillin, streptomycin, tetracyclin, chloramphenicol)

Cardiovascular drugs-nitrates, beta blockers (propranolol and atenolol) and calcium channel blockers.

UNIT – III: Enzymes

Classification, specificity. Coenzymes, Cofactor, ATP, Mechanism of enzyme action and Immobilization of enzymes.

UNIT – IV: Body Fluid

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.

UNIT – V: Biotechnology

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)

Text Books:

1. Jayashree Ghosh, A Textbook of Pharmaceutical Chemistry, S. Chand & Co., New Delhi, 1999.
2. Rastogi. S.C, Biochemistry, Tata McGraw Hill Publishing Co., 1993.
3. Ashutosh Kar, Medicinal Chemistry, Wiley Eastern Ltd., 1993, New Delhi.

Reference Books:

1. Le Roy, O, Natural and Synthetic Organic Medicinal Compounds, Ealemi, 1976.
2. Oser, B.L, Hawk's Physiological Chemistry, 14th Edition, Tata McGraw Hill Publishing Co., 1965.
3. Kleiner. O and Martin. J, Biochemistry, Prentice-Hall of India, 1974, New Delhi.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Programme : UG **Part IV : Skill**
Semester : V **Hours : 02**
Subject Code : 18UCHS51 **Credits : 02**

DRUG CHEMISTRY

Course outcomes:

On successful completion of the course, the learners should be able to:

CO1: Mention and outline the action of drugs. [K1 & K2]

CO2: Identify role of drug as therapeutic. [K3]

CO3: Justify and write various chemical processes taking place in all derivatives of drug. [K4]

CO4: Identify various types of reactions and can illustrate its scope to wider areas. [K5]

CO5: Describe feasibility and the extent of application of drug. [K6]

UNIT – I: 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 – Morphine and derivatives. Total synthetic analgesics pethidine and methadone. Antipyretic analgesics – salicylic acid derivatives, Indole derivatives and p-amino phenol derivatives (Medicinal uses and structure only). Antibiotics – Definition, Penicillin – Tetracycline (Auromycin & Terramycin) –Streptomycin and Chloromycetin – drug action and uses.

UNIT – II: Anaesthetics

Gaseous anaesthetics – Vinyl ether – Cyclopropane – Halo hydrocarbons – Chloroform – Haloethane– Trichloro ethylene – Intravenous anaesthetics – Thiopentone – Local anaesthetics – Cocaine and its derivatives. (Therapeutic use only)

UNIT – III: Chemotherapy and Application of a Few Drugs (Elementary study)

Sulpha drugs – Sulphadiazine, prontosil and prontosil-S. Antimalarials – quinine and its derivatives. Arsenical drugs – Salvarsan – 606 – Neosalvarsan.

UNIT – IV: Synthetic Drugs

Synthetic drugs and its therapeutic function of paracetamol – Aspirin – naproxen – Amoxyllin – ciprofloxacin – Ibuprofen.

Visit to an Industry and submission of Report. For industrial visit / Assignment = 5 marks internal) Contact District Industrial Centre (DIC for visits)

UNIT – V: Hormones and Vitamins

Definition and Classification Testosterone, Progesterone, Thyroxine, Vitamin C, Structure only (Structural elucidation not necessary)

Text Book:

1. Jayashree Ghosh, A Textbook of Pharmaceutical Chemistry, S. Chand & Co., 1999, New Delhi.

Reference Books:

1. Charles R. Craig and Robert E. Stitzel, Modern Pharmacology, 3rd Edition, Little Brown and Co., Boston, 1990.
2. Corwin Hansch, Peter G. Sammer, John B. Taylor and Peter D.K. Kennewell, Comprehensive Medicinal Chemistry, Pergmon Press, Great Britain, 1990.
3. Bertram G. Katzung, Basic and Clinical Pharmocology, Lange Medical Publications, Atos, 1982, California.


SIXTH SEMESTER

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Programme : UG	**Part III : Core**
Semester : VI	**Hours : 05**
Subject Code : 18UCHC61	**Credits : 05**

ORGANIC CHEMISTRY – III

Course outcomes:

On successful completion of the course the learners should be able to:

CO1: Reminiscence the alicyclic compounds, free radicals and proteins and deliberate the reaction mechanism of aromatic compounds. [K1 & K2]

CO2: Prepare the heterocyclic compounds, short lived and long-lived free radicals. [K3]

CO3: Differentiate between configuration and conformation and between proteins and nucleic acids. [K4]

CO4: Interpret the directive influence of substituents on electronic effects and properties of aromatic compounds. [K5]

CO5: Integrate the reaction mechanism of aromatic compounds and formulate in the synthetic applications. [K6]

UNIT – I: Alicyclic compounds, Conformational analysis, Civetone and Muscone

Alicyclic compounds: General methods of preparation and properties of cyclo paraffines – 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)

UNIT – II: Molecular rearrangement and Free radicals

Molecular rearrangements: Detailed mechanisms of the following: pinacol - Pinacolone, Hofmann, Curtius, benzil-benzilic acid, claisen, benzidine, Beckmann, Fries and Wagner-Meerwein rearrangements. **Free radicals:** Definition – preparation and reactions of short lived and long-lived free radicals – stability of free radicals – detection of free radicals – chain reactions – photochemical reactions of olefins. cis-trans isomerization. Mechanism of Sand Meyer reaction, Gomberg reaction and Hofmann-Loeffler reaction.

UNIT – III: Heterocyclic compounds

Heterocyclic compounds: Introduction and definition, Preparation and basic properties of pyrrole, pyridine, quinoline and isoquinoline. **Alkaloids:** Definition – occurrence and extraction of alkaloids – general methods for determining the structure of alkaloids – classification of alkaloids – structural elucidation – coniine, piperine and nicotine. **Terpenes:** Introduction, classification, occurrence and isolation – general properties – isoprene rule – general methods of determining structure. Properties, Structure of citral and terpineol.

UNIT – IV: Proteins and Nucleic acids

Proteins: Definition – Classification of proteins – colour reactions of proteins – primary, secondary, tertiary and quarternary structure of proteins (an elementary idea only). **Nucleic acids**: Definition – Classification of Nucleic acids – nucleosides – nucleotides – RNA and DNA general structure.

UNIT – V: Principles and Applications of Spectroscopy

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 λ_{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 – NH_2. **NMR:** Introduction – chemical shift – shielding and deshielding effects - factors influencing chemical shift – solvent used (TMS) – splitting of signals –NMR spectra of simple ethanol and anisole. Conditions for NMR active.

Text Book:

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

Reference Books:

1. Jain. M.K and Sharma. S.C, Modern Organic Chemistry, 4th Edition, Vishal Publishing CO., 2016, Jalandhar.
2. Bahl. B.S and ArunBahl, A Textbook of Organic Chemistry, S. Chand & Co., 2012, New Delhi.
3. Jerry March, Advanced Organic Chemistry, 4th Edition, John Wiley & Sons, 1992, New York.
4. Pine, S.H, Organic Chemistry, 5th Edition, McGraw Hill International Edition, Chemistry Series, 1987, New York.
5. Sehan N. Ege, Organic Chemistry – Structure and Reactivity, 3rd Edition, A.I.T.B.S., 1998, New Delhi.
6. Morrison. R.T and Boyd. R.N, Organic Chemistry, 6th Edition, Printice-Hall of India Ltd., 1992, New Delhi.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Programme	**: UG**	**Part III**	**: Core**
Semester	**: VI**	**Hours**	**: 05**
Subject Code	**: 18UCHC62**	**Credits**	**: 05**

PHYSICAL CHEMISTRY – III

Course outcomes:

On successful completion of the course, the learners should be able to:

CO1: Define thermodynamic terms and photochemical reaction and describe the study of thermal and photochemical reaction. [K1 & K2]

CO2: Relate the thermodynamic process and conductance. [K3]

CO3: Differentiate between reversible and irreversible cells and between photochemical reactions. [K4]

CO4: Evaluate the types of electrodes and determine the emf of cells. [K5]

CO5: Compile Nernst heat Theorem and state the third law of thermodynamics and its applications. [K6]

Unit – 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

UNIT – II: Thermodynamics - II

Need for the second law-different statements of the second law-Carnot cycle and efficiency-Carnot's theorem – Thermodynamic scale of temperature – 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. Need for the third law of thermodynamics – Nernst heat Theorem – statement of the third law of thermodynamics and its applications.

UNIT– III: Photochemistry

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 – Photochemical equilibrium – flash photolysis – photosensitization chemiluminescence – bioluminescence.

UNIT – IV: Electrochemistry - I

Specific conductance – equivalent conductance – variation of equivalent conductance with dilution – Migration of ions - Kohlrausch's law – Arrhenius theory of electrolyte dissociation and its limitations - Ostwald's dilution law – Debye Huckel - Onsagar's equation for strong electrolytes (elementary treatment only) – Definition of transport number – determination by Hittorfs method – Application of conductivity measurements – conductometric titrations – HCl Vs NaOH, CH_3COOH Vs NaOH.

UNIT– V: Electrochemistry - II

Single electrode potential, sign convention, Reversible and irreversible cells, conditions for a cell to be a reversible and irreversible – Nernst Equation – Reference electrode, Standard Hydrogen electrode, calomel electrode, Indicator electrode, metal – metal ion electrode, Inert electrode, Determination of EMF of cell, Applications of EMF measurements. Potentiometric titrations – HCl Vs NaOH and $K_2Cr_2O_7$Vs $FeSO_4$

Text Book:

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

Reference Books:

1. Gilbert W. Castellan, Physical Chemistry, 3rd Edition, Narosa Publishing House, 1985.
2. S. Glasstone, Textbook of Physical Chemistry, McMillan and Co., 1974, London.
2. Soni. P.L and Dharmarha, Textbook of Physical Chemistry, S. Chand & Co., 1991, New Delhi.
3. ArunBahl, B.S. Bahl and Tuli. G.D, Essentials of Physical Chemistry, S. Chand & Co., 2014, New Delhi.
3. Dogra. S.K and Dogra. S, Physical Chemistry through Problems, 4th Edition, New Age International, 1996.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Programme	**: UG**	**Part III**	**: Core**
Semester	**: VI**	**Hours**	**: 03**
Subject Code	**: 18UCHCP3**	**Credits**	**: 06**

PHYSICAL CHEMISTRY EXPERIMENTS (PRACTICAL)

Course outcomes:

On successful completion of the course, the learners should be able to:

CO1: Recall the molecular weight of chemical compounds and discuss the determination of molecular weight by various methods. [K1 & K2]

CO2: Determine the CST of phenol-water system, cell constant and conductivity titrations. [K3]

CO3: Inspect the phase diagram involving simple eutectic and compound formation. [K4]

CO4: Interpret the relative strength of acids by hydrolysis of ester [K5]

CO5: Predict the effect of impurity on CST of phenol-water system. [K6]

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 and effect of impurity on CST – Determination of Strength of NaCl.

IV. Potentiometric titrations

(a) HCl Vs NaOH (b) $K_2Cr_2O_7$ Vs $FeSO_4$.

V. Partition Coefficient experiments:

a) Study of the equilibrium constant for the reaction

$KI+I_2 \leftrightarrow KI_3$

By determining the partition Co-efficient of I_2 between water an CCl_4

Determination of strength of given KI.

VI. **Kinetics:** Determination of relative strength of acids by hydrolysis of ester.

VIII. Conductivity: Determination of cell constant and conductivity titration between as acid and a base (HCl Vs NaOH)

Text Book:

1. Thomas. A.O and Mani, Textbook of Practical Chemistry, 4th Revised Edition, Scientific Publication, 1976.

Distribution of Marks (Max. marks – 100)

Duration of examination: 6 hrs

Regular Test in the Class	: 30 Marks
Observation note book	: 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

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Programme :UG	**Part III : Core**
Semester : VI	**Hours : 03**
Subject Code : 18UCHCP4	**Credits : 05**

GRAVIMETRIC ANALYSIS AND ORGANIC PREPARATION (PRACTICAL)

Course outcomes:

On successful completion of the course, the learners should be able to:

CO1: Relate and classify between gravimetric analysis and organic preparation [K1 & K2]

CO2: Estimate lead, barium, calcium, copper and nickel. [K3]

CO3: Analyze the various types of organic preparation. [K4]

CO4: Interpret the organic preparation like nitration, bromination, hydrolysis, oxidation, benzoylation and acetylation. [K5]

CO5: Assemble the analyzed and prepared organic compounds samples. [K6]

1. **Gravimetric Analysis**
    1. Estimation of lead as lead chromate
    2. Estimation of barium as barium chromate
    3. Estimation of calcium as calcium oxalate monohydrate
    4. Estimation of copper as cuprous thiocyanate
    5. Estimation of nickel as Ni DMG.

2. **Organic Preparation**
    1. Nitration
        - **i.** M-dinitrobenzene from nitrobenzene
        - **ii.** Picric acid from phenol
    2. Bromination:p-bromoacetanilide 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

Text Books:

1. Thomas. A.O and Mani, Textbook of Practical Chemistry, 4th Revised Edition, Scientific Publication, 1976.
2. Gnanapragasam. N.S and Ramamurthy.G, Organic Chemistry Lab Manual, Viswanath. S Printers & Publishers Pvt. Ltd., Chennai, 2010.

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

Record Note Book - 10 Marks Viva Voce - 10 Marks Ext: 60

Organic preparation (10 Marks)

Procedure - 2 Marks
Crude sample - 6 Marks
Recrystallised sample - 2 Marks

Gravimetric Estimation (30 Marks)

Procedure - 10 Marks
Estimation - 20 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

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
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Programme	**: UG**	**Part III**	**:Core**
Semester	**: VI**	**Hours**	**: 02**
Subject Code	**: 18UCHCP5**	**Credits**	**: 04**

ORGANIC ANALYSIS AND ESTIMATION (PRACTICAL)

Course outcomes:

On successful completion of the course, the learners should be able to:

CO1: State functional group and classify the organic compounds containing one or two functional groups. [K1 & K2]

CO2: Estimate the organic compound like phenol, aniline and glucose. [K3]

CO3: Distinguish between organic analysis and organic estimation. [K4]

CO4: Justify the conformation by the preparation of a solid derivative. [K5]

CO5: Assemble the analyzed and estimated given organic compounds. [K6]

I. Organic Analysis

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.

II. ORGANIC ESTIMATION

1. Estimation of phenol
2. Estimation of aniline
3. Estimation of glucose

Text Books:

1. Thomas. A.O and Mani, Textbook of Practical Chemistry, 4th Revised Edition, Scientific Publication, 1976.
2. Gnanapragasam. N.S and Ramamurthy. G, Organic Chemistry Lab Manual, Viswanath.S Printers & Publishers Pvt. Ltd., 2010, Chennai.

Distribution of Marks (Max.marks – 100)

Duration of examination: 6 hrs

Regular Test in the Class : 30 Marks
Observation note book : 10 Marks

Total : 40 Marks

Organic estimation (30 Marks)

Record Note - 10 marks
Procedure - 5 marks
Estimation - 15 marks
Less than 3% Error – 15 Marks
3-4% Error – 13 Marks
4-5% Error – 10 Marks
Greater than 5% - 8 Marks

Organic analysis (30 Marks)

Viva Voce – 10 marks
Preliminary reaction - 2 marks
Elements present - 4 marks
Aliphatic or aromatic - 3 marks
Saturated / Unsaturated - 3 marks
Functional group - 6 marks
Derivative - 2 marks

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Class : B.Sc., Chemistry **Part III : Allied**
Semester : VI **Hours : 06**
Subject Code: 18UMCA62 **Credits : 04**

ALLIED MATHEMATICS – IV

Course outcomes:
CO1: To develop skills in Bilinear transformations.
CO2: To introduce different techniques of finding Analytic functions.
CO3: To familiarize concepts of Matrices.
C04: To teach various types of Groups through examples.

Unit-I

Bilinear Transformations: Elementary Transformations - Bilinear Transformations – Cross Ratio – Fixed points of Bilinear Transformations.

Unit-II

Analytic Functions: Introduction - Analytic Functions – Alternate forms of C-R equations.

Unit -III

Matrices: Matrices – Simultaneous Linear Equations – Cayley Hamilton Theorem – Eigenvalues and Eigenvectors (Problems only).

Unit-IV

Groups: Definition and Examples - Elementary Properties of Group - Permutation Groups.

Unit – V

Subgroups - Cyclic Groups.

Text Book:

1. Dr S.Arumugam and A.Thangapandi Isaac, **Ancillary Mathematics Volume III (Revised)**, New Gamma publishing House, Palayamkottai, 2002.
   Unit I - Chapter 1: Sections: 1.0 – 1.4
   Unit II - Chapter 2: Sections: 2.0, 2.2, 2.3
   Unit III - Chapter 7: Sections: 7.0 – 7.4
   Unit IV - Chapter 8: Sections: 8.1, 8.2, 8.4
   Unit V – Chapter 8: Sections: 8.5, 8.6.

Reference Books:

1. Dr.S.Arumugam, A. Thangapandi Isaac and A.Somasundaram, **Complex Analysis**, Scitech Publication, Chennai, 2003.
2. Dr.S.Arumugam A.Thangapandi Isaac and A.Somasundaram, **Modern Algebra**, Scitech Publication, Chennai, Reprint July 2008.
3. B.Choudhary, **The Elements of Complex Analysis**, New Age International Publishers, New Delhi, 2009.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Programme : UG **Part III : Elective**
Semester : VI **Hours : 04**
Subject Code : 18UCHE61 **Credits : 04**

APPLIED CHEMISTRY

Course outcomes:

On successful completion of the course, the learners should be able to:

CO1: Define insecticides, pesticides, petrochemicals and fertilizers and discuss their classification. [K1 & K2]

CO2: Determine water quality, raw materials needed for match and silicate industries. [K3]

CO3: Distinguish between water and sewage treatment and chemicals used between petrochemicals and paints and lacquers. [K4]

CO4: Interpret the preparation of domestically useful chemical products. [K5]

CO5: Integrate the method of sewage treatment and fertilizer industries in India. [K6]

UNIT – I: Water and Seweage Treatment

Water Treatment: Water Quality Analysis – Chemical and Physical Analysis of water - Quality Parameters – Standards prescribed for Water Quality by WHO and other Indian standards – Sea Water as a source of Drinking Water – Electro dialysis method and Reverse osmosis method for purifications of water. **Sewage Treatment**: Municipal Waste Water – Sewage Treatment – Aerobic and Anaerobic process – Miscellaneous Method of Sewage Treatment

UNIT – II: Insecticides, Pesticides and Preparation of Chemicals

Insecticides and Pesticides: Definition – Classification – Inorganic pesticides: lead arsenate, Paris green, lime, sulphur, hydrocyanic acid – Organic pesticides, natural, synthetic (DDT, Gammaxene) – Fungicides – repellants. **Preparation of domestically useful chemical products:** Washing powder – Cleaning powder – Phenoyls (White, Black and Coloured) Shampoo, Liquid Blue, Blue, Red and Green inks, Soap Oil, Face powder, pain balm.

UNIT – III: Match and Silicate Industry

Match Industry: Pyrotechnics and explosives – Raw materials needed for match industry – Manufacturing process – Pyrotechniques – Coloured smokes. **Silicate Industry:** Cement Glass and Ceramics, Raw materials and manufacture of Cement, Glass and Ceramics.

UNIT – IV: Petrochemicals and Lacquer Paint

Petrochemicals: Elementary study – Definition – Origin – Composition – Chemicals from natural gas, Petroleum, Light Naphtha and Kerosene – Synthetic Gasoline. **Paints and lacquers:** Pigments – Paints – Ingredients in Paints – Manufacture – Lacquers – Varnishes.

UNIT – V: Fertilizers

Definition – nutrients for plants – role of various elements in plants growth – natural and chemical fertilizers-classification of chemical fertilizers –urea, super phosphate and potassium nitrate-mixed fertilizer-fertilizer industry in India.

Text Book:

1. Sharma. B.K, Industrial Chemistry including Chemical Engineering, Goel Publishing House – 13th Revised and enlarged Edition, 2009, New Delhi.

Reference Books:

1. Srilakshmi. B, Food Science, 3rd Edition, New Age International Pvt. Ltd., Publishers, 2002.
2. Jayashree Ghosh, Fundamental concepts of Applied Chemistry, S. Chand & Co., Publishers, 1998.
3. Thanlamma Jacob, Text Books of Applied Chemistry for Home Science and Allied Sciences, Macmillan, 2000.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
(For those who joined in 2018-2019 and after)

Programme :UG **Part III : Elective**
Semester : VI **Hours : 04**
Subject Code : 18UCHE62 **Credits : 04**

NANO CHEMISTRY

Course outcomes:

On successful completion of the course, the learners should be able to:

CO1: Define nanotechnology and nanosensors and elaborate the synthesis in confined media. [K1 & K2]

CO2: Estimate the synthesis of quantum dots, Nobel metal materials on its electronic structure of nanocrystals. [K3]

CO3: Differentiate between nanotechnology and biology and between biomolecules and nanoparticles. [K4]

CO4: Interpret the electrochemical sensors – Sensor based on physical properties. [K5]

CO5: Compute nanoshells and nanotechnology in diagnostics applications. [K6]

UNIT – I: Investigating and Manipulating Materials in the Nanoscale

Introduction – difference between nanotechnology and biology – electronic microscopies – scanning electron microscopy (SEM) - TEM.

UNIT – II: Semiconductors Quantum Dots

Introduction – synthesis of quantum dots – synthesis in confined media – molecular precursors. – Electronic structure of nanocrystals – How does we study quantum dots Uses.

UNIT – III: Nanobiology

Interaction between biomolecules and nano particles surfaces – Nobel metal materials – semiconductor – Nanocrystals – Magnetic nanoparticles – Application of nanobiology.

UNIT – IV: Nanosensors

What is sensor – What make them possible – Electrochemical sensors – Sensor based on physical properties – Nano biosensors – Smart dust – Sensors of the future**.**

UNIT V: Nanomedicine

Nanoshells – Nanopores – Tectodendrimers – Nanotechnology in diagnostics application – Gold nanoparticles - Magnetic nano particles.

Text Book:

1. Pradeep. T, Nano the essential, Tata McGraw Hill Co., 2007, New Delhi.

Reference Books:

1. Kenneth J. Klabunde, Nanoscale Materials in Chemistry, Wiley Interscience – John Wiley & Sons Inc., New York, 2003.
2. Edelstein.A.S and Cammarata.R.C, Nanomaterials- Synthesis, Properties and Applications, Institute of Physics Publishing, 1998, London.
3. Ozin.G and Arsenault. A, Nanochemistry: A Chemical Approach to Nanomaterials, RSC Publishing, 2005.
4. Edward L. Wolf, Wiley-VCH, Nanophysics and Nanotechnology: An Introduction to Modern Concepts in Nanoscience, 2nd Reprint, 2005.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
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Programme : UG **Part III : Elective**
Semester : VI **Hours : 04**
Subject Code : 18UCHE63 **Credits : 04**

FUNDAMENTALS OF COMPUTER AND GREEN CHEMISTRY

Course outcomes:

On successful completion of the course, the Students will able to:

CO1: State the characteristics, features of computer and discuss the parts of computer and fundamentals of green chemistry. [K1 & K2]

CO2: Identify the types of memory, salient features of windows and MS word and need for green chemistry. [K3]

CO3: Analyze the programming languages and evolution of green chemistry. [K4]

CO4: Interpret the parts of computer and basic concept of creating and accessing databases using MS access. [K5]

CO5: Justify the drawing chemical structure and pasting them in the text and environmental protection laws, changes ahead for a chemist. [K6]

UNIT – I: Characteristics of Computer

Introduction to computer – Characteristics – Types of computer – Parts of computer – Input devices – Output devices.

UNIT – II: Types of Memory and System

Memory unit – types of memory – Hardware –Software – Algorithm – Flowchart – Programming languages – Number system – Decimal – Binary system – Octal number system

UNIT – III: Salient Features of Windows and MS word

Salient features of windows and MS word for typing texts and equation in Chemistry – Tabular columns – Advanced concepts. Basic concept of creating and accessing databases using MS access – Significance of chemdraw – Drawing chemical structure and pasting them in the text.

UNIT – IV: Introduction to Green Chemistry

Introduction to Green Chemistry – The need for Green Chemistry – Sustainability and cleaner production – Green Chemistry and Eco-efficiency – Environmental protection laws, changes ahead for a chemist – Green Chemistry education.

UNIT – V: Fundamentals of Green Chemistry

Introduction, Inception and evolution of Green Chemistry, Introduction – Twelve Principles of Green Chemistry – Atom economy Scope of Green Chemistry

Text Books:

1. ArunBahl, B.S. Bahl and G.D. Tuli, Essentials of Physical Chemistry, S. Chand & Co., 2003, New Delhi.
2. RashmiSanghi and M.M. Srivastave, Green Chemistry, Narosa Publishing House, 2003.

Reference Books:

1. Raman. K.V, Computers in Chemistry, Tata McGraw Hill Publishing Co., 1993, New Delhi.
2. Venit. S.M, Programming in Basic: Problem solving with structure and style.Jaico Publishing House: 1996, Delhi.
3. Engel. T and Reid. P, Physical Chemistry 2nd Edition Pearson, 2010.

MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF CHEMISTRY
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Programme	**:UG**	**Part IV**	**: Skill**
Semester	**: VI**	**Hours**	**: 02**
Subject Code	**: 18UCHS61**	**Credits**	**: 02**

MACROMOLECULAR CHEMISTRY

Course outcomes:

On successful completion of the course, the learners should be able to:

CO1: Quote and outline the different mechanisms involved in the polymer (K1&K2)
CO2: Construct different types of polymerization techniques (K3)
CO3: Illustrate in detail about the change in temperature(K4)
CO4: Evaluate the factors influencing polymerization (K5)
CO5: Design feasibility and the extent the application of polymer (K6)

UNIT – I: Basic concepts of polymers

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.

UNIT – II: Types of Polymerization

Coordination polymerization - Ziegler Natta catalyst. Step polymerization - Ring opening polymerization. Copolymerization - Random, block and graft co polymers - Polymerization techniques; bulk, solution, suspension and emulsion polymerization.

UNIT – III: Molecular Weight and Glass Transition Temperature

Measurement of molecular weight and size - Number average and weight average molecular weights - Glass transition temperature- Concepts of glass transition temperature and associated properties.

UNIT – IV: Glassy Solids and Polymer Crystallization

Glassy solids and glass transition - factors influencing glass transition temperature (Tg). Crystallinity in polymers - Polymer crystallization, structural and other factors affecting crystallisability - effect of crystallinity on the properties of polymers.

UNIT – V: Types of Polymers and Polymer Degradation

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.

Text Book:

1. Gowariker. R.V, Polymer Science, New Age International Publication, 2006.

Reference Books:

1. Young. R.J and Powell. P.A, Introduction to Polymers, 3rd Edition, CRC Press, 1991.
2. Ravve. A, Principles of Polymer Chemistry, 3rd Edition, Springer, 2012, New York.
3. Fred W. Billmeyer, Textbook of Polymer Science, 3rd Edition, John Wiley & Sons, 2007.