THIAGARAJAR COLLEGE MADURAI - 625009

(An Autonomous Institution, affiliated to Madurai Kamaraj University)

(Re-Accredited with 'A' Grade by NAAC)

Department of Chemistry

B.Sc., Chemistry

(Aided & SF)

M.Sc., Chemistry

M.Sc., Chemistry

(SPL -SF)

M.Phil Chemistry

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)
BACHELOR OF CHEMISTRY

BACHELOR OF CHEMISTRY
Semester – I

Course	Code No	Subject	Hrs/ Week	Cred.	Total Hrs	Max Mark CA	Max Marks SE	Total
Part I	P111	Tamil	6	3	90	25	75	100
Part II	P211	English	6	3	90	25	75	100
Core 1	MC11	Fundamental concepts in organic chemistry	3	3	45	25	75	100
Core 2	MC12	Fundamental concepts in Inorganic and Physical Chemistry	3	3	45	25	75	100
Core Lab – I	MCL-I	Organic qualitative analysis	4	2	60	40	60	100
Generic elective.	AP11(P)	Ancillary Physics I	4	4	60	25	75	100
Gen.ele. lab	APL11(P)	Ancillary Physics practical –I	2	-	30	-	-	-
AECC (I)	ES	Environmental Science	2	2	30	15	35	50
Total			**30**	**20**	**450**			

Semester – II

Course	Code No	Subject	Hrs/ Week	Cred.	Total Hrs	Max Mark CA	Max Marks SE	Total
Part I	P121	Tamil	6	3	90	25	75	100
Part II	P221	English	6	3	90	25	75	100
Core 3	MC21	Inorganic Chemistry - I	3	3	45	25	75	100
Core 4	MC22	Physical Chemistry - I	3	3	45	25	75	100
Core lab-II	MCL21	Inorganic qualitative analysis	4	2	60	40	60	100
Generic elective	AP21(P)	Ancillary physics-II	4	4	60	25	75	100
Gen.ele. lab	APL21 (P)	Ancillary physics practical	2	2	30	0	60	100
AECC (II)	MCAEC 21	Personality Development	2	2	30	15	35	100
			30	**22**	450			

Semester – III

Course	Code No	Subject	Hrs/ Week	Credits	Total Hrs	Max Marsk CA	Max Marks SE	Total
Part I	P131	Tamil	6	3	90	25	75	100
Part II	P231	English	6	3	90	25	75	100
Core 5	MC31	Inorganic Chemistry –II	3	3	45	25	75	100
Core 6	MC32	Organic Chemistry-I	3	3	45	25	75	100
Core lab-III	MCL31	Inorganic volumetric analysis	4	2	60	40	60	100
Generic Eletive	AM31/ AZ31	Ancillary Maths/Zoology-I	4	4	60	25	75	100
Generic lab	AZL3I	Ancillary Zoology practical	2	-	30	-	-	-
Non-Major Elective	MCNME31	Chemistry in day-to-day life	2	2	30	15	35	50
		Total	**30**	**20**	450		560	750

Semester – IV

Course	Code No	Subject	Hrs/ Week	Credits	Total Hrs	Max Mark CA	Max Marks SE	Total
Part I	P141	Tamil	6	3	90	25	75	100
Part II	P241	English	6	3	90	25	75	100
Core 7	MC41	Organic chemistry – II	3	3	45	25	75	100
Core 8	MC42	Physical Chemistry-II	3	3	45	25	75	100
Core lab-IV	MCL41	Estimation and Preparation of organic compounds	4	2	60	40	60	100
Generic elective	AM41/ AZ41	Ancillary Maths/Zoology -II	4	4	60	25	75	100
Generic ele.lab	AZL41	Ancillary Zollogy practical – I	2	2	30	40	60	100
SEC(I)	MCSEC41	Agricultural Chemistry (option A)	2	2	30	15	30	50
		Dairy Chemistry(Option B)						
		Forensic Chemisty(Option C)						
Total			**30**	**22**	**450**			

Semester – V

Course	Code	Subject	Hrs/ Week	Credits	Total Hrs	Max Mark CA	Max Marks SE	Total
Core 9	MC51	Inorganic Chemistry-III	6	6	90	25	75	100
Core 10	MC52	Organic Chemistry-III	6	6	90	25	75	100
Core11	MC53	Physical Chemistry –III	5	5	75	25	75	100
Core lab-V	MCL51	Inorganic Estimations and Preparations	4	2	60	40	60	100
Core ele. I	MCME51	Group theory and spectroscopy (Option-A) Industrial Chemistry (Option B)	5	5	75	25	75	100
Non-Major elective-II	MCNME51	Processing of consumer products - Lab	2	2	30	25	75	100
Value Education	VE	Value Education	2	1	30	15	30	50
Total			**30**	27	450			

Semester – VI

Course	Code	Subject	Hrs/ Week	Credits	Total Hrs	Max Marks	Max Marks SE	Total
Core 12	MC61	Inorganic Chemistry and Computer Applications	6	6	90	25	75	100
Core 13	MC62	Organic Chemistry-IV	6	6	90	25	75	100
Core 14	MC63	Physical Chemistry-IV	6	6	90	25	75	100
Core lab-VI	MCL-61	Experiments in Physical Chemistry	5	3 (1L:0T:2P)	75	40	60	100
Core. Elective II	MCME 61 (C) or (B)	Coordination Chemistry(option A) Bioinorganic Chemistry (option B)	5	5	75	25	75	100
SEC (II)	MCSE C61	Water analysis-Lab (Option A) Food Chemistry (option B) Polymer(Option C)	2	2	30	15	35	50
Total			**30**	**28**	450	25	75	100
Part V			-	1	-	-	-	-
Total (for semesters I to VI)			**180**	**140**	**2700**			

A) CONSOLIDATION OF CONTACT HOURS AND CREDITS: UG

Semester	Contact hours	Credits
I	30	21
II	30	21
III	30	21
IV	30	21
V	30	27
VI	30	28
Part - V	30	01
Total	**180**	**140**

B) Curriculum Credits: Part wise

Part I	Tamil	4 x 3	= 12 Credits
Part II	English	4 x 3	= 12 Credits
Part III	Core	(6+6+6+6+17+18)	= 59 Credits
	Core Lab	(2+2+2+2+2+3)	= 13 Credits
	Core electives	5+5	= 10 Credits
	Generic elective	(4 +4+4+4)	= 16 Credits
	Generic elective Lab	(1+1+1+1)	= 04 Credits
Part IV	AECC	2+2	= 04 Credits
	SEC	2+2	= 04 Credits
	Open elective	2+2	= 04 Credits
	Value Education	1	= 01 Credits
Part V		1	= 01 Credits
	Total		**= 140 Credits**

AECC : Ability Enchancement Compulsory Course.
SEC : Skill Enchancement Course

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DEPARTMENT OF CHEMISTRY
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Course	: B.Sc. Chemistry (Core-1)	Int. Marks	: 25
Class	: I Year	Ext. Marks	: 75
Semester	: I	Max. Marks	: 100
Sub. Code	: MC11	Hours/Week	: 3
Title of the Paper	**: Fundamental Concepts in Organic Chemistry**	**Credits**	**: 3**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- Remember nomenclature, structure and shape of organic molecules.
- Understand the reaction mechanism, isomerism and stereochemistry of organic molecules.
- Gain the knowledge of purification of organic compounds.

UNIT-I: 11 Hrs

IUPAC NOMENCLATURE, STRUCTURE AND PROPERTIES

Classification and nomenclature of organic compounds – IUPAC systems.

Structure and shape of organic molecules: Hybridization – Definition, sp^3 hybridization of carbon (methane) – sp^2 hybridization in alkenes (ethene) and sp hybridization in alkynes (ethyne).

Electronic Displacement Effects: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation.

Reactive Intermediates: Carbocations, Carbanions, free radicals, carbenes and nitrenes (Structure and stability).

UNIT-II 7 Hrs

REACTION MECHANISM AND ISOMERISM

Cleavage of Bonds: Homolysis and Heterolysis.

Types of reagents: Electrophilic and Nucleophilic reagents –Definition and examples.

Types of organic reactions (one example for each reaction; mechanism not required) – Energy profile of organic reactions.

Isomerism (Definition and examples): Types of isomerism- structural isomerism – chain, position, functional – metamerism – tautomerism – stereo isomerism – Geometrical and optical isomerism.

UNIT-III 8 Hrs

ALKANES AND CYCLOALKANES

Alkanes: Preparation (Catalytic hydrogenation, from alkyl halide, By Wurtz reaction, By Corey-House synthesis), Physical and chemical properties (free radical halogenations reaction).

Cycloalkanes: Definition, nomenclature, symbols of cycloalkanes

Stability: Baeyer's strain theory and its limitations, Sache-Mohr theory.

Conformations of cyclohexane.

UNIT-IV **10 hrs**

STEREOCHEMISTRY

Conformations of ethane and butane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds. Threo and erythro; D and L; cis – trans nomenclature; CIP Rules: R/ S (for only one chiral carbon atoms) and E / Z Nomenclature (for ethene).

UNIT-V **9 hrs**

PURIFICATION TECHNIQUES

Different methods of purification of organic substances – distillation: under reduced pressure - steam distillation - Soxhlet method – Crystallization – Sublimation -Fractional distillation. Chromatography - adsorption chromatography (column) - partition chromatography (paper) - Thin layer chromatography (TLC) – Gas chromatography (GC) – High Pressure Liquid Chromatography (HPLC).

Text books

1. Bhupinder Mehta, Manju Mehta, 2015, Organic Chemistry, Prentice Hall of India Pvt Ltd,. New Delhi.
2. B.S. Bahl and Arun Bahl, 1998, Advanced Organic Chemistry, 1st edition, S. Chand and Company Ltd, New Delhi.

Reference books

1. I.L.Finar, 2005, Organic chemistry Vol 1, 6th edition, Pearson Edition, Singapore.
2. R.T. Morrision and R.N. Boyd, 1997, Organic chemistry, 6th edition, Prentice Hall Private Limited, New Delhi.
3. P.L. Soni, 2005, Text Book of Organic Chemistry, Sultan Chand, New Delhi.
4. K.S. Tewari, N.K. Vishil and S.N. Mehotra. 2001, A text book of Organic Chemistry, 1st edition, Vikas Publishing House Pvt Ltd, New Delhi.

Course designers

1. Dr. P. Tharmaraj
2. Dr. P. Prakash
3. Dr. R. Mahalakshmy
4. Dr. A. Tamil Selvi

THIAGARAJAR COLLEGE, MADURAI- 9

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DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: B.Sc Chemistry (Core 2)	Int. Marks	: 25
Class	: I Year	Ext. Marks	:75
Semester	: I	Max.Marks	: 100
Sub. Code	: MC 12	Hours/Week	: 3
Title of the Paper	**: Fundamental Concepts in Inorganic and Physical Chemistry**	Credit	: 3

Course Outcomes:

On the successful completion of the course, students will be able to

- Understand the basic structure of atoms and periodicity of elements.
- Know the various processes involved in extraction of metals from its ore.
- Understand the physical behaviour of gases and liquids.

Unit I: Atomic Structure (9 hrs)

Rutherford model of the atom- defects of Rutherford model - Discovery of neutron, Bohr model of an atom- merits and demerits- Hydrogen atom spectra - Sommerfield modification- de Broglie's concept- dual nature, quantum numbers- shapes of s, p, d atomic orbitals. Arrangement of electrons in atoms- Hund's rule – Pauli exclusion principle- Heisenberg's uncertainty principle.

Unit II: Periodicity and Periodic properties (9 hrs)

Periodic law and Cause of periodicity. Division of elements in to s, p, d and f blocks.

General Properties of atoms: Atomic properties- Elementary ideas of Covalent radius - van der Waals radius-Ionic radius and their periodic trends. Ionisation Energy, Electron affinity, Electronegativity-Pauling, Mulliken-Jaffe, Allred-Rochow definitions.

Unit III: Metallurgical Processes (9 hrs)

Definition for minerals and ores - ore dressing – **gravity separation** - froth flotation- magnetic separation - chemical separation- calcination and roasting- **Thermodynamics of reduction processes-Ellinghem diagram.**

Extraction of metal-chemical reduction-auto reduction-electrolytic reduction-metal displacement. Refining methods - distillation - fractional crystallization - van Arkel method - electrolytic refining - vapour phase refining-ion exchange method-muffle furnace.

Unit IV: States of Matter (Gas and Liquid) (9 hrs)

Gaseous State: Postulates and derivation of the kinetic gas equation - Kinds of velocities - mean, RMS, most probable velocities (definition only) – Collision frequency – mean free path - Deviation of real gas from ideal behaviour- Derivation of van der Waal's equation.

Liquid State: Physical properties of liquids – Vapour pressure – surface tension – coefficient of viscosity – Effect of temperature and pressure on viscosity – concentration terms – molarity (M), Normality (N), molality (m), formality, mole fraction, percentage concentration.

Unit V: Colligative Properties of Dilute Solution (9 hrs)

Colligative Properties: Relative lowering of vapour pressure – elevation of boiling point – depression in freezing point – osmotic pressure – Applications in calculating molar masses of normal solutes in solution.**Dilute Solution**: Lowering of vapour pressure – Raoult's and Henry's Law and their applications.

Text Books:

1 .Puri,B.R . Sharma L.R and .Kalia.K.C.2004 Principles of Inorganic Chemistry, 28th edition,Vallabh Publication, NewDelhi.

2. Puri.B.R., Sharma L.R and Madan S.Pathania,2007 Principles of Physical chemistry, 30th edition, Vishal publication, Jalandhar-Delhi.

Reference Books:

1. Madan R.D., 2004, Modern Inorganic Chemistry, S. Chand & Company, 2nd edition,, New Delhi.
2. Albert Cotton F.A, Kotz, 1998, Basic Inorganic Chemistry, Geofferey Wilkinson, Carlos, Murillo, Manfred Bochmann, John Wiley & Sons, Inc. New York.
3. Lee, J. D, 2002, A New Concise Inorganic Chemistry, Blackwell Science Ltd.,ELBS 5th Ed., London.
4. Bahl B.L, , Tuli G.D, and Arun Bahl,2004, Essential of Physical chemistry,S.Chand publications, Reprint , Ram nagar, New Delhi.

Course designers

1. Dr.D.S. Bhuvaneshwari
2. Dr. T.Arumuganathan
3. Dr. K. Selvakumar

THIAGARAJAR COLLEGE, MADURAI- 9

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DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: B.Sc. Chemistry (Core Lab-I)	Int. Marks	: 40
Class	: I B.Sc Chemistry	Ext. Marks	: 60
Semester	: I	Max. Marks	: 100
Sub. Code	: MCL-11	Hours/Week	: 4
Title of the Paper	**: Organic Qualitative Analysis**	Credit	**: 2**

Analysis of Organic compounds

1. Aromatic Organic Compounds like mono and dicarboxylic acids.
2. Aromatic primary and secondary amines.
3. Aromatic amides.
4. Aromatic aldehyde and ketones.
5. Phenols and naphthols.
6. Chloro and nitro aromatic compounds.
7. Aliphatic diamides.

Course designers

1. Dr. P. Tharmaraj
2. Dr. P. Prakash
3. Dr. R. Mahalakshmy
4. Dr. A. Tamil Selvi

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DEPARTMENT OF CHEMISTRY
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Course	: B.Sc Chemistry (Core 3)	Int. Marks	:25
Class	: I Year	Ext. Marks	:75
Semester	: II	Max. Marks	: 100
Sub. Code	: MC21	Hours/Week	: 3
Title of the Paper	: **Inorganic Chemistry – I**	Credit	: 3

Course Outcomes:

On the successful completion of the course, students will be able to

- Identify the various types of bonds.
- Understand the concept of hybridisation.
- Know the characteristics of s-block, boron and carbon group elements.

Unit I: Chemical Bonding (9 hrs)

Chemical bond - definition, types of chemical bonds.

Ionic or electrovalent bond - Definition, Illustration of the formation of ionic bond (Examples: NaCl, MgO, CaF_2, Al_2O_3 only), Condition for the formation of ionic compounds, Born Haber cycle.

Covalent bond: Definition, types of covalent bond (single, double and triple), Illustration of the formation of covalent bond (Example: HF, H_2O, NH_3, O_2, N_2 only), factors favouring the formation of covalent compounds.

Coordinate bond: Definition, Illustration of the formation of coordinate bond (Example: H_2O_2, SO_2, CO, NH_4^+, Al_2Cl_6 only), comparision between ionic, covalent and coordinate bond.

Hydrogen bond: Definition, properties, types and significance of hydrogen bonding.

Unit II : Hybridization and Shape of Covalent Molecules (9 hrs)

Hybridization –concept-VB theory-sp,sp^2,sp^3spd, spd^2-VSEPR theory-Geometry of $SnCl_2$ NH_3,H_2O. ClF_3,IF_5. Formation of molecular orbitals from atomic orbitals.

Molecular Orbital Theory- Homonuclear (H_2, Li_2, N_2, O_2) and Heteronuclear (CO and NO) diatomic molecules.

Unit III:-Block Elements (9 hrs)

General characteristics - anomalous behaviour of lithium and beryllium - diagonal relationships of lithium with magnesium and beryllium with aluminium.

Preparation, properties and uses of lithium hydride, sodium peroxide, potassium iodide, BeO, $BeCl_2$, calcium carbide, $CaCl_2$, super phosphate of lime, Plaster of Paris and lithopone- **Biological importance.**

Unit IV: p- Block Elements (Boron group) (9 hrs)

Group 13 (boron group): General Characteristics, extraction of boron, **Anomalous behaviour of Boron,** Diagonal relationship of boron with silicon, reaction of B with other elements, water, air, acids, alkali, metals and non-metals. Preparation, Properties and structure of diborane. Structure of borazine, boric acid, borohydrides- Hydroboration- Ultramarine. **Anomalous behaviour of Aluminium, Inert pair effect of Thallium.**

Unit V : p- Block Elements (Carbon group) (9 hrs)

Group 14 (carbon group): catenation and heterocatenation, allotropy of carbon- Structure of diamond, graphite and fullerenes; Metal carbides, Applications of carbides in industry.

Properties and structure of Silicates (ortho-, pyro-, cyclic-, chain-, sheet-, three dimensional silicates)- **oxides and chlorides of carbon(CO, CO_2, $COCl_2$, CCl_4), $SiCl_4$, bonding in $(SiH_3)_3N$, Pigments of Lead.**

Text Books:

1. Puri B.R, Sharma L.R, and Kalia K.C,2004, Principles of Inorganic Chemistry, 28th edition, Vallabh Publication, NewDelhi.
2. Madan R.D,2002, Modern Inorganic Chemistry, Chand S.& Company, 2nd edition, New Delhi.

Reference Books:

1. Albert Cotton F.A,1998, Advanced Inorganic Chemistry, Geofferey Wilkinson, Carlos, Murillo, Manfred Bochmann, John Wiley & Sons, Inc. New York.
2. Huheey J.E and Ellen Keiter A., Richard Keiter L.2004, Inorganic Chemistry, 4th edition, Pearson Education Pvt Ltd, Harper Collins College Publishers, Singapore.
3. Malik, Tuli, Madan, 2006, Selected Topics in Inorganic Chemistry, S. Chand & Co., New Delhi.
4. Lee, J. D, 2002, A New Concise Inorganic Chemistry, ELBS 5th Ed.

Course designers

1. Dr. A. Suganthi
2. Dr. A. Elangovan
3. Dr. D.S. Bhuvaneswari
4. Dr. K. Selvakumar

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DEPARTMENT OF CHEMISTRY
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Course	: B.Sc Chemistry (Core 4)	Int. Marks	: 25
Class	: I Year	Ext. Marks	: 75
Semester	: II	Max. Marks	: 100
Sub. Code	: MC 22	Hours/Week	: 3
Title of the paper	: **Physical Chemistry – I**	Credit	: 3

Course Outcomes:
On the successful completion of the course, students will be able to
- Understand the basic concepts of Nuclear and polymer chemistry in detail
- Realize the function and types of catalyst
- Analyze physical properties of molecules like distribution, polarization, magnestism etc.

UNIT I **(9 hrs)**

NUCLEAR CHEMISTRY: Composition of the nucleus - Nuclear forces, Mass defect - 'Binding energy – Binding energy per nucleon (Problems related to this) Nuclear stability and Binding energy.

NATURAL RADIOACTIVITY: Types of radioactive rays, Detection and measurement of radioactivity - GM counter method and Wilson cloud chamber method, Fajan's - Russell - Soddy group displacement law – illustration, Laws of radioactive disintegration - derivation of radioactive disintegration constant, average life and half-life period (related simple problems).

UNIT II **(9 hrs)**

DISTRIBUTION LAW

Nernst Distribution law - thermodynamic derivation – limitations, association of solute in one of the solvent, dissociation of solute in one of the solvent, solute enters into chemical combination with one of the solvent - Applications of Nernst distribution law

UNIT III **(9 hrs)**

CATALYSIS: Definition- different types of catalysts – homogenous and heterogeneous catalysis, acid-base catalysis, enzyme catalysis- Michaelis-Menton mechanism, auto catalysis- catalytic poisoning- promoters.

UNIT IV **(9 hrs)**

MOLECULAR PROPERTIES AND STRUCTURE

Electrical properties of molecules - polarization of a molecule in an electric field, Derivation of Clausius - Mosotti equation, Dipole moments and molecular structure, Magnetic properties of molecules - Magnetic permeability - Magnetic susceptibility - Measurement of magnetic susceptibility, Diamagnetism, Paramagnetism, Ferro magnetism and Anti-Ferromagnetism.

UNIT V **(9 hrs)**

POLYMER CHEMISTRY:

Classification of polymers – Functionality – Tacticity, addition and condensation polymerization, Thermoplastic resin and thermosetting resin, number average and weight average molecular weights, Moulding of polymers – injection and compression.

Text Books

1.Puri B.R., Sharma L.R. and Pathania M.S., 2007, Principles of Physical chemistry, 30th edition, Vishal publication, 2007, Jalandhar-Delhi, India.

2. Billmeyer Jr., F.W, 1984, A text book of Polymer Chemistry ,III edition, John Willey and Sons, UK.

Reference Books

1.Bahl B.S., Tuli G.D. and Arun Bahl, 2004, Essential of Physical chemistry, S.Chand publications, Ram nagar, New Delhi, India.

2.Arnikar H.J., 2005, Essentials of Nuclear Chemistry, IV Edn., New Age international (P) Ltd., New Delhi, India.

3.Gowarikar V., et al., 1986, Polymer Science, Willey Eastern Limited, New York, USA.

Course Designer:

1. Dr. R. Sayee Kannan
2. Dr. A. R. Ramesh
3. Dr. T. Arumuganathan

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Course	: B.Sc. Chemistry (Core Lab-II)	Int. Marks	: 40
Class	: I year	Ext. Marks	: 60
Semester	: II	Max. Marks	: 100
Sub. Code	: MCL-21	Hours/Week	: 4
Title of the Paper	: **Inorganic Qualitative Analysis**	Credits	: 2

Course Outcomes:

On the successful completion of the course, students will be able to

1. Analyse simple salts containing one acid and one basic radical.

Analysis of simple salts
Acid radicals:
Simple: Nitrate, Sulphate, Bromide, Iodide and Carbonate
Interfering: Phosphate, Oxalate, Borate**, tartarate** and fluoride
Basic Radicals:
Lead, Copper, Cadmium, Iron, Nickel, Zinc, Calcium, Barium, Strantium, Magnesium, Ammonium.

Internal Marks = 40
External marks = 60
Total Marks = 100

Internal Marks Distribution:

Acid radical = 15
Basic radical = 15
Procedure = 05
Record = 05

Total = 40

Course Designers
1. Dr. A. Elangovan
2. Dr.D.S.Bhuvaneshwari

THIAGARAJAR COLLEGE, MADURAI – 9.

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DEPARTMENT OF BOTANY

(For those who join in 2017 and after)

Course	: B.Sc. Chemistry	Int. Marks	: 15
Class	: I	Ext. Marks	: 35
Semester	: II	Max. Marks	: 50
Sub.Code	: MCAEC21	Hours/Week	: 2
Title of the Paper: **Personality Development**		Credits	: 2

Course Outcomes

On the successful completion of the course, students will be able to

- understand the cause of a problem and way to solve it
- be acquainted with different and difficult situations

Unit I

Life skill strategies- Effective communication, Creative thinking, Decision making, Goal setting, Problem solving, Resume writing.

Unit II

Attitude, Interpersonal Skills, self awareness, SWOT, Emotional Intelligence, Leadership development- Team building, Time, Stress and Conflict Management.

Text books

1. N.Chockan 2011 Learn to understand others,Prodigy books, Chennai
2. Machakkalai,R and L. Saraswathi 2005.Personality development a need. Mangai Publishers, Madurai

Reference books

1. S.P.Sharma 2005. Youngsters guide for Personality development.Pustak Mahal, New Delhi
2. Sean Convey 1998. The 7 habits of highly effective teens.Fireside New York, USA.

Course designer

Dr. Rm. Murugappan

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DEPARTMENT OF CHEMISTRY
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Course	: B.Sc Chemistry (Core 5)	Int. Marks	: 25
Class	: II Year	Ext. Marks	: 75
Semester	: III	Max. Marks	: 100
Sub. Code	: MC31	Hours/Week	: 3
Title of the Paper	: **Inorganic Chemistry-II**	Credit	: 3

Course Outcomes:
On the successful completion of the course, students will be able to

- Study the characteristics of nitrogen and oxygen group elements
- Learn the concepts and strengths of acids and bases
- Be Aware of Lab safety and to learn sources and eradication of errors.

Unit I : p-Block elements (Nitrogen group) (9 hrs)

Group 15 (nitrogen group): General Characteristics- difference between nitrogen and the rest of the family members. preparation, properties, structure and uses of hydrazine, hydrazoic acid hydroxyl amine. Preparation and structure of ammonia, dinitrogen trioxide, dinitrogen pentoxide, nitrogen dioxide, nitrous oxide, nitric acid, phosphinic acid, phosphonic acid, hypo phosphorus acid, ortho, pyro and meta phosphoric acid – **oxides and sulphides of phosphorus- Allotrophy of phosphorus, Arsenic, Antimony and Bismuth.** Preparation and uses of sodium bismuthate, As_2O_3, Scheele's green, tartaremetic. Preparation and uses of Urea, triple superphosphate, potassium nitrate.

Unit II: p-Block elements (Oxygen group) (9 hrs)

Group 16 (oxygen group): structure and allotropy of elements- preparation, properties and structure of ozone, oxides and oxyacids of Sulphur. Halides and **oxyhalides** of Sulphur, Thionic acids, **thionyl chloride,** permono and perdi sulphuric acid. Biologically important sulphur compounds – sulphur bridged Molybdenum V dimeric complexes.

Unit III: Halogens (9hrs)

Group 17 (halogens): General characteristics, comparison of oxidizing action of halogens. Nomenclature and structure of oxy acids of halogens. **Acid strength of HX**- Preparation, properties and structure of Interhalogen and Psuedohalogens compounds: xenon hexafluoride, xenon oxyfluoride and xenon trioxide, ClF, ICl; ClF_3, BrF_3; ClF_5, BrF_5, IF_5, IF_7, $HClO_4$, I_2O_5, Fluorocarbons- structure and properties. **Isolation of noble gases from the atmosphere-Uses of noble gases.**

Unit IV: A**cids and Bases (9hrs)**

Arrehenius concept, proton transfer theory – concept of Lowry and Bronsted – Luxflood concept – the solvent system concept – Lewis concept – Classification of solvents. Relative strength of acids and bases – effect of solvent – leveling effect – effect of polarity and dielectric constant – effect of substituents – factors influencing relative strengths of acids and bases.

Unit V: Laboratory Safety and Error Analysis (9 hrs)

i. Laboratory Safety

Storage and handling of corrosive, toxic and poisonous chemicals-simple first aid procedure for acid and alkali in eye, acid and alkali burns, heat burns and cut by glasses.

ii. Error Analysis

Accuracy, precision, classification of errors, minimization of errors, significant figures, mean and standard deviation – method of least squares – student Q test.

Text Books:

1. Puri.B.R., Sharma.L.R., and Kalia.K.C 2004., Principles of Inorganic Chemistry, 28th edition, Vallabh Publication, NewDelhi.
2. Sharma.B.K.,1996, Instrumental methods of chemical analysis, 5th edition, Goel publication, Meerut.

Reference Books:

1. Madan.R.D.2002, Modern Inorganic Chemistry, S. Chand & Company, 2nd edition, New Delhi.
2. Albert.F.A., Cotton 1998, Advanced Inorganic Chemistry, Geofferey Wilkinson, Carlos, Murillo, Manfred Bochmann, John Wiley & Sons, Inc. New York.
3. Huheey J.E and Ellen Keiter A., Richard Keiter L.2004, Inorganic Chemistry, 4th edition, Pearson Education Pvt Ltd, Harper Collins College Publishers, Singapore.
4. Skoog D.A, James F. Hollar and .Niemans T.A,2004, Principles of industrial analysis, 5th edition, Thomson Books Cole, Singapore.

Course designers

1. Dr. A. Suganthi
2. Dr. A. Elangovan
3. Dr. D.S. Bhuvaneswari
4. Dr. K. Selvakumar

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: B.Sc. Chemistry (Core 6)	Int. Marks	: 25
Class	: II Year	Ext. Marks	: 75
Semester	: III	Max. Marks	: 100
Sub. Code	: MC32	Hours/Week	: 3
Title of the Paper	**: Organic Chemistry– I**	Credit	: 3

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- Understand the chemistry of unsaturated hydrocarbons, alkyl halides, alcohols, ethers, thioethers, epoxides, aldehydes & ketones.
- Remember the naming reactions, and concepts of addition and elimination reactions.
- Analyze the chemical reactions.

UNIT-I **9 hrs**

UNSATURATED HYDROCARBONS

Alkenes: Methods of preparation (Catalytic hydrogenation, Birch reduction, Saytzeffs and Hofmann's rule) **–** addition reactions: Markonikov and anti-Markonikov mechanism of addition to conjugated dienes.

Alkynes: Preparation and Acidity of alkynes – chemical reaction (Nucleophilic and electrophilic addition reactions).

UNIT-II **9 hrs**

ALKYL HALIDES

Haloalkanes: Introduction – Methods of Preparation (from alkanes, alkenes, alcohols, Finkelstein reaction). Chemical properties: Substitution reactions (SN1, SN2 and SNi mechanism) – Elimination reactions (E1 and E2 mechanism).

Unsaturated alkyl halides: Vinyl and allyl chlorides

UNIT-III **9 hrs**

ALCOHOLS

Monohydric alcohols: Classification (1°, 2° and 3°) – Ethanol: preparation (from alkenes, alkanes, Grignard reagent) – Physical properties, acidic nature of alcohols, chemical reactions and uses.

Dihydric alcohol: Ethylene glycol: Preparation, chemical properties and uses.

Trihydric alcohol: Glycerol: Preparation, chemical properties and uses.

UNIT-IV **9 hrs**

ETHERS, THIOETHER AND EPOXIDES

Ethers: Nomenclature - General methods of preparation, Williamson's Synthesis - Properties - Estimation of number of alkoxy groups – Ziesel's method.

Thioethers**:** Nomenclature - General methods of preparation – properties - mustard gas.

Epoxides**:** Synthesis – reactions – acid and base-catalyzed ring opening of epoxides – (Symmetrical epoxides only).

UNIT-V **9 hrs**

ALDEHYDES AND KETONES

General methods of preparation of carbonyl compounds (by oxidation reactions, By heating calcium salts of carboxylic acids) – Reactivity of carbonyl compounds: Nucleophilic addition reactions (Reaction with HCN, Wittings reactiion, Reformsky reaction, Baeyer-Villiger rearrangement, Reactions with NH3 and their derivatives) – Oxidation reactions, Reduction

reactions (Meerwein-Ponndorf-Verley reduction, Wolf-Kishner reduction, Clemmensen reduction), Aldol Condensation reactions – Cannizaro reaction – Distinguishing aldehyde and ketones – Chemistry of acrolein and crotonaldehyde.

Text Book

- Bhupinder Mehta, Manju Mehta, 2015, Organic Chemistry, Prentice Hall of India Pvt Ltd,. New Delhi.
- B.S.Bahl and Arun Bahl, 1998, Advanced Organic Chemistry, 1st edition, S. Chand and Company Ltd, New Delhi.

Reference Books

1. I.L.Finar, 1997, Organic chemistry, Vol 1, 6th edition, Pearson Edition, 2005, Singapore.
2. R.T. Morrision and R.N. Boyd, 1997, Organic chemistry, 6th edition, Prentice Hall Private Limited, New Delhi.
3. P.L. Soni, 2005, Text Book of Organic Chemistry, Sultan Chand, New Delhi.
4. K.S.Tewari, N.K.Vishil and S.N.Mehotra. 2001, A text book of Organic Chemistry, 1st edition, Vikas Publishing House Pvt Ltd, New Delhi.

Course designers

1. Dr. P. Tharmaraj
2. Dr. P. Prakash
3. Dr. R. Mahalakshmy
4. Dr. A. Tamil Selvi

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: B.Sc. Chemistry (Core Lab-III)	Int. Marks	: 40
Class	: II B.Sc Chemistry	Ext. Marks	: 60
Semester	: III	Max. Marks	: 100
Sub. Code	: MCL31	Hours/Week	: 4
Title of the Paper	: **Inorganic Volumetric Analysis**	**Credit**	**:2**

Course Outcomes:
On the successful completion of the course, students will be able to
1. Estimate the amount of metal ion present in the given solution
2. Prepare the inorganic complexes.

VOLUMETRIC ANALYSIS
A. ACIDIMETRY - ALKALIMETRY
1. Na_2CO_3 (Std)-HCl - Na_2CO_3
2. Na_2CO_3 (Std)-HCl - NaOH
3. NaOH-Oxalic acid - (Std)-NaOH
B. PERMANGANIMETRY
1. $KMnO_4$- Fe^{2+}- $KMnO_4$
2. Oxalic acid - $KMnO_4$-Oxalic acid
3. $KMnO_4$-Oxalic acid - $KMnO_4$
C. DICHROMETRY
1. Fe^{2+}-$K_2Cr_2O_7$-FAS
2. K_2Cr2O_7 - Fe^{2+}- $K_2Cr_2O_7$
D. IODOMETRY
1. $K_2Cr_2O_7$-Thio- $K_2Cr_2O_7$
2. $CuSO_4$-Thio- $K_2Cr_2O_7$
(Any Eight estimations from the above mentioned volumetric estimations)

Course Designers
1. Dr.A. Elangovan
2.Dr.D.S.Bhuvaneshwari

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: B.Sc./B.A (Non Major elective -I)	Int. Marks	: 15
Class	: II B.A/B.Sc	Ext. Marks	: 35
Semester	: III	Max. Marks	: 50
Sub. Code	: MCNME31	Hours/Week	: 2
Title of the Paper	**: Chemistry in Day-To-Day Life**	Credit	: 2

Course Outcomes:
On the successful completion of the course, students will be able to
- Remember the various ingredients present in the consumer products.
- Prepare all these products on their own.

Unit I: Cosmetics **20 hrs**

Dental Preparations: Tooth pastes- ingredients, their characteristics and functions. Mouth washes (Composition only). Soap- Hard soap, Soft soap- types. Face powder (Composition only), Deodorants and antiperspirants-Distinction between astringents and deodorants, deodorant powders (Composition only), Hair care preparations: shampoo different types and formulations, hair conditioners and setting lotions.Hair colourants: Hair lighteners and bleaches, Temporary colourant, Semi-permanent colourants, permanent colourants – vegetable dyes. Moisturizing creams, Perfumes, Lip sticks, shaving creams, after shave preparations.

Unit II: Consumer Products **10hrs**

Composition and Uses of Safety Matches, Agarbattis, Naphthalene Balls, Wax candles, shoe polish, Gum, Ink, Chalk crayons.

Text Books:
1. Poucher, W.A. Perfumes, Cosmetics and soaps, Vol. III, Modern Cosmetics.
   Simons, J.V. Chemistry and the beauty business.
2. B.K.Sharma, Industrial Chemistry, Goel publishing House, Meerut, 2003, New Delhi.

Reference Books:
1. R.V.Shreve, Industrial Chemical Process, Tata McGraw Hill publishing company, 2005, Mumbai.
2. Mohan Malhotra, Latest Cottage Industries, 20th Edition Edn, Vishal publishers, 1980, Meerut.

Course Designer
Dr. D. Bhuvaneshwari

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: B.Sc. Chemistry (Core 7)	Int. Marks	: 25
Class	: II Year	Ext. Marks	: 75
Semester	: IV	Max. Marks	: 100
Sub. Code	: MC41	Hours/Week	: 3
Title of the Paper	**: Organic Chemistry – II**	**Credit**	**: 3**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- Understand the chemistry of aliphatic carboxylic acid and their derivatives, hydroxyl acids, aliphatic nitrogen compounds,
- Apply the organometallic reagents in organic functional group conversion.
- Remember the chemistry of carbohydrates.

UNIT –I **9 hrs**

CARBOXYLIC ACID AND THER DERIVATIVES

Saturated Monocarboxylic acids: Resonance structure of the carboxyl group – relative strength of acidity of carboxylic acids (effect of substituent effect). Acid derivatives (preparation and chemical properties): acid chlorides, anhydrides, amides and esters.

Unsaturated monocarboxylic acids: Preparation and chemical reactions of acrylic and crotonic acids.

Hydroxyl acids – alpha and beta hydroxyl acids – preparation and reactions – action of heat – chemistry of lactic and tartaric acids.

UNIT –II **9 hrs**

ALDEHYDIC AND KETONIC ACIDS

Preparation and properties of glyoxalic acids, pyruvic and laevulic acid – Preparation and synthetic importance of acetoacetic ester.

Dicarboxylic acids: Preparation and properties of Oxalic acid, malonic acid, succinic acid, glutaric acids – reactions of reactive methylene group.

Unsaturated dicarboxylic acid: Prpearation and properties of fumaric and maleic acid

UNIT –III **9 hrs**

ALIPHATIC NITROGEN COMPOUNDS

Nitroalkanes: Preparation, properties, and structure of nitroalkanes – chemical reactions of nitroalkanes.

Alkyl cyanides and isocyanides: Preparation and chemical reactions – Distinction between ethylcyanide and ethylisocyanides.

Aliphatic amines: Classification – Nomenclature - General methods of preparation, primary amine preparation (Lossen rearrangement, Hofmann degradation of amides, Curtius reaction) – Properties and reaction - separation of mixture of amines (Hofmann's method) – Basicity of amines - distinction between primary, secondary and tertiary amine.

Aliphatic diazo compounds: Preparation and properties of diazomethane.

UNIT-IV **9 hrs**

ORGANOMETALLIC REAGENTS

Organo magnesium halides: preparation, reactions and synthetic uses of Grignard reagents and its limitations.

Organolithiums: General methods of preparation, reactions, and synthetic applications.

Lithium Dialkylcuprates (Gilman reagent): Preparation and synthetic uses.

Tetra ethyl lead (TEL): preparation, reactions and synthetic uses.

UNIT-V **9 hrs**

CARBHOYDRATES

Introduction and classification — glucose – mutarotation – Killiani-Fischer synthesis – Ruff degradation - structure elucidation of glucose – Fructose: Structure elucidation of fructose - methods of interconversion between aldose and ketose – Disaccharides – sucrose – structure elucidation – Polysachharides - starch and cellulose (classification and structure only).

Text Book:

- Bhupinder Mehta, Manju Mehta, "Organic Chemistry", Prentice Hall of India Pvt Ltd,. New Delhi, 2015.
- B.S. Bahl and Arun Bahl, Advanced Organic Chemistry, 1st edition, S.Chand and Company Ltd, 1998, New Delhi.

References:

1. I.L.Finar, 2005, Organic chemistry Vol I, 6th edition, Pearson Edition, Singapore.
2. R.T. Morrision, and R.N. Boyd, Organic chemistry, 6th edition, Prentice Hall Private Limited, 1997, New Delhi.
3. P.L. Soni, 2005, Text Book of Organic Chemistry, Sultan Chand, New Delhi.
4. K.S.Tewari, N.K.Vishil and S.N.Mehotra. 2001, A text book of Organic Chemistry, 1st edition, Vikas Publishing House Pvt Ltd, New Delhi.
5. P.S. Kalsi, 2005, Stereo chemistry, Conformation and Mechanism, 4th edition, New Age International Publishers, New Delhi.

Course designers

1. Dr. P. Tharmaraj
2. Dr. P. Prakash
3. Dr. R. Mahalakshmy
4. Dr. A. Tamil Selvi

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: B.Sc Chemistry (Core 8)	Int. Marks	: 25
Class	: II year	Ext. Marks	: 75
Semester	: IV	Max. Mars	: 100
Sub. Code	: MC 42	Hours/Week	: 3
Title of the paper	**: Physical Chemistry - II**	**Credit**	**: 3**

Course Outcomes:

On the successful completion of the course, students will be

- Expected to learn the three laws of the thermodynamics and their application
- Understand the basic principles of chemical equilibrium
- Aware of the heat changes accompanying in chemical reactions

UNIT – I **(9 hrs)**

FIRST LAW OF THERMODYNAMICS

Importance of thermodynamics- limitations of thermodynamics-concepts of a system and surrounding, state variable- extensive and intensive properties, state function and their differential (exact and Inexact), different types of processes- Isothermal, Adiabatic, Isobaric, isochoric, reversible, irreversible and cyclic.

Statement, Mathematical expression-enthalpy and energy of a system-Heat capacity at constant P & V-Correlation between Cp and Cv - Joule Thomson effect – inversion temperature.

UNIT – II **(9 hrs)**

SECOND LAW OF THERMODYNAMICS

Need for second law- Different forms of second law, Carnot cycle-efficiency of Carnot engine and entropy a state function, Entropy changes in reversible and irreversible processes, calculation of entropy change of an ideal gas with change in P,V &T-Entropy of mixing, Physical significance of entropy- work function and free energy, variation of free energy change with temperature and pressure- Maxwell's relationships, The Gibbs-Helmholtz equation- Clausius Clapeyron equation- Application of Clausius- Clapeyron equation.

UNIT – III **(9 hrs)**

THIRD LAW OF THERMODYNAMICS

Nernst heat theorem-Statement of third law of thermodynamics, determination of Absolute entropy of solid, liquids & gases, experimental verification of third law, entropy changes in chemical reaction- residual entropy- exceptions to third law-definition of zeroth law of thermodynamics.

UNIT – IV **(9 hrs)**

THERMOCHEMISTRY

Enthalpy of combustion- Standard enthalpy of combustion, Bomb calorimeter- Enthalpy of formation- Standard enthalpy of formation – Bond energy and its applications, Enthalpy of neutralization, Hess's law of heat of summation and its application, Kirchoff's equation, flame and explosion temperature.

UNIT – V **(9 hrs)**

CHEMICAL EQUILIBRIUM

The law of mass action- Thermodynamic treatment of law of mass action, Relationship between K_p and K_c, Application of Law of mass action to Homogeneous system- dissociation of PCl_5 and N_2O_4, application of Law of mass action to Heterogeneous system-Calcium carbonate - LeChatlier principle - LeChatlier principle and physical equilibria.

TEXT BOOKS

1.Puri B.R., Sharma L.R. and Pathania M.S., 2007, Principles of Physical chemistry, 30th edition, Vishal publication, 2007, Jalandhar-Delhi, India.

2.Jain P.C. and Jain M., 2005, Engineering chemistry, 15th edition, Dhanpat Rai publishing company, New Delhi, India.

REFERENCE BOOKS:

1. Atkins P., 2002, Physical Chemistry, VII Edition, Oxford University Press, UK

2. Bahl B.S., Tuli G.D. and Arun Bahl, 2004, Essential of Physical chemistry S.Chand publications, Ram nagar, New Delhi, India.

3. Van Samuel Glasstone D., 2002, Thermodynamics, 5th edition, Eastern Wiley Publication, London, UK.

Course Designers

1. Dr. R. Sayee Kannan
2. Dr. A. R. Ramesh
3. Dr. T. Arumuganathan

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: B.Sc.Chemistry (core Lab-IV)	Int. Marks	: 40
Class	: II Year	Ext. Marks	: 60
Semester	: IV	Max. Marks	: 100
Sub. Code	: MCL-41	Hours/Week	: 4
		Credit	:2

Title of the Paper : Estimation and Preparation of Organic Compounds

ORGANIC ESTIMATIONS

1. Estimation of Phenol
2. Estimation of Aniline
3. Estimation of Glycine
4. Estimation of Ascorbic acid (Vitamin C)
5. Estimation of Saponification value of an Oil
6. Determination of Iodine value

ORGANIC PREPARATIONS

Preparation of the following Organic Compounds:

1. Benzoic acid from Methyl benzoate
2. Salicylic acid from Methy or ethyl salicylate
3. Osazone from Glucose
4. Benzoic acid from Benzaldehyde

(Any three estimations from each of the above mentioned volumetric estimations and also any three preparations)

Course Designers

1. Dr. P. Tharmaraj
2. Dr. P. Prakash

THIAGARAJAR COLLEGE, MADURAI – 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(w.e.f. 2017 Batch onwards)

Course	: B.Sc.Chemistry (SEC)	Int. Marks	: 15
Class	: II Year	Ext. Marks	: 35
Semester	: IV	Max. Marks	: 50
Sub. Code	: MCSEC41	Hours/Week	: 2
Title of the Paper	**: Agricultural Chemistry (Option A)**	Credit	:2

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- Understand the nature of soil and the fertilizers.
- Gain knowledge on pesticides.

UNIT 1: SOIL AND FERTILIZERS CHEMISTRY (15 hrs)

Soil analysis: Composition of soil: Organic and Inorganic constituents. Soil acidity : buffering capacity of soils. Limiting of soil. Absorption of cations and anions: availability of soil nutrients to plants.

Fertilizers: Peat and organic manures (composts). Role of humus. Effluent form gobar gas plants. Use of fertilizers: urea, DAP, Super phosphate, Gypsum, NPK-mixed fertiizers, Optimal addition of Fertilizers to obtain estimated yields.

UNIT II: PESTICIDES (15 hrs)

Insecticides: stomach and contact poisons. Plant derivatives : pyrethrine, Nicotine and rotenone Synthetic organic: carbophos, carbaryl, p-DCB, dimethoate, butachlor, Endrin, Aldrin (Chemical name and uses). Rodenticides. Fungicides: Inorganic (Bordeaux Mixture) and organic(dithiocarbamate). Industrial fungicides: creosote fractions. Herbicides and weedicides : Selective and non-selective, 2, 4-D and 2, 4, 5-t (structure and function) Intenerated pest management-**Bioinsecticides-Biofertilizers.**

Text books:

1. G.T. Austin : shreve's Chemical Process Industries, 5th edition, Mc-Graw-Hill, 1984

Reference books

1.B.A. Yagodin (Ed). Agricultural Chemistry, 2 Volumes, Mir Publishers (Moscow), 1976.

Course Designers

Dr. A. Suganthi
Dr. R.Mahalakshmy

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: B.Sc.Chemistry (SEC-I)	Int. Marks	: 15
Class	: II BSc Chemistry	Ext. Marks	: 35
Semester	: IV	Max. Marks	: 100
Sub. Code	: MCSEC41	Hours/Week	: 2
Title of the Paper	**: Dairy Chemistry (option B)**	**Credit**	**: 2**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- Learn the composition and processing of milk.
- Understand the chemistry of milk products.

UNIT-I: COMPOSITION AND PROCESSING OF MILK

Milk-definition-general composition of milk-constituents of milk-lipids, proteins, carbohydrates, vitamins and minerals-physical properties of milk-colour-odour-acidity-specific gravity-viscosity and conductivity - factors affecting the composition of milk-adulterants, preservative and neutralizer-

Microbiology of milk-destruction of micro-organisms in milk-physico-chemical changes taking place in milk due to processing-boiling pasteurization-types of pasterurization-Bottle, batch and HTST (High Temperature Short Time)-Vacuum pasterurization-Ultra High Temperature Pasteurization.

UNIT – II MAJOR MILK PRODUCTS

Cream-composition-Chemistry of creaming process-gravitational and centrifugal methods of separating cream-estimation of fat in cream. Butter –composition-desibutter-salted butter-estimation of acidity and moisture content in butter. Ghee-major constituents-common adulterants added to ghee and their detection- rancidity-definition-prevention-antioxidants and synergists-natural and synthetic.

Special milk- definition, composition and nutritive value of -flavoured milk-vitaminised milk-tonned milk-imitation milk-vegetable toned milk - condensed milk.

Reference book:

1. Robert Jenness and S. Patom, Principles of dairy chemistry, Wiley, New York.

Text book:

1. K.S. Rangappa and K.T Acharya, Indian Dairy products.

Course designer:

Dr. A. Suganthi

THIAGARAJAR COLLEGE, MADURAI- 9
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DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: B.Sc.Chemistry (SEC)	Int. Marks	:15
Class	: III Year	Ext. Marks	:35
Semester	: V	Max. Marks	:50
Sub. Code	: MCSEC41	Hours/Week	:2
Title of the Paper	**: Forensic Chemistry (Option C)**	Credit	:2

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- Analyse the adulterants in food stuffs.
- Find a suitable method to detect the crime.

UNIT I: FOOD ADULTRATION (15 hrs)

Contamination of wheat, rice, dhal, milk, butter, etc. With clay, sand, stone, water and toxic chemicals (e.g. Kasseri dhal with mentanil yellow).

Food poisons: natural poisons (alkaloids, nephrotoxins), pesticides (DDT, BHC, Follidol), Chemical poisons (KCN). First aid and Antidotes for poisoned persons.

Heavy metal (Hg, Pb,Cd) Contamination of Sea food. Use of neutron activation analysis in detecting poisoning (e.g.,As in human hair).

UNIT II: FORGERY AND COUNTERFEITING (15 hrs)

Detecting forgery in bank cheques / drafts and educational records (mark lists, certificates), using UV-light. Alloy analysis using AAS to detect counterfeit coins. Checking silverline water mark in currency notes. Jewellery: detection of gold purity in 22 carat ornaments, detecting gold plated jewels, authenticity of diamonds (natural, synthetic, glassy).

Text books

1. Javad I. Khan, Thomas J, Kennedy, Dobbell R, Christian Jr, 2011. Basic principles of Forensic Chemistry, Springer Science and Business media.

Reference Book

1. Jay Siegel, 2015, Forensic Chemistry: Fundamentals and applications, Wiley – Blackwell(ISBN:978-1-118-89772-0).

Course Designers

1. Dr. A. Suganthi
2. Dr. R. Mahalakshmy

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: B.Sc Chemistry (Core 9)	Int. Marks	: 25
Class	: III Year	Ext. Marks	: 75
Semester	: V	Max. Marks	: 100
Sub. Code	: MC51	Hours/Week	: 6(5L:1T:0P)
Title of the Paper	**: Inorganic Chemistry - III**	Total hours	:90(75L+15T)
		Credits	**: 6**

Course Outcomes:
On the successful completion of the course, students will be able

- To study the arrangement of atom in solid state and its application elaborately.
- To understand the concept of organometalics and their uses in transition metal catalysts.

Unit-I: SOLID STATE- I (15L Hrs + 3T Hrs)

Types of solids – Amorphous – crystalline – Seven Crystal systems – Unit cell & Space lattice, Symmetry elements – Simple cubic – bcc – fcc lattices –Miller indices – Bragg equation – Packing of atoms and ions – packing arrangements ccp and hcp – radius ratio – co ordination number 3, 4 and 6 – packing efficiency – simple cubic, bcc and fcc. Structures of Cesium chloride, Zinc blende, Wurtzite, Diamond and Graphite.

Unit-II: SOLID STATE- II (15L Hrs + 3T Hrs)

Crystal defects, schottky and frenkel defects – colour centres – point defects – plane defects – edge dislocation – non-stoichiometric defects – Semiconductors – Application of solar cell-Types of crystals Molecular , Covalent, Metallic and Ionic crystals-Free electron theory and band theory of solids – P-N junction – Transistors – super conductors.-High temperature and low temperature super conductors, Organic super conductors.

Unit -III: d-BLOCK ELEMENTS (15L Hrs + 3T Hrs)

General characteristics- electronic configuration, metallic character, ionization energy, variable valency, reducing property, colour, magnetic property, non-stoichiometric compounds, catalytic properties and tendency to form complexes. Metallurgy of Au, Ni and Cr. Preparation, properties and uses of potassium permanganate, V_2O_5, Ni $(DMG)_2$, CrO_3, potassium dichromate, potassium ferrocyanide-Nessler's reagent. Anamalous behaviour of mercury. Alloys of copper and Nickel.

Unit -IV: (15L Hrs + 3T Hrs)

A. BIO –INORGANIC CHEMISTRY

Essential and Trace elements in biological systems (Mg, Al, Si, P, Ca, V, Cr, Mn, Fe, Zn) – Structure and functions of Haemoglobin and Chlorophyll.

B. TRANSITION METAL COMPOUNDS AS CATALYSTS

Wilkinson catalyst (hydrogenation of olefins) – Zeigler-natta catalyst (propylene polymerization) – organo palladium catalyst – Walker's process (oxidation of olefins) – Mechanism of these processes.

C. ORGANOMETALLIC COMPOUNDS

Definition-Types- Alkene complexes—Zeise's Salt-Structural Features of Zeise's Salt-Iron- Butadiene Complex-Nomenclature of organometallic compounds, 16- and 18-

electron rule, Ferrocene- structure and Bonding. Mansanto process-Hydroformylation-Mechanism of these processes.

UNIT -V: f- BLOCK ELEMENTS (15L Hrs + 3T Hrs)

General characteristics- electronic configuration- oxidation states- colour and magnetic properties. mplexes of lanthanides and actinides. Lanthanide and actinide contraction and their consequences- **Uses of Lanthanides as** Shift reagents. Separation methods-fractional crystallization, oxidation- reduction, ion-exchange method and chromatographic separation. Uranium-occurrence, metallurgy; Properties of Uranyl nitrate and Uranyl acetate.

Text Books:

1. Puri, B.R. Sharma, L.R. and Kalia, K.C. 2004, Principles of Inorganic Chemistry, 28th edn, Vallabh Publication, New Delhi.
2. Madan, R.D. 2005, Advanced Inorganic Chemistry, 2nd edn.S. Chand & Company, New Delhi.

Referance Books

1. Hannay, N. B. 1976, Solid State Chemistry, Prentic- Hall of India Pvt Ltd, New Delhi.
2. Anthony, B. West, R. 1989, Solid State Chemistry and its applications, John Wiley & Sons, Singapore.
3. Albert Cotton, F.A. 1998, Advanced Inorganic Chemistry, Geofferey Wilkinson, Carlos, Murillo, Manfred Bochmann, John Wiley & Sons, Inc. New York.
4. Huheey, J. E. Keiter, Ellen A. Keiter, Richard L. 2004, Inorganic Chemistry, 4th edn, Pearson Education Pvt Ltd, Harper Collins College Publishers, Singapore.

Course designers

1. Dr. A. Suganthi
2. Dr. A. Elangovan
3. Dr. D.S. Bhuvaneswari
4. Dr. K. Selvakumar

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: B.Sc. Chemistry (Core 10)	Int. Marks	: 25
Class	: III Year	Ext. Marks	: 75
Semester	: V	Max. Marks	: 100
Sub. Code	: MC52	Hours/Week	: 6(5L:1T:0P)
Title of the Paper	**: Organic Chemistry – III**	**Credit**	**: 6**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- Understand the concept of aromaticity and chemical properties of aromatic carbonyl compounds, sulphonic acid and nitrogen containing compounds
- Apply the concepts of organic spectroscopic techniques to analyse the given organic molecules.

UNIT-I (15L Hrs + 3T Hrs)

AROMATIC COMPOUNDS AND AROMATIC SUBSTITUTION

Introduction – Aromaticity and Huckel's rule – non benzenoid aromatics - Isolation of aromatic compounds from coaltar. Structure of benzene-resonance- aromatic Electrophilic substitution – Mechanism of nitration, sulphonation and Friedel-craft reaction, Directing effects of substituents – electronic interpretation - Aromatic nucleophilic substitution – Benzyne mechanism.

Poly Nuclear Hydrocarbons: Properties of the following compounds with reference to electrophilic and nucleophilic substitution: Naphthalene and Anthracene

UNIT – II (15L Hrs + 3T Hrs)

AROMATIC ALDEHYDES AND KETONES

Aldehydes: General methods of preparation, and properties of aromatic aldehydes – benzaldehyde – Mechanism of benzoin condensation – perkin reaction, claisen reaction, Knovenagel reaction and cannizaro reaction.

Unsaturated aldehyde – cinnamaldehyde

Ketones: Preparation and properties of acetophenone, benzophenone – Houben Hoesech synthesis.

Rearrangement: Mechanism of the following rearrangements: Pinacol – Pinacolone, Hoffmann, Benzilic acid, Claisen, and Fries rearrangement

UNIT – III (15L Hrs + 3T rs)

Aromatic Sulphonic Acids: Methods of sulphonation – preparation and reaction of benzene sulphonic acid, sulphanilic acid – saccharin, and chloramine – T.

Aromatic hydroxy compounds: General methods of preparation and reaction of phenol – acid strength of phenol – General methods of preparation and reaction of phenolic ether (anisole).

Aromatic acids: Monocarboxylic acids – general methods of preparation, properties and reactions - benzoic acid – anthranilic acid – salicylic acid – cinnamic acid.

Dicarboxylic acid: phthalic acid and terephalic acid.

UNIT – IV (15L Hrs + 3T Hrs)

AROMATIC COMPOUNDS CONTAINING NITROGEN

Nitro benzene – reduction products of nitrobenzene – T.N.T – picric acid - difference between nitro toluenes and phenylnitromethane.

Aniline – Preparation and reactions - basicity of aromatic amines – effect of substituents – phenylene diamine – Toludines – benzyl amine.

Diazonium compounds: Diazotization – mechanism - benzenediazoniumchloride – structure and reactions - synthetic applications – Mechanism of diazo coupling reaction.

UNIT – V (15L Hrs + 3T Hrs)

ORGANIC SPECTROSCOPY

UV-Visible spectroscopy - Types of electronic transitions – chromophore – auxochrome – bathochromic shift – hypsochromic shift – hyperchromic shift – applications of UV spectroscopy.

IR spectroscopy – Molecular vibrations – number of fundamental vibrations – factors affecting vibrational frequency – hydrogen bonding – applications of IR spectroscopy.

NMR spectroscopy – Introduction – relaxation process – number of signals - chemical shift – shielding and deshielding – splitting of signals – spin - spin coupling – coupling constants – Applications of NMR spectroscopy.

Text Book

1. P.L. Soni, 1991.Text Book of Organic chemistry, Sultans chand, New Delhi,

Reference books:

2. I.L.Finar,2005. Organic chemistry Vol 1, 6th edition, Pearson Edition, Singapore.
3. K.S. Tewari, N.K. Vishil, S.N. Mehotra 2001– A text book of org. chem – 1st edition, Vikas Publishing House Pvt Ltd., New Delhi.
4. Y.R. Sharma, O.P. Vig,1997. Elementary organic absorption spectroscopy – 1st edition, Goel Pulishers, India.

Course designers

1. Dr. P. Tharmaraj
2. Dr. P. Prakash
3. Dr. R. Mahalakshmy
4. Dr. A. Tamil Selvi

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: B.Sc. Chemistry (Core 11)	Int. Marks	: 25
Class	: III year	Ext. Marks	: 75
Semester	: V	Max. Mars	: 100
Sub. Code	: MC 53	Hours/Week	: 5
Title of the paper	**: Physical Chemistry – III**	**Credit**	**: 5**

Course Outcomes:

On the successful completion of the course, students will be able to

- Understand basics of nanoscience and its technological applications
- Deal with the concepts of phase rule and chemical kinetics
- Learn about quantum theory and its applications

UNIT – I **(15 hrs)**

NANO TECHNOLOGY

Definition of nanoscience, top down and bottom up approach, Sol-gel mehod, electron microscopes – Scanning electron microscope (SEM) - transmission electron microscope (TEM), application of nano materials – insulation materials, machine tools, phosphors, batteries and solar energy.

UNIT-II **(15 hrs)**

PHASE RULE

Statement and thermodynamic derivations, application of phase rule – one component system (Water and Sulphur only) – Two component systems – simple eutectic (Lead – Silver only) – Compound formation – congruent melting point (Zn – Mg only) – Incongruent melting point (Na – K only)

UNIT – III **(15 hrs)**

CHEMICAL KINETICS

Rate constant, order and molecularity – Integrated rate expression - I order, II order (reactants same and different) and zero order reaction – derivation, Half life period - zero, I, II order reactions, methods of determining order of the reaction-use of differential rate expression-use of integral rate expression-half-life method- isolation method, Arrhenius equation – significance of energy of activation.

UNIT – IV **(15 hrs)**

ATOMIC STRUCTURE AND WAVE MECHANICS

Black body radiation- Quantum theory of radiation -Planck's theory (no derivation required) , Bohr's theory of hydrogen atom – spectrum of hydrogen atom, Derivation of Ritz combination principle, Photoelectric effect-Einstein photoelectric equation, Compton effect, de Broglie's wave equation, Heisenberg's uncertainty principle, Hund's rule and Pauli's exclusion principle.

UNIT – V **(15 hrs)**

QUANTUM CHEMISTRY

Postulates of quantum mechanics, derivation of Schrödinger wave equation, wave function and its significance, probability of finding electrons, operators - differential and integral operators only, application of Schrödinger wave equation - particle in one dimensional box.

Text Books

1.Puri B.R., Sharma L.R. and Pathania M.S., 2007, Principles of Physical chemistry, 30th edition, Vishal publication, 2007, Jalandhar-Delhi, India.

Reference Books

1.Laidler K.J., 2005, Chemical Kinetics, 2nd edition, TaTa Mc Graw – Hill, UK.
2.Chandra A.K., 1994, Introductory quantum chemistry, 4th edition, TaTa McGraw – Hill publishing company limited, UK.
3.Wilson M., Geolf Smith K.K., Simmons M., Raguse B., 2005, Nanotechnology, Overseas press, New Delhi, India.

Course Designers

1. Dr. R. Sayee Kannan
2. Dr. A. R. Ramesh
3.Dr. T. Arumuganathan

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: B.Sc. Chemistry (Core Lab-V)	Int.Marks	: 40
Class	: III Year	Ext. Marks	: 60
Semester	: V	Max. Marks	: 100
Sub. Code	: MCL51	Hours/Week	: 4
Title of the Paper	**: Inorganic Estimations and Preparations**	**Credit**	**: 2**

I. Gravimetric Analysis: (Any TWO)

a) Estimation of lead as lead chromate
b) Estimation of Nickel as Ni-DMG
c) Estimation of Magnesium as Magnesium oxinate

III. Preparation: (Any FOUR)

a) Potassium cupricsulphate
b) Potassium trioxalatoaluminate
c) Hexathioureaplumbusnitrate
d) Tetrammine copper(II)sulphate
e) Ferrous/Ferric oxalate

III. Colorimetry: (Any ONE)

a) Estimation of Iron (III)
b) Estimation of Copper (II)

IV. Chromatography (Demo only NOT for the Exam)

a) Paper Chromatography: Chromatographic separation of a mixture of Co, Mn, Ni and Zn
b) Column Chromatography: Chromatographic separation of potassium permanganate and dichromate**.**

V. UV-visible spectrophotometer (Demo only NOT for the Exam)

Estimation of concentration of an inorganic compound using UV-visible spectrophotometer.

Course Designers

1. Dr. A. Suganthi
2. Dr. D.S. Bhuvaneshwari

THIAGARAJAR COLLEGE, MADURAI- 9
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DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: B.Sc.Chemistry (Core elective 1)	Int. Marks	: 25
Class	: III year	Ext. Marks	: 75
Semester	: V	Max. Marks	: 100
Sub. Code	: MCME51(G)	Hours/Week	: 5
Title of the Paper	**: Group theory and Spectroscopy (Option A)**	**Credit**	**: 5**

Course Outcomes:
On the successful completion of the course, students will be able to

- Understand the fundamentals and application of group theory in chemistry
- Learn about theory and applications of Microwave, IR and Raman spectroscopy
- Deal with the theory and application of resonance spectroscopy such as NMR and ESR

UNIT – I
GROUP THEORY-I **15 hrs**

(i) Introduction - Symmetry elements and symmetry operations - Definition of mathematical group – four cardinal properties of a group – closure, associative, idendity and inverse rule – cyclic group – Abelian group (H_2O only) and non-abelian group (NH_3 only) – Group multiplication table- C_2v and C_3v; subgroup – similarity transformation – class of group – Point group – Assignment of point group of simple molecules – H_2O, NH_3, HCl and H_2.

(i) Matrix-introduction - matrix representation of the symmetry operations – idendity (E), Proper axis of rotation (C_n), Vertical reflection (σ_v), Improper axis of rotation (S_n) and Inverse (i); Representation definition – reducible and irreducible representation of a group.

UNIT-II **15 hrs**
MOLECULAR SPECTROSCOPY

Electromegnetic Spectrum –different regions in electromagnetic spectrum-Molecular spectra-Types of molecular spectra.

Microwave spectra –Classification of molecules –Rotational spectra of diatomic molecules –Rigid rotator-Selection rules-Relative intensities of spectral lines –effect of isotopic substitution –Application of microwave spectroscopy – Determination of bond distances in diatomic molecules.

Electronic spectra –electronic spectra of diatomic molecules – Franck Cotton principle – vibronic transitions and vibrational progression – group frequencies and factors affecting band position and intensities.

UNIT-III **15 hrs**
INFRA-RED SPECTROSCOPY

IR spectra - range - theory of IR spectroscopy- selection rule-Instrumentation - diatomic molecule as a harmonic oscillator - Diatomic molecule as anharmonic oscillator - Analysis of IR spectra on the basis of modes of vibrations of CO_2, H_2O - Finger print region and Characteristic frequencies – Overtones- Finger print region.

UNIT-IV

RAMAN SPECTROSCOPY **15 hrs**

Introduction – Difference between IR and Raman spectra –polarization of light –Raman effect – Strokes and antistrokes- Rayleigh-–Application of Raman effects to chemistry – Mutual exclusion principle –Instrumentation -advantages and limitations of Raman spectroscopy.

UNIT-V **15 hrs**

RESONANCE SPECTROSCOPY

NMR: Introduction – Nuclear spin and magnetic moment - origin of NMR spectra - theory of NMR spectroscopy-Basic instrumentation – factor affecting chemical shift-spin-spin splitting, NMR spectrum of ethanol, acetone - coupling constant.

ESR: ESR introduction –factors affecting the g value- difference between ESR and NMR-basic instrumentation-Hyperfine interactions –Applications of ESR-hydrogen radical and methyl radical.

Text Books:

1**.** 1. Puri B. R., Sharma L.R. 2003, Physical chemistry, 33rd edition, Vishal Puplications, New Delhi,
India.
2. Cotton F.A., 1971, Chemical applications of group theory, 3rd edition, Wiley eastern Ltd., UK.
3. Banwell C. M., 2005, Fundamentals of Molecular spectroscopy, 4th edition, TMH company limited, 2005.

Reference Books:

1. Gurudeep Chatwal R., Anand S. K., 2002, Spectroscopy, 5th edition, Himalaya Puplications, NewDelhi , India.
2. Raman K.V., 1990, Group theory, 1st edition, Tata McGraw Hill Publishing Limited, NewDelhi, India.

Course designer:

1. Dr. A. Suganthi
2. Dr. T. Arumuganathan

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: B.Sc.Chemistry (Core elective 2)	Int. Marks	: 25
Class	: III year	Ext. Marks	: 75
Semester	: V	Max. Marks	: 100
Sub. Code	: MCME51 (I)	Hours/Week	: 5
Title of the Paper	: **Industrial Chemistry (Option B)**	**Credit**	**: 5**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- Understand the generation of energy from various types of fuels.
- Know the usage of chemicals in improvement of agricultural crops
- Employ method for purification of water for industry and home
- Identify Pollution occurring from various sources and resulting toxic effects

UNIT-1: Industrial fuels (15 h)

Energy Sources: non-renewable, classification of fuels: solid, liquid and gaseous. Calorific value of fuels and its determination.

Solid fuels Coal: types – properties and uses – lignite, sub-bituminous coal, bituminous coal and anthracite. Coking and non-coking coal.

Liquid fuels: Refining of crude petroleum and uses of fractions. Hydrodesulphurisation. Cracking: thermal and catalytic (fixed bed and fluidised bed cataylsis). Octane number. Production and uses of tetraethyl lead, ETBE and MTBE.

Gaseous fuels: Natural gas and gobar gas: production, composition and uses, Gobar electric cell.

UNIT-2: Chemistry and agriculture (15 h)

Fertilizers: NPK, representation,superphosphate, triple superphosphate, uses of mixed fertilizers. Micronutrients and their role, biofertilizers, plant growth harmones.

Pesticides: Classification of pesticides with examples. Insectides; stomach poisons, contact insecticides, fumigants. Manufacture and uses of insecticides. DDT, BHC (gammaxane: Conformation of gamma isomer) pyrethrin. Mention of aldrin, dieldrin, endrin and pentachlorophenel (and its Na salts) and **Biopesticides**: Herbicides: Manufacture of 2,4-D and 2,4,5-T Fungicides: Preparation of Bordeaux mixture. Mention of lime-sulphur, creosote oil and formula.

Sugar industry: Double sulphitation process. Refining and grading of sugar. Saccharin: synthesis and use as a sugar substitute - aspartame. Ethanol: manufacture from molasses by fermentation.

UNIT-3: Water treatment **(15 h)**

Introduction to sources of water. Hardness of water-temporary or carbonate hardness, permanent hardness or non-carbonate hardness. Units of hardness, disadvantages of hard water – In domestic, in industry and in steam generation in boilers. Effect of iron and manganese in water. Estimation of hardness – EDTA method – Estimation of total hardness – O. Hehner's method or alkali titration method.

Water softening methods Industrial purpose Lime – soda process, Zeolite process; Ion-exchange - Demineralisation - deionisation process. Mixed – bed deionisation. Domestic purpose Removal of suspended impurities. Removal of microorganism – Chlorination . Break point chlorination. Reverse osmosis. Desalination.

UNIT- 4: Pollution and chemical toxicology **(15 h)**

Pollution: Air pollution - Acid rain. Green house effect (global warming), ozone layer depletion - photochemical oxidants. Control of air pollution. Water pollution – organic pollutants, Chemical oxygen demand (COD), Biological oxygen demand (BOD), total organic carbon. International standards for water and air quality and regulations

Chemical toxicology: Effect of toxic chemicals on enzymes. Lead, mercury and cyanide pollution and their biochemical effects. Carbon monoxide, sulfur dioxide, oxides of nitrogen, ozone – biochemical effects.

UNIT-5: Small scale units **(15 h)**

Safety matches, agarbatties, naphthalene balls, wax candle, shoe polish, gum paste, writing/ fountain pen ink, chalk/crayons, plaster of paris, silicon carbide crucibles, how to remove stains.

Text book:

1. B.K. Sharma, Industrial Chemistry, Goel publishing house, sixteenth edition 2011.

Reference book:

2. O.P. Veramani, A.K. Narula, Industrial Chemistry, Galgotia publication Pvt. Limited, 2004.

Course designer:

1. Dr. A. Suganthi
2. Dr. R. Mahalakshmy

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: B.Sc.Chemistry (Non major elective)	Int. Marks	: 15
Class	: II B. A/B.Sc	Ext. Marks	: 35
Semester	:V	Max. Marks	: 50
Sub. Code	: MCNME51	Hours/Week	: 2
Title of the Paper	: **Processing of Consumer Products (Lab)**	**Credit**	**:2**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

1. Prepare the consumer products which are useful in day to day life.

Training in the laboratory preparation of the following products:

(i) Tooth powder
(ii) Detergent powder
(iii) Cleaning powder
(iv) Phenoyl
(v) Shampoo
(vi) Pain Balm
(vii) Face powder
(viii) Candle
(ix) Chalk
(x) Soap oil

Text Books:

1. Poucher, W.A. Perfumes, Cosmetics and soaps, Vol. III, Modern Cosmetics;
2. Simons, J.V. Chemistry and the beauty business.
3. B.K.Sharma, Industrial Chemistry, Goel publishing House, Meerut, 2003, New Delhi.

Reference Books:

1. R.V.Shreve, Industrial Chemical Process, Tata McGraw Hill publishing company, 2005, Mumbai.
2. Mohan Malhotra, Latest Cottage Industries, 20th Edition Edn, Vishal publishers, 1980, Meerut.

Course Designer:

Dr. D. S. Bhuvaneshwari

THIAGARAJAR COLLEGE, MADURAI- 9

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DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: B.Sc Chemistry (Core 12)	Int. Marks :25
Class	: III Year	Ext. Marks :75
Semester	: VI	Max. Marks : 100
Sub. Code	: MC61	Hours/Week : 6(5L:1T:0P)

Title of the Paper : Inorganic Chemistry and Computer Applications Credit **: 6**

Course outcomes

On the successful completion of the course, students will be able to

- Understand the basic concepts of analytical Chemistry, inorganic polymers and computer applications.
- To know the basic components and function of various analytical instruments.
- Students gain hand on training of instruments and experience in writing C programming of their application in physical chemistry practical's.

Unit I: ANALYTICAL CHEMISTRY -I (15L Hrs + 3T Hrs)

i. Redox titrations, redox potentials, theory of redox indicators- principles involved in iodometric and iodimetric titrations- Complexometric titrations involving EDTA - indicators for Complexometric titrations.

ii. Colorimetric and Spectrophotometric analysis-Beer's - Lambert's law and problems involving concentrations using Beer's-Lambert's law, working of double beam UV-visible spectrophotometer-determination of Nickel (II) and iron(III).

Unit II: ANALYTICAL CHEMISTRY-II (15L Hrs + 3T Hrs)

i. Principle, instrumentation and aplication of Cyclic voltammetry, amphrometric titration, Electrogravimetric methods (with out potantial control) and Coulumetric methods.

ii. Principles and instrumentation TGA and DTA- glass transition temperature of polymer- applications of calcium oxalate monohydrate, Copper sulphate pentahydrate and mixture of polymers.

Unit-III: **INORGANIC POLYMERS** (15L Hrs + 3T Hrs)

Inorganic polymers-General properties- Glass transition temperature-phosphorous based polymers- chain polymers, Maddrell's salts- kuroll's salts-phosphorous based network polymers-Sulphur based polymers- Switching phenomenon in chalcogenide glass- Boron based polymers- Polymeric boron nitride-comparision of polymer of boron nitride and graphite -Silicon polymers-linear polymer- cross linking polymer- copolymer-**coordination polymers.**

Unit-IV: INTRODUCTION OF COMPUTERS (15L Hrs + 3T Hrs)

Importance of Computers-history and development-hardware and software-structure of a computer - operating systems - DOS and UNIX – Low level and High level languages-Interpreter and compiler-Types of Computers - various input and output devices.

Unit-V: PROGRAMMING IN `C' LANGUAGE (15L Hrs + 3T Hrs)

i. Advantages - types-style of the language - Structure of C-program- keywords - variables –constants-data types-operators-arithmetic expressions--input and output functions-Running of C program -control-statements-Looping statements- arrays.

ii. Application Of C Program In Chemistry-Formula Translations

Calculation of RMS and average velocities of O_2 - Mean activity coefficient of an electrolyte - Calculation of pH of the given solution - Use of braces in if-else ladder to obtain the lines of Lyman series-Applying C-programming to simple physical chemistry practicals like Rast method and Ester hydrolysis - Calculation of Normality, Molarity and molality of the given solution - Conversion of Celsius to Kelvin temperature and vice versa.

Text Books:

1. Sharma, B. K. 2000. Instrumental Methods of Chemical Analysis, 5th edn. Goel publication,
New Delhi.
2. Balaguruswamy, 1. E. 2005. Programming in ANSI C, 3rd edn, Tata McGraw-Hill publishing
Company Ltd., New Delhi.

Reference Books:

1. Yaswant Kanitkar, 1998. Let us C, BPB Publications, New Delhi.
2. Puri, B.R. and Sharma, L.R. and Kalia, K. C. 2004. Principles of Inorganic Chemistry, 28th edn, Vallabh publication, New Delhi.
3. Skoog. and West. 2004. Principles of instrumental analysis, 5th edn. Thomson Brooks Cole, Singapore.

Course designers

1. Dr. A. Suganthi
2. Dr. A. Elangovan
3. Dr. D.S. Bhuvaneswari
4. Dr. K. Selvakumar

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: B.Sc. Chemistry (Core 13)	Int. Marks	: 25
Class	: III Year	Ext. Marks	: 75
Semester	: VI	Max. Marks	: 100
Sub. Code	: MC62	Hours/Week: 6 (5L:1T:0P)	
Title of the Paper	**: Organic Chemistry – IV**	Credit	**: 6**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- Understand the chemistry of heterocyclic compounds, dyes and natural products.
- Write the mechanism of photochemical reactions.
- Learn amino acids, peptides, proteins and enzymes.
- Apply green chemistry principles.

UNIT – I **(15L Hrs + 3T Hrs)**

HETROCYCLIC COMPOUNDS AND DYES

Introduction to heterocyclic compounds, Nomenclature – preparation and reactions of furan, thiophene, pyrrole, pyridine, quinoline, isoquinoline and indole.

Introduction to dyes – colour and constitution - Classification based on structure and application – preparation and applications of the following dyes – methylorange, congored, malachite green, flourescein, phenolphthalene and indigo.

UNIT –II

CHEMISTRY OF NATURAL PRODUCTS **(15L Hrs + 3T Hrs)**

Alkaloids

Introduction - general characteristics - classification – Hofmann Exhaustive methylation - structure and synthesis of the following alkaloids – piperine, nicotine, and atropine.

Terpenoids

Introduction and classification - isoprene rule – gem dialkyl rule - structure, synthesis and stereochemistry of the following terpenoids – citral, menthol and camphor.

UNIT – III

PHOTOCHEMISTRY **(15L Hrs + 3T Hrs)**

Difference between photochemical and thermal reaction – Jablonski diagram - introduction to photochemical reaction - photochemical reactions of carbonyl compounds: Norrish type I and II reactions, photo elimination - photo reductions - photo oxidations - Cis - trans isomerisation – rearrangements – Cyclisation (Diel's Alder reaction) – Woodward – Hofmann rules for cyclo additions.

UNIT – IV **(15L Hrs + 3T Hrs)**

AMINO ACIDS, PEPTIDES, PROTEINS AND ENZYMES:

Strecker synthesis using Gabriel's phthalimide synthesis. Zwitterion, Isoelectric point and Electrophoresis – Protection of –COOH group and –NH2 group – ninhydrin test.

Enzymes – specificity – Prosthetic group – co-enzyme, apoenzyme, holoenzyme, co-factor – nomenclature and classification of enzyme – application of enzymes.

UNIT – V **(15L Hrs + 3T Hrs)**

GREEN CHEMISTRY

Definition – Basic principles- Solid state and solvent free organic reactions (using supported reagents)- Microwave radiation- Characteristics of microwave heating- Difference between microwave heating and conventional heating.

Microwave assisted reactions in aqueous media, organic solvents, Supercritical CO_2 and ionic liquids.

Text Books:

1. Bhupinder Mehta, Manju Mehta, 2015, "Organic Chemistry", Prentice Hall of India Pvt Ltd,. New Delhi.
2. Bahl, A. and Bahl, B.S. 2009, A Text Book of Organic Chemistry, S. Chand & Company Limited, New Delhi.

Reference books

- I.L.Finar, 2005, Organic chemistry Vol 1, 6th edition, Pearson Edition Singapore.
- I.L. Finar, 2005, Organic Chemistry, Vol. II, V Edition, ELBS, UK.
- K.S.Tewari, N.K.Vishil and S.N.Mehotra. 2001, A text book of Organic Chemistry, 1st edition, Vikas Publishing House Pvt Ltd, New Delhi.
- R.T. Morrision and R.N. Boyd, 1997, Organic chemistry, 6th edition, Prentice Hall Private Limited, New Delhi.
- Hermann Dugus, 2004, Bioorganic Chemistry, Springer International, III Edition, New Delhi.
- K. R. Desai, 2005, Green Chemistry, Himalaya Publishing House, Mumbai.

Course designer

1. Dr. P. Tharmaraj
2. Dr. P. Prakash
3. Dr. R. Mahalakshmy
4. Dr. A. Tamil Selvi

THIAGARAJAR COLLEGE, MADURAI- 9
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DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: B.Sc Chemistry (Core 14)	Int. Marks	: 25
Class	: III year	Ext. Marks	: 75
Semester	: VI	Max. Mars	: 100
Sub. Code	: MC 63	Hours/Week: 6 (5L + 1T+0P)	
Title of the paper	: **Physical Chemistry – IV**	**Credit**	**: 6**

Course Outcomes:

On the successful completion of the course, students will be able to

- Understand the principle of electrochemistry
- Learn about various photochemical processes, surface chemistry and their kinetics
- Deal with the preparation, properties and applications of colloids.

UNIT – I

ELECTRO CHEMISTRY – I (15L+ 3T + 0P- hrs)

(i) Conductance: Electrical conductance in solution – Ohm's law and Faraday's law, specific, equivalent and molar conductance, variation of conductance with dilution – Oswald's dilution law, Kohlrausch's law and its application, conductometric titrations (Strong acid and strong base, weak acid and weak base)

(ii) Ionic equilibria: Ionic product of water, Ionization constant of weak acids and bases, pH, pOH and pKa, buffer solutions – Henderson-Haselbach equation, common ion effect (definition only).

UNIT – II

ELECTROCHEMISTRY – II (15L+3T +0P - hrs)

Electrochemical cells – Galvanic cells and Emf, electrode reaction and electrode potential – thermodynamics of cells -concentration cells, measurement of Emf (Poggendrof's method) and it's applications, Nernst's equation - standard electrode potential –representation of cells- Electrochemical ells, dry cell – Leglanche's cell, lead storage battery, potentiometric titration (FAS Vs $K_2Cr_2O_7$ only), fuel cells – hydrogen-oxygen fuel cell.

UNIT – III PHOTOCHEMISTRY (15L+3T +0P - hrs)

Introduction-definition-Absorption of photochemical reactions, Absorption of radiation – Laws of photochemistry – quantum efficiency, thermal and photochemical reactions, Jablonski diagram – fluorescence and phosphorescence – photosensitization – chemluminescence – bioluminescence - Hydrogen – bromine reaction, Hydrogen -chlorine reaction.

UNIT – IV COLLOIDS (15L+3T +0P hrs)

Definition-Differene between true solution, colloidal solution and suspension – classification of colloids, difference between lyophilic and lyophobic colloids, preparation and properties of colloids-electrical double layer- zeta potential – coagulation, Hardy Schulze law, Hofmeister series protective effects – protective colloids - gold number – gels, thixotrophy, synerisis and imbibition –applications of colloids (purification of drinking water, pollution control, sewage disposal, medicine and detergent)

UNIT – V SURFACE CHEMISTRY (15L+3T +0P - hrs)

Definition-Adsorption, adsorbent, adsorbate, occlusion - types of adsorption- -Differences between physisorption and chemisorption-Langmuir's and Freundlich adsorption isotherms, positive and negative adsorption, application of adsorption (gas masks, chromatography, preserving vacuum, cleaning of sugar, paint industry and catalysis).

Text Books

1.Puri B.R., Sharma L.R. and Pathania M.S., 2007, Principles of Physical chemistry, 30th edition, Vishal publication, Jalandhar-Delhi, India.

Reference Books

1.Bokris J. O. M. and Reddy A. K. N., 1998, Modern Electrochemistry, Vol I and Vol II, Plenum Press, New York, USA.

2.Van Samuel Glasstone D., 2002, Thermodynamics, 5th edition, Eastern Wiley Publication, London, UK.

3.Rahatgi Mukherjee, 1994, Fundamentals of Photochemistry, Willey Eastern Ltd., New York, USA.

Course designers

1. Dr. P. Sayee Kannan
2. Dr. A. R. Ramesh
3. Dr. T. Arumuganathan

THIAGARAJAR COLLEGE, MADURAI- 9
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DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: B.Sc. Chemistry (Core Lab-VI)	InternalMarks	: 40
Class	: III Year	Ext. Marks	: 60
Semester	: VI	Max. Marks	: 100
Sub. Code	: MCL-61	Hours/Week	: 5
		Credit	: 3

Title of the Paper : **Experiments in Physical Chemistry - Lab**

Course Outcomes :

On the successful completion of the course, students will be able to

1. Understand the concepts of Physical chemistry experiments.

2. Do the physical chemistry experiments.

EXPERIMENTS

1. Potentiometric Titrations (Redox titration).
2. Conductometric Titrations (Strong acid Vs Strong base).
3. Molecular weight determination by Rast Micro Method.
4. Simple Eutectic system (Phase diagram).
5. Compound formation (Phase diagram).
6. Ester hydrolysis using acid HCl or H_2SO_4
7. Critical Solution Temperature (CST) of Phenol-water system and effect of impurity on CST.

Course designers

1. Dr. P. Prakash
2. Dr. R. Mahalakshmy
3. Dr. T. Arumuganathan

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: B.Sc. (Core elective 3)	Int. Marks	:25
Class	: III BSc Chemistry	Ext. Marks	: 75
Semester	: VI	Max. Marks	: 100
Sub. Code	: MCME61(C)	Hours/Week	: 5
Title of the Paper	**: Coordination Chemistry (Option A)**	**Credit**	**: 5**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- Understand the basic concepts, theories, mechanism and application of Coordination chemistry.
- Gain knowledge on metal carbonyls.

UNIT – I: Introduction to coordination Chemistry (15 hrs)

Introduction to the transition elements – electronic configuration – variable valency – double salts and coordination compounds – coordination number and geometries, nomenclature – physical methods in the study of complexes – Werner's theory – stability of complexes – determination of stability constants – jobs method – stepwise stability constant – overall stability constant – factors affecting stability of coordination compounds – charge of central metal ion – size of central metal ion – chelate ring size – steric effects. Isomerism in coordination compounds.

UNIT – II: Theories of Coordination Chemistry (15 hrs)

Theories – Valence bond theory - application to octahedral and square planar complexes – crystal field theory – magnetic properties of metal complexes – factors influencing the magnitude of crystal field splitting – colour of transition metal complexes Jahn Teller distortion – Electronic spectra – Orgel diagram – d1 and d9 systems – MO theory applied to sigma bonding only.

UNIT – III: Reaction mechanism of coordination complexes (15 hrs)

Reactions of metal complexes. Labile and Inert complexes VBT, Taube's explanation of lability and inertness – ligand substitution reactions applied to Octahedral complexes SN1, SN2 reactions. Electron transfer reactions, inner sphere and outer sphere mechanism.

UNIT – IV: Metal Carbonyls (15 hrs)

Complexes of Pi acceptor ligands – metal carbonyls and **its types**– EAN rule – classification preparation – properties – uses of metal carbonyls – bonding in metal carbonyls – IR spectra of metal complexes in cis – trans isomerism – determination of bond order of CO – differentiating terminal and bridging CO – structures of some common binary metal carbonyls – Preparation, properties, structure and bonding of mononuclear carbonyls of nickel, iron and chromium, binuclear carbonyls of iron, cobalt and manganese and trinuclear carbonyls of iron and osmium. Tetra nuclear carbonyls of iridium-Vibrational spectroscopy in the study of **carbonyls.**

UNIT – V: Application of coordination compounds (15 hrs)

Application of coordination compounds- metal complexes in analytical chemistry – Inorganic qualitative analysis – complexometric titrations – complexes in colourimetry, gravimetry - metal complexes in therapy – metal complexes in industries –Metal Complexes in Biological system.

Text books:

1. W. U. Malik, G.D. Tuli, R.D. Madan,2003.Selected topics in Inorganic Chemistry, 7th edition, S. Chand & Company Ltd, New Delhi.
2. R. Gopalan, V. Ramalingam,2001.Concise coordination chemistry –Vikas publishing House, PVT LTD, New Delhi.

Reference books:

1. J.E. Huheey, Ellen A.Keiter, Richard L.Keiter,2004. Inorganic Chemistry, IV Edn., Pearson Education (Singapore) Pvt. Ltd., New Delhi..
2. J.D. Lee, 2002.Concise Inorganic Chemistry, Blackwell Science Ltd., V Edn., London.

Course Designer:

1. Dr. A. Suganthi
2. Dr. P. Tharmaraj

THIAGARAJAR COLLEGE, MADURAI- 9
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DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: B.Sc.(Core elective 4)	Int. Marks	:25
Class	: III BSc Chemistry	Ext. Marks	: 75
Semester	: VI	Max. Marks	: 100
Sub. Code	: MCME61(B)	Hours/Week	: 5
Title of the Paper	: **Bioinorganic Chemistry (Option B)**	Credit	**: 5**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- Understand the role of metal ions in biological system
- Understand the theory of enzyme catalysis
- Gain knowledge on metals in medicine

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UNIT I: ROLE OF METALS IN BIOLOGY (15 hrs)

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: BIOCHEMISTRY FUNDAMENTALS (15 hrs)

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

Unit III: IRON-CONTAINING OXYGEN CARRIERS (15 hrs)

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 ENZYMES AND NITROGENASE (15 hrs)

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: METALS IN MEDICINE (15 hrs)

Inorganic Medicinal Chemistry - Metal Toxicity and Homeostasis – Anti-cancer agents: Cis-platin and related compounds - Chelation therapy – Cancer treatment – Anti-arthritis drugs – Gadolinium MRI Imaging Agents.

Text Books

1. K. Hussain Reddy,2003 Bioinorganic Chemistry New Age Internation (P) limited, New Delhi.
2. W. U. Malik, G.D. Tuli, R.D. Madan 2003. Selected topics in Inorganic Chemistry, 7th edition, S. Chand & Company Ltd, New Delhi.

Reference books

1. Rosette M. Roat-Malone, 2002, Bioinorganic Chemistry: A short course, Wiley—Interscience, John Wiley & Sons, Inc.
2. G.L. Miessler & Donald A. Tarr 2002: Inorganic Chemistry, Pearson Publication.
3. James E. Huheey, Ellen Keiter & Richard Keiter: Inorganic Chemistry: Principles of Structure and Reactivity, Pearson Publication.
4. Lippard S.T., and Berg T.M., Principles of Bio-inorganic Chemistry, Panima Publishing Company, New York,1997.
5. J. E. Huheey, Inorganic Chemistry, 3rd ed., Harper & Row Publishers, Singapore.

Course Designers

1. Dr. R. Mahalakshmy
2. Dr. A. Tamil Selvi

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: B.Sc Chemistry (SEC)	Int. Marks	: 15
Class	: III year	Ext. Marks	: 35
Semester	: VI	Max. Marks	: 50
Sub. Code	: MCSEC61	Hours/Week	: 2
Title of the Paper	: **Water analysis –Lab (Option A)**	**Credit**	**: 2**

Course Outcomes:

On the successful completion of the course, students will be able to

- Estimate hardness producing ions present in water.
- Determine BOD and COD.

Experiments

1. Estimation of temporary and permanent hardness.
2. Estimation of calcium and magnesium hardness.
3. Estimation of chloride by Mohr's method.
4. Estimation of sulphate.
5. Spectro photometric estimation of fluoride.
6. Estimation of dissolved oxygen (DO).
7. Estimation of TDS.
8. Determination of Biological Oxygen Demand (BOD).
9. Determination of Chemical Oxygen Demand (COD).
10. Flame photometric estimation of sodium.

Course designer

Dr. P. Prakash

THIAGARAJAR COLLEGE, MADURAI- 9

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DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	:B.Sc Chemistry (SEC)	Int. Marks	: 15
Class	: III year	Ext. Marks	: 35
Semester	: VI	Max. Marks	: 50
Sub. Code	: MCSEC61	Hours/Week	: 2
Title of the Paper	: **Food Chemistry (Option B)**	**Credit**	**: 2**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- Gain basic knowledge in Food and milk chemistry.
- Get practical knowledge in food analysis.

UNIT I: Introduction **(10 hours)**

Food: source, functions of food – food groups – food guide – basic five food groups, usage of the food guide – food in relation to health – objectives of cooking.

Milk: Composition and effectiveness as a diet. Fat content in milk, whole and skimmed. Effect of cooking and heat processing of milk – pasteurization. Preservation of milk. Deep freeze preservation, dairy products – cheese, butter, ghee and kova. Spray drying technique – milk powder, infant food preparation. Lactose intolerance Milk substitutes – vegetable milk. Toned milk.

UNIT 2: Nutrition and Balanced Diet **(10 hours)**

Nutrition – calorific value of food stuff – RQ of food (Respiratory quotient of food) – basal metabolic rate – factors influencing BMR, specific dynamic action (SDA) of food. Thermogenic effect – energy requirements of individuals – diet and its components – the protein requirements – biological value of proteins, supplementary value of proteins. Diseases associated with protein malnutrition. Nutritional value of carbohydrates. – Fibers in the diet, dietary sugars – nutritional aspects of lipids.

Text books:

1.S.A. Iqbal, Y.Mido, Food Chemistry, Discovery Publishing House, Delhi, 2005.

Reference Book

1. M. Swaminathan, Food and Nutrition, Bappio publication, 1989.

Course Designer:

Dr. A. Suganthi

THIAGARAJAR COLLEGE, MADURAI- 9
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DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: B.Sc. Chemistry (SEC)	Int. Marks	: 15
Class	: III year	Ext. Marks	: 35
Semester	: VI	Max. Marks	: 50
Sub. Code	: MCSEC61	Hours/Week	: 2
Title of the Paper	: **Polymer Chemistry (option-C)**	**Credit**	**: 2**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- Understand the chemistry of polymers.
- Write the preparation, properties and uses of commercial polymers.

UNIT-I

INTRODUCTION TO POLYMERS (15 hrs)

Introduction - polymers- monomers and polymers-degree of polymerization- definition- Classification of polymers- Homo, Hetero and copolymers- Block – Graft polymers- functionality – tacticity- Addition, co-polymerisation and Condensation polymers - Thermosetting & Thermoplastics.

UNIT-II

CHEMISTRY OF COMMERCIAL POLYMERS (15 hrs)

General methods of preparation, properties and uses of the following polymers: Polyethylene (LDPE & HDPE), PVC, Polystyrene, PAN, Teflon, Polyurethanes, phenol-folmaldehydes- composites- ABS.

Text Book:

1. V.R.Gowariker, N.V. Viswanathan and J.Sreedhar, 2000, Polymer Science, Wiley Eastern Ltd., New Delhi.

Reference Book:

1. B.K.Sharma, 2002, Polymer Chemistry, Goel publishing House, Meerut.

Course Designer

Dr. R. Sayeekannan

GENERIC ELECTIVES

THIAGARAJAR COLLEGE, MADURAI- 9

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DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course : B.Sc. MB, Physics, Botany, Mathematics (Generic elective)		Int. Marks:25
Class	: I & II year	Ext. Marks :75
Semester	: I & III	Max. Marks : 100
Sub. Code	: AC11/AP31	Hours/Week : 4
Title of the Paper	: **General Chemistry - I**	**Credits :4**

Course Outcomes:

On the successful completion of the course, students will be able to

- to study the structure of atom, importance of hydrogen and its isotopes and purification of water.
- get an idea about the chemistry in industry and agriculture.

Unit-I: STRUCTURE OF ATOM **12 Hrs**

Rutherford model of the atom- defects of Rutherford model - Discovery of neutron, Bohr model of an atom (postulates only)- merits and demerits- de Broglie's concept of durality - quantum numbers- shapes of s, p, d atomic orbitals. Arrangement of electrons in atoms- Hund's rule – Pauli exclusion principle- Heisenberg's uncertainty principle.

Unit- II: WATER **12 Hrs**

Introduction – Definition- Units of Hardness- Scales and Sludge – Sterilization and flocculation. Hardness of water – Treatment of water: Ion –exchange method and reverse Osmosis – Estimation of hardness by EDTA method – Mineral Water – packed drinking water- ISI specification of drinking water.

Unit-III: CARBOHYDRATE **12 Hrs**

Classification- preparation and properties and uses of sucrose- muta rotation- conversion of aldopentose to aldohexone and vice versa. Conversion of glucose to fructose vice versa.

Unit-IV: INDUSTRIAL FUELS **12 Hrs**

Fuels- definition- Classification of Fuels- Calorific value- Characteristic of a good fuel- Comparison between solid-liquid and gaseous fuels- knocking- Gaseous fuels- preparation and uses of water gas-producer gas- compressed natural gas (CNG)- Liquefied petroleum gas (LPG)- biogas- biomass.

Unit-V: CHEMISTRY AND AGRICULTURE **12 Hrs**

Fertilizers: Preparation and uses of urea, super phosphate, triple super phosphate and potassium nitrate. Pesticides: Classification of pesticides with examples-Insecticides: stomach poisons, contact insecticides and uses of insecticides- DDT, BHC (gammexane: conformation of gamma isomer)- Herbicides- 2,4-D and 2,4,5-T- Fungicides definition and uses.

Text Books

1. Gopalan, R. Sundaram, S. 1993, Allied chemistry- Sulthan Chand & Son LTD.

2. Soni, P.L. and Chand S. 1998, Text book of Organic Chemistry, & Company, New Delhi.

Reference Books

1. Puri, B.R. Sharma, L.R. and Kalia, K.C. 2004, Principles of Inorganic Chemistry, 28th edn, Vallabh Publication, New Delhi.

2. Puri, B.R. Sharma, L. and Kalia-Shoban K.C., 1998, Principles of Inorganic Chemistry, Lal Nagin Chand & co.

Course designers

1. Dr. A. R. Ramesh

2. Dr. D.S.Bhuvaneshwari

3. Dr. K.S. Selvakumar

THIAGARAJAR COLLEGE, MADURAI- 9
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DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course : B.Sc. MB, Physics, Botany, Mathematics (Generic elective)		Int. Marks	:25
Class	: I & II year	Ext. Marks	:75
Semester	: II & IV	Max. Marks	: 100
Sub. Code	: AC21/ AP41	Hours/Week	: 4
Title of the Paper	: **General Chemistry - II**	**Credits**	**:4**

Course Outcomes:
On the successful completion of the course, students will be able

- To understand the basic concept of conductance in solution, type of catalysts and application of nuclear chemistry.
- To get an idea about aminoacids and uses of vitamin and nano and green chemistry reactions.

Unit- I: ELECTROCHEMISTRY 12 Hrs

Arrehenius theory of electrolysis- strong electrolytes- weak electrolytes- Oswald's dilution law and its significance. *Conductance*: Specific, equivalent and molar conductance- measurements, Kohlraush's Law and applications- conductometric titrations. *pH*: Definition simple calculation of pH from molarity of acids - common ion effects and its applications - Buffer solution – definition- theory of buffer action and applications.

Unit- II: CATALYSIS 12Hrs

Definition- different types of catalysts – homogenous and heterogeneous catalysis- acid-base catalysis- enzyme catalysis-mechanism. Mechanism of heterogeneous catalytic reactions - auto catalysis- catalytic poisoning- promoters.

Unit- III: NUCLEAR CHEMISTRY 12Hrs

Introduction – Comparison of properties of alpha, beta and gamma rays- mass defect- binding energy- Nuclear fission – Nuclear Fusion – nuclear reactor- Nuclear reactor in India- advantage and disadvantage of nuclear reactor-hydrogen bomb- nuclear waste and its disposal- Uses of radioactive isotopes as tracers.

Unit- IV: AMINOACIDS & VITAMINES 12 Hrs

Amino acids: Definition- general methods of preparation, properties and uses- Glycine, and alanine. *Proteins*: Definitions- Classification and general properties – colour reactions and the relation of amino acids to proteins. Effect of toxic chemicals on enzymes. Lead, mercury and cyanide pollution and their biochemical effects. *Vitamins*: Definition- classification, sources and role of vitamins or deficiency symptoms - A, B complex, C, D and K (structure and synthesis not expected).

Unit- V: NANO AND GREEN CHEMISTRY **12 Hrs**

Definition of nanoscience-preparation methods- top down approach – bottom up approach-sol-gel synthesis- application- Green chemistry-basic postulates of green chemistry- Green solvents- microwave reaction principle- advantage of microwave synthesis.

Text Books:

1. Gopalan, R. Sundaram, S. 1993, Allied chemistry- Sulthan Chand & Son., LTD.

2. Soni, P.L. and Chand S. 1998, Text book of Organic Chemistry, & Company, New Delhi.

Reference Books

1. Puri, B.R. Sharma, L.R. and Kalia, K.C. 2004, Principles of Inorganic Chemistry, 28th edn, Vallabh Publication, New Delhi.

2. Puri, B.R. Sharma, L. and Kalia-Shoban K.C., 1998, Principles of Inorganic Chemistry, Lal Nagin

Chand & co.

3. Bahl B. S. and Arun Bhal, Text book of Organic Chemistry 2005 S. Chand Limited,

4. Jain and Jain 1976, Engineering Chemistry, 5th edn, Dhanpat Rai Publishing Company (P)

Ltd.,

Course designers

1. Dr. A. R. Ramesh

2. Dr. D.S.Bhuvaneshwari

3. Dr. K.S. Selvakumar

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course : B.Sc. MB, Physics, Botany, Mathematics (Generic elective) Int. Marks:40

Class	: I & II year	Ext. Marks :60
Semester	: I & III	Max. Marks : 100
Sub. Code	: ACL21/APL41	Hours/Week: 2
Title of the Paper	: Ancillary Chemistry Lab	**Credits :2**

Inorganic Chemistry Lab

Course Outcomes:

On the successful completion of the course, students will be able to

1. Understand the concept of volumetric titration.

2. Do titrations of acidimetry- alkalimetry, permanganometry, dichrometry and iodometry.

I ACIDIMETRY - ALKALIMETRY

1 Na_2CO_3 (Std)-HCl - Na_2CO_3

2 Na_2CO_3 (Std)-HCl - NaOH

3 HCL- Na_2CO_3 (Std)-HCl

4 NaOH-Oxalic acid - (Std)-NaOH

II PERMANGANIMETRY

1 Fe^{2+}- $KMnO_4$-FAS

2 $KMnO_4$- Fe^{2+}- $KMnO_4$

3 Oxalic acid - $KMnO_4$-Oxalic acid

4 $KMnO_4$-Oxalic acid - $KMnO_4$

III DICHROMETRY

1 Fe^{2+}-$K_2Cr_2O_7$-FAS

2 $K_2Cr_2O_7$ - Fe^{2+}- $K_2Cr_2O_7$

IV IODOMETRY

1 $K_2Cr_2O_7$-Thio- $K_2Cr_2O_7$

2 $KMnO_4$-Thio- $K_2Cr_2O_7$

3 $CuSO_4$-Thio- $K_2Cr_2O_7$

4 $CuSO_4$-Thio- $KMnO_4$

Course Designers

1. Dr. A.R. Ramesh
2. Dr. K.Selvakumar

M.Sc.,Chemistry(Aided)

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

MASTER OF CHEMISTRY

Semester – I

Course	Code No	Subject	Hrs/ Week	Cred.	Total Hrs	Max Mark CA	Max Marks SE	Total
Core 1	1PC1	Organic chemistry- I	5	5	75	25	75	100
Core 2	1PC2	Inorganic Chemistry-I	5	5	75	25	75	100
Core 3	1PC3	Physical Chemistry –I	5	5	75	25	75	100
Core 1-Lab	2PCL1	Organic Chemistry-Lab I	5	*	75	-	-	-
Core 2 – Lab	2PCL2	Inorganic Chemistry-Lab I	5	*	75	-	-	-
Core 3 - Lab	2PCL3	Physical Chemistry-Lab I	5	*	75	-	-	-
Total			**30**	**15**	**450**	**75**	**225**	**300**

Semester – II

Course	Code No	Subject	Hrs/ Week	Cred.	Total Hrs	Max Mark CA	Max Marks SE	Total
Core 4	2PC1	Organic chemistry-II	4	4	60	25	75	100
Core 5	2PC2	Inorganic Chemistry-II	4	4	60	25	75	100
Core 6	2PC3	Physical Chemistry-II	4	4	60	25	75	100
Core elective-1	2PCE1	C-Programming Fundamentals & Applications in Chemistry (OptionA) Medicinal Chemistry (Option B)	5	5	75	25	75	100
Core 1-Lab	2PCL1	Organic Chemistry-Lab	5	5	75	40	60	100
Core 2 Lab	2PCL2	Inorganic Chemistry-Lab I	4	4	60	40	60	100
Core 3 – Lab	2PCL3	Physical Chemistry –Lab I	4	4	60	40	60	100
Total			**30**	**30**	**450**	**220**	**480**	**700**

Semester – III

Course	Code No	Subject	Hrs/ Week	Cred.	Total Hrs	Max Mark CA	Max Marks SE	Total
Core 7	3PC1	Organic chemistry-III	5	5	75	25	75	100
Core 8	3PC2	Inorganic Chemistry-III	5	5	75	25	75	100
Core 9	3PC3	Physical Chemistry – III	5	5	75	25	75	100
Core elective-1	3PCE1	Computer Applications in Chemistry (Option A) Advanced Organic synthesis **(Option B)**	5	5	75	25	75	100
Core 7-Lab	4PCL1	Organic Chemistry-Lab 2	5*	-	75	-	-	-
Core 8 – Lab	4PCL2	Inorganic Chemistry-Lab 2	5*	-	75	-	-	-
Total			**30**	**20**	**450**	**220**	**480**	**400**

Semester – IV

Course	Code No	Subject	Hrs/ Week	Cred.	Total Hrs	Max Mark CA	Max Marks SE	Total
Core 10	4PC1	Organic chemistry-IV	5	4	75	25	75	100
Core 11	4PC2	Inorganic Chemistry-IV	5	4	75	25	75	100
Core 12	4PC3	Physical Chemistry –IV	4	4	60	25	75	100
Core 10-Lab	4PCL1	Organic Chemistry-Lab 2	5	5	75	40	60	100
Core 11 – Lab	4PCL2	Inorganic Chemistry-Lab 2	5	5	75	40	60	100
PJ	PJ	Project	6	3	90	40	60	100
Total			**30**	**25**	**450**	**225**	**405**	**600**

- **For core practical credits will be given at the end of II semester (Year wise practical)**

A) CONSOLIDATION OF CONTACT HOURS AND CREDITS: PG

Semester	Contact hours	Credits
I	30	15
II	30	30
III	30	20
IV	30	25
Total	**120**	**90**

B) Curriculum Credits

Core 12 papers	(15+12+15+12) =	54 Credits
Core Lab 11	(13+10) =	23 Credits
Core electives	5+5 =	10 Credits
Project	=	03 Credits
Total	**=**	**90 Credits**

THIAGARAJAR COLLEGE, MADURAI- 9
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DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: M.Sc. Chemistry (Core 1)	Int. Marks	: 25
Class	: I Year	Ext. Marks	: 75
Semester	: I	Max. Marks	: 100
Sub. Code	: 1PC1	Hours/Week	: 5
Title of the Paper	**: Organic Chemistry – I**	**Credits**	**:5**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- 1.Understand the concept of aromaticity.
- 2.Gain the knowledge about structure and stability of reaction intermediates.
- 3.Understand the reaction mechanism, isomerism and stereochemistry of organic molecules.

UNIT-I Delocalized chemical bonding, Aromaticity and Reaction intermediate (15 hrs)

Electron displacement – Steric effect – Tautomerism

Concept of aromaticity – Benzenoid and non-benzenoid compounds – Huckel's rule - Non aromatic and anti aromaticity - Alternant and non alternant hydrocarbons - aromaticity of cyclopentadienyl anion and Tropylium cation – Azulenes and annulenes.

Generation , structure, stability, reactivity and reactions of carbocations, carbanions, free radicals (reactions include Pinacol coupling, McMurray reactions, acyloin reaction, selective radical bromination). Carbenes: Stability - Structure – Generation – Types – Reactions. Nitrenes: Generation and reactions.

UNIT - II Reaction mechanism-I (Basics) (15 hrs)

Guidelines for proposing reasonable mechanism – Energetics and energy profile diagrams – transition state – Intermediate – Hammond's postulate – principle of microscopic reversibility - kinetic and thermodynamic controls – kinetic and non-kinetic methods of determining organic reaction mechanism – primary and secondary kinetic isotope effects – Effect of structure on reactivity: Resonance and field effects – Quantitative treatments – Hammett and Taft equation.

UNIT - III Reaction mechanism-II (Substitution Reactions) **(18 Hrs)**

Aliphatic Nucleophilic Substitution Reactions - Mechanism – S_N1 and S_N2, mixed S_N1& S_N2, S_Ni, SET, Neighboring group participation by σ and π bonds – Reactivity at an allylic, aliphatic trigonal and vinylic carbon – Effect of substrate structure, attacking nucleophile, leaving group and reaction medium on reactivity – Ambident nuleophiles.

Aromatic Nucleophilic Substitution Reactions – Unimolecular, Bimolecular and Benzyne mechanism – Effect of substrate, leaving group and attacking nucleophile.

Electrophilic substitution reactions:

Aliphatic: Bimolecular mechanism SE2 and SE1 – Aromatic: Arenium ion mechanism – Orientation and reactivity: Ortho and Para ratio, partial rate factor

UNIT-IV Reaction Mechanism III (Elimination reactions) **(12 hrs)**
E_1, E_2 and E_1CB mechanism- Competition between substitution and elimination – orientation of double bonds (Bredt's rule and Hofmann and saytzeff rules) – Effect of substrate structure, attacking nucleophile, leaving group and nature of reaction medium on reactivity – Mechanism and orientation in pyrolytic eliminations - Cope and Chugaev reaction (cis-elimination)

UNIT-V Reaction Mechanism IV (Addition to carbon-Carbon multiplebonds) **(15 hrs)**
Electrophilic, Nucleophilic & free radical addition – Mechanism, Orientation and reactivity and reactions - addition to conjugated systems- addition to α,β-unsaturated carbonyl and nitrile systems- Michael addition – addition of Grignard reagents-Diels Alder reaction- Enamine reaction - Mechanism of Reformatsky reaction- Darzen reaction- Mannich reaction - Wittig reaction - Stobbe and Dieckman condensation.

Text books:

1. Jerry March, 1992. Advanced Organic Chemistry, Reaction mechanism and structure, John Wiley and sons, 4th Edition, New york.
2. R.O.C. Norman, 2001. Principles of organic synthesis, 3rd Edition Nelson Thorines, Hong Kong.
3. P.J. Garrat, 1991. Aromaticity, Mc Graw Hill, India
4. F.A. Carey and R.J. Sundberg, 1990. Advanced Organic Chemistry, Part A and B, Plenum Press, 3rd Edition.
5. G.M. Badger, 2001 Aromatic character and Aromaticity, Cambridge, USA.

Reference Books:

1. Clayden, Greeves, Warren and Wothers, 2007.Organic Chemistry, Oxford Uni Press, UK.
2. E.S. Gould, 1960. Mechanism and structure in Organic Chemistry, Holtoo INC.
3. G. Solomon, 1992. Organic Chemistry, John Wiley and sons INC, 5th Edition,.
4. R.K. Mackie and D.M. Smith, 1993 Guide Book to Organic synthesis, Longman, UK.
5. Peter sykes, 2003. A Guidebook to Mechanism in Organic Chemistry, Longman, 6th Edition.

Course designer

1 Dr. P. Tharmaraj
2 Dr. P. Prakash
3 Dr. R. Mahalakshmy
4 Dr. A. Tamil Selvi

THIAGARAJAR COLLEGE, MADURAI- 9
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DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: M.Sc Chemistry (Core 2)	Int. Marks	: 25
Class	: I Year	Ext. Marks	:75
Semester	: I	Max. Marks	: 100
Sub. Code	: 1PC2	Hours/Week	: 5
Title of the Paper	**: Inorganic Chemistry- I**	**Credits**	**:5**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- Understand the concepts of bonding and electronic structure of atom.
- Write the concept of acid base systems and non aqueous solvents.
- Understand nuclear Chemistry.

UNIT – I: ELECTRONIC STRUCTURE OF ATOM 15 Hrs

Modern views on atomic structure: Wave mechanical description of electron and orbitals, radial density functions and orbital energies, angular functions and orbital shapes- term symbol.

Modern periodic table: Periodic properties-Ionisation potential, Ionic radii and covalent radii, Electron affinity, Electronegativity and their trend in the periodic table- Comparison of transition metals of 3d, 4d and 5d series.

UNIT – II: NATURE OF THE CHEMICAL BOND 15Hrs

Ionic bond – Lattice energy and its determination by Born-Haber cycle and Born-Lande Equation – Hardness, electrical conductivity and solubility of ionic compounds – ionic radii. Goldschmidths radius ratio- packing of atoms and ions in solids. Calculation of ionic radius –Pauling's method and Linde's method. Effective nuclear charge-Slater's rule.

Covalent bond – qualitative treatment of valence bond theory – Heitler-London theory – Pauling theory and Molecular orbital theory LCAO theory – Hybridisation and resonance.

UNIT – III: BONDING APPLICATION 15 Hrs

Application of VB and MO theories to the structure of homonuclear (H_2, B_2, C_2, N_2 and O_2) and heteronuclear (CO, NO, HCl, HF) diatomic and selective polyatomic molecules (CO_3^{2-}, NO_2, BeH_2, CO_2) comparison of VB and MO theories. Bond properties, bond order, bond energy, bond length and bond polarity. Partial ionic character of covalent bonds-Fajan's Rule –Effects of polarization. VSEPR theory and its applications to H_2O, NH_3, ICl_2^-, IF_5 IF_7, ClO_4^- ions. VSEPR applied to Xenon compounds like Xenon halides and xenon oxides.

UNIT – IV: ACID-BASE SYSTEMS AND NON-AQUEOUS SOLVENTS. 15Hrs

A generalized acid base concepts – steric effects and solvation effects – Measures of Acid-Base strength –Factors affecting the strength of acids and bases- Common ion effect and Henderson's equation- - Hard and Soft acids and bases – symbiosis – theoretical basis of hardness and softness. Classification of solvents – properties of ionizing solvents. Typical reactions in non–aqueous solvents- liquid HF, liquid SO_2, liquid NH_3, and Sulphuric acid.

UNIT – V: NUCLEAR CHEMISTRY 15Hrs

Radioactive decay and equilibrium- Different types of nuclear reaction – spallation – fission and fusion. Theories of fission. Fissile and Fertile isotopes.-Nuclear fusion – stellar energy-Nuclear forces: Liquid drop model, shell model-Calculation of Q-values – Cross section. Detectors: Scintillation counter, Gas Ionisation chamber. Proportional Counter, Cerenkov Counter-Accelerators: Cyclotron, Synchrocyclotron, Betatron. Radio isotopes and their Applications: Activation analysis, Isotopic dilution technique-radiometric titration.

Nuclear reactors: Types (Thermo nuclear and breeder reactors) feed materials production. Reprocessing of nuclear materials waste disposal. Atomic power projects in India. Hazardous of radioactive materials and Safety measures.

TEXT BOOKS:

1. Clyde Day, M. Jr & Joel Selbin, Theoretical Inorganic Chemistry, Chapman & Hall Ltd., London, 5th Reprint, 1967.
2. Chandra, A. K. Introductory Quantum Chemistry, Tata McGraw Hill, New Delhi, 3rd Edn., 1988.
3. Lee, J. D. Concise Inorganic Chemistry, Blackwell Science Ltd., V Edn., London. 2002.
4. Durrant P. J. and Durrant, B. Introduction to advanced inorganic chemistry, Longman Group Ltd, London,1970.
5. Glasstone, S. Source Book of Atomic Energy, Van Nostrand, III Edn, East West Press (P) Ltd., New Delhi.1967
6. Friedlander, G. Kennedy J.S and Millodr, M. M. Nuclear and radiochemistry, John Wiley & Sons, New York.1984.

REFERENCE BOOKS:

1. Huheey, J. E. Ellen A. Keiter, Richard L. Keiter, Inorganic Chemistry, IV Edn., Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2004.
2. Madan, R. D. Modern Inorganic Chemistry, S. Chand & Company Ltd., New Delhi, 2004.
3. Wahid U. Malik, G. D. Tuli and R. D. Madan, Selected Topics in Inorganic Chemistry, S. Chand & Co. Ltd., New Delhi, 2006.
4. Gary L. Miessler and Donald A. Tarr, Inorganic Chemistry, Pearson Education, Inc., 3rd Edn., New Delhi, 2004.
5. William W. Porterfield, Inorganic Chemistry, II Edn., Elsevier, New Delhi, 2005.
6. Sharpe, A.G. Inorganic Chemistry, III Edn., Addition – Wesley Longman, UK, 2004.
7. Shriver D. F. and Atkins, P.W. Inorganic Chemistry, Oxford University Press, London, 1999.
8. Arnikar, H. J. Essentials of Nuclear Chemistry, IV Edn., New Age international (P) Ltd., New Delhi. 2005.

Course designer

1 Dr.A.Suganthi
2 Dr.A. Elangovan
3 Dr.D.S. Bhuvaneshwari
4 Dr.K.Selvakumar

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: M.Sc Chemistry (Core 3)	Int. Marks	: 25
Class	: I Year	Ext. Marks	:75
Semester	: I	Max. Marks	: 100
Sub. Code	: 1PC3	Hours/Week	: 5
Title of the Paper	**: Physical Chemistry- I**	**Credits**	**:5**

Course Outcome:

On successful completion of the course students will be able to

1. Understand the properties of gases, liquid crystals, theory of thermodynamic equilibrium and non-equilibrium.
2. Aware of concepts of quantum chemistry and their applications.
3. Develop their knowledge in physical features of biochemistry.

UNIT-I

PROPERTIES OF GASES AND LIQUID CRYSTAL (15 HRS)

Equations of states - molecular speeds- Maxwell distribution of molecular velocities - one, two and three dimensions; Energy distribution-Maxwell – Boltzmann distribution law- Rotation, vibrations and translational degree of freedom- principle of equipartition of energy and heat capacity; Molecular collisions- collision diameter, cross-section, number, frequency, mean free path (definition only); Transport phenomena in gases - Viscosity of gases – viscosity in terms of momentum transfer, thermal conductivity, and diffusion.

Liquid crystals- Nematic (p-methoxycinnamic acid), cholesteric (cholestryl benzoate), smectic (ethyl-p-azoxybenzoate)- theory and its application in liquid crystals display.

UNIT-II

THERMODYNAMICS – EQUILIBRIUM AND NON-EQUILIBRIUM (15 HRS)

A general review of enthalpy, entropy and free energy concepts: Nernst heat theorem- Genesis of third law and its limitations - derivation of third law and their application to real gases- calculation of $(\delta H/dP)T$, $(\delta E/dV)T$ and $\mu j.T$ for gases-

Thermodynamics of open systems - partial molar properties- internal energy, molar enthalpy, molar entropy, molar volume, free energy (chemical potential) – determination of partial molar properties; Chemical potential- relationship between partial molal quantities - Gibbs - Duhem equation- Duhem Margules equation; thermodynamic properties of real gases- Fugacity concept- Determination of Fugacity of real gases.

Electrolytes and Non-Electrolytes- Equilibrium thermodynamics- Gibbs phase rule and its application to three component systems- quantitative treatment of Le Chatlier principle- equilibria respond to pressure and temperature; Non Equlibrim Thermodynamics -Basic concepts - Principle of microscopic reversibility and the Onsager reciprocal relations.

UNIT –III

QUANTUM CHEMISTRY-I (15 HRS)

Black Body radiation- Heisenberg's uncertainity principle- de Broglie wave particle duality- Experimental verification of matter waves- Compton effect- The Schrodinger equation and the postulates of quantum mechanics- operators –linear and non-linear operators- commutative and non-commutative operators- Hermitian operators- Eigen function, Eigen values and degeneracy- Orthogonality and Normalization of wave functions- Derivation of Schrodinger's wave equation.

UNIT- IV

QUANTUM CHEMISTRY-II (15 HRS)

Application of quantum mechanics to simple system-Application of SWE to free particle moving in one dimension- particle moving in a one dimension box - particle moving in 3D cubical and rectangular box- Quantum Mechanical tunneling - particle in a ring- rigid rotor- Simple Harmonic oscillator - hydrogen atom- angular momentum spin momentum- ladder operator.

UNIT-V

PHYSICO-CHEMICAL PRINCIPLES AND BIOLOGICAL REACTIONS (15 HRS)

(i) Studies on biochemical equilibria: Buffer system of intracellular fluids – H_2CO_3 / HCO_3^- HPO_4^{2-} / $H_2PO_4^-$ - Application of Henderson-Hasselbach equation; Ion channels – membrane and static potentials - Role of Na+ / K+ ions in neural communications –Na^+ / K^+ ion pump; allosterism and oxygen saturation curves for hameoglobin and myoglobin – derivation of Hill equation

(ii) Medicinal Chemistry – QSAR; Partition parameters – Partition Coefficients (P) – hydrophobicity or lipophilicity constant (π); Electronic Parameters – Hammett constant (σ); Steric parameters – Taft Steric paramerter (Es); Hansch equation; Craig Plot – Topliss Scheme; ΔG criteria for biological reactions – ATP and ADP conversion.

Text Books:

1. Glasstone S. A., 1999, text book of Physical Chemistry, McMillan India Ltd.,
2. Alberty R. A. and Daniels F., 1978, Physical Chemistry, John Wiley & Sons, New York.
3. Castellan G. W., 1986, Physical chemistry, 3rd edition, Wesley Publishing Company, UK.
4. Glasstone S., 2002, Thermodynamics for Chemists, Eastern Wiley publications.
5. Atkins P, 2002, Physical Chemistry, VII Edition, Oxford University Press, UK.
6. Atkins P. W., 1986, Molecular Quantum Mechanics, II Edition, Oxford University Press, UK.
7. Hanna H. W., 1983, Quantum Mechanics in Chemistry, Benjamin- Cummiza London Publishing company, UK.
8. Chandra A.K., 1988, Introductory quantum chemistry, 3rd edition, Tata McGrow- Hill
9. Publishing Co Ltd., New Delhi, India.
10. Gareth Morris J. 1974, Biologists physical chemistry, Edward Arnold, UK.
11. Barrow G. M., 1994, physical chemistry for the life sciences, McGraw Hill Kogakusha Ltd., New York.

12. Prasad R.K., 2004, Quantum Chemistry, 4th revised edition.
(ISBN:8122424082/9788122424089)

Reference Books:

1. Glasstone S., 1999, A text book of Physical Chemistry, McMillan India Ltd., Alasca.
2. Walter J. Moore, 2006, Physical Chemistry, 6th edition, Orient Longman, New York.
3. Klotz, M., Rosenberg, R. M., 1996, Chemical thermodynamics, 4th edition, Benjamin, New York.
4. Glasstone, S., 2002, Thermodynamics for Chemists, 5th edition, Eastern Wiley publications.
5. Rajaram J., Kuriakose J. C., 1999, Thermodynamics, 3rd edition, S. N. Chand, New Delhi.
6. Levine, 2006, Quantum Chemistry, 6th edition, Prentice-Hall, New Delhi.
7. Mcquarrie D. A., 2003, Quantum Chemistry,Viva Books Pvt. Ltd., New Delhi.
8. Levine, 2003, Quantum Chemistry, 5th edition, Prentice-Hall, UK.
9.Raymond Chang, 2002, Physical Chemistry with application to biochemical system, Mc Millan
Publishing Company. Inc., New Delhi.
10. Graham L Patrick, An Introduction to Medicinal Chemistry, Oxford University Press.

Course Designed by

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THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc. Chemistry (Core 4)	Int. Marks	: 25
Class	: I year	Ext. Marks	: 75
Semester	: II	Max. Marks	: 100
Sub. Code	: 2PC1	Hours/Week	: 4
Title of the Paper	**: Organic Chemistry – II**	**Credits**	**: 4**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- Understand the principles and application of UV-Vis, IR, NMR and Mass spectroscopy.
- Apply the spectroscopy concept in analyzing and determining the structure of organic compounds.
- Gain insight on conformational characteristic of organic acyclic and cyclic compounds
- Identify the effect of conformational flexibility on reactivity.

Unit-I UV and IR Spectrsocopy (12 Hrs)

Ultraviolet spectroscopy – basic principle – instrumentation – the absorption laws, types of electronic transitions – Effect of solvent and hydrogen bonding on λ_{max} values - Woodward rules to calculate λ_{max} values of conjugated dienes, conjugated polyenes, and carbonyl compounds

Infrared spectroscopy – basic principle – Molecular Vibrations – instrumentation – characteristic IR absorption of different functional groups – factors influencing the vibrational frequencies

Unit-II ^{1}H NMR and ^{13}C NMR spectroscopy (12 Hrs)

^{1}H NMR spectroscopy: Basic principles – number of signals – chemical shift – factors influencing chemical shift – spin-spin coupling – coupling constant and factors influencing coupling constant. Simplification of complex spectra – shift reagents, deuterium substitution and spin decoupling.

^{13}C NMR spectroscopy: Basic principle – comparison with ^{1}H NMR – noise decoupling – off resonance decoupling – factors affecting the C-13 chemical shifts.

Advanced NMR Spectroscopy - Introduction to 2D-NMR - Classification of 2D experiments – HOMO and HETERO nuclear correlation – J resolved correlation. Correlation Spectroscopy (COSY): Pulse sequence – HOMO-COSY, HETERO-COSY, 1D- and 2D-INADEQUATE and NOESY.

UNIT-III: Mass Spectroscopy, ORD and CD (12 hrs)

Basic instrumentation of Mass spectrometer - types of ions – molecular, isotopic, metastable and fragmentation ions – Tests for molecular ion peak – General fragmentation modes- Retro Diels - Alder reactions – Mc Lafferty rearrangement – Fragmentation pattern of simple organic molecules. Application – Accurate Molecular weight, Molecular formula

(Nitrogen rule) – Determination of structures of organic molecules. Introduction to ESI, MALDI and FAB mass spectrometer.

Optical rotatory dispersion (ORD) and Circular Dichroism (CD): Circularly polarized light – Circular birefringence and CD – plain curves and their applications – Cotton effects curves – structural applications – axial haloketone rule, octant rule and their applications.
Solving problems based on UV, IR, NMR and Mass data.

UNIT IV - Organic Stereochemistry (12 hrs)

Optical isomerism

Symmetry elements – the concept of chirality – chirality about a center – specification by Cahn-Ingold-Prelog notations – compounds with more than one chiral center – erythro, threo and meso nomenclature – concept of prochirality – homotopic, enantiotopic and diastereotopic ligands and faces – Asymmetric synthesis – Cram's rule and Prelog's rule. Optical activity in allenes and spiranes – StereoChemistry of nitrogen compounds.

Geometrical isomerism

E and Z notation – Determination of configuration of geometrical isomers by simple techniques like hydroxylation, hydroboration and methods based on physical properties – Stereoisomerism in cyclic compounds – 3, 4 and 5 membered ring systems.

UNIT V – Conformational Analysis (12 hrs)

Configuration and conformation – definition – conformational free energy- atropisomers- conformational analysis of acyclic, cyclic, heterocyclic systems – conformational analysis of cyclohexane system: stability and isomerism in mono and disubstituted cyclohexanes – conformation and reactivity of cyclohexane derivatives - conformational analysis of fused ring system - decalins, and perhydrophenanthrene.

Text Books:

1. D. Nasipuri,2004. Stereochemistry of Organic compounds 2nd edition, New Age International, New Delhi .
2. William Kemp,1994. Organic Spectroscopy, 4th Edition, ELBS, UK.
3. R.M. Silverstein, G.C. Bassler and T.C. Morrill, Spectrometric Identification of organic compounds, 6th Edition, John Wiley, New York, 2005.

Reference Books:

1. E.L. Eliel and S.H.Wiley, 2003. Stereochemistry of carbon compounds. John Wiley & Son, Inc
2. V.M.Potapov,1999. Stereochemistry, MIR Publisher, Moscow.
3. H.Kagan, 2001.Organic Stereochemistry, Edward Arnold, London.
4. E.L. Eliel, N.L. Allinger, S.J. Angyal and G.A. Morrison,2004. Conformational Analysis, Interscience, New York.
5. P. Wetirli Marchand, 1987. Interpretation of ^{13}C NMR Spectra, VCH Weinheim, UK.
6. Atta-ur Rahman,1990. Nuclear Magnetic Resonance, Springer Verlog, New York.

Course designer

1 Dr. P. Tharmaraj
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3 Dr. R. Mahalakshmy
4 Dr. A. Tamil Selvi

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: M.Sc Chemistry (Core 5)	Int. Marks	: 25
Class	: I Year	Ext. Marks	:75
Semester	: II	Max. Marks	: 100
Sub. Code	: 2PC2	Hours/Week	: 4
Title of the Paper	: **Inorganic Chemistry- II**	**Credits**	**:4**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- study the solid state chemistry of inorganic compounds.
- understand analytical Chemistry.
- know the techniques like Colorimetry, Fluorimetry, AAS, TGA, DTA, Chromatography and cyclic voltammetry.

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UNIT I SUPRAMOLECULAR CHEMISTRY (12 Hrs)

Definition, Nature of supramolecular interactions- Non - Covalent interactions, Host - guest interaction, complexing involving crowns and cryptands- cyclodextrine - Inclusion compounds-Clatharates-intercalation compounds -Molecular recognition, Types of recognition, Self- assembly. General properties of Supra molecular complexes- Molecular Library- Transition metal mediated supramolecules- Directional bond approach- Molecular triangles (Pd and Pt)- Molecular squares (Pd, Pt and Re)- Molecular rectangles-(Pd, Pt, Cu and Re) Molecular Cages (Pd, Pt and Re) and their applications.

UNIT II SOLID-STATE CHEMISTRY (12 Hrs)

Packing of atoms and ions- close packing arrangements-HCP, CCP and BCC lattice. Radius ratio rules- Limiting radius ratio. Structure of typical lattices such as calcite, cesium chloride, Nickel arsenide, Fluorite, Antifluorite, Cadmium iodide, Perovskite, Spinels (normal and inverse). Bragg's equation- problems involving Bragg's equation. Crystal structure determination- X-ray diffraction study, Electron and Neutron diffractions

Crystal defects- point – Schotky and Frenkel defect - line and plane defects- colour centers- non- stoichiometric Compounds- experimental methods of study of non-stoichiometry- effect of imperfections and non- stoichiometry on physical properties-types of solids- electronic structure of solids- free electron and band theories.

UNIT-III Inorganic Rings, Cages, Clusters and Polymers- I (12 Hrs)

Electron deficient compounds: Borane and carboranes- Synthesis, structure and bonding (VBT and MO approach) –topological treatment-wades rule –styx numbers-structural studies by NMR-metallocarboranes-other heteroatom boron derivatives, borates-boroxines-B-P and B-As heterocycles. Synthesis, structure and bonding in Binary sulphur nitrils, S-N cations and anions, cyclic S-N compounds, S-N halogen compounds-bonds and electron counting in S-N heterocycles-polythiazyls. Structure of aluminosilicates- mica, clay, zeolites, fullers earth. Manufacture, Types and Uses of glasses.

UNIT- IV Inorganic Rings, Cages, Clusters and Polymers- II (12 Hrs)

P-N Heterocyclics- Phosphonitrilic compounds: Synthesis, Structure and bonding-phosphazene oligomers-high polymers-polymeric phosphorus nitrides-hydrolysis of phosphazenes- reactions of halo phosphazenes- aminolysis-metathetical reactions-reaction with organometallic reagents-Friedel-Crafts substitutions-rearrangements-theories of bonding-electronic structure and aromaticity-posphazene oligomers-high polymers-polymeric phosphorus nitrides. High, low nuclearcity carbonyl clusters-halide clusters. Isolobal analogy-Synthesis, structure and bonding in Poly anions and isopoly anions of phosphorous, vanadium, chromium, Nolybdenum and tugston. Hetero poly anions of molybdenum and tungsten. Structural prediction by Wade's rule-Cappit rule

UNIT-V ANALYTICAL CHEMISTRY-1 (12 Hrs)

Principles and practice of complexometric estimations/- Spectro analytical methods:- Principles and applications of colorimetry and spectro photometry, fluorimetry, nephelometry and turbidimetry-emission and atomic absorption spectroscopy (AAS) and atomic fluorescence spectroscopy.

ANALYTICAL CHEMISTRY-II

Principles, Instrumentation and applications of Cyclic Voltametry, Thermogravimetry, Differential thermal analysis and differential scanning colorimetry, Chromatography: GC, HPLC and Ion Exchange Chromatographic techniques.

Text book:

1. Bradley J. Holliday & Chad A. Mirkin, Strategies for the Construction of Supramolecular Compounds through Coordination Chemistry- Reviews, Angew. Chem. Int. Ltd., Ed., 2001, 40, 2022-2043., Chemie@Wiley-VCH
2. Katsuhiko Ariga, Toyoki Kunitaka, Supramolecular Chemistry-Fundamentals and Applications: Advanced Textbook, Springer Science & Business Media, 2006.
3. W. Jones, C. N. R. Rao, Supramolecular Organization and Materials Design, Cambridge University Press, Landon, 2001.
4. Lee, J. D. Concise Inorganic Chemistry, Blackwell Science Ltd., V Edn., London. 2002.
5. Keer, H.V. Principles of the Solid State, Wiley Eastern Ltd., 1993.
6. H. G.Heal, the Inorganic Heterocyclic Chemistry of Sulphur, Nitrogen and Phosphorus, Academic press, New York, 1980.
7. J. D. Woolings, Non Metal Rings, Cages and Clusters, John Wiley and sons, New York, 1989.
8. P.J. Durrant and B. Durrant, Introduction to advanced inorganic chemistry, Longman Group Ltd, London,1970.
9. Purcell K.F. and Kotz J.C., Saunders, Inorganic Chemistry, Philadelphia, 1977.
10. D. A. Skoog and D. M. West, Fundamentals of Analytical Chemistry, Holler Saunders college publishing, USA.VI Edn., 1998.
11. F.A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry, Wiley-Interscience publications, John Wiley & Sons, V Edn., New Delhi, 1988.
12. Walter E. Harris and Byron Kratochvil, An Introduction to Chemical Analysis, Saunders Golden Sunburst Series, Philadelphia,1982.
13. Galen W. Ewing, Instrumental Methods of Chemical Analysis, Mc Graw Hill International Editions, V Edn., New Delhi, 1987.
14. K. Sharma, Instrumental Methods of Chemical Analysis, GOEL Publishing House, 12th Reprint, New Delhi, 1993.

Reference books:

1. J. E. Huheey, Ellen A. Keiter, Richard L. Keiter, Inorganic Chemistry, Pearson Education (Singapore) Pte. Ltd., IV Edn., Delhi, 2004.
2. I. Azaroff, Introduction to Solids, Tata McGraw hill, New Delhi, 2004.
3. K. Chakrabarthy, Solid State Chemistry, New Age International Publishers, (P) Ltd., 2005.
4. D. F. Shriver and P.W. Atkins, Inorganic Chemistry, Oxford University Press, London, 1999.
5. Wahid U. Malik, G.D. Tuli and R. D. Madan, Selected Topics in Inorganic Chemistry, S. Chand & Co. Ltd., New Delhi, 2006.
6. William W. Porterfield, Inorganic Chemistry, II Edn., Elsevier, New Delhi, 2005.
7. A.G. Sharpe, Inorganic Chemistry, III Edn., Addition – Wesley Longman, UK 2004.
8. A. I. Vogel, Textbook of Quantitative Chemical Analysis, ELBS Longman Singapore Publisher (P) Ltd., Singapore. V Edn., 2002.

Course designer

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THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc Chemistry (Core 6)	Int. Marks	: 25
Class	: I Year	Ext. Marks	:75
Semester	: II	Max. Marks	: 100
Sub. Code	: 2PC3	Hours/Week	: 4
Title of the Paper	: **Physical Chemistry- II**	**Credits**	**:4**

Course outcomes:

On successful completion of the course students will be able to

- Learn about theories and applications of electrochemistry
- Understand the need and applications of statistical thermodynamics
- Gain knowledge in advanced quantum chemistry

UNIT-I **(12 Hrs)**

ELECTROCHEMISTRY-I

Theory of strong electrolytes – Interionic attraction theory – Debye-Huckel theory of strong electrolytes - Debye-Huckel model of ionic atmosphere–Debye-Huckel Onsager equation-derivation, verification and modifications- Debye – Falkenhagen effect and Wien effect; Electrical double layers – formation – Structure of electrified interfaces – Stern model. Debye-Huckel limiting law- extension- Huckel-Bronsted equation - Determination of activity coefficients using Bronsted equation – Applications of conductivity measurements; Nernst equation and its significance – reversible and irreversible cells - electrodes – SHE – Calomel – Glass electrode – Platinum electrode – Glassy carbon electrode – ion selective electrode and measurement of pH.

UNIT-II **(12 Hrs)**

ELECTROCHEMISTRY-II

Over voltage – theories of over voltage- applications of over voltage-hydrogen and oxygen overvoltage; Butler-Volmer equation- Tafel equation; Corrosion- principles of electrochemical corrosion – dry and wet corrosion and its mechanism – Pilling-Bedworth rule. Types of corrosion- galvanic, aeration, stress, pitting corrosion and passivity – factor influencing corrosion – corrosion control- cathodic production - corrosion inhibitors.

Principles of Polorography - Cyclic Voltametry –quasi – reversible – irreversible voltamogram; electrochemical energy conversions-Nickel Cadmium, lead acid battery; Fuel cells – H_2 - O_2 Fuel cell – methyl alcohol fuel cell.

UNIT-III **(12 Hrs)**

STATISTICAL THERMODYNAMICS-I

Need for statistical mechanics or thermodynamics-Ensemble- types of ensemble – micro canonical - canonical and grand canonical ensemble; Phase space- microstates- probability and distribution- Maxwell Boltzmann classical distribution law- derivation in term of degeneracy; Partition function (Q) – relation between partition function and the following thermodynamic functions – internal energy (E), Helmholtz free energy (A), Pressure (P), Enthalpy (H), Gibbs free energy (G), chemical potential (μ_i), heat capacity (Cv) and entropy (S); Derivation of Sackur-Tetrode equation-thermodynamic properties of monoatomic gases.

UNIT-IV **(12 Hrs)**

STATISTICAL THERMODYNAMICS-II

Quantum statistics- Bose-Einstein Statistics derivation- application of Bose-Einstein statistics for a photon gas – Planck‘s radiation formula-Derivation of Rayleigh-Jeans law-Stefan Boltzman equation. Fermi-Dirac statistics derivation -Application of Fermi-Dirac statistics to electron gas in metals; Population inversion-negative absolute temperature -heat capacity of diatomic gases-Einstein‘s theory and Debye‘s theory of heat capacities of solids- third law of thermodynamics and statistical entropy - hydrogen ortho and para nuclear states.

UNIT –V **(12 Hrs)**

Approximation methods, application of SWE to many electron systems.

Necessity for approximation methods- Variation methods for the Hydrogen atom – Perturbation (first order) method to Helium atom - Slater determinant wave function- secular determinant – Hartree – Fock self consistent field method to Helium atom – HMO bielectron theory of Ethylene and Butadiene.

Text Books:

1. Bokris J. O. M., Reddy A. K. N., 1978, Modern Electrochemistry, Vol I, Plenum Press, New York.
2. Crow Dr., 1988, Principles and Applications of Electrochemistry, Chapman Hall, UK.
3. Venkataraman R., Rengarajan K., Raghavan P. S., 2007, Electrochemistry, First edition
4. Glasstone S., 2002, Thermodynamics for Chemists, Eastern Wiley Publication.
5. Lee, Sears, Tercotte, 1973, Statistical Thermodynamics, Addision Wesley Publishing Co., London – I Edition.
6. Chandra A. K., 1988, Introductory Quantum Chemistry, 3rd edition, Tata McGraw-Hill Publishing Co, New Delhi, India.
7. Mc Quarie D.A., 1983, Quantum Mechanics, Oxford University press, Oxford,UK.

Reference Books:

1. Antropov L., 1999, Theoretical electrochemistry, MIR Publications, New Delhi.
2. Glasstone S., 2002, An Introduction to Electrochemistry, Von Nostrand Co. Inc., Toronto.
3. Gupta M. C., 1993, Statistical Thermodynamics, Wiley Eastern limited, New Delhi.
4. Kuriakose J. C., Rajaram, J. 1999, Thermodynamics, III edition, Shoban lal Nagin Chand, New Delhi, India.
5. Levine, 2006, Quantum Chemistry, 6th Edition, Prentice-Hall, New Delhi, 2006.
6. H.W. Hanna, 1993, Quantum Mechanics in Chemistry-Benjamin –Cummiza London Publishing Company, New Delhi, India.

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THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc.(Core elective 1)	Int. Marks	: 75
Class	: I M.Sc Chemistry	Ext. Marks	: 25
Semester	: II	Max. Marks	: 100
Sub. Code	: 2PCE1(C)	Hours/Week	: 5
		Credits	:5

Title of the Paper : **C-Programming: Fundamentals And Applications in Chemistry (Option A)**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

1. To have an Overview of C-Programme.
2. To comprehend the basic ideas of Operators, Data input and Output.
3. To know about Decision Making, Arrays, and Functions and to understand Applications of C in Chemistry

UNIT-I Introduction and overview of C (15 HRS)

Introduction – Importance of C-structure of C-programs- Simple programs-style of the language.

Characters–Keywords, Variables and parameters-Data types-Constants-Declaration of and assignments of values to variables.

Operators-Arithmetic, Relational, Logical, assignment, Increment and Decrement, Conditional and bitwise operators-Special operators.

Expressions- Arithmetic - Evaluation of expression- Procedure of arithmetic operators-Library functions.

UNIT-II Data input and Output (T: 7 HRS + P: 8 HRS)

Character input- The getchar function – Character output- The putchar function – Entering input data- the Scanf function-Writing output data- The printf function- Formatted input and output data-the gets and puts functions-preparing and running a complete program.

Decision making and branching: Decision making with IF statement –simple IF statement-the IF…ELSE statement- Nesting of IF…Else statements – The ELSE IF ladder –The Switch statement – The ?: operator – the GOTO statement.

UNIT-III (T: 10 HRS + P: 5 HRS)

Decision making and Looping: The WHILE statement – The DO statement-The FOR statement – Jumps in loops.

Arrays: One dimensional array –Two dimensional arrays –Initializing two dimensional arrays- Multidimensional arrays.

User defined functions: Need for user–defined functions – A multifunction program – The form of C functions -Return values and their types- Calling a function –Category of function-No arguments and no return values –Nesting functions- Recursions- The scope and life time of variables in function.

UNIT-IV Applications of C in Chemistry-I (T: 5 HRS + P: 10 HRS)

Explanation of the formulae, equations and programs to solve the following problems in chemistry:

1. Calculation of Molecular weight of Organic Compounds.

2. Calculation of pH.
3. Determination on First Order rate constant for the given reaction
4. Evaluation of lattice energy using
   i). Born- Haber Cycle
   ii). Born –Lande equation
5. Computing ionic radii- Lande's method and Paulings method
6. Calculation of Normality, Molarity and Molality of a given solution
7. Converting Kelvin to Celsius temperature and vice versa.
8. Determination of enthalpy of a given solution
9. Evaluation of Cell constant
10. Calculation of energy of Hydrogen atom spectral lines.

UNIT-V: Applications of C in Chemistry-II (T: 5 HRS + P: 10 HRS)

Explanation of the formulae, equations and programs to solve the following problems in chemistry:

Organic Chemistry:

1. Use of Recursive functions to calculate the number of π Resonance structures for an organic conjugated system using
   res - str = n! / ((n/2)! * ((n/2) + 1)!)
2. Empirical formula of Hydrocarbons and other Organic compounds.

Inorganic Chemistry:

1. Array manipulation to balance the chemical equations.
2. Half life and average life periods of radioactive nuclei.
3. Binding energy of nucleus.
4. Program to get output as First ten elements of Periodic Table with their Name, Symbol, Atomic number and Atomic Weight.

Physical chemistry:

1. Calculation of RMS, average and MPV of gases.
2. Solving Quadratic equation to evaluate the Equilibrium constant for the reaction
   $H_2 + I_2$ 2HI
3. Illustrate use of Loop to calculate the NMR frequency for a nucleus with Spin ½
4. Mean activity coefficient of an Electrolyte (KCl)

TEXT BOOK

1. E. Balagurusamy,2005. Programming in ANSI C, Tata McGraw- Hill Publishing Company Ltd., New Delhi, 3rd Edn., 10th Reprint.

REFERENCES:

1. Brian W. Kernighan & Dennis M. Ritchie, 2001 The C Programming Language, Prentice Hall of India Private Limited, New Delhi, 2nd Edn.,.
2. Byron S. Gottfried,2001. Programming with C, Tata McGraw- Hill Publishing Company Ltd., New Delhi, 2nd Edn.,
3. R. Rajaram,1999. C Programming Made Easy, Scitech Publications, Chennai.
4. Yeshavant Kanitkar, 1999. Let Us C, BPB Publications, New Delhi, 3rd Edn..
5. Yeshavant Kanitkar, C 1998- Projects, BPB Publications, New Delhi,.
6. K. V. Raman, 1993 Computers in Chemistry, Tata McGraw- Hill Publishing Company Ltd., New Delhi, 3rd Edn..

Course designer

1. Dr. A. Elangovan
2. Dr. R. Mahalakshmy
3. Dr. A. Tamilselvi

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc (Core elective 1)	Int. Marks	: 75
Class	: I MSc Chemistry	Ext. Marks	: 100
Semester	: II	Max. Marks	: 100
Sub. Code	: 2PCE1(M)	Hours/Week	: 5
		Credits	**:5**

Title of the Paper : Medicinal Chemistry (Option B**)**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

1. Understand the concept of pharmacokinetics, pharmacodynamics drug discovery by design.
2. Synthesis different types of drugs.

Unit – I : Introduction to Drug Design **15 hrs**

a) ADME Properties

The pharmacokinetics phase-Adsorption-Distribution, Metabolism-Elimination-Bioavailability of drug. pharmacokinetics models, Intravascular and Extravascular administration. The use of pharmacokinetics in Drug dsign**.**

b) Pharmacodynamics - Stereoelectronic structure.

Unit - II Drug Discovery by Design **15 hrs**

a) Streochemistry and Drug Design

Structurally rigid Groups –procaine, Acetylcholine. Conformation-Syn and Anti Acetylcholine, Phenyl ethanoate methiodides. Configuration-Variations in the biological activities of stereoisomers

b) Strutural –Activity –Relationship (SAR)

Changing the size and shape.Changing th degree of unsaturation. Introduction or removal of ring system. Introduction of new substituents-methyl group, Halogens, hydroxyl groups, Basic groups, carboxylic and sulphonic acid groups. Changing the excisting substituents of lead-isosteres,bioisoteres.

Unit III a)Quantitative-structural Activity-Relationship (QSAR) **15 hrs**

Partition parameters-partition coefficients(p), Lipophilic subtituents constants ( ) Electronic parameters-The Hammett constants-Steric parameters-The Taft Steric parameters (Es), Molar refractivity (MR), Hansch analysis-craig plots, The toplss decision tree. Compute –aided drug design- Modelling Drug-Receptor Interaction.

b) Combinatorial Chemistry

Basic concepts-The design of combinatorial syntheses. The general technique used in combinatorial synthesis i) Solid support mthod-parrllel synthesis –Furka's mix and splt techniques-sequential chemical tagging methods-Still;s binary code Tag systemcomputerised tagging. ii) Combinaterial synthesis in solution iii) Screening and deconvolution

Unit – IV

a) Antineoplastic Agents: 15 hrs

Introduction, cancer chemotherapy, special problems, role of alkylating agents and antimetabolites in treatment of cancer

b) Psychoactive drugs – The chemotherapy of Mind:

Introduction, neutotransmitters, CNS depressants, general anaesthetics, mode of action of hypnotics, sedatives, neurochemistry of mental diseases

c) Cardiovascular Drugs and Local Antiinfective Drugs:

Introduction, Cardiovascular diseases, drug inhibitors of peripheral sympathetic function, central intervention of cardiovascular output.

Unit V Synthesis of Drugs 15 hrs

a) Synthesis of Antineoplastic agents

Mechlorethamine, Cyclophosphamide uracil, mustards and 6-mercaptopurine

b) Synthesis of cardiovascular drugs

Amyl-nitrate, sorbitrate,
Verapamil.

c) Synthesis of Phychoactive drugs

Synthesis of Diazepam, Chlorazepam, oxazepam, Alprazolam, Phenyltocin or Diphenylhydantoin, Barbitol, Phenobarbital.

Text Books:

1.Gringuage, 2004.Introduction to Medical Chemistry, Wiley – VCH,.
2. Robert F.Dorge2003 Wilson and Gisvold's Text Book of Organic Medicinal and Pharmaceutical Chemistry,
3. S.S.Pandeya and J.R.Dimmock,2006. An Introduction to Drug Design, New Age International.
4. M.E. Wolff, 2005. Burger's Medicinal Chemistry and Drug Discovery, Vol-1 (Chapter-9 and Ch-14) John Wiley publications.
5. Goodman and Gilman's Pharmacological Basis of Therapeutics, McGraw-Hill, 2006.
6. R.B.Silverman, 2006. The Organic Chemistry of Drug Design and Drug Action, Academic Press.

Reference Books:

1. D. Lednicer, Strategies for Organic Drug Synthesis and Design, John Wiley.
2. Gareth Thomas, 2004. Medicinal Chemistry, An introduction, John wiley& sons,Ltd.,
3. M.L Gangwal2007. Medicinal chemistry Lectures on Drug design and Synthetic Drugs, Student publishing House.

Course Designer

1. Dr. P. Tharmaraj
2. Dr. P. Prakash

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc.(Core 1 Lab)	Int. Marks	: 40
Class	: I Year	Ext. Marks	: 60
Semester	: II	Max. Marks	: 100
Sub. Code	: 2PCL1	Hours/Week	: 5
Title of the Paper	**: Organic Chemistry Lab 1 Organic qualitative analysis**	**Credits**	**:5**

Course Outcomes

On the successful completion of the course, students will be able to

1. get practical skills in analyzing a mixture of two organic substances
2. do preparation of organic compounds.

Analysis

Analysis of Organic mixtures: Two component Systems (Maximum of SIX Mixtures)

Preparation of organic compounds

1. Dibenzal acetone
2. Dimethyl pyrazole
3. DiphenylChalcone
4. P.Nitroacetanilide
5. Salicylaldoxime

Course Designers

1. Dr. P. Tharmaraj
2. Dr. A. Tamilselvi

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: M.Sc.Chemistry (Core 2 Lab)	Int.Marks	: 40
Class	: I Year	Ext. Marks	: 60
Semester	: II	Max. Marks	: 100
Sub. Code	: 2PCL2	Hours/Week	: 4
Title of the Paper	: **Inorganic Chemistry Lab 1**	**Credits**	**:4**

Course objective:

To impart skills in both qualitative and quantitative inorganic analysis

I. COMPLEXOMETRIC TITRATIONS WITH EDTA

1. Estimation of ZINC
2. Estimation of MAGNESIUM
3. Estimation of COPPER
4. Estimation of NICKEL
    a) By Direct Method
    b) By Indirect Method

II. SEMI MICRO ANALYSIS

Semi micro analysis of samples containing two Familiar Cations and two Less Familiar Cations. – Maximum of Five samples.

Course Designers

1. Dr. A. Elangovan
2. Dr. T. Arumuganathan

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc.Chemistry (Core 3 Lab)	Int.Marks	: 40
Class	: I Year	Ext. Marks	: 60
Semester	: I &II	Max. Marks	: 100
Sub. Code	: 2PCL3	Hours/Week	: 4
Title of the Paper	**: Physical Chemitry Lab1**	**Credits**	**: 4**

Course Objective:

On successful completion of the course students will be able to

1. Develop practical skills in conductometric and potentiometric titration experiments.
2. Understand experimental knowledge on kinetics and surface chemistry
3. Learn about the estimation of metal ions by using spectrophotometer

S. No.	EXPERIMENT
1	**Kinetics of Acid hydrolysis of an ester**
2	**Estimation of strong acid conductometrically**
3	**Estimation of mixture of acids conductometrically**
4	**Estimation of NH_4Cl by Conductometrically**
5	**Estimation of CH_3COONa by conductometrically**
6	**Estimation of $BaCl_2$ by conductometrically**
7	**Estimation of Fe(II) using $K_2Cr_2O_7$ by Potentiometry**
8	**Estimation of Fe(II) using CAS by Potentiometry**
9	**Estimation of KI with $KMnO_4$ by Potentiometry**
10	**Estimation of Copper (II) by Spectrocolorimetry**
11	**Determination of the Adsorption Parameters of Oxalic acid on Charcoal**
12	**Adsorption of acetic acid on to activated charcoal**
13	**Estimation of thiocyanate using iron (III) by spectrocolorimetry**
14	**Determination of Iron ion content by photometric method based on complex formation**

Course Designer

1. Dr. R. Sayeekannan
2. Dr. A. R. Ramesh

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: M.Sc. Chemistry(Core 7)	Int. Marks	: 25
Class	: II Year	Ext. Marks	: 75
Semester	: III	Max. Marks	: 100
Sub. Code	: 3PC1	Hours/Week	: 5
Title of the Paper	: **Organic chemistry – III**	**Credits**	**:5**

COURSE OUTCOMES

On the successful completion of course students will be able to

- Apply various reagents in organic synthesis.
- Write advanced synthetic routes for an ideal organic synthesis.
- Write the mechanism of pericyclic and photochemical reactions.
- Understand the mechanism of molecular rearrangement reaction.

Unit-I: Reagents in Organic Synthesis (15 Hrs)

Use of the following reagents in organic syntheses and functional group transformations – complex metal hydrides, Gilman's reagent, lithium dimethyl cuprate – lithium diisopropylamide (LDA) — trimethyl silyliodide – tri-n-butyl tin hydride – Jones reagent – pyridinium chloro chromate – SeO_2 – peracids – DMSO – $Pb(OAc)_4$ – HIO_4 – Prevost and Woodward hydroxylation – Etard's reagent – Waker's reagent – RuO_4 – $Hg(OAc)_2$ – Oppenauer oxidation – DDQ – $LiAlH_4$, $NaBH_4$, Lawesson's reagent – Crown ethers – Thallium nitrate – Phase transfer catalysts – Birch reduction.

Unit-II Advanced Organic Synthesis I (Retro-synthesis) (15 hrs)

Disconnection Approach: Importance of organic synthesis-Planning synthesis – Synthons and types – synthetic equivalents – latent functionality Guideliness for best disconnection approach, Reactions involving functional group interconversions – Reterosynthetic analysis – concept of umpolung – two group C-X disconnections and synthetic strategies 1,2-, 1,3-, 1,4-, 1,5- and 1,6- difunctionalised disconnection. Steroselective and stereospecific reactions-Chemoselectivity–Stereoselectivity- Regioselectivity.

Unit-III Advanced Organic Synthesis II (Asymmetric synthesis) (15hrs)

Definition of enantiomeric, disatereomeric excess – analytical methods to determine ee and de – strategy and classification of methods of asymmetric synthesis – chiral substrates – Chiral auxiliaries – chiral reagents – chiral catalysts.

Chiral catalysts and chiral reagents: BINAP-ruthenium (II) Mc Murray's reagent – $Ti(i\text{-}PrO)_4$, and $K_2Os_2(OH)_4$ – Sharpless asymmetric epoxidation, – Heck reactions – Suzuki Coupling – Sonogashira coupling.

Unit-IV Photochemistry and Pericyclic reactions (15 hrs)

General principles – orbital symmetry considerations related to photochemical reactions, thermal versus photochemical reactions – principles of energy transfer – photochemical reactions of ketones – Norrish type I and type II reactions – Paterno Buchi reaction – Dienone

photochemistry – photo reduction, photochemical oxidation, Barton reaction – photochemistry of alkenes and dienes.

Pericyclic reactions Application of symmetry to orbital interactions – selection rules (Woodward and Hoffmann rules) – Electrocyclisation, cycloaddition and sigmatropic rearrangements – cheletropic reactions – Diels-Alder Reactions: Endoselectivity and regioselectivity – Explanation of these reaction in terms of correlation diagrams approach, FMO approach and Dewar – Zimmermann approach – (PMO) Huckel-Mobius concepts.

Unit-V Molecular rearrangements (15 hrs)

Classification – Nucleophilic, electrophilic, and radical – Mechanism of Favorski, Benzil-Benzilic acid, Bayer-Villiger, Wagner-Meerwin rearrangement, Carbanionic rearrangements, Stevan's rearrangement, Sommelet-Hauser, Cope, and Wesly-Moser rearrangement, Fries Rearrangement.

Acid catalyzed rearrangement – Arndt-Eistert synthesis – carbon to nitrogen migration – Hofmann rearrangement, Curtius rearrangement, Lossen rearrangement, Schmidt and Beckmann rearrangement

Text book:

1. Jerry March.1992. Advanced Organic Chemistry, Reaction mechanism and structure, John Wiley and sons, 4th Edition, New York.
2. S. Warren,2004. Organic synthesis - The disconnection approach, John Wiley & Sons, UK, 2004**.**
3. Cary and Sundberg1990. Advanced Organic Chemistry, Part B, Reactions and Synthesis, Plenum Press, 3rd Edition.
4. R. K. Mackei and D. M. Smith1982. Guide Book to Organic synthesis, ELBS.
5. I.L. Finar2005. Organic Chemistry, Vol. II, V Edition, ELBS, New York.
6. W. Caruthers, Some modern methods of organic synthesis, Cambridge university.
7. C.H. Depuy and O.L. Chapman,1975. Molecular reactions and Photo Chemistry, Eastern and Economic Edition, Tata MacGraw Hill.

Reference Books:

1. Graham Solomons,1992. Organic Chemistry, John Wiley and Sons INC, 5th Edition.
2. Michael B. Smith, 1994.Organic Synthesis, McGraw Hill, International Edition.
3. Clayden, Greeve, Warren and Wothers, 2007.Organic Chemistry, OXFORD University Press.
4. A.J. Bellamy,1974. An introduction to conservation of orbital symmetry, Longman group Limited,
5. H. O. House,1972. Modern synthetic reactions, Cambridge University press, 3rd Edition.
6. W. Carruthers and I. Coldham, 2004. Modern methods of organic synthesis, Cambridge University Press, 4th Edition.

Course designer

1. Dr. P. Tharmaraj
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THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: M.Sc Chemistry (Core 8)	Int. Marks	: 25
Class	: II Year	Ext. Marks	:75
Semester	: III	Max. Marks	: 100
Sub. Code	: 3PC2	Hours/Week	: 5
Title of the Paper	: **Inorganic Chemistry- III**	**Credits**	**:5**

Course Outcomes:
On the successful completion of course students will be able to

- understand coordination Chemistry, lanthanides and actinides chemistry.
- write the basic concept, theories , mechanism and spectra of coordination compounds..
- An emphasize is given on Separation techniques of lanthanides and synthesis of actinides.
- gain knowledge about the synthesis, properties, characterization and the applications of nano materials.

UNIT I COORDINATION CHEMISTRY-1 15 Hrs

Nomenclature of coordination complexes-Stereochemistry of coordination compounds: Geometrical isomerism- optical isomerism of complexes having C.N.4,6-stability constants of complexes-stepwise and overall stability constant- their determination-Jobs' continuous variation method-Chelate effect

CFT. LFT and MO theories- **pi bonding**-Influence of ligands on crystal field splitting- Octahedral and Tetrahedral splitting of "d" orbitals, CFSE. Spectrochemical series-Nephelauxetic effect– John Teller effect-site preferences. Spectral properties of complexes-Magnetic properties- **spin-orbit contribution**-Para, Dia, ferro magnetism and antiferro magnetism- Determination of magnetic properties – Gouy's method.

UNIT-II COORDINATION CHEMISTRY-II 15 Hrs
(INORGANIC REACTION MECHANISMS)

Substitution reactions- lability-inertness- square planar substitution reactions- Factors affecting reactivity of square planar complexes- Trans effect- Theories of Trans effect- Stereo chemistry of substitution in octahedral complexes.(SN^1, SN^2, SNiCB)- Reactions of coordinated ligands- Acid hydrolysis- anation reactions and base hydrolysis.

Mechanism of electron transfer reactions- Outer sphere, inner sphere electron transfer reactions- Marcus Theory and its applications. Synthesis of coordination compounds using electron transfer and substitution reaction.

UNIT- III CHEMISTRY OF NANOSCIENCE AND TECHNOLOGY 15 Hrs

Introduction- Types of nano materials-Nanoparticles, nanotubes-Carbon nanotubes: SWCNT and MWCNT, nanowires, nanoribbons, nanorods, nano composites.

Preparation methods-Chemical vapour deposition, Sol-Gel method, Electrodeposition method, Ball milling method, Chemical reduction method, spin coating technique, Solvothernal synthesis, Colloidal method, Co-precipitation method, Flame spray synthesis (Arc Plasma)-Preparation of metal oxide nanoparticles- Properties of nanoparticles- Optical, mechanical, magnetic, electrical, thermal properties. Characterization Techniques like SEM, TEM, AFM, XRD, UV-DRS, B.E.T analysis, DLS, PL -Applications of Nanoparticles.

UNIT – IV PHYSICAL METHODS IN INGORGANIC CHEMISTRY-I 15 Hrs

Electronic spectra: selection rules – polarization – splitting of spectral terms – L.S Coupling scheme- Russel- Saunders method- Term Symbols -Orgel and Tanabe-Sugano diagram. – Evaluation of 10 Dq and beta $\mathbf{d^2}$, $\mathbf{d^3}$, $\mathbf{d^7}$, $\mathbf{d^8}$ systems

IR and Raman spectra: Applications of IR and Raman. Selection rules to structure determination – IR spectral studies of carbonyl compounds.

Nuclear magnetic resonance : Application of chemical shift and spin coupling to structure determination using multiple NMR (H,P,F) chemical exchange, dynamic processes in inorganic and organometallic compounds- Fluxional NMR of metal carbonyls and allyl complexes – paramagnetic NMR and contact and pseudo contact shifts.

NQR- Basic theory, principles and applications.

UNIT-V LANTHANIDES AND ACTINIDES 15Hrs

a) Lanthanides:-

Occurrence- differences between 4f and 5f orbitals-Separation techniques (Fractional crystallisation, precipitation, ion-exchange, solvent-extraction and thermal decomposition-Selective reduction and oxidation)- Electronic configuration- Oxidation states, Lanthanide contraction- Spectral and Magnetic properties- Ln chelates-organometallic compounds of Ln. Uses of lanthanides **(shift reagents, Pu bomb)** and their compounds- aqueous chemistry of uranyl compounds- position in the periodic table.

b) Actinides:-

Synthesis of elements- Extraction of Th and U and Pu- electronic configuration and oxidation states, spectral and magnetic properties- position in the periodic table.

TEXT BOOKS:

1. Shriver D. F. and Atkins, P.W.1999 Inorganic Chemistry, Oxford University Press, London.
2. Cotton F.A. and Wilkinson, G. 1988.Advanced Inorganic Chemistry, Wiley-Interscience publications, John Wiley & Sons, V Edn. New York.
3. Gurdeep R. Chatwal & M. S. Yadav,1993. Coordination Chemistry, Himalaya Publishing
4. House, I Edn.,
5. Figgis, B.N, 1964.Introduction to Ligand Fields, Wiley Interscience, Eartern Ltd., I Edn.,
6. New Delhi, .
7. Banerjea, D,1993. Coordination Chemistry, Tata McGraw- Hill Publishing Co. Ltd., .
8. Purcell, K. F. Kotz, J.C. Holt Saunders,1977. Inorganic Chemistry, Philedelphia,USA
9. Pradeep, T,2003 A Textbook of Nanoscience and Nanotechnology Tata McGraw-Hill Education, India.
10. Drago, R. S. Van Nostrand and Reinhold, 1976.Physical methods in Chemistry.
11. Nakamoto, Kazuo,1986. Infrared and Raman Spectra of Inorganic and coordination compounds, IV edition, John Wiley and Sons, New York.
11. Raymond Chang M,1971 Basic principles of Spectroscopy, Mc Graw Hill, New Delhi.
12. Straughan B. P. and Walker S.1976. Spectroscopy Vol.3, Chapman and Hall NewDelhi.

REFERENCES:

1. Douglas and McDaniel,2002. A Concise of Inorganic Chemistry, Oxford and IBH Publishing Company (P) Ltd., New Delhi.
2. E. Huheey, Ellen A. Keiter, Richard L. Keiter, 2004.Inorganic Chemistry, IV Edn., Pearson Education (Singapore) (P).Ltd., Delhi,
3. Wahid U. Malik, G. D. Tuli and R. D. Madan,2006. Selected Topics in Inorganic Chemistry, S. Chand & Co. Ltd., New Delhi,
4. William W. Porterfield, 2005.Inorganic Chemistry, Elsevier, II Edn., New Delhi.
5. A.G. Sharpe, 2004.Inorganic Chemistry, Addition – Wesley Longman, UK III Edn.,
6. Gary L. Miessler and Donald A. Tarr,2004 Inorganic Chemistry, Pearson Education,
7. Inc., 3rd Edn., New Delhi, .
8. Mick Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons and Burkhard
9. Raguse 2005. Nano technology-Basic Science and Emerging Technologies, Overseas
10. Press India (P). Ltd. New Delhi Ist Edn, .
11. Mark Ratner and Daniel Ratnar, 2003. Nanotechnology-A Gentle Introduction to the Next
12. Big Idea, Pearson Education Inc., US and UK,
13. D.N. Sathyanarayana, 2001. Electronic Absorption Spectroscopy and Related Techniques, Universities Press (India) Limited.

Course Designer

1. Dr. A. Suganthi
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3. Dr.D.S. Bhuvaneshwari
4. Dr.K.Selvakumar

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: M.Sc Chemistry (Core 9)	Int. Marks	: 25
Class	: II Year	Ext. Marks	:75
Semester	: III	Max. Marks	: 100
Sub. Code	: 3PC3	Hours/Week	: 5
Title of the Paper	: **PHYSICAL CHEMISTRY-III**	**Credits**	**:5**

Course outcomes:
On successful completion of the course students will be able to
- Learn about the fundamentals of symmetry and applications of group theory.
- Understand in detail about IR, Raman and microwave spectroscopy
- Study the concepts of PES, ESR, Mossbauer, NQR spectroscopy and their applications.

UNIT – I **15 Hrs**

GROUP THEORY – I (Basics of Group Theory)

(i) Introduction - Symmetry elements and symmetry operations - Definition of mathematical group – four cardinal properties of a group – closure, associative, idendity and inverse rule – cyclic group – Abelian group (H_2O only) and non-abelian group (NH_3 only) – Group multiplication table- C_2v and C_3v; subgroup – similarity transformation – class of group – Point group – Assignment of point group of simple molecules;

(ii) Matrix-introduction - matrix representation of the symmetry operations – idendity (E), Proper axis of rotation (C_n), Vertical reflection (σ_v), Improper axis of rotation (S_n) and Inverse (i); (iii) Representation definition – reducible and irreducible representation of a group –block factorization. The great orthogonality theorem (GOT) – rules for writing (properties of) irreducible representations – Projection operator (definition only) – character table definition – construction of character table C_{2V} and C_{3V}.

UNIT – II

GROUP THEORY – II (Applications of Group Theory) **15 Hrs**

Prediction of symmetry of atomic orbitals - linear vector, rotation vector – symmetries of tensor like properties (α & g); Prediction of orbitals and hybridization in BF_3 and CH_4 molecules ; Normal mode analysis – H_2O and NH_3; Direct product representation and its applications – identification of IR and Raman active vibration of H_2O and N_2F_2 – selection rules to predict allowed and forbidden electronic transition in UV-Visible spectra for example formaldehyde (HCHO); HMO energy calculation for ethylene and butadiene.

UNIT – III SPECTROSCOPY - I **15 Hrs**

Absorption and emission of electromagnetic radiation (emr) – LASER — Interaction of electromagnetic radiation with matter – Einstein coefficients; Microwave, IR and Raman spectroscopy of diatomic molecules – determination of molecular parameters – vibrational spectra of polyatomic molecules – IR and Raman active modes – overtone and combination bands – Fermi resonance – group frequencies and coupling interaction.

UNIT – IV SPECTROSCOPY – II **15 Hrs**

Electronic spectra of diatomic molecules – molecular quantum numbers – dissociation energy calculations – Birge-sponer extrapolation technique – pre-dissociation spectra – charge

transfer spectra – Fortrat diagram – electronic spectra of molecules – absorbance – oscillator strength;
Photoelectron spectroscopy – basic principles, spectrum, X-ray PES, (ESCA) – vibrational structure – koopman's theorem – PES of argon, oxygen and nitrogen.

UNIT – V

SPECTROSCOPY - III **15 Hrs**

ESR spectroscopy – principle, g-factor, experimental method, spectrum, fine and hyperfine structures and applications (H-atom, CH_3 radical, *p*-1,4 benzosemiquinone radical anion, naphthalene anion, Tempol)
NQR spectroscopy – quadrupole movement, coupling constant, quadrupole transition-electric field gradient and molecular structure ($_7N^{14}$, $_5B^{11}$, $_{17}Cl^{36}$)
Mossbauer spectroscopy – recoilless emission and resonance absorbtion, experimental method, isomeric shift and electric quadrupole splitting in Fe^{57}.

TEXT BOOKS: (UNIT I & II)

1. Ccotton F.A., 1971, Chemical applications of group theory, 3rd edition, wiley eastern Ltd., UK.
2. Ramakrishnan, V., Gopinathan M.S., 1988, Group theory in chemistry, Vishal publication, New delhi, India.
3. Veera Reddy, K. 1998, Symmetry and spectroscopy of molecules, New age International (p) Ltd.,

REFERENCE BOOKS:

1. G.M. Barrow, Introduction to molecular spectroscopy, McGraw-Hill, Newyork.
2. Banwell G.M., Fundamentals of molecular spectroscopy, IV Edn., TMH company Ltd.
3. Chang R., 1971, Basic principles of spectroscopy, McGraw-Hill.
4. Straughan B.P., Walker S., 1976, Spectroscopy – Vol. 1, 2 and 3, Chapman and Hall.
5.Drago R.S., 1999, Physical methods in chemistry, Saunder college publishing.

Course Designers

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2 Dr. A. R. Ramesh,
3 Dr. T. Arumuganathan,

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc.(Core elective 2)	Int. Marks	: 75
Class	: II MSc Chemistry	Ext. Marks	: 25
Semester	: III	Max. Marks	: 100
Sub. Code	: 3PCE1(C)	Hours/Week	: 5
Title of the Paper	: **Computer Applications in Chemistry (Option A)**	**Credits**	**:5**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- Understand the concepts in internet and E-mail.
- Have an understanding on HTML and JAVA APPLET and also to emphazise on their applications in chemistry.
- Get hands-on experience on chemistry-related software and their applications

UNIT-I: INTERNET AND E-MAIL **T: 10 + P: 5 Hrs**

INTERNET: Introduction- History- Importance of the Internet- Internet Access- Dial-Up connection, Direct connection and equipments –- Internet protocol(TCP/IP,FTP HTTP, TELNET and WAP)-Internet addressing – Domain Name-Mail address-Uniform Resource Locator(URL)-Web Browsing- Searching the Web- Search Engines(Yahoo, Google)- Intranet – Searching and utilizing Popular websites in Chemistry. On line literature survey- accessing of e-journals. Preparing articles for e-publications. Online structure drawing- Collection of spectral data using databases.

ELECTRONIC MAIL: Introduction-Working of E-Mail - Word processor for E-Mail-Mailing Basics – Composing and sending of an E-Mail- Address Book – Signature- File Attachments- Customizing your Mail program –Advantages and Disadvantages of E-Mail - Tips for effective E-Mail use- Smile keys.

UNIT- II: HTML **T: 8 + P: 7 Hrs**

HTML - Need- Structure of HTML Document- HTML Tags- Horizontal line Tags- Background and Text color Tags- Font Tags- MARQUEES Tags- Adding pictures - Ordered and Unordered Lists- Creating Links- Construction of Periodic Table with required data for first ten elements- Frames – Developing and hosting of Web Pages for a given molecule / chemical.

JAVA APPLETS: - Simple and Java applets with graphics- Applications of applet to draw 2D and 3D view of molecules.

UNIT-III: APPLICATIONS OF CHEMDRAW AND CHEM 3D SOFTWARE IN CHEMISTRY **T: 8 + P: 7 Hrs**

Introduction- Tool Pallets- Construction of the molecule using Chem Draw- Tools- Manipulating a molecule-Model display- Display type- Structure displays- Molecular Surface display- NMR simulation and interpretation- Naming IUPAC- Structure from Name and Name from Structure-Computational Concepts: - Computational methods: - Potential energy surface, geometry Optimizations property (calculations)-Molecular Mechanics Theory in brief - Animations- Difference between Chemdraw and Chem 3D.

UNIT-IV: APPLICATIONS OF SHELX PROGRAM IN CHEMISTRY

T: 5 + P: 10 Hrs

Basics of Crystals- Symmetry and operations- Seven Crystal systems- Bravais lattices – X-Ray Diffractometers- Unit cell parameters- X-ray data- Deduction of Space group - Structure solution and refinement using SHELX- Structure building using PLATON- H-Bonding.

UNIT-V: APPLICATIONS OF RASMOL and MATLAB IN CHEMISTRY-III

8 + P:7 Hrs

RASMOL: - Introduction- User commands– Identification of disulfide-bridges and visualization of :-hydrophobic and polar residues, the distribution of polar and non polar amino acids, side chain of carboxylate and amine , the different structural motives like α-helix, β-sheet and β - turn, the amino acids bound to Zn, active site of carboxypeptidase A, the environment of the active center.

MATLAB: - Introduction-advantages- getting started- windows for workspace, command interpretation, command history and current history- Addition- Use of sine and Cosine of angles(pi)- variable 'ans'- order of operations- significant decimals- Representation of matrix- getting transpose of a matrix- display of images- saving images-solving linear equations(case m=n only).

Text Books:

1. . Alexis Leon and Mathews Leon. 1999.Fundamentals of Information Technology Leon TECH World, UBS Publishers & Distributors Ltd., 1999.
2. E. Balagurusmy,2003. Programming with Java- A Primer, , Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2nd Edn., 15th Reprint
3. C. Xavier,2000 World wide web design with HTML, , Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2nd Reprint.

Reference Books:

1. Margaret Levine Young, 2001. Internet- Complete Reference, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
2. Barbara Kassev,1998. Using the Internet, EE edition, New Delhi, IV Edition.
3.Alexis Leon and Mathews Leon,2000 Internet for Everyone, Leon TECH World, Publishers & Distributors Ltd..
4. John Zukowski,2000. Mastering Java 2, BPB Publications, New Delhi.
5 Patrick Naughten,2002. The Java Hand Book, Tata McGraw-Hill Publishing Company Ltd., NewDelhi, 11th Reprint.
6. Herbert Schildt,2001. Java 2- The Complete Reference, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 4th Edn.
7. Holzner, John Zukowski,1999. Java 2 Complete: Steven BPB Publications, New Delhi, 1st Indian Edn..
8. Harley Hahn,2001. The Internet Complete Reference, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2nd Edn.
9 Chem Draw & Chem 3D –Manual
10. Shelx, Rasmol and MATLAB- Manuals.

REFERENCES in the NET

1.http://SCS 99.unige. Che/eng/toc.html
2.http://hackberry.chem.niu.edu: to/o/webpage.html
3.http://java.Sun.Com/applet/applets/chemical Models/index.html
4.http://ccl.osc.edu/chemistry.html
5. http://www.umass.eud/microbio/rasmol/
6. http://www. Mdli.com/cgi/dynamic/welcome.html/ (for CHIME similar to Rasmol)

Course designers

1. Dr. A. Elangovan
2. Dr. R. Mahalakshmy
3. Dr. A. Tamilselvi

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: M.Sc.(Core elective 2)	Int. Marks	: 75
Class	: II M.Sc Chemistry	Ext. Marks	: 25
Semester	: III	Max. Marks	: 100
Sub. Code	: 3PCE1(A)	Hours/Week	: 5
Title of the Paper	: **Advanced Organic Synthesis (Option B)**	**Credits**	**:5**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- gain knowledge in Stereoselective and retrosynthetic analysis
- understand about the guest-host interaction.
- gain scientific and technical knowledge in Green chemistry and biotransformation

UNIT-I REETEROSYNTHETIC ANALYSIS (15 Hrs)

Synthetic Strategy of the following target molecules: longifolene-juvabione-jasmone- 5-hexenoic acid-trans-9-methyl I-decalone- bicyclo (4,1,0) heptan-2 one- α-onocerin-isonootketone.

UNIT-II BIOGENESIS OF ALKALOIDS,TERPENOIDS & FLAVONES (15 Hrs)

Alkaloids(pyridine,phenanthrene and indole type)-nicotine-gramine-harmine-morphine-codine-terpenoids of classes with examples Lanosterol & Cholesterol from squalene-coumarins-carbohydrates-fructose-6-phosphate-xylose-5-phosphate-ribulose-5-phosphate-sucrose-amylose and amylopectin-flavones-proteins

Terpenoids: Geranyl diphosphate-Geraniol-Farnesol–Camphor-limonene-citronellol-caryophyllene(Corey methods) – santonin

UNIT-III BIOSYNTHESIS OF FATTY ACIDS (15 Hrs)

Introduction-acetate pathway-acetyl co-enzyme-A-biosynthesis of fatty acids-malonyl co-A-malonyl ACP-Acyl ACP-Acetoacetyl Co-A- biosynthesis of unsaturated fatty acids Major biosynthetic pathways: 1) Acetate-Malonate pathway: Biosynthesis of aromatic compounds, 2) Shikimic acid pathway ; Biosynthesis of essential amino acids – phenylalanine, tyrosine and tryptophan, carboxylic acid derivatives 3)Mevalonic acid pathway : Biosynthesis of mevalonic acid.

UNIT-IV: DYES (15 Hrs)

Introduction, various methods of dyeing, classification of dyes, nitroso dyes,Azodyes,-Fast green, Methyl Orange, Methyl Red, Fast Red, tripheylmethane dyes-Malachite green, Rosaniline, Aniline blue, Crystal violet, Xanethene dyes-Fluorescein,Rhodamine B, Anthroquinone dyes – Alizarin –Preparation and uses.

UNIT – V : BIOTRANSFORMATION (15 Hrs)

Advantages and disadvantages of Biocatalysts – Biocatalytic application. Hydrolytic reaction, reduction, oxidation, peroxidation – addition and elimination Reaction. Formation of C-C bond-glycosyl transfer reactions - Immobilisation – adsorbtion – ion binding entrapment into gels, into membranes – compartments – Micells and vesicles – modified and artificial enzymes – semisynthetic enzymes – catalytic antibodies.

Text Books:

1. R.K. Mackie, D.M. Smith and R.A.Aitken,1990. Guide book to Organic synthesis, Longman group, UK, 2n edition.
2. S.Warren, 1997.Organic synthesis, The disconnection approach, John Wiley & Son.
3. C.Daniel Gutsche, Calixarent,1989. Royal Society of Chemistry, Cambridge UK.

References:

1. Organnic Synthesis-Robert E.Ireland-Prantice Hall of India Pvt Ltd,NewDelhi.

2. Advanced Organic Chemistry-Reaction & Synthesis-Francis A.Corey & Richard J.Sundberg-V Edition-Springer.

3. Organic Chemistry-Francis A.Corey & Robert M.Giuliano-Tata McGraw-Hill Edition

4.Organic Chemistry-Natural Products Volume II-Dr.O.P.Agarwal-Goel Publishing House.

5. Chemistry of Carbocyclic Compounds-Azhuwalia

6. Pharmaceutical,Medicinal and Natural Product Chemistry-P.S.Kalsi & Sangeetha Jagtap-Narosa Publishing House

7. Organic Chemistry-Jonathan Clayden,Nick Greeves and Stuart Warren-Second Editiion-Oxford University Press

8. Synthetic Dyes-Gurudeep Chatwal

9.Biotransformation in Organic Chemistry-Kurt Faber-A Textbook-V Edition-Springer.

Course Designers

1. Dr. P. Tharmaraj
2. Dr. P. Prakash

THIAGARAJAR COLLEGE, MADURAI- 9
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DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: M.Sc. (Core 10)	Int. Marks	: 75
Class	: II MSc Chemistry	Ext. Marks	: 25
Semester	: IV	Max. Marks	: 100
Sub. Code	: 4PC1	Hours/Week	: 5
Title of the Paper	: **Organic Chemistry – IV**	**Credits**	**:4**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- Kindle the synthetic aptitude on the heterocycles and chemistry of steroids and vitamins.
- Understand the chemistry of heterocycles as alkaloids and terpenoids in natural products.
- Understand the Protein and Green Chemistry.

Unit - I CHEMISTRY OF HETEROCYCLIC COMPOUNDS (15 hrs)

Heterocyclics – Nomenclature – Compounds containing two hetero atoms: Synthesis and reactivity of pyrazole, imidazole, oxazole, thiazole, quinoline and isoquinoline. diazines: the chemistry of pyridazine, pyrimidine and pyrazine – Comparison of basicity of diazines. Introduction to anthrocyanins and flavonoids

Unit - II CHEMISTRY OF TERPENOIDS AND ALKALOIDS (15 hrs)

Chemistry of terpenoids: General methods of determining structure of terpenoids – α-pinene, Zingiberene, and Abietic acid.

Chemistry of alkaloids: General methods of determining structure of alkaloids – Structure elucidation of (i) Morphine (ii) Reserpine.

Unit- III CHEMISTRY OF STEROIDS AND VITAMINS (15 hrs)

Chemistry of steroids : Introduction – Structural elucidation of Cholesterol – Androsterone and Testosterone (male sex hormones) – Oesterone, progesterone (Female sex hormone).

Classification of Vitamins: Nomenclature of Vitamins – Strucure and Biological functions of vitamins: Vitamin A (Retinol), Vitamin B2 (Riboflavin), Vitamin B6 (Pyridoxine), Vitamin B12, Vitamin C, D and E (Structure elucidation and synthesis not required).

Unit IV CHEMISTRY OF PEPTIDES AND NUCLEIC ACID (15 hrs)

(a) Polypeptides – Classification - the peptide linkage - Structure of amino acids – 1^0, 2^0, 3^0 and quaternary structure) – Solid phase peptide synthesis (Merifield) – use of protecting groups and reagents – Structural elucidation of glutathione, thyroxin and oxytocin.

(b) Nucleosides, Nucleotides and Nucleic acids – structure and synthesis of nucleosides and nucleotides – Elementary treatment on the structure of DNA and RNA

Unit – V GREEN CHEMISTRY (15 hrs)

Green Chemistry: Importance and principles of Green chemistry - Solid state and Solvent free organic reactions – Solid supported reagents – Microwave assisted reactions - Sonochemical approach - Reactions in ionic liquids – supercritical CO_2 medium – aqueous medium - enzymatic and electrochemical methods.

Text Books:

1. I.L. Finar, 2005.Organic Chemistry, Vol. II, V Edition, ELBS, UK.
2. S.F. Dyke,1965. Chemistry of Vitamins, Interscience, Toronto.
3. O.P. Agarwal,2002 Chemistry of Natural products, Vol. I and II, Himalaya Publishing House, New Delhi..
4. V.K. Ahluwalia, M. Kidwai2006. " New trends in Green Chemistry" Second Edition, Anamaya publishers, New Delhi,.
5. Gurdeep Chatwal,1997. Organic Chemistry of natural products, Vol. I, Himalaya Publishing House .
6. Morrison and Boyd, Organic Chemistry, Prentice-Hall of India private limited, New Delhi, 6th Edition.

Reference Books

1. Hermann Dugus, 2004.Bioorganic Chemistry, Springer International, III Edition, New Delhi.
2. D.L. Nelson and M.M. Cox, 2008.Lehningers' Principal of Biochemistry, W.H. Freeman and Company, New York, 5th Edition.
3. L.F Fieser and M. Fieser,1991 Steroids, Reinhold Press, Atlanta,.

Course designer

1 Dr. P. Tharmaraj
2 Dr. P. Prakash
3 Dr. R. Mahalakshmy
4 Dr. A. Tamil Selvi

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: M.Sc Chemistry (Core 11)	Int. Marks	: 25
Class	: II Year	Ext. Marks	:75
Semester	: IV	Max. Marks	:100
Sub. Code	: 4PC2	Hours/Week	:5
Title of the Paper	: **Inorganic Chemistry- IV**	**Credits**	**:4**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- gain knowledge on organo metallic chemistry and transition metal catalysts.
- understnand bioinorganic chemistry.
- get an idea about inorganic photochemistry.
- understand the concept of PES, EPR, Mossbauer spectroscopic techniques.

UNIT –I ORGANOMETALLIC CHEMISTRY –I 15 Hrs

Stability of organo metallic compounds- β hydrogen elimination- the sixteen and eighteen electron rule. Synthesis – structure and bonding in metal carbonyls – isoelectronic and isolobal analogy- use of IR in the structural elucidation of carbonyl compounds– metal nitrosyls – dinitrogen complexes. π donors-**Carboxylic ligands and complexes**. Synthesis structure bonding and reactivity of carbenes, carbines, metallocenes and other aromatic cyclopolyenes – Ferrocene – bonding and structure – sigma, pi and hapto nomenclature. Arene complexes – olefin – acetylene and pi allyl complexes.

UNIT – II ORGANOMETALLIC CHEMISTRY –II 15 Hrs

Catalysis involving organometallic compounds – properties of metals and ligands in homogeneous catalysis – oxidative addition and reductive elimination – hydrogen abstraction – activation of small molecules by complexation-agnostic interaction-insertion-alkyl migration-insertion and elimination-catalytic reactions- hydrogenation of olefins – Wilkinson's catalyst – hydroformylation – syn-gas-water gas shift reactions- oxidation of olefins – Wacker process – propylene polymerization - Olefin metathesis -Ziegler natta catalyst -cyclo oligomerisation of acetylene , butadiene- Reppe's catalyst . Mansanto's acetic acid synthesis-Fischer-Tropsch's synthesis of Synthetic gasoline.

UNIT –III BIO-INORGANIC CHEMISTRY
15Hrs

Essential and trace elements in biological systems –ion pump- metalloporphyrins – the porphyrine ring system – chlorophyll – photosynthetic electron transfer - Electron transport sequence – biological electron transfer – electron transfer agents – cytochromes – Hemoglobin – myoglobins – and synthetic oxygen carriers – nitrogen fixation – in vivo and in vitro – copper proteins-Metal complexes in medicine- Biomineralisation of iron-Metal complexes in medicine-Chelate therapy- Metals used for diagnosis and chemotherapy-metal-nucleic acid interactions.

UNIT-IV PHYSICAL METHODES IN INORGANIC CHEMISTRY-II 15Hrs

Electron paramagnetic resonance spectroscopy: Applications of hyperfine splitting and g factor to structural elucidation- Zero field splitting-Krammer's Degeneracy- EPR spectra of Cu (II) and Mn (II) in various site symmetry- covalency of metal-ligand bonding

by EPR- study of dynamic processes in solids- Study of phase transition by Mn (II) – John Teller distortions in Cu (II) complexes.

Mossbauer spectroscopy: Basic principles- Doppler effect- Isomer shift- Electron nuclear hyperfine interactions- Quadrupole and magnetic interactions in the study of structure and bonding in Iron and Tin complexes and in Biological systems.

UNIT –V INORGANIC PHOTOCHEMISTRY 15 Hrs

Excited states of coordination complexes – properties of excited states charge transfer and energy transfer – photochemical pathways.

Photoredox reactions of Co(III) and Cr(III) complexes – photosubstitution reactions – photoaquation, photoanation and photorearrangements - Role of TiO_2 in solar energy conversion – Photoredox chemistry of Ruthenium bipyridyl and Ruthenium(II) poly pyridyl compounds- energy conversion and photochemical decomposition of water using Ru complexes- storage of solar energy.

TEXT BOOKS: -

1. Cotton F.A. and Wilkinson, G.1998. Advanced Inorganic Chemistry, Wiley-Interscience publications, John Wiley & Sons, V Edn. New York.
2. Wahid U. Malik, G.D. Tuli and R. D. Madan,2006. Selected Topics in Inorganic Chemistry, S. Chand & Co. Ltd., New Delhi,
3. Nakamoto, Kazuo, Paul J. McCarthy,1986. Spectroscopy and Structure of Metal Chelate Compounds, IV edition, John Wiley and Sons. Inc., New York.
4. Drago, R. S. Van Nostrand and Reinhold,1976. Physical Methods in Chemistry.
5. Purcell K.F. and Kotz J.C.,1977. Holt Saunders, Inorganic chemistry, Philadelphia.
6. Raymond Chang, 1971.Basic principles of Spectroscopy, Mc Graw Hill, New Delhi.
7. Straughan B. P. and Walker, S. 1976.Spectroscopy, Vol.3, Chapman and Hall, New York,
8. T.C. Gibbs,1978. Principles of Mossbauer Spectroscopy, Chapman and Hall, New York.
9. Arthur W. Adamson & Paul D. Fleischauer, 1975Concepts of Inorganic Photochemistry, John Wiley & Sons. In., New York.

REFERENCE BOOKS: -

1. Huheey, J. E., Ellen A. Keiter, Richard L. Keiter,2004. Inorganic chemistry, IV Edn., pearson Education (Singapore) (P) .Ltd., Delhi.
2. Wahid U. Malik, G.D. Tuli and R. D. Madan, 2006.Selected Topics in Inorganic
3. Chemistry, S. Chand & Co.Ltd., New Delhi.
4. A.G. Sharpe,2004. Inorganic Chemistry, III Edn., Addition – Weskey Longman, UK .
5. Gary L. Miessler and Donald A. Tarr, 2004.Inorganic Chemistry, Pearson Education, Inc., 3rd Edn., New Delhi.
6. D. F. Shriver and P.W. Atkins,1999. Inorganic Chemistry, Oxford University Press, London.
7. K. Hussain Reddy, 2005. Bioinorganic Chemistry, New Age International (P) Ltd., Delhi.
8. William W. Porterfield, 2005.Inorganic Chemistry, II Edn., Elsevier, New Delhi..

Course designers

1 Dr.A.Suganthi
2 Dr.A. Elangovan
3 Dr.D.S. Bhuvaneshwari
4 Dr.K.Selvakumar

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: M.Sc Chemistry (Core 12)	Int. Marks	: 25
Class	: II Year	Ext. Marks	: 75
Semester	: IV	Max. Marks	: 100
Sub. Code	: 4PC3	Hours/Week	: 4
Title of the Paper	: **Physical Chemistry-IV**	**Credits**	**: 4**

Course Outcomes:
On successful completion of the course students will be able to
- Impart knowledge on various kinetic theories and reaction rate
- Understand the physical concepts of photochemistry and surface chemistry
- Gain knowledge on basics and applications on polymer chemistry

UNIT-I **(12 hrs)**
CHEMICAL KINETICS-I
Simple Collision theory- modification - Absolute reaction rate theory (ARRT) - Statistical and thermodynamics formulation - Comparison of ARRT with collision theory- Significance of entropy of activation- Relation between ΔH and Ea- Transmission co-efficient; ARRT of termolecular reactions – Unimolecular reactions - Lindemann, Hinshelwood, RRKM and Slater treatments. –solution kinetics – ARRT of reaction in solution – Influence of ionic strength on the rates of ionic reactions (salt effects).

UNIT-II **(12 hrs)**
CHEMICAL KINETICS-II
Fast reactions-flow and relaxation techniques, Temperature Jump and pressure jump method - complex reactions – opposing, consecutive and parallel reactions; Chain reaction – kinetics and general characteristic – H_2 - Br_2 reaction, Rice – Herzfeld mechanism for decomposition of acetaldehyde & ethane – Branched chain reaction – study of H_2-O_2 explosive reaction-homogeneous catalysis – acid, base catalysis.

UNIT-III **(12 hrs)**
PHOTOCHEMISTRY
Physical properties of the electronically excited molecules – radiationless transitions – Jablonski diagram-Internal conversion and intersystem crossing – Stern-Volmer equation and its application – radiative transition – fluorescence, phosphorescence and other deactivation processes; Effect of temperature on emission process – photosensitization and Chemiluminescence; Experimental techniques in photochemistry, chemical actinometers.
photochemical Kinetics of H_2-X_2 reactions – Photolysis of acetaldehyde Photodimerisation of anthracene – Photoequation of $[Cr(NH_3)_5NCS]^{2+}$ and photo isomerisation of Cis-bis glycinato Pt(II); Applications of photochemistry – Solar energy conversion and storage – photo synthesis- excited state acidic property and energy transfer.

UNIT-IV **(12 hrs)**
SURFACE CHEMISTRY
Physisorption and Chemisorption – adsorption isotherm – derivation of Langmuir and Freundlich, derivation of B.E.T equation of multilayer adsorption – application of BET equation to surface area determination, derivation of Gibbs adsorption isotherm. Heterogeneous catalysis and their kinetics – chemical reactions on solid surfaces -

Mechanism & Kinetics of unimolecular and bimolecular surface reactions – Langmuir – Hinshelwood, Langmuir –Ridel mechanism, ARRT of surface reactions; Basic concepts of Micelles and Reverse Micelles.

UNIT-V **(12 hrs)**

POLYMER CHEMISTRY

Introduction of Polymers – Classification-Tacticity - Polymerisation - Addition, Co-polymerisation and Condensation polymerisation – Kinetics of polymerization-Free radical Chain polymerization-Cationic- anionic polymerization- Molecular weight determination – Osmotic pressure methods- Light Scattering method-Ultra Centrifuge and Viscosity methods; Classification of Plastics-Thermosetting & Thermoplastic resins-Adhesives-Compounding of Plastic - Fabrication - compression moulding, injection moulding, extrusion moulding and Blow moulding.

Industrially important polymers – Preparation, Properties and uses of (LDPE & HDPE), Polystyrene, polyester, acrylo polymer, Teflon, Phenolic resins, amino resins and epoxy resins, Polyvinyl acetate-composites of Resins-ABS-Conducting Polymers-Polyacetylene, Polyaniline, Inorganic polymer-Silicone and Biopolymers-cellulose.

Text Books:

1. Glasstone S., 1974, Textbook of Physical chemistry, III Edition McMillan, Alasca.
2. Daniels F., Alberty, R.A. 1974, Physical Chemistry, John willey and sons , UK.
3. Moore, W.J. 1972, Physical Chemistry, V Edition, Orient Longman, UK.
4. Billmeyer Jr F.W., 1984, A text book of Polymer Chemistry – III edition, John Willey and Sons, UK.
5. Gowarikar V *et al*., 1986, Polymer Science, Willey Eastern Limited, New York.
6. Rodriguez F., 1987, Principles of polymer chemistry, Tata McGraw- Hill Publishing Co. Ltd., New Delhi, India.

Reference Books:

1. Laidler K.J., 2005, Chemical Kinetics, II Edition, Tata McGraw Hill, UK.
2. Frost A.A., Pearson R.G., 1990, Kinetics and Mechanism, New York.
3. Wilkinson F., 2000, Chemical Kinetics and Reaction Mechanism, Var Nostrard Reinhold Co., New York.
4. Rohatgi-Mukherjee K.K., 1999, Fundamentals of Photochemistry, Wiley Eastern Ltd., Revised edition, New York.
5. Adamson A.M., 2002, Physical Chemistry of Surfaces, V.Edition, John Willey, UK.
6. Laider, K.S., 2005, Chemical kinetics, III Edition, TMH, New York.
7. Allcock H.R., Lampe W., 1991, Contemporary polymer chemistry, Prentice Hall UK.
8. Young, 2002, Polymer Chemistry II, Chapman Hall.
9. Arora Singh, 2001, Polymer Chemistry, Anmol Publications Pvt. Ltd.

Course Designers

1. Dr. R. Sayee Kannan,
2. Dr. A. R. Ramesh,
3. Dr. T. Arumuganathan,

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: M.Sc.Chemistry (Core 7 lab)	Int.Marks	: 40
Class	: II Year	Ext. Marks	: 60
Semester	: IV	Max. Marks	: 100
Sub. Code	: 4PCL1	Hours/Week	: 5
Title of the Paper	: **Organic Chemistry Lab 2**	**Credits**	**:5**

Course Outcomes:
On successful completion of the course students will be able to
- Prepare organic compounds in two steps.
- Do quantitative estimation of organic compounds.

DOUBLE STAGE PREPARATION
1. p-Nitroaniline
2. p-Bromoaniline
3. 1,3,5-Tribromobenzene
4. Benzanilide
5. m-Nitrobenzoic acid
6. p-Iodonitrobenzene (III stage)
7. 2,5-dihydroxy acetophenone

(any five preparations only)

ESTIMATION

1. Estimation of glucose – Lane and Eynon method
2. Estimation of glucose-Betrand method
3. Estimation of ethyl methyl ketone
4. Estimation of acetone
5. Estimation of glycine

Course Designers

1. Dr. P. Prakash
2. Dr. R. Mahalakshmy

THIAGARAJAR COLLEGE, MADURAI- 9

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DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc.Chemistry (Core 8 Lab)	Int.Marks	: 40
Class	: II Year	Ext. Marks	: 60
Semester	: IV	Max. Marks	: 100
Sub. Code	: 4PCL2	Hours/Week	: 5
Title of the Paper	: **Inorganic Chemistry Lab 2**	**Credits**	**:5**
	Inorganic Estimations and Preparations		

I. Gravimetric Analysis:

a) Estimation of lead as lead chromate
b) Estimation of Nickel as Ni-DMG
c) Estimation of Magnesium as Magnesium oxinate

III. Preparation: (Any FOUR)

a) Potassium cupricsulphate
b) Potassium trioxalatoaluminate
c) Hexathioureaplumbusnitrate
d) Tetrammine copper(II)sulphate
e) Ferrous/Ferric oxalate

III. Colorimetry:

a) Estimation of Iron (III)
b) Estimation of Copper (II)

IV. Chromatography (Demo only NOT for the Exam)

a) Paper Chromatography: Chromatographic separation of a mixture of Co, Mn, Ni and Zn
b) Column Chromatography: Chromatographic separation of potassium permanganate and dichromate**.**

V. UV-visible spectrophotometer (Demo only NOT for the Exam)

Determination stability constant for a complex.

Total Marks = 100 (Internal 40 + External 60)

Course Designers

1. Dr. A. Suganthi
2. Dr. D. S. Bhuvaneshwari

THIAGARAJAR COLLEGE, MADURAI- 9

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DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc.Chemistry	Int.Marks	: 40
Class	: II Year	Ext. Marks	: 60
Semester	: IV	Max. Marks	: 100
Sub. Code	: PJ	Hours/Week	: 6
Title of the Paper	**: Project**	**Credits**	**:3**

Course Outcomes

On successful completion of the course students will be able to

1. Get skills on developing new materials through new synthetic routes and

2. Characterize the material using different techniques.

2. Learn research methodologies along with literature survey.

Marks

External Examiner **:** Viva : 20
External Examiner **:** Evaluation of Project : 40
Internal Examiner **:** Evaluation of Project : 40

100

M.Sc.,Chemistry(Special)

Self finance

THIAGARAJAR COLLEGE, MADURAI- 9
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DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

MASTER OF CHEMISTRY
Semester – I

Course	Code No	Subject	Hrs/ Week	Cred.	Total Hrs	Max Mark CA	Max Marks SE	Total
Core 1	S1PC1	Organic chemistry I	4	4	60	25	75	100
Core 2	S1PC2	Inorganic Chemistry I	4	4	60	25	75	100
Core 3	S1PC3	Physical Chemistry I	4	4	60	25	75	100
Special Lab1	S1PC L4	Separation techniques and quantitative analysis.	4	4	60	40	60	100
Core Lab-1	S2PC L1	Organic Chemistry-Lab 1	5	*	75	-	-	-
Core Lab-2	S2PC L2	Inorganic Chemistry-Lab 1	5	*	75	-	-	-
Core Lab-3	S2PC L3	Physical Chemistry-Lab 1	4	*	60	-	-	-
Total			**30**	**16**	**450**	**75**	**225**	**400**

SEMESTER 2

Course	Code No	Subject	Hrs/ Week	Cred.	Total Hrs	Max Mark CA	Max Marks SE	Total
Core 4	S2PC1	Organic chemistry II	4	4	60	25	75	100
Core 5	S2PC2	Inorganic Chemistry II	4	4	60	25	75	100
Core 6	S2PC3	Physical Chemistry II	4	4	60	25	75	100
Core elective-1	S2PCE1	C-Programming Fundamentals & Applications in Chemistry (Option A) Medicinal Chemistry (Option B)	5	5	75	25	75	100
Core Lab 1	S2PCL1	Organic Chemistry-Lab1	5	5	75	40	60	100
Core Lab 2	S2PCL2	Inorganic Chemistry-Lab1	4	4	60	40	60	100
Core Lab 3	S2PCL3	Physical Chemistry – Lab	4	4	60	40	60	100
Total			**30**	**30**	**450**	**220**	**480**	**700**

Semester – III

Course	Code No	Subject	Hrs/ Week	Cred.	Total Hrs	Max Mark CA	Max Marks SE	Total
Core 7	S3PC1	Organic chemistry-III	5	4	75	25	75	100
Core 8	S3PC2	Inorganic Chemistry-III	5	4	75	25	75	100
Core 9	S3PC3	Physical Chemistry -III	5	4	75	25	75	100
Core Elective 2	S3PCE 1	ComputerApplications in Chemistry (Option A) Advanced organic synthesis (Option B)	5	5	75	25	75	100
Core 7 Lab	S4PCL 1	Organic Chemistry-Lab2	5*	-	75	-	-	-
Core 8 Lab	S4PCL 2	Inorganic Chemistry-Lab2	5*	-	75	-	-	-
Total			**30**	**17**	**450**	**220**	**480**	**400**

Semester – IV

Course	Code No	Subject	Hrs/ Week	Cred.	Total Hrs	Max Mark CA	Max Marks SE	Total
Core 10	S4PC1	Organic chemistry-IV	4	4	75	25	75	100
Core 11	S4PC2	Inorganic Chemistry-IV	4	4	75	25	75	100
Core 12	S4PC3	Physical Chemistry –IV	4	4	75	25	75	100
Core 7 Lab	S4PCL1	Organic Chemistry-Lab 2	4	4	75	40	60	100
Core 8 Lab	S4PCL2	Inorganic Chemistry-Lab 2	4	4	75	40	60	100
Special Lab 2	S4PCL3	Synthesis and spectral analysis	4	4	75	40	60	100
S PJ	SPJ	Project	6	3	4	40	60	100
Total			**30**	**27**	**450**	**225**	**405**	**700**

- **For core practical credits will be given at the end of even semester (Year wise practical)**

A) CONSOLIDATION OF CONTACT HOURS AND CREDITS: PG

Semester	Contact hours	Credits
I	30	16
II	30	30
III	30	17
IV	30	27
Total	**120**	**90**

B) Curriculum Credits

Core	(16+12+12+12) =	52 Credits
Core Lab	(12+13) =	25 Credits
Core electives	5+5 =	10 Credits
Project	=	03 Credits
Total	**=**	**90 Credits**

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: M.Sc. Chemistry (Spl) (Core 1)	Int. Marks	: 25
Class	: I Year	Ext. Marks	: 75
Semester	: I	Max. Marks	: 100
Sub. Code	: S1PC1	Hours/Week	: 4
Title of the Paper	: **Organic Chemistry – I**	**Credits**	**: 4**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- Understand the concept of aromaticity.
- Gain the knowledge about structure and stability of reaction intermediates.
- Understand the reaction mechanism, isomerism and stereochemistry of organic molecules.

UNIT-I Delocalized chemical bonding, Aromaticity and Reaction intermediate (12 hrs)

Electron displacement – Steric effect – Tautomerism

Concept of aromaticity – Benzenoid and non-benzenoid compounds – Huckel's rule - Non aromatic and anti aromaticity - Alternant and non alternant hydrocarbons - aromaticity of cyclopentadienyl anion and Tropylium cation – Azulenes and annulenes.

Generation , structure, stability, reactivity and reactions of carbocations, carbanions, free radicals (reactions include Pinacol coupling, McMurray reactions, acyloin reaction, selective radical bromination). Carbenes: Stability - Structure – Generation – Types – Reactions. Nitrenes: Generation and reactions.

UNIT - II Reaction mechanism-I (Basics) (12 hrs)

Guidelines for proposing reasonable mechanism – Energetics and energy profile diagrams – transition state – Intermediate – Hammond's postulate – principle of microscopic reversibility - kinetic and thermodynamic controls – kinetic and non-kinetic methods of determining organic reaction mechanism – primary and secondary kinetic isotope effects – Effect of structure on reactivity: Resonance and field effects – Quantitative treatments – Hammett and Taft equation.

UNIT - III Reaction mechanism-II (Substitution Reactions) **(12 Hrs)**

Aliphatic Nucleophilic Substitution Reactions - Mechanism – S_N1 and S_N2, mixed S_N1& S_N2, S_Ni, SET, Neighboring group participation by σ and π bonds – Reactivity at an allylic, aliphatic trigonal and vinylic carbon – Effect of substrate structure, attacking nucleophile, leaving group and reaction medium on reactivity – Ambident nuleophiles.

Aromatic Nucleophilic Substitution Reactions – Unimolecular, Bimolecular and Benzyne mechanism – Effect of substrate, leaving group and attacking nucleophile.

Electrophilic substitution reactions:

Aliphatic: Bimolecular mechanism SE2 and SE1 – Aromatic: Arenium ion mechanism – Orientation and reactivity: Ortho and Para ratio, partial rate factor

UNIT-IV Reaction Mechanism III (Elimination reactions) **(12 hrs)**

E_1, E_2 and E_1CB mechanism- Competition between substitution and elimination – orientation of double bonds (Bredt's rule and Hofmann and saytzeff rules) – Effect of substrate structure, attacking nucleophile, leaving group and nature of reaction medium on reactivity – Mechanism and orientation in pyrolytic eliminations - Cope and Chugaev reaction (cis-elimination)

UNIT-V Reaction Mechanism IV (Addition to carbon-Carbon multiplebonds) **(12 hrs)**

Electrophilic, Nucleophilic & free radical addition – Mechanism, Orientation and reactivity and reactions - addition to conjugated systems- addition to α,β-unsaturated carbonyl and nitrile systems- Michael addition – addition of Grignard reagents-Diels Alder reaction- Enamine reaction - Mechanism of Reformatsky reaction- Darzen reaction- Mannich reaction - Wittig reaction - Stobbe and Dieckman condensation.

Text books:

1 Jerry March,1992. Advanced Organic Chemistry, Reaction mechanism and structure, John Wiley and sons, 4th Edition, New york.
2 R.O.C. Norman,2001. Principles of organic synthesis, 3rd Edition Nelson Thorines, Hong Kong
3 P.J. Garrat,1991. Aromaticity, Mc Graw Hill.
4 F.A. Carey and R.J. Sundberg,1990. Advanced Organic Chemistry, Part A and B, Plenum Press, 3rd Edition .
5 G.M. Badger, 2001.Aromatic character and Aromaticity, Cambridge, USA.

Reference Books:

1 Clayden, Greeves, Warren and Wothers, 2007. Organic Chemistry, Oxford University Press.
2 E.S. Gould,1960 Mechanism and structure in Organic Chemistry, Holtoo INC.
3 G. Solomon, 1992.Organic Chemistry, John Wiley and sons INC, 5th Edition.
4 R.K. Mackie and D.M. Smith,1993. Guide Book to Organic synthesis,Longman, UK.
5 Peter sykes,2003. A Guidebook to Mechanism in Organic Chemistry, Longman, 6th Edition.

Course designer

1 Dr. P. Tharmaraj
2 Dr. P. Prakash
3 Dr. R. Mahalakshmy
4 Dr. A. Tamil Selvi

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc Chemistry(Spl) (Core 2)	Int. Marks	: 25
Class	: I Year	Ext. Marks	:75
Semester	: I	Max. Marks	: 100
Sub. Code	: S1PC2	Hours/Week	: 4
Title of the Paper	: **Inorganic Chemistry- I**	**Credits**	**:4**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- Understand the concepts of bonding and electronic structure of atom.
- Write the concept of acid base systems and non aqueous solvents.
- Understand nuclear Chemistry.

UNIT – I: ELECTRONIC STRUCTURE OF ATOM 12 Hrs

Modern views on atomic structure: Wave mechanical description of electron and orbitals, radial density functions and orbital energies, angular functions and orbital shapes-term symbol.

Modern periodic table: Periodic properties-Ionisation potential, Ionic radii and covalent radii, Electron affinity, Electronegativity and their trend in the periodic table- Comparison of transition metals of 3d, 4d and 5d series.

UNIT – II: NATURE OF THE CHEMICAL BOND 12Hrs

Ionic bond – Lattice energy and its determination by Born-Haber cycle and Born-Lande Equation – Hardness, electrical conductivity and solubility of ionic compounds – ionic radii. Goldschmidths radius ratio- packing of atoms and ions in solids. Calculation of ionic radius – Pauling's method and Linde's method. Effective nuclear charge-Slater's rule.

Covalent bond – qualitative treatment of valence bond theory – Heitler-London theory – Pauling theory and Molecular orbital theory LCAO theory – Hybridisation and resonance.

UNIT – III: BONDING APPLICATION 12 Hrs

Application of VB and MO theories to the structure of homonuclear (H_2, B_2, C_2, N_2 and O_2) and heteronuclear (CO, NO, HCl, HF) diatomic and selective polyatomic molecules (CO_3^{2-}, NO_2, BeH_2, CO_2) comparison of VB and MO theories. Bond properties, bond order, bond energy, bond length and bond polarity. Partial ionic character of covalent bonds-Fajan's Rule –Effects of polarization. VSEPR theory and its applications to H_2O, NH_3, ICl_2^-, IF_5 IF_7, ClO_4^- ions. VSEPR applied to Xenon compounds like Xenon halides and xenon oxides.

UNIT – IV: ACID-BASE SYSTEMS AND NON-AQUEOUS SOLVENTS. 12Hrs

A generalized acid base concepts – steric effects and solvation effects – Measures of Acid-Base strength –Factors affecting the strength of acids and bases- Common ion effect and Henderson's equation- - Hard and Soft acids and bases – symbiosis – theoretical basis of hardness and softness. Classification of solvents – properties of ionizing solvents. Typical reactions in non–aqueous solvents- liquid HF, liquid SO_2, liquid NH_3, and Sulphuric acid.

UNIT – V: NUCLEAR CHEMISTRY 12Hrs

Radioactive decay and equilibrium- Different types of nuclear reaction – spallation – fission and fusion. Theories of fission. Fissile and Fertile isotopes.-Nuclear fusion – stellar energy-Nuclear forces: Liquid drop model, shell model-Calculation of Q-values – Cross section. Detectors: Scintillation counter, Gas Ionisation chamber. Proportional Counter, Cerenkov Counter-Accelerators: Cyclotron, Synchrocyclotron, Betatron. Radio isotopes and their Applications: Activation analysis, Isotopic dilution technique-radiometric titration.

Nuclear reactors: Types (Thermo nuclear and breeder reactors) feed materials production. Reprocessing of nuclear materials waste disposal. Atomic power projects in India. Hazardous of radioactive materials and Safety measures.

TEXT BOOKS:

1 Clyde Day, M. Jr & Joel Selbin,1967. Theoretical Inorganic Chemistry, Chapman & Hall Ltd., London, 5th Reprint.

2 Chandra, A. K. 1988.Introductory Quantum Chemistry, Tata McGraw Hill, New Delhi, 3rd Edn..

3 Lee, J. D. 2002.Concise Inorganic Chemistry, Blackwell Science Ltd., V Edn., London. .

4 Durrant P. J. and Durrant, B. 1970.Introduction to advanced inorganic chemistry, Longman Group Ltd, London.

5 Glasstone, S. 1967.Source Book of Atomic Energy, Van Nostrand, III Edn, East West Press (P) Ltd., New Delhi.

6 Friedlander, G. Kennedy J.S and Millodr, M. M. 1984.Nuclear and radiochemistry, John Wiley & Sons, New York.

REFERENCE BOOKS:

1. Huheey, J. E. Ellen A. Keiter, Richard L. Keiter,2004. Inorganic Chemistry, IV Edn., Pearson Education (Singapore) Pvt. Ltd., New Delhi.

2. Madan, R. D.2004. Modern Inorganic Chemistry, S. Chand & Company Ltd., New Delhi,

3. Wahid U. Malik, G. D. Tuli and R. D. Madan,2006. Selected Topics in Inorganic Chemistry, S. Chand & Co. Ltd., New Delhi.

4. Gary L. Miessler and Donald A. Tarr, 2004.Inorganic Chemistry, Pearson Education, Inc., 3rd Edn., New Delhi.

5. William W. 2005.Porterfield, Inorganic Chemistry, II Edn., Elsevier, New Delhi.

6. Sharpe, A.G.2004 Inorganic Chemistry, III Edn., Addition – Wesley Longman, UK,

7. Shriver D. F. and Atkins, P.W.1999. Inorganic Chemistry, Oxford University Press, London,

8. Arnikar, H. J.2005 Essentials of Nuclear Chemistry, IV Edn., New Age international (P) Ltd., New Delhi.

Course Designer

1. Dr. A. Suganthi
2. Dr. A. Elangovan
3. Dr. D.S. Bhuvaneshwari
4.Dr. K.Selvakumar

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc Chemistry (Spl) (Core 3)	Int. Marks	: 25
Class	: I Year	Ext. Marks	:75
Semester	: I	Max. Marks	: 100
Sub. Code	: S1PC3	Hours/Week	: 4
Title of the Paper	: **Physical Chemistry- I**	**Credits**	**: 4**

Course Outcome:

On successful completion of the course students will be able to

- Understand the properties of gases, liquid crystals, theory of thermodynamic equilibrium and non-equilibrium.
- Aware of concepts of quantum chemistry and their applications
- Develop their knowledge in physical features of biochemistry

UNIT-I

PROPERTIES OF GASES AND LIQUID CRYSTAL (12 HRS)

Equations of states - molecular speeds- Maxwell distribution of molecular velocities - one, two and three dimensions; Energy distribution-Maxwell – Boltzmann distribution law- Rotation, vibrations and translational degree of freedom- principle of equipartition of energy and heat capacity; Molecular collisions- collision diameter, cross-section, number, frequency, mean free path (definition only); Transport phenomena in gases - Viscosity of gases – viscosity in terms of momentum transfer, thermal conductivity, and diffusion.

Liquid crystals- Nematic (p-methoxycinnamic acid), cholesteric (cholestryl benzoate), smectic (ethyl-p-azoxybenzoate)- theory and its application in liquid crystals display.

UNIT-II

THERMODYNAMICS – EQUILIBRIUM AND NON-EQUILIBRIUM (12 HRS)

A general review of enthalpy, entropy and free energy concepts: Nernst heat theorem- Genesis of third law and its limitations - derivation of third law and their application to real gases- calculation of $(\delta H/dP)T$, $(\delta E/dV)T$ and $\mu j.T$ for gases-

Thermodynamics of open systems - partial molar properties- internal energy, molar enthalpy, molar entropy, molar volume, free energy (chemical potential) – determination of partial molar properties; Chemical potential- relationship between partial molal quantities - Gibbs - Duhem equation- Duhem Margules equation; thermodynamic properties of real gases- Fugacity concept- Determination of Fugacity of real gases.

Electrolytes and Non-Electrolytes- Equilibrium thermodynamics- Gibbs phase rule and its application to three component systems- quantitative treatment of Le Chatlier principle- equilibria respond to pressure and temperature; Non Equlibrim Thermodynamics -Basic concepts - Principle of microscopic reversibility and the Onsager reciprocal relations.

UNIT –III

QUANTUM CHEMISTRY-I (12 HRS)

Black Body radiation- Heisenberg's uncertainity principle- de Broglie wave particle duality- Experimental verification of matter waves- Compton effect- The Schrodinger equation and the postulates of quantum mechanics- operators –linear and non-linear operators- commutative and non-commutative operators- Hermitian operators- Eigen function, Eigen values and degeneracy- Orthogonality and Normalization of wave functions- Derivation of Schrodinger's wave equation.

UNIT- IV

QUANTUM CHEMISTRY-II (12 HRS)

Application of quantum mechanics to simple system-Application of SWE to free particle moving in one dimension- particle moving in a one dimension box - particle moving in 3D cubical and rectangular box- Quantum Mechanical tunneling - particle in a ring- rigid rotor- Simple Harmonic oscillator - hydrogen atom- angular momentum spin momentum- ladder operator.

UNIT-V

PHYSICO-CHEMICAL PRINCIPLES AND BIOLOGICAL REACTIONS (12 HRS)

(i) Studies on biochemical equilibria: Buffer system of intracellular fluids – H_2CO_3 / HCO_3^-

HPO_4^{2-} / $H_2PO_4^-$ - Application of Henderson-Hasselbach equation; Ion channels – membrane and static potentials - Role of Na+ / K+ ions in neural communications –Na^+ / K^+ ion pump; allosterism and oxygen saturation curves for hameoglobin and myoglobin – derivation of Hill equation

(ii) Medicinal Chemistry – QSAR; Partition parameters – Partition Coefficients (P) – hydrophobicity or lipophilicity constant (π); Electronic Parameters – Hammett constant (σ); Steric parameters – Taft Steric paramerter (Es); Hansch equation; Craig Plot – Topliss Scheme; ΔG criteria for biological reactions – ATP and ADP conversion.

Text Books:

1. Glasstone S. A., 1999, text book of Physical Chemistry, McMillan India Ltd.,
2. Alberty R. A. and Daniels F., 1978, Physical Chemistry, John Wiley & Sons, New York.
3. Castellan G. W., 1986, Physical chemistry, 3rd edition, Wesley Publishing Company, UK.
4. Glasstone S., 2002, Thermodynamics for Chemists, Eastern Wiley publications.
5. Atkins P, 2002, Physical Chemistry, VII Edition, Oxford University Press, UK.
6. Atkins P. W., 1986, Molecular Quantum Mechanics, II Edition, Oxford University Press, UK.
7. Hanna H. W., 1983, Quantum Mechanics in Chemistry, Benjamin- Cummiza London, Publishing company, UK.
8. Chandra A.K., 1988, Introductory quantum chemistry, 3rd edition, Tata McGrow- Hill Publishing Co Ltd., New Delhi, India.
9. Gareth Morris J. 1974, Biologists physical chemistry, Edward Arnold, UK.

10. Barrow G. M., 1994, physical chemistry for the life sciences, McGraw Hill Kogakusha Ltd., New York.
11. Prasad R.K., 2004, Quantum Chemistry, 4th revised edition. (ISBN: 8122424082/9788122424089)
12. Lehniger A.L., 2006, Principles of BioChemistry, 4th Edition.

Reference Books:

1. Glasstone S., 1999, A text book of Physical Chemistry, McMillan India Ltd., Alasca.
2. Walter J. Moore, 2006, Physical Chemistry, 6th edition, Orient Longman, New York.
3. Klotz, M., Rosenberg, R. M., 1996, Chemical thermodynamics, 4th edition, Benjamin, New York.
4. Glasstone, S., 2002, Thermodynamics for Chemists, 5th edition, Eastern Wiley publications.
5. Rajaram J., Kuriakose J. C., 1999, Thermodynamics, 3rd edition, S. N. Chand, New Delhi.
6. Levine, 2006, Quantum Chemistry, 6th edition, Prentice-Hall, New Delhi.
7. Mcquarrie D. A., 2003, Quantum Chemistry,Viva Books Pvt. Ltd., New Delhi.
8. Levine , 2003, Quantum Chemistry, 5th edition, Prentice-Hall, UK.
9.Raymond Chang, 2002, Physical Chemistry with application to biochemical system, Mc Millan Publishing Company. Inc., New Delhi.
10. Graham L Patrick, An Introduction to Medicinal Chemistry, Oxford University Press.

Course Designers

1. Dr. R. Sayeekannan

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3. Dr. T. Arumuganathan

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc. Chemistry (Spl) (Core Spl.Lab)	Int. Marks	: 40
Class	: I year	Ext. Marks	: 60
Semester	: II	Max. Marks	: 100
Sub. Code	: S1PCL4	Hours/Week	: 4

Title of the Paper: **Separation Technique and Quantitative Analysis Credits :4**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

Gain knowledge of separation technique

Extract the component from the natural source.

I.SEPARATION TECHNIQUE

(i) Chromatographic Separation of Carbohydrates.
(ii) Separation of amino acids by TLC.
(iii) Separation of amino acids by paper chromatography
(iv) Separation of organic compounds by Column chromatography

II. EXTRACTION

(i) Isolation of lactose from milk.
(ii) Isolation of Citric acid from lemon
.

III. ESTIMATIONS

(i) Iodine value on an Oil using Hanus method.
(ii) Saponification value of an oil.
(iii) Estimation of Ascorbic acid.
(iv) Reichert-Meissel value of an oil.

Course Designers

1. Dr. P. Tharmaraj
2. Dr. S. Pitchaimuthu

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc. Chemistry (Spl) (Core 4)	Int. Marks	: 25
Class	: I year	Ext. Marks	: 75
Semester	: II	Max. Marks	: 100
Sub. Code	: S2PC1	Hours/Week	: 4
Title of the Paper	: **Organic Chemistry – II**	**Credits**	**: 4**

COURSE OUTCOMES

- On the successful completion of the course, students will be able to
- Understand the principles and application of UV-Vis, IR, NMR and Mass spectroscopy.
- Apply the spectroscopy concept in analyzing and determining the structure of organic compounds.
- Gain insight on conformational characteristic of organic acyclic and cyclic compounds
- Identify the effect of conformational flexibility on reactivity.

Unit-I UV and IR Spectrsocopy (12 Hrs)

Ultraviolet spectroscopy – basic principle – instrumentation – the absorption laws, types of electronic transitions – Effect of solvent and hydrogen bonding on λ_{max} values - Woodward rules to calculate λ_{max} values of conjugated dienes, conjugated polyenes, and carbonyl compounds

Infrared spectroscopy – basic principle – Molecular Vibrations – instrumentation – characteristic IR absorption of different functional groups – factors influencing the vibrational frequencies

Unit-II ^{1}H NMR and ^{13}C NMR spectroscopy (12 Hrs)

^{1}H NMR spectroscopy: Basic principles – number of signals – chemical shift – factors influencing chemical shift – spin-spin coupling – coupling constant and factors influencing coupling constant. Simplification of complex spectra – shift reagents, deuterium substitution and spin decoupling.

^{13}C NMR spectroscopy: Basic principle – comparison with ^{1}H NMR – noise decoupling – off resonance decoupling – factors affecting the C-13 chemical shifts.

Advanced NMR Spectroscopy - Introduction to 2D-NMR - Classification of 2D experiments – HOMO and HETERO nuclear correlation – J resolved correlation. Correlation Spectroscopy (COSY): Pulse sequence – HOMO-COSY, HETERO-COSY, 1D- and 2D-INADEQUATE and NOESY.

UNIT-III: Mass Spectroscopy, ORD and CD (12 hrs)

Basic instrumentation of Mass spectrometer - types of ions – molecular, isotopic, metastable and fragmentation ions – Tests for molecular ion peak – General fragmentation modes- Retro Diels - Alder reactions – Mc Lafferty rearrangement – Fragmentation pattern of

simple organic molecules. Application – Accurate Molecular weight, Molecular formula (Nitrogen rule) – Determination of structures of organic molecules. Introduction to ESI, MALDI and FAB mass spectrometer.

Optical rotatory dispersion (ORD) and Circular Dichroism (CD): Circularly polarized light – Circular birefringence and CD – plain curves and their applications – Cotton effects curves – structural applications – axial haloketone rule, octant rule and their applications.

Solving problems based on UV, IR, NMR and Mass data.

UNIT IV - Organic Stereochemistry (12 hrs)

Optical isomerism

Symmetry elements – the concept of chirality – chirality about a center – specification by Cahn-Ingold-Prelog notations – compounds with more than one chiral center – erythro, threo and meso nomenclature – concept of prochirality – homotopic, enantiotopic and diastereotopic ligands and faces – Asymmetric synthesis – Cram's rule and Prelog's rule. Optical activity in allenes and spiranes – StereoChemistry of nitrogen compounds.

Geometrical isomerism

E and Z notation – Determination of configuration of geometrical isomers by simple techniques like hydroxylation, hydroboration and methods based on physical properties – Stereoisomerism in cyclic compounds – 3, 4 and 5 membered ring systems.

UNIT V – Conformational Analysis (12 hrs)

Configuration and conformation – definition – conformational free energy- atropisomers- conformational analysis of acyclic, cyclic, heterocyclic systems – conformational analysis of cyclohexane system: stability and isomerism in mono and disubstituted cyclohexanes – conformation and reactivity of cyclohexane derivatives - conformational analysis of fused ring system - decalins, and perhydrophenanthrene.

Text Books:

1. D. Nasipuri, 2004. Stereochemistry of Organic compounds 2nd edition, New Age International, New Delhi.
2. William Kemp, 1994.Organic Spectroscopy, 4th Edition, ELBS, UK.
3. R.M. Silverstein, G.C. Bassler and T.C. Morrill, 2005. Spectrometric Identification of organic compounds, 6th Edition, John Wiley, New York.

Reference Books:

1. E.L. Eliel and S.H.Wiley, 2003.Stereochemistry of carbon compounds. John Wiley & Son,
2. V.M.Potapov,1999 Stereochemistry, MIR Publisher, Moscow.
3. H.Kagan,2001 Organic Stereochemistry, Edward Arnold, London.
4. E.L. Eliel, N.L. Allinger, S.J. Angyal and G.A. Morrison, 2004.Conformational Analysis, Interscience, New York.
5. P. Wetirli Marchand,1987. Interpretation of ^{13}C NMR Spectra, VCH Weinheim, UK.
6. Atta-ur Rahman, 1990Nuclear Magnetic Resonance, Springer Verlog, New York.

Course designer

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4 Dr. A. Tamil Selvi

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc Chemistry (Spl) (Core 5)	Int. Marks	: 25
Class	: I Year	Ext. Marks	:75
Semester	: II	Max. Marks	: 100
Sub. Code	: S2PC2	Hours/Week	: 4
Title of the Paper	: **Inorganic Chemistry- II**	**Credits**	**:4**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- Study the solid state chemistry of inorganic compounds.
- Understand analytical Chemistry.
- Know the techniques like Colorimetry, Fluorimetry, AAS, TGA, DTA, Chromatography and cyclic voltammetry.

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UNIT I SUPRAMOLECULAR CHEMISTRY (12 Hrs)

Definition, Nature of supramolecular interactions- Non - Covalent interactions, Host - guest interaction, complexing involving crowns and cryptands- cyclodextrine - Inclusion compounds-Clatharates-intercalation compounds -Molecular recognition, Types of recognition, Self- assembly. General properties of Supra molecular complexes- Molecular Library- Transition metal mediated supramolecules- Directional bond approach- Molecular triangles (Pd and Pt)- Molecular squares (Pd, Pt and Re)- Molecular rectangles-(Pd, Pt, Cu and Re) Molecular Cages (Pd, Pt and Re) and their applications.

UNIT II SOLID-STATE CHEMISTRY (12 Hrs)

Packing of atoms and ions- close packing arrangements-HCP, CCP and BCC lattice. Radius ratio rules- Limiting radius ratio. Structure of typical lattices such as calcite, cesium chloride, Nickel arsenide, Fluorite, Antifluorite, Cadmium iodide, Perovskite, Spinels (normal and inverse). Bragg's equation- problems involving Bragg's equation. Crystal structure determination- X-ray diffraction study, Electron and Neutron diffractions

Crystal defects- point – Schotky and Frenkel defect - line and plane defects- colour centers- non- stoichiometric Compounds- experimental methods of study of non-stoichiometry- effect of imperfections and non- stoichiometry on physical properties-types of solids- electronic structure of solids- free electron and band theories.

UNIT-III Inorganic Rings, Cages, Clusters and Polymers- I (12 Hrs)

Electron deficient compounds: Borane and carboranes- Synthesis, structure and bonding (VBT and MO approach) –topological treatment-wades rule –styx numbers-structural studies by NMR-metallocarboranes-other heteroatom boron derivatives, borates-boroxines-B-P and B-As heterocycles. Synthesis, structure and bonding in Binary sulphur nitrils, S-N cations and anions, cyclic S-N compounds, S-N halogen compounds-bonds and electron counting in

S-N heterocycles-polythiazyls. Structure of aluminosilicates- mica, clay, zeolites, fullers earth. Manufacture, Types and Uses of glasses.

UNIT- IV Inorganic Rings, Cages, Clusters and Polymers- II (12 Hrs)

P-N Heterocyclics- Phosphonitrilic compounds: Synthesis, Structure and bonding-phosphazene oligomers-high polymers-polymeric phosphorus nitrides-hydrolysis of phosphazenes- reactions of halo phosphazenes- aminolysis-metathetical reactions-reaction with organometallic reagents-Friedel-Crafts substitutions-rearrangements-theories of bonding-electronic structure and aromaticity-posphazene oligomers-high polymers-polymeric phosphorus nitrides. High, low nuclearcity carbonyl clusters-halide clusters. Isolobal analogy-Synthesis, structure and bonding in Poly anions and isopoly anions of phosphorous, vanadium, chromium, Nolybdenum and tugston. Hetero poly anions of molybdenum and tungsten. Structural prediction by Wade's rule-Cappit rule

UNIT-V ANALYTICAL CHEMISTRY-1 (12 Hrs)

Principles and practice of complexometric estimations/- Spectro analytical methods:- Principles and applications of colorimetry and spectro photometry, fluorimetry, nephelometry and turbidimetry-emission and atomic absorption spectroscopy (AAS) and atomic fluorescence spectroscopy.

ANALYTICAL CHEMISTRY-II

Principles, Instrumentation and applications of Cyclic Voltametry, Thermogravimetry, Differential thermal analysis and differential scanning colorimetry, Chromatography: GC, HPLC and Ion Exchange Chromatographic techniques.

Text book:

1. Bradley J. Holliday & Chad A. Mirkin, 2001Strategies for the Construction of Supramolecular Compounds through Coordination Chemistry- Reviews, Angew. Chem. Int. Ltd., Ed., 40, 2022-2043., Chemie@Wiley-VCH
2. Katsuhiko Ariga, Toyoki Kunitaka,2006. Supramolecular Chemistry-Fundamentals and Applications: Advanced Textbook, Springer Science & Business Media.
3. W. Jones, C. N. R. Rao,2001 Supramolecular Organization and Materials Design, Cambridge University Press, Landon,
4. Lee, J. D.2002 Concise Inorganic Chemistry, Blackwell Science Ltd., V Edn., London.
5. Keer, H.V. 1993.Principles of the Solid State, Wiley Eastern Ltd..
6. H. G.Heal,1980. the Inorganic Heterocyclic Chemistry of Sulphur, Nitrogen and Phosphorus, Academic press, New York.
7. J. D. Woolings,1989. Non Metal Rings, Cages and Clusters, John Wiley and sons, New York.
8. P.J. Durrant and B. Durrant,1970 Introduction to advanced inorganic chemistry, Longman Group Ltd, London,.
9. Purcell K.F. and Kotz J.C., Saunders,1977 Inorganic Chemistry, Philadelphia.
10. D. A. Skoog and D. M. West,1998 Fundamentals of Analytical Chemistry, Holler Saunders college publishing, USA.VI Edn.
11. F.A. Cotton and G. Wilkinson,1988. Advanced Inorganic Chemistry, Wiley-Interscience publications, John Wiley & Sons, V Edn., New Delhi.
12. Walter E. Harris and Byron Kratochvil, 1982.An Introduction to Chemical Analysis, Saunders Golden Sunburst Series, Philadelphia.
13. Galen W. Ewing, 1987.Instrumental Methods of Chemical Analysis, Mc Graw Hill International Editions, V Edn., New Delhi.

14. K. Sharma,1993. Instrumental Methods of Chemical Analysis, GOEL Publishing House, 12th Reprint, New Delhi.

REFERENCE BOOKS:

1. J. E. Huheey, Ellen A. Keiter, Richard L. Keiter, 2004.Inorganic Chemistry, Pearson Education (Singapore) Pte. Ltd., IV Edn., Delhi.
2. K. Chakrabarthy,2005 Solid State Chemistry, New Age International Publishers, (P) Ltd.,
3. D. F. Shriver and P.W. Atkins,1999. Inorganic Chemistry, Oxford University Press, London.
4. Wahid U. Malik, G.D. Tuli and R. D. Madan,2006. Selected Topics in Inorganic Chemistry, S. Chand & Co. Ltd., New Delhi.
5. William W. Porterfield,2005 Inorganic Chemistry, II Edn., Elsevier, New Delhi.
6. A.G. Sharpe,2004 Inorganic Chemistry, III Edn., Addition – Wesley Longman, UK .
7. I. Vogel,2002 Textbook of Quantitative Chemical Analysis, ELBS Longman Singapore Publisher (P) Ltd., Singapore. V Edn.,
8. Azaroff, 2004.Introduction to Solids, Tata McGraw hill, New Delhi.

Course designers

1 Dr.A.Suganthi
2 Dr.A. Elangovan
3 Dr.D.S. Bhuvaneshwari
4 Dr.K.Selvakumar

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc Chemistry (Spl)(Core 6)	Int. Marks	: 25
Class	: I Year	Ext. Marks	:75
Semester	: II	Max. Marks	: 100
Sub. Code	: S2PC3	Hours/Week	: 4
Title of the Paper	: **Physical Chemistry- II**	**Credits**	**:4**

Course outcomes:

On successful completion of the course students will be able to

- Learn about theories and applications of electrochemistry
- Understand the need and applications of statistical thermodynamics
- Gain knowledge in advanced quantum chemistry

UNIT-I **(12 Hrs)**

ELECTROCHEMISTRY-I

Theory of strong electrolytes – Interionic attraction theory – Debye-Huckel theory of strong electrolytes - Debye-Huckel model of ionic atmosphere–Debye-Huckel Onsager equation-derivation, verification and modifications- Debye – Falkenhagen effect and Wien effect; Electrical double layers – formation – Structure of electrified interfaces – Stern model. Debye-Huckel limiting law- extension- Huckel-Bronsted equation - Determination of activity coefficients using Bronsted equation – Applications of conductivity measurements; Nernst equation and its significance – reversible and irreversible cells - electrodes – SHE – Calomel – Glass electrode – Platinum electrode – Glassy carbon electrode – ion selective electrode and measurement of pH.

UNIT-II **(12 Hrs)**

ELECTROCHEMISTRY-II

Over voltage – theories of over voltage- applications of over voltage-hydrogen and oxygen overvoltage; Butler-Volmer equation- Tafel equation; Corrosion- principles of electrochemical corrosion – dry and wet corrosion and its mechanism – Pilling-Bedworth rule. Types of corrosion- galvanic, aeration, stress, pitting corrosion and passivity – factor influencing corrosion – corrosion control- cathodic production - corrosion inhibitors.

Principles of Polorography - Cyclic Voltametry –quasi – reversible – irreversible voltamogram; electrochemical energy conversions-Nickel Cadmium, lead acid battery; Fuel cells – H_2 - O_2 Fuel cell – methyl alcohol fuel cell.

UNIT-III **(12 Hrs)**

STATISTICAL THERMODYNAMICS-I

Need for statistical mechanics or thermodynamics-Ensemble- types of ensemble – micro canonical - canonical and grand canonical ensemble; Phase space- microstates- probability and distribution- Maxwell Boltzmann classical distribution law- derivation in term of degeneracy; Partition function (Q) – relation between partition function and the following thermodynamic functions – internal energy (E), Helmholtz free energy (A), Pressure (P), Enthalpy (H), Gibbs free energy (G), chemical potential (μ_i), heat capacity (Cv) and entropy (S); Derivation of Sackur-Tetrode equation-thermodynamic properties of monoatomic gases.

UNIT-IV **(12 Hrs)**

STATISTICAL THERMODYNAMICS-II

Quantum statistics- Bose-Einstein Statistics derivation- application of Bose-Einstein statistics for a photon gas – Planck‘s radiation formula-Derivation of Rayleigh-Jeans law-Stefan Boltzman equation. Fermi-Dirac statistics derivation -Application of Fermi-Dirac statistics to electron gas in metals; Population inversion-negative absolute temperature -heat capacity of diatomic gases-Einstein‘s theory and Debye‘s theory of heat capacities of solids- third law of thermodynamics and statistical entropy - hydrogen ortho and para nuclear states.

UNIT –V **(12 Hrs)**

Approximation methods, application of SWE to many electron systems.

Necessity for approximation methods- Variation methods for the Hydrogen atom – Perturbation (first order) method to Helium atom - Slater determinant wave function- secular determinant – Hartree – Fock self consistent field method to Helium atom – HMO bielectron theory of Ethylene and Butadiene.

Text Books:

1. Bokris J. O. M., Reddy A. K. N., 1978, Modern Electrochemistry, Vol I, Plenum Press, New York.
2. Crow Dr., 1988, Principles and Applications of Electrochemistry, Chapman Hall, UK.
3. Venkataraman R., Rengarajan K., Raghavan P. S., 2007, Electrochemistry, First edition
4. Glasstone S., 2002, Thermodynamics for Chemists, Eastern Wiley Publication.
5. Lee, Sears, Tercotte, 1973, Statistical Thermodynamics, Addision Wesley Publishing Co., London – I Edition.
6. Chandra A. K., 1988, Introductory Quantum Chemistry, 3rd edition, Tata McGraw-Hill Publishing Co, New Delhi, India.
7. Mc Quarie D.A., 1983, Quantum Mechanics, Oxford University press, Oxford,UK.

Reference Books:

1. Antropov L., 1999, Theoretical electrochemistry, MIR Publications, New Delhi.
2. Glasstone S., 2002, An Introduction to Electrochemistry, Von Nostrand Co. Inc., Toronto.
3. Gupta M. C., 1993, Statistical Thermodynamics, Wiley Eastern limited, New Delhi.
4. Kuriakose J. C., Rajaram, J. 1999, Thermodynamics, III edition, Shoban lal Nagin Chand, New Delhi, India.
5. Levine, 2006, Quantum Chemistry, 6th Edition, Prentice-Hall, New Delhi, 2006.
6. H.W. Hanna, 1993, Quantum Mechanics in Chemistry-Benjamin –Cummiza London Publishing Company, New Delhi, India.

Course Designed by

1. Dr. R. Sayee Kannan
2. Dr. A. R. Ramesh
3. Dr. T. Arumuganathan

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc.Chemistry (Spl)(Core elective 1)	Int. Marks	: 75
Class	: I MSc Chemistry	Ext. Marks	: 25
Semester	: II	Max. Marks	: 100
Sub. Code	:S2PCE1 (C)	Hours/Week	: 4
		Credits	:5

Title of the Paper : C-Programming: Fundamentals and Applications in Chemistry (Option A)

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- To have an Overview of C-Programme.
- To comprehend the basic ideas of Operators, Data input and Output.
- To know about Decision Making , Arrays, and Functions and to understand Applications of C in Chemistry

UNIT-I Introduction and overview of C (12 HRS)

Introduction – Importance of C-structure of C-programs- Simple programs-style of the language.

Characters–Keywords, Variables and parameters-Data types-Constants-Declaration of and assignments of values to variables.

Operators-Arithmetic, Relational, Logical, assignment, Increment and Decrement, Conditional and bitwise operators-Special operators.

Expressions- Arithmetic - Evaluation of expression- Procedure of arithmetic operators-Library functions.

UNIT-II Data input and Output (T: 6 HRS + P: 6 HRS)

Character input- The getchar function – Character output- The putchar function – Entering input data- the Scanf function-Writing output data- The printf function- Formatted input and output data-the gets and puts functions-preparing and running a complete program.

Decision making and branching: Decision making with IF statement –simple IF statement-the IF…ELSE statement- Nesting of IF…Else statements – The ELSE IF ladder –The Switch statement – The ?: operator – the GOTO statement.

UNIT-III (T: 8 HRS + P: 4 HRS)

Decision making and Looping: The WHILE statement – The DO statement-The FOR statement – Jumps in loops.

Arrays: One dimensional array –Two dimensional arrays –Initializing two dimensional arrays- Multidimensional arrays.

User defined functions: Need for user–defined functions – A multifunction program – The form of C functions -Return values and their types- Calling a function –Category of function-No arguments and no return values –Nesting functions- Recursions- The scope and life time of variables in function.

UNIT-IV Applications of C in Chemistry-I (T: 4 HRS + P: 8 HRS)

Explanation of the formulae, equations and programs to solve the following problems in chemistry:

13. Calculation of Molecular weight of Organic Compounds.
14. Calculation of pH.
15. Determination on First Order rate constant for the given reaction
16. Evaluation of lattice energy using
    i). Born- Haber Cycle
    ii). Born –Lande equation
17. Computing ionic radii- Lande's method and Paulings method
18. Calculation of Normality, Molarity and Molality of a given solution
19. Converting Kelvin to Celsius temperature and vice versa.
20. Determination of enthalpy of a given solution
21. Evaluation of Cell constant
22. Calculation of energy of Hydrogen atom spectral lines.

UNIT-V: Applications of C in Chemistry-II (T: 4 HRS + P: 8 HRS)

Explanation of the formulae, equations and programs to solve the following problems in chemistry:

Organic Chemistry:

3. Use of Recursive functions to calculate the number of π Resonance structures for an organic conjugated system using
   res - str = n! / ((n/2)! * ((n/2) + 1)!)
4. Empirical formula of Hydrocarbons and other Organic compounds.

Inorganic Chemistry:

1. Array manipulation to balance the chemical equations.
2. Half life and average life periods of radioactive nuclei.
3. Binding energy of nucleus.
4. Program to get output as First ten elements of Periodic Table with their Name, Symbol, Atomic number and Atomic Weight.

Physical chemistry:

1. Calculation of RMS, average and MPV of gases.
2. Solving Quadratic equation to evaluate the Equilibrium constant for the reaction
   $H_2 + I_2 \quad 2HI$
3. Illustrate use of Loop to calculate the NMR frequency for a nucleus with Spin ½
4. Mean activity coefficient of an Electrolyte (KCl)

TEXT BOOK

1. E. Balagurusamy,2005. Programming in ANSI C, Tata McGraw- Hill Publishing Company Ltd., New Delhi, 3rd Edn., 10th Reprint.

REFERENCES:

1. Brian W. Kernighan & Dennis M. Ritchie,2001 The C Programming Language, Prentice Hall of India Private Limited, New Delhi, 2nd Edn.,.
2. Byron S. Gottfried,2001. Programming with C, Tata McGraw- Hill Publishing Company Ltd., New Delhi, 2nd Edn.,.
3. R. Rajaram,1999. C Programming Made Easy, Scitech Publications, Chennai.
4. Yeshavant Kanitkar,1999 Let Us C, BPB Publications, New Delhi, 3rd Edn..
5. Yeshavant Kanitkar, C 1998- Projects, BPB Publications, New Delhi,.
6. K. V. Raman,1993 Computers in Chemistry, Tata McGraw- Hill Publishing Company Ltd., New Delhi, 3rd Edn..

Course designer

1 Dr. A. Elangovan
2 Dr. R. Mahalakshmy
3 Dr. A. Tamilselvi

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: M.Sc Chemistry (Spl) (Core elective 1)	Int. Marks: 75
Class	: I Year	Ext. Marks : 25
Semester	: II	Max. Marks : 100
Sub. Code	: S2PCE1(M)	Hours/Week : 4
		Credits :5

Title of the Paper : Medicinal Chemistry (Option B**)**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

1. Understand the concept of pharmacokinetics, pharmacodynamics drug discovery by design.
2. synthesis different types of drugs.

Unit – I :: Introduction to Drug Design: 12 hrs

a) ADME Properties

The pharmacokinetics phase-Adsorption-Distribution, Metabolism-Elimination-Bioavailability of drug. pharmacokinetics models, Intravascular and Extravascular administration. The use of pharmacokinetics in Drug dsign**.**

b) Pharmacodynamics - Stereoelectronic structure.

Unit II Drug Discovery by Design 12 hrs

a) Streochemistry and Drug Design

Structurally rigid Groups –procaine, Acetylcholine. Conformation-Syn and Anti Acetylcholine, Phenyl ethanoate methiodides. Configuration-Variations in the biological activities of stereoisomers

b) Strutural –Activity –Relationship (SAR)

Changing the size and shape.Changing th degree of unsaturation. Introduction or removal of ring system. Introduction of new substituents-methyl group, Halogens, hydroxyl groups, Basic groups, carboxylic and sulphonic acid groups. Changing the excisting substituents of lead-isosteres,bioisoteres.

Unit III a)Quantitative-structural Activity-Relationship (QSAR) 12 hrs

Partition parameters-partition coefficients(p), Lipophilic subtituents constants ( ) Electronic parameters-The Hammett constants-Steric parameters-The Taft Steric parameters (Es), Molar refractivity (MR), Hansch analysis-craig plots, The toplss decision tree. Compute –aided drug design- Modelling Drug-Receptor Interaction.

b) Combinatorial Chemistry

Basic concepts-The design of combinatorial syntheses. The general technique used in combinatorial synthesis i) Solid support mthod-parrllel synthesis –Furka's mix and splt techniques-sequential chemical tagging methods-Still;s binary code Tag systemcomputerised tagging. ii) Combinaterial synthesis in solution iii) Screening and deconvolution

Unit – IV

a) Antineoplastic Agents: 12 hrs

Introduction, cancer chemotherapy, special problems, role of alkylating agents and antimetabolites in treatment of cancer

b) Psychoactive drugs – The chemotherapy of Mind:

Introduction, neutotransmitters, CNS depressants, general anaesthetics, mode of action of hypnotics, sedatives, neurochemistry of mental diseases

c) Cardiovascular Drugs and Local Antiinfective Drugs:

Introduction, Cardiovascular diseases, drug inhibitors of peripheral sympathetic function, central intervention of cardiovascular output.

Unit V Synthesis of Drugs 12 hrs

a) Synthesis of Antineoplastic agents

Mechlorethamine, Cyclophosphamide uracil, mustards and 6-mercaptopurine

b) Synthesis of cardiovascular drugs

Amyl-nitrate, sorbitrate, , Verapamil.

c) Synthesis of Phychoactive drugs

Synthesis of Diazepam, Chlorazepam, oxazepam, Alprazolam, Phenyltocin or Diphenylhydantoin, Barbitol, Phenobarbital.

Text Books:

1.Gringuage, 2004. Introduction to Medical Chemistry, Wiley – VCH,.

2. Robert F.Dorge, 2003 Wilson and Gisvold's Text Book of Organic Medicinal and Pharmaceutical Chemistry,

3. S.S.Pandeya and J.R.Dimmock, 2006. An Introduction to Drug Design, New Age International.

4. M.E. Wolff, 2005. Burger's Medicinal Chemistry and Drug Discovery,Vol-1 (Chapter-9 and Ch-14) John Wiley publications.

5. Goodman and Gilman's Pharmacological Basis of Therapeutics, McGraw-Hill, 2006.

6. R.B.Silverman, 2006. The Organic Chemistry of Drug Design and Drug Action, Academic Press.

Reference Books:

1. D. Lednicer, 2004. Strategies for Organic Drug Synthesis and Design, John Wiley.

2. Gareth Thomas, 2004. Medicinal Chemistry, An introduction, John wiley& sons,Ltd.,

3. M.L Gangwa l2007. Medicinal chemistry Lectures on Drug design and Synthetic Drugs, Student publishing House.

Course Designers

1. Dr. P. Tharmaraj

2. Dr. P. Prakash

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc.Chemistry (Spl) (Core 1 Lab)	Int. Marks	: 40
Class	: I Year	Ext. Marks	: 60
Semester	: II	Max. Marks	: 100
Sub. Code	: S2PCL1	Hours/Week	: 5
Title of the Paper	: **Organic Chemistry Lab 1**	**Credits**	**:5**

Course Outcomes

On the successful completion of the course, students will be able to

1. get practical skills in analyzing a mixture of two organic substances
2. do preparation of organic compounds.

Analysis

Analysis of Organic mixtures: Two component Systems (Maximum of SIX Mixtures)

Preparation of organic compounds

1. Dibenzal acetone
2. Dimethyl pyrazole
3. DiphenylChalcone
4. P.Nitroacetanilide
5. Salicylaldoxime

Course Designers

1. Dr. P. Tharmaraj
2. Dr. A. Tamilselvi

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc.Chemistry (Spl) (Core 2 Lab)	Int.Marks	: 40
Class	: I Year	Ext. Marks	: 60
Semester	: II	Max. Marks	: 100
Sub. Code	: S2PCL2	Hours/Week	: 4
Title of the Paper	: **Inorganic Chemistry Lab 1**	**Credits**	**:4**

Course outcomes:

To impart skills in both qualitative and quantitative inorganic analysis

I. COMPLEXOMETRIC TITRATIONS WITH EDTA

1. Estimation of ZINC
2. Estimation of MAGNESIUM
3. Estimation of COPPER
4. Estimation of NICKEL
   a) By Direct Method
   b) By Indirect Method

II. SEMI MICRO ANALYSIS

Semi micro analysis of samples containing two Familiar Cations and two Less Familiar Cations. – Maximum of Five samples.

Course Designers

1. Dr. A.Elangovan

Dr. T. Arumuganathan

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc.Chemistry (Spl) (Core 3 Lab)	Int.Marks	: 40
Class	: I Year	Ext. Marks	: 60
Semester	: I/II	Max. Marks	: 100
Sub. Code	: S2PCL3	Hours/Week	: 5
Title of the Paper	: **Physical Chemistry Lab 1**	**Credits**	**: 4**

Course Objective:

On successful completion of the course students will be able to

1. Develop practical skills in conductometric and potentiometric titration experiments.
2. Understand experimental knowledge on kinetics and surface chemistry
3. Learn about the estimation of metal ions by using spectrophotometer

S. No.	EXPERIMENT
1	**Kinetics of Acid hydrolysis of an ester**
2	**Estimation of strong acid conductometrically**
3	**Estimation of mixture of acids conductometrically**
4	**Estimation of NH_4Cl by Conductometrically**
5	**Estimation of CH_3COONa by conductometrically**
6	**Estimation of $BaCl_2$ by conductometrically**
7	**Estimation of Fe(II) using $K_2Cr_2O_7$ by Potentiometry**
8	**Estimation of Fe(II) using CAS by Potentiometry**
9	**Estimation of KI with $KMnO_4$ by Potentiometry**
10	**Estimation of Copper (II) by Spectrocolorimetry**
11	**Determination of the Adsorption Parameters of Oxalic acid on Charcoal**
12	**Adsorption of acetic acid on to activated charcoal**
13	**Estimation of thiocyanate using iron (III) by spectrocolorimetry**
14	**Determination of Iron ion content by photometric method based on complex formation**

Course Designed by

1. Dr. R. Sayeekannan
2. Dr. A. R. Ramesh

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: M.Sc.Chemistry (Spl) (Core 7)	Int. Marks	: 25
Class	: II Year	Ext. Marks	: 75
Semester	: III	Max. Marks	: 100
Sub. Code	: S3PC1	Hours/Week	: 5
Title of the Paper	: **Organic Chemistry – III**	**Credits**	**:4**

COURSE OUTCOMES

On the successful completion of course students will be able to

- Apply various reagents in organic synthesis.
- Write advanced synthetic routes for an ideal organic synthesis.
- Write the mechanism of pericyclic and photochemical reactions.
- Understand the mechanism of molecular rearrangement reaction.

Unit-I: Reagents in Organic Synthesis (15 Hrs)

Use of the following reagents in organic syntheses and functional group transformations – complex metal hydrides, Gilman's reagent, lithium dimethyl cuprate – lithium diisopropylamide (LDA) — trimethyl silyliodide – tri-n-butyl tin hydride – Jones reagent – pyridinium chloro chromate – SeO_2 – peracids – DMSO – $Pb(OAc)_4$ – HIO_4 – Prevost and Woodward hydroxylation – Etard's reagent – Waker's reagent – RuO_4 – $Hg(OAc)_2$ – Oppenauer oxidation – DDQ – $LiAlH_4$, $NaBH_4$, Lawesson's reagent – Crown ethers – Thallium nitrate – Phase transfer catalysts – Birch reduction.

UNIT-II Advanced Organic Synthesis I (Retro-synthesis) (15 hrs)

Disconnection Approach: Importance of organic synthesis-Planning synthesis – Synthons and types – synthetic equivalents – latent functionality Guideliness for best disconnection approach, Reactions involving functional group interconversions – Reterosynthetic analysis – concept of umpolung – two group C-X disconnections and synthetic strategies 1,2-, 1,3-, 1,4-, 1,5- and 1,6- difunctionalised disconnection. Steroselective and stereospecific reactions-Chemoselectivity–Stereoselectivity- Regioselectivity.

UNIT-III Advanced Organic Synthesis II (Asymmetric synthesis) (15 hrs)

Definition of enantiomeric, disatereomeric excess – analytical methods to determine ee and de – strategy and classification of methods of asymmetric synthesis – chiral substrates – Chiral auxiliaries – chiral reagents – chiral catalysts.

Chiral catalysts and chiral reagents: BINAP-ruthenium (II) Mc Murray's reagent – $Ti(i\text{-}PrO)_4$, and $K_2Os_2(OH)_4$ – Sharpless asymmetric epoxidation, – Heck reactions – Suzuki Coupling – Sonogashira coupling.

UNIT-IV Photochemistry and Pericyclic reactions (15 hrs)

General principles – orbital symmetry considerations related to photochemical reactions, thermal versus photochemical reactions – principles of energy transfer – photochemical reactions of ketones – Norrish type I and type II reactions – Paterno Buchi reaction – Dienone

photochemistry – photo reduction, photochemical oxidation, Barton reaction – photochemistry of alkenes and dienes.

Pericyclic reactions Application of symmetry to orbital interactions – selection rules (Woodward and Hoffmann rules) – Electrocyclisation, cycloaddition and sigmatropic rearrangements – cheletropic reactions – Diels-Alder Reactions: Endoselectivity and regioselectivity – Explanation of these reaction in terms of correlation diagrams approach, FMO approach and Dewar – Zimmermann approach – (PMO) Huckel-Mobius concepts.

UNIT-V Molecular rearrangements **(15 hrs)**

Classification – Nucleophilic, electrophilic, and radical – Mechanism of Favorski, Benzil-Benzilic acid, Bayer-Villiger, Wagner-Meerwin rearrangement, Carbanionic rearrangements, Stevan's rearrangement, Sommelet-Hauser, Cope, and Wesly-Moser rearrangement, Fries Rearrangement.

Acid catalyzed rearrangement – Arndt-Eistert synthesis – carbon to nitrogen migration – Hofmann rearrangement, Curtius rearrangement, Lossen rearrangement, Schmidt and Beckmann rearrangement

Text book:

1. Jerry March.1992. Advanced Organic Chemistry, Reaction mechanism and structure, John Wiley and sons, 4th Edition, New York.
2. S. Warren,2004. Organic synthesis - The disconnection approach, John Wiley & Sons, UK, 2004**.**
3. Cary and Sundberg1990. Advanced Organic Chemistry, Part B, Reactions and Synthesis, Plenum Press, 3rd Edition.
4. R. K. Mackei and D. M. Smith1982. Guide Book to Organic synthesis, ELBS.
5. I.L. Finar2005. Organic Chemistry, Vol. II, V Edition, ELBS, New York.
6. W. Caruthers, Some modern methods of organic synthesis, Cambridge university.
7. C.H. Depuy and O.L. Chapman,1975. Molecular reactions and Photo Chemistry, Eastern and Economic Edition, Tata MacGraw Hill.

Reference Books:

1. Graham Solomons,1992. Organic Chemistry, John Wiley and Sons INC, 5th Edition.
2. Michael B. Smith, 1994.Organic Synthesis, McGraw Hill, International Edition.
3. Clayden, Greeve, Warren and Wothers, 2007.Organic Chemistry, OXFORD University Press.
4. A.J. Bellamy,1974. An introduction to conservation of orbital symmetry, Longman group Limited,
5. H. O. House,1972. Modern synthetic reactions, Cambridge University press, 3rd Edition.
6. W. Carruthers and I. Coldham,2004. Modern methods of organic synthesis, Cambridge University Press, 4th Edition.

Course designer

1. Dr. P. Tharmaraj
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THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: M.Sc Chemistry (Spl) (Core 8)	Int. Marks	: 25
Class	: II Year	Ext. Marks	:75
Semester	: III	Max. Marks	: 100
Sub. Code	: S3PC2	Hours/Week	: 5
Title of the Paper	: **Inorganic Chemistry- III**	**Credits**	**:4**

Course Outcomes:
On the successful completion of course students will be able to

- understand coordination Chemistry, lanthanides and actinides chemistry.
- write the basic concept, theories , mechanism and spectra of coordination compounds..
- An emphasize is given on Separation techniques of lanthanides and synthesis of actinides.
- gain knowledge about the synthesis, properties, characterization and the applications of nano materials.

UNIT I COORDINATION CHEMISTRY-1 15 Hrs

Nomenclature of coordination complexes-Stereochemistry of coordination compounds: Geometrical isomerism- optical isomerism of complexes having C.N.4,6-stability constants of complexes-stepwise and overall stability constant- their determination-Jobs' continuous variation method-Chelate effect

CFT. LFT and MO theories- **pi bonding**-Influence of ligands on crystal field splitting- Octahedral and Tetrahedral splitting of "d" orbitals, CFSE. Spectrochemical series-Nephelauxetic effect– John Teller effect-site preferences. Spectral properties of complexes-Magnetic properties- **spin-orbit contribution**-Para, Dia, ferro magnetism and antiferro magnetism- Determination of magnetic properties – Gouy's method.

UNIT-II COORDINATION CHEMISTRY-II 15 Hrs
(INORGANIC REACTION MECHANISMS)

Substitution reactions- lability-inertness- square planar substitution reactions- Factors affecting reactivity of square planar complexes- Trans effect- Theories of Trans effect- Stereo chemistry of substitution in octahedral complexes.(SN^1, SN^2, SNiCB)- Reactions of coordinated ligands- Acid hydrolysis- anation reactions and base hydrolysis.

Mechanism of electron transfer reactions- Outer sphere, inner sphere electron transfer reactions- Marcus Theory and its applications. Synthesis of coordination compounds using electron transfer and substitution reaction.

UNIT- III CHEMISTRY OF NANOSCIENCE AND TECHNOLOGY 15 Hrs

Introduction- Types of nano materials-Nanoparticles, nanotubes-Carbon nanotubes: SWCNT and MWCNT, nanowires, nanoribbons, nanorods, nano composites.

Preparation methods-Chemical vapour deposition, Sol-Gel method, Electrodeposition method, Ball milling method, Chemical reduction method, spin coating technique, Solvothernal synthesis, Colloidal method, Co-precipitation method, Flame spray synthesis (Arc Plasma)-Preparation of metal oxide nanoparticles- Properties of nanoparticles- Optical, mechanical, magnetic, electrical, thermal properties. Characterization Techniques like SEM, TEM, AFM, XRD, UV-DRS, B.E.T analysis, DLS, PL -Applications of Nanoparticles.

UNIT – IV PHYSICAL METHODS IN INGORGANIC CHEMISTRY-I 15 Hrs

Electronic spectra: selection rules – polarization – splitting of spectral terms – L.S Coupling scheme- Russel- Saunders method- Term Symbols -Orgel and Tanabe-Sugano diagram. – Evaluation of 10 Dq and beta $\mathbf{d^2}$, $\mathbf{d^3}$, $\mathbf{d^7}$, $\mathbf{d^8}$ systems

IR and Raman spectra: Applications of IR and Raman. Selection rules to structure determination – IR spectral studies of carbonyl compounds.

Nuclear magnetic resonance : Application of chemical shift and spin coupling to structure determination using multiple NMR (H,P,F) chemical exchange, dynamic processes in inorganic and organometallic compounds- Fluxional NMR of metal carbonyls and allyl complexes – paramagnetic NMR and contact and pseudo contact shifts.

NQR- Basic theory, principles and applications.

UNIT-V LANTHANIDES AND ACTINIDES 15Hrs

a) Lanthanides:-

Occurrence- differences between 4f and 5f orbitals-Separation techniques (Fractional crystallisation, precipitation, ion-exchange, solvent-extraction and thermal decomposition-Selective reduction and oxidation)- Electronic configuration- Oxidation states, Lanthanide contraction- Spectral and Magnetic properties- Ln chelates-organometallic compounds of Ln. Uses of lanthanides **(shift reagents, Pu bomb)** and their compounds- aqueous chemistry of uranyl compounds- position in the periodic table.

b) Actinides:-

Synthesis of elements- Extraction of Th and U and Pu- electronic configuration and oxidation states, spectral and magnetic properties- position in the periodic table.

TEXT BOOKS:

1. Shriver D. F. and Atkins, P.W. 1999.Inorganic Chemistry, Oxford University Press, London.
2. Cotton F.A. and Wilkinson, G.1988. Advanced Inorganic Chemistry, Wiley-Interscience publications, John Wiley & Sons, V Edn. New York.
3. Gurdeep R. Chatwal & M. S. Yadav,1993 Coordination Chemistry, Himalaya Publishing House, I Edn..
4. Figgis, B.N, 1964.Introduction to Ligand Fields, Wiley Interscience, Eartern Ltd., I Edn., New Delhi.
5. Banerjea, D,1993. Coordination Chemistry, Tata McGraw- Hill Publishing Co. Ltd.,.
6. Purcell, K. F. Kotz, J.C. Holt Saunders,1977. Inorganic Chemistry, Philedelphia,USA.
7. Pradeep, T, A.2003 Textbook of Nanoscience and Nanotechnology Tata McGraw-Hill Education, New Delhi.
8. Drago, R. S. Van Nostrand and Reinhold,1976. Physical methods in Chemistry.
9. Nakamoto, Kazuo,1986. Infrared and Raman Spectra of Inorganic and coordination compounds, IV edition, John Wiley and Sons, New Yark.
10. Raymond Changm,1971. Basic principles of Spectroscopy, Mc Graw Hill, New Delhi.
11. Straughan B. P. and Walker S. 1976. Spectroscopy Vol.3, Chapman and Hall, New Delhi.

REFERENCES:

1 Douglas and McDaniel, A 2002.Concise of Inorganic Chemistry, Oxford and IBH Publishing Company (P) Ltd., New Delhi.

2 E. Huheey, Ellen A. Keiter, Richard L. Keiter,2004. Inorganic Chemistry, IV Edn., Pearson Education (Singapore) (P).Ltd., Delhi.

3 Wahid U. Malik, G. D. Tuli and R. D. Madan, 2006.Selected Topics in Inorganic Chemistry, S. Chand & Co. Ltd., New Delhi.

4 William W. Porterfield, 2005.Inorganic Chemistry, Elsevier, II Edn., New Delhi.

5 A.G. Sharpe, 2004.Inorganic Chemistry, Addition – Wesley Longman, UK III Edn.
6 Gary L. Miessler and Donald A. Tarr, 20004.Inorganic Chemistry, Pearson Education, Inc., 3rd Edn., New Delhi.
7 Mick Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons and Burkhard Raguse2005. Nano technology-Basic Science and Emerging Technologies, Overseas Press India (P). Ltd. New Delhi Ist Edn, .
8 Mark Ratner and Daniel Ratnar, 2003.Nanotechnology-A Gentle Introduction to the Next Big Idea, Pearson Education Inc., US
9 D.N. Sathyanarayana, 2001 Electronic Absorption Spectroscopy and Related Techniques, Universities Press (India) Limited.

Course Designers

1. Dr.A.Suganthi
2. Dr.A. Elangovan
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THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: M.Sc Chemistry (Spl) (Core 9)	Int. Marks	: 25
Class	: II Year	Ext. Marks	:75
Semester	: III	Max. Marks	: 100
Sub. Code	: S3PC3	Hours/Week	: 5
Title of the Paper	: **Physical Chemistry- III**	**Credits**	**:4**

Course outcomes:
On successful completion of the course students will be able to
- Learn about the fundamentals of symmetry and applications of group theory.
- Understand in detail about IR, Raman and microwave spectroscopy
- Study the concepts of PES, ESR, Mossbauer, NQR spectroscopy and their applications.

UNIT – I **15 Hrs**

GROUP THEORY – I (Basics of Group Theory)

(i) Introduction - Symmetry elements and symmetry operations - Definition of mathematical group – four cardinal properties of a group – closure, associative, idendity and inverse rule – cyclic group – Abelian group (H_2O only) and non-abelian group (NH_3 only) – Group multiplication table- C_2v and C_3v; subgroup – similarity transformation – class of group – Point group – Assignment of point group of simple molecules;

(ii) Matrix-introduction - matrix representation of the symmetry operations – idendity (E), Proper axis of rotation (C_n), Vertical reflection (σ_v), Improper axis of rotation (S_n) and Inverse (i); (iii) Representation definition – reducible and irreducible representation of a group –block factorization. The great orthogonality theorem (GOT) – rules for writing (properties of) irreducible representations – Projection operator (definition only) – character table definition – construction of character table C_{2V} and C_{3V}.

UNIT – II

GROUP THEORY – II (Applications of Group Theory) **15 Hrs**

Prediction of symmetry of atomic orbitals - linear vector, rotation vector – symmetries of tensor like properties (α & g); Prediction of orbitals and hybridization in BF_3 and CH_4 molecules ; Normal mode analysis – H_2O and NH_3; Direct product representation and its applications – identification of IR and Raman active vibration of H_2O and N_2F_2 – selection rules to predict allowed and forbidden electronic transition in UV-Visible spectra for example formaldehyde (HCHO); HMO energy calculation for ethylene and butadiene.

UNIT – III SPECTROSCOPY - I **15 Hrs**

Absorption and emission of electromagnetic radiation (emr) – LASER — Interaction of electromagnetic radiation with matter – Einstein coefficients; Microwave, IR and Raman spectroscopy of diatomic molecules – determination of molecular parameters – vibrational spectra of polyatomic molecules – IR and Raman active modes – overtone and combination bands – Fermi resonance – group frequencies and coupling interaction.

UNIT – IV SPECTROSCOPY – II **15 Hrs**

Electronic spectra of diatomic molecules – molecular quantum numbers – dissociation energy calculations – Birge-sponer extrapolation technique – pre-dissociation spectra – charge transfer spectra – Fortrat diagram – electronic spectra of molecules – absorbance – oscillator strength;

Photoelectron spectroscopy – basic principles, spectrum, X-ray PES, (ESCA) – vibrational structure – koopman's theorem – PES of argon, oxygen and nitrogen.

UNIT – V

SPECTROSCOPY - III **15 Hrs**

ESR spectroscopy – principle, g-factor, experimental method, spectrum, fine and hyperfine structures and applications (H-atom, CH_3 radical, *p*-1,4 benzosemiquinone radical anion, naphthalene anion, Tempol)

NQR spectroscopy – quadrupole movement, coupling constant, quadrupole transition-electric field gradient and molecular structure ($_7N^{14}$, $_5B^{11}$, $_{17}Cl^{36}$)

Mossbauer spectroscopy – recoilless emission and resonance absorbtion, experimental method, isomeric shift and electric quadrupole splitting in Fe^{57}.

TEXT BOOKS: (UNIT I & II)

1. Ccotton F.A., 1971, Chemical applications of group theory, 3rd edt. wiley eastern Ltd., UK.
2. Ramakrishnan, V., Gopinathan M.S., 1988, Group theory in chemistry, Vishal pub, New delhi,
3. Veera Reddy, K. 1998, Symmetry and spectroscopy of molecules, New age International (p) Ltd., New Delhi.

REFERENCE BOOKS:

1. G.M. Barrow, Introduction to molecular spectroscopy, McGraw-Hill, Newyork.
2. Banwell G.M., Fundamentals of molecular spectroscopy, IV Edn., TMH company Ltd.
3. Chang R., 1971, Basic principles of spectroscopy, McGraw-Hill.
4. Straughan B.P., Walker S., 1976, Spectroscopy – Vol. 1, 2 and 3, Chapman and Hall.
5. Drago R.S., 1999, Physical methods in chemistry, Saunder college publishing.

Course Designed by

1. Dr. R. Sayeekannan,
2. Dr. A. R. Ramesh,
3. Dr. T. Arumuganathan,

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc. Chemistry(Spl) (Core elective 2)	Int. Marks	: 75
Class	: II Year	Ext. Marks	: 25
Semester	: III	Max. Marks	: 100
Sub. Code	:S3PCE1(C)	Hours/Week	: 5
Title of the Paper	: **Computer Applications in Chemistry (Option A)**	**Credits**	**:5**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- Understand the concepts in internet and E-mail.
- Have an understanding on HTML and JAVA APPLET and also to emphazise on their applications in chemistry.
- Get hands-on experience on chemistry-related software and their applications

UNIT-I: INTERNET AND E-MAIL **T: 10 + P: 5 Hrs**

INTERNET: Introduction- History- Importance of the Internet- Internet Access- Dial-Up connection, Direct connection and equipments –- Internet protocol(TCP/IP,FTP HTTP, TELNET and WAP)-Internet addressing – Domain Name-Mail address-Uniform Resource Locator(URL)-Web Browsing- Searching the Web- Search Engines(Yahoo, Google)- Intranet – Searching and utilizing Popular websites in Chemistry. On line literature survey- accessing of e-journals. Preparing articles for e-publications. Online structure drawing- Collection of spectral data using databases.

ELECTRONIC MAIL: Introduction-Working of E-Mail - Word processor for E-Mail-Mailing Basics – Composing and sending of an E-Mail- Address Book – Signature- File Attachments- Customizing your Mail program –Advantages and Disadvantages of E-Mail - Tips for effective E-Mail use- Smile keys.

UNIT- II: HTML **T: 8 + P: 7 Hrs**

HTML - Need- Structure of HTML Document- HTML Tags- Horizontal line Tags- Background and Text color Tags- Font Tags- MARQUEES Tags- Adding pictures - Ordered and Unordered Lists- Creating Links- Construction of Periodic Table with required data for first ten elements- Frames – Developing and hosting of Web Pages for a given molecule / chemical.

JAVA APPLETS: - Simple and Java applets with graphics- Applications of applet to draw 2D and 3D view of molecules.

UNIT-III: APPLICATIONS OF CHEMDRAW AND CHEM 3D SOFTWARE IN CHEMISTRY **T: 8 + P: 7 Hrs**

Introduction- Tool Pallets- Construction of the molecule using Chem Draw- Tools- Manipulating a molecule-Model display- Display type- Structure displays- Molecular Surface display- NMR simulation and interpretation- Naming IUPAC- Structure from Name and Name from Structure-Computational Concepts: - Computational methods: - Potential energy surface, geometry Optimizations property (calculations)-Molecular Mechanics Theory in brief - Animations- Difference between Chemdraw and Chem 3D.

UNIT-IV: APPLICATIONS OF SHELX PROGRAM IN CHEMISTRY

T: 5 + P: 10 Hrs

Basics of Crystals- Symmetry and operations- Seven Crystal systems- Bravais lattices – X-Ray Diffractometers- Unit cell parameters- X-ray data- Deduction of Space group - Structure solution and refinement using SHELX- Structure building using PLATON- H-Bonding.

UNIT-V: APPLICATIONS OF RASMOL and MATLAB IN CHEMISTRY-III

: 8 + P: 7 Hrs

RASMOL: - Introduction- User commands– Identification of disulfide-bridges and visualization of :-hydrophobic and polar residues, the distribution of polar and non polar amino acids, side chain of carboxylate and amine , the different structural motives like α-helix, β-sheet and β - turn, the amino acids bound to Zn, active site of carboxypeptidase A, the environment of the active center.

MATLAB: - Introduction-advantages- getting started- windows for workspace, command interpretation, command history and current history- Addition- Use of sine and Cosine of angles(pi)- variable 'ans'- order of operations- significant decimals- Representation of matrix- getting transpose of a matrix- display of images- saving images-solving linear equations(case m=n only).

Text Books:

1. . Alexis Leon and Mathews Leon. 1999.Fundamentals of Information Technology Leon TECH World, UBS Publishers & Distributors Ltd.
2. E. Balagurusmy,2003. Programming with Java- A Primer, , Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2nd Edn., 15th Reprint
3. C. Xavier,2000 World wide web design with HTML, , Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2nd Reprint.

Reference Books:

1. Margaret Levine Young,2001. Internet- Complete Reference, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
2. Barbara Kassev,1998. Using the Internet, EE edition, New Delhi, IV Edition.
3.Alexis Leon and Mathews Leon,2000 Internet for Everyone, Leon TECH World, Publishers & Distributors Ltd..
4. John Zukowski,2000. Mastering Java 2, BPB Publications, New Delhi.
5 Patrick Naughten,2002. The Java Hand Book, Tata McGraw-Hill Publishing Company Ltd., NewDelhi, 11th Reprint.
6. Herbert Schildt,2001. Java 2- The Complete Reference, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 4th Edn.
7. Holzner, John Zukowski,1999. Java 2 Complete: Steven BPB Publications, New Delhi, 1st Indian Edn..
8. Harley Hahn,2001. The Internet Complete Reference, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2nd Edn.
9 Chem Draw & Chem 3D –Manual
10. Shelx, Rasmol and MATLAB- Manuals.

REFERENCES in the NET

1.http://SCS 99.unige. Che/eng/toc.html
2.http://hackberry.chem.niu.edu: to/o/webpage.html
3.http://java.Sun.Com/applet/applets/chemical Models/index.html
4.http://ccl.osc.edu/chemistry.html
5. http://www.umass.eud/microbio/rasmol/
6. http://www. Mdli.com/cgi/dynamic/welcome.html/ (for CHIME similar to Rasmol)

Course designers

1. Dr. A. Elangovan
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3. Dr. A. Tamilselvi

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: M.Sc.Chemistry (Spl) (Core elective 2)	Int. Marks: 75	
Class	: II M.Sc Chemistry	Ext. Marks	: 25
Semester	: III	Max. Marks	: 100
Sub. Code	: S3PCE1(A)	Hours/Week	: 5
Title of the Paper	: **Advanced Organic Synthesis (Option B)**	**Credits**	**:5**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

1. gain knowledge in Stereoselective and retrosynthetic analysis
2. understand about the guest-host interaction.
3. gain scientific and technical knowledge in Green chemistry and biotransformation

UNIT-I REETEROSYNTHETIC ANALYSIS (15 Hrs)

Synthetic Strategy of the following target molecules: longifolene-juvabione-jasmone- 5-hexenoic acid-trans-9-methyl I-decalone- bicyclo (4,1,0) heptan-2 one- α-onocerin-isonootketone.

UNIT-II BIOGENESIS OF ALKALOIDS,TERPENOIDS & FLAVONES (15 Hrs)

Alkaloids(pyridine,phenanthrene and indole type)-nicotine-gramine-harmine-morphine-codine-terpenoids of classes with examples Lanosterol & Cholesterol from squalene-coumarins-carbohydrates-fructose-6-phosphate-xylose-5-phosphate-ribulose-5-phosphate-sucrose-amylose and amylopectin-flavones-proteins

Terpenoids: Geranyl diphosphate-Geraniol-Farnesol–Camphor-limonene-citronellol-caryophyllene(Corey methods) – santonin

UNIT-III BIOSYNTHESIS OF FATTY ACIDS (15 Hrs)

Introduction-acetate pathway-acetyl co-enzyme-A-biosynthesis of fatty acids-malonyl co-A-malonyl ACP-Acyl ACP-Acetoacetyl Co-A- biosynthesis of unsaturated fatty acids Major biosynthetic pathways: 1) Acetate-Malonate pathway: Biosynthesis of aromatic compounds, 2) Shikimic acid pathway ; Biosynthesis of essential amino acids – phenylalanine, tyrosine and tryptophan, carboxylic acid derivatives 3)Mevalonic acid pathway : Biosynthesis of mevalonic acid.

UNIT-IV: DYES (15 Hrs)

Introduction, various methods of dyeing, classification of dyes, nitroso dyes,Azodyes,-Fast green, Methyl Orange, Methyl Red, Fast Red, tripheylmethane dyes-Malachite green, Rosaniline, Aniline blue, Crystal violet, Xanethene dyes-Fluorescein,Rhodamine B, Anthroquinone dyes – Alizarin –Preparation and uses.

UNIT – V : BIOTRANSFORMATION (15 Hrs)

Advantages and disadvantages of Biocatalysts – Biocatalytic application. Hydrolytic reaction, reduction, oxidation, peroxidation – addition and elimination Reaction. Formation of C-C bond-glycosyl transfer reactions - Immobilisation – adsorbtion – ion binding entrapment into gels, into membranes – compartments – Micells and vesicles – modified and artificial enzymes – semisynthetic enzymes – catalytic antibodies.

Text Books:

1. R.K. Mackie, D.M. Smith and R.A.Aitken,1990. Guide book to Organic synthesis, Longman group, UK, 2n edition.
2. S.Warren, 1997.Organic synthesis, The disconnection approach, John Wiley & Son.

3. C.Daniel Gutsche, Calixarent,1989. Royal Society of Chemistry, Cambridge UK.

References:

1. Organnic Synthesis-Robert E.Ireland-Prantice Hall of India Pvt Ltd,NewDelhi.

2. Advanced Organic Chemistry-Reaction & Synthesis-Francis A.Corey & Richard J.Sundberg-V Edition-Springer.

3. Organic Chemistry-Francis A.Corey & Robert M.Giuliano-Tata McGraw-Hill Edition

4.Organic Chemistry-Natural Products Volume II-Dr.O.P.Agarwal-Goel Publishing House.

5. Chemistry of Carbocyclic Compounds-Azhuwalia

6. Pharmaceutical,Medicinal and Natural Product Chemistry-P.S.Kalsi & Sangeetha Jagtap-Narosa Publishing House

7. Organic Chemistry-Jonathan Clayden,Nick Greeves and Stuart Warren-Second Editiion-Oxford University Press

8. Synthetic Dyes-Gurudeep Chatwal

9.Biotransformation in Organic Chemistry-Kurt Faber-A Textbook-V Edition-Springer

Course designer

1. Dr. P. Tharmaraj
2. Dr. P. Prakash
3. Dr. R. Mahalakshmy
4. Dr. A.Tamilselvi

THIAGARAJAR COLLEGE, MADURAI- 9

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DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc.Chemistry (Spl) (Core 10)	Int. Marks	: 75
Class	: II MSc Chemistry	Ext. Marks	: 25
Semester	: IV	Max. Marks	: 100
Sub. Code	: S4PC1	Hours/Week	: 4
Title of the Paper	: **Organic Chemistry – IV**	**Credits**	**:4**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- Kindle the synthetic aptitude on the heterocycles and chemistry of steroids and vitamins.
- Understand the chemistry of heterocycles as alkaloids and terpenoids in natural products.
- Understand the Protein and Green Chemistry.

Unit - I CHEMISTRY OF HETEROCYCLIC COMPOUNDS (12 hrs)

Heterocyclics – Nomenclature – Compounds containing two hetero atoms: Synthesis and reactivity of pyrazole, imidazole, oxazole, thiazole, quinoline and isoquinoline. diazines: the chemistry of pyridazine, pyrimidine and pyrazine – Comparison of basicity of diazines. Introduction to anthrocyanins and flavonoids

Unit - II CHEMISTRY OF TERPENOIDS AND ALKALOIDS (12 hrs)

Chemistry of terpenoids: General methods of determining structure of terpenoids – α-pinene, Zingiberene, and Abietic acid.

Chemistry of alkaloids: General methods of determining structure of alkaloids – Structure elucidation of (i) Morphine (ii) Reserpine.

Unit- III CHEMISTRY OF STEROIDS AND VITAMINS (12 hrs)

Chemistry of steroids : Introduction – Structural elucidation of Cholesterol – Androsterone and Testosterone (male sex hormones) – Oesterone, progesterone (Female sex hormone).

Classification of Vitamins: Nomenclature of Vitamins – Strucure and Biological functions of vitamins: Vitamin A (Retinol), Vitamin B2 (Riboflavin), Vitamin B6 (Pyridoxine), Vitamin B12, Vitamin C, D and E (Structure elucidation and synthesis not required).

Unit IV CHEMISTRY OF PEPTIDES AND NUCLEIC ACID (12 hrs)

(c) Polypeptides – Classification - the peptide linkage - Structure of amino acids – 1^0, 2^0, 3^0 and quaternary structure) – Solid phase peptide synthesis (Merifield) – use of protecting groups and reagents – Structural elucidation of glutathione, thyroxin and oxytocin.

(d) Nucleosides, Nucleotides and Nucleic acids – structure and synthesis of nucleosides and nucleotides – Elementary treatment on the structure of DNA and RNA

Unit – V GREEN CHEMISTRY (12 hrs)

Green Chemistry: Importance and principles of Green chemistry - Solid state and Solvent free organic reactions – Solid supported reagents – Microwave assisted reactions - Sonochemical approach - Reactions in ionic liquids – supercritical CO_2 medium – aqueous medium - enzymatic and electrochemical methods.

Text Books:

1. I.L. Finar, 2005. Organic Chemistry, Vol. II, V Edition, ELBS, UK.
2. S.F. Dyke,1965 Chemistry of Vitamins, Interscience, Toronto,USA.
3. O.P. Agarwal,2002. Chemistry of Natural products, Vol. I and II, Himalaya Publishing House, New Delhi.
4. V.K. Ahluwalia, M. Kidwai 2006"New trends in Green Chemistry" Second Edition, Anamaya publishers, New Delhi.
5. Gurdeep Chatwal,1997. Organic Chemistry of natural products, Vol. I, Himalaya Publishing House New Delhi.
6. Morrison and Boyd, Organic Chemistry, Prentice-Hall of India private limited, New Delhi, 6^{th} Edition.

Reference Books

1. Hermann Dugus, 2004.Bioorganic Chemistry, Springer International, III Edition, New Delhi,
2. D.L. Nelson and M.M. Cox,2008 Lehningers' Principal of Biochemistry, W.H. Freeman and Company, New York, 5^{th} Edition.
3. L.F Fieser and M. Fieser, 1991.Steroids, Reinhold Press, Atlanta,USA.

Course designers

1. Dr. P. Tharmaraj
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THIAGARAJAR COLLEGE, MADURAI- 9

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DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc Chemistry (Spl) (Core 11)	Int. Marks	: 25
Class	: II Year	Ext. Marks	:75
Semester	: IV	Max. Marks	: 100
Sub. Code	: S4PC2	Hours/Week	: 4
Title of the Paper	**: Inorganic Chemistry- IV**	**Credits**	**: 4**

COURSE OUTCOMES

On the successful completion of the course, students will be able to

- gain knowledge on organo metallic chemistry and transition metal catalysts.
- understnand bioinorganic chemistry.
- get an idea about inorganic photochemistry.
- understand the concept of PES, EPR, Mossbauer spectroscopic techniques.

UNIT –I ORGANOMETALLIC CHEMISTRY –I 12 Hrs

Stability of organo metallic compounds- β hydrogen elimination- the sixteen and eighteen electron rule. Synthesis – structure and bonding in metal carbonyls – isoelectronic and isolobal analogy- use of IR in the structural elucidation of carbonyl compounds– metal nitrosyls – dinitrogen complexes. π donors-**Carboxylic ligands and complexes**. Synthesis structure bonding and reactivity of carbenes, carbines, metallocenes and other aromatic cyclopolyenes – Ferrocene – bonding and structure – sigma, pi and hapto nomenclature. Arene complexes – olefin – acetylene and pi allyl complexes.

UNIT – II ORGANOMETALLIC CHEMISTRY –II 12 Hrs

Catalysis involving organometallic compounds – properties of metals and ligands in homogeneous catalysis – oxidative addition and reductive elimination – hydrogen abstraction – activation of small molecules by complexation-agnostic interaction-insertion-alkyl migration-insertion and elimination-catalytic reactions- hydrogenation of olefins – Wilkinson's catalyst – hydroformylation – syn-gas-water gas shift reactions- oxidation of olefins – Wacker process – propylene polymerization - Olefin metathesis -Ziegler natta catalyst -cyclo oligomerisation of acetylene , butadiene- Reppe's catalyst . Mansanto's acetic acid synthesis-Fischer-Tropsch's synthesis of Synthetic gasoline.

UNIT –III BIO-INORGANIC CHEMISTRY 12Hrs

Essential and trace elements in biological systems –ion pump- metalloporphyrins – the porphyrine ring system – chlorophyll – photosynthetic electron transfer - Electron transport sequence – biological electron transfer – electron transfer agents – cytochromes – Hemoglobin – myoglobins – and synthetic oxygen carriers – nitrogen fixation – in vivo and in vitro – copper proteins-Metal complexes in medicine- Biomineralisation of iron-Metal complexes in medicine-Chelate therapy- Metals used for diagnosis and chemotherapy-metal-nucleic acid interactions.

UNIT-IV PHYSICAL METHODES IN INORGANIC CHEMISTRY-II 12Hrs

Electron paramagnetic resonance spectroscopy: Applications of hyperfine splitting and g factor to structural elucidation- Zero field splitting-Krammer's Degeneracy- EPR spectra of Cu (II) and Mn (II) in various site symmetry- covalency of metal-ligand bonding by EPR- study of dynamic processes in solids- Study of phase transition by Mn (II) – John Teller distortions in Cu (II) complexes.

Mossbauer spectroscopy: Basic principles- Doppler effect- Isomer shift- Electron nuclear hyperfine interactions- Quadrupole and magnetic interactions in the study of structure and bonding in Iron and Tin complexes and in Biological systems.

UNIT –V INORGANIC PHOTOCHEMISTRY 12 Hrs

Excited states of coordination complexes – properties of excited states charge transfer and energy transfer – photochemical pathways.

Photoredox reactions of Co(III) and Cr(III) complexes – photosubstitution reactions – photoaquation, photoanation and photorearrangements - Role of TiO_2 in solar energy conversion – Photoredox chemistry of Ruthenium bipyridyl and Ruthenium(II) poly pyridyl compounds- energy conversion and photochemical decomposition of water using Ru complexes- storage of solar energy.

TEXT BOOKS: -

1. Cotton F.A. and Wilkinson, G.1998. Advanced Inorganic Chemistry, Wiley- Interscience publications, John Wiley & Sons, V Edn. New York.
2. Wahid U. Malik, G.D. Tuli and R. D. Madan,2006. Selected Topics in Inorganic Chemistry, S. Chand & Co. Ltd., New Delhi,
3. Nakamoto, Kazuo, Paul J. McCarthy,1986. Spectroscopy and Structure of Metal Chelate Compounds, IV edition, John Wiley and Sons. Inc., New York.
4. Drago, R. S. Van Nostrand and Reinhold,1976. Physical Methods in Chemistry .
5. Purcell K.F. and Kotz J.C.,1977. Holt Saunders, Inorganic chemistry, Philadelphia.
6. Raymond Chang, 1971.Basic principles of Spectroscopy, Mc Graw Hill, New Delhi..
8. Straughan B. P. and Walker, S. 1976.Spectroscopy, Vol.3, Chapman and Hall, New York, .
9. T.C. Gibbs,1978. Principles of Mossbauer Spectroscopy, Chapman and Hall, New York.
10. Arthur W. Adamson & Paul D. Fleischauer, 1975Concepts of Inorganic Photochemistry, John Wiley & Sons. In., New York.

REFERENCE BOOKS: -

1. Huheey, J. E., Ellen A. Keiter, Richard L. Keiter,2004. Inorganic chemistry, IV Edn., pearson Education (Singapore) (P) .Ltd., Delhi.
2. Wahid U. Malik, G.D. Tuli and R. D. Madan, 2006.Selected Topics in Inorganic Chemistry, S. Chand & Co.Ltd., New Delhi.
3. A.G. Sharpe,2004. Inorganic Chemistry, III Edn., Addition – Weskey Longman, UK .
4. Gary L. Miessler and Donald A. Tarr, 2004.Inorganic Chemistry, Pearson Education, Inc., 3rd Edn., New Delhi.
5. D. F. Shriver and P.W. Atkins,1999. Inorganic Chemistry, Oxford University Press,
6. London.
7. K. Hussain Reddy,2005. Bioinorganic Chemistry, New Age International (P) Ltd., Delhi.
8. William W. Porterfield, 2005.Inorganic Chemistry, II Edn., Elsevier, New Delhi..

Course Designers

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THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc Chemistry (Spl) (Core 12)	Int. Marks : 25
Class	: II Year	Ext. Marks : 75
Semester	: IV	Max. Marks: 100
Sub. Code	: S4PC3	Hours/Week: 4
Title of the Paper	: **Physical Chemistry-IV**	Credits :4

Course Outcomes:

On successful completion of the course students will be able to

- Impart knowledge on various kinetic theories and reaction rate
- Understand the physical concepts of photochemistry and surface chemistry
- Gain knowledge on basics and applications on polymer chemistry

UNIT-I **(12 hrs)**

CHEMICAL KINETICS-I

Simple Collision theory- modification - Absolute reaction rate theory (ARRT) - Statistical and thermodynamics formulation - Comparison of ARRT with collision theory- Significance of entropy of activation- Relation between ΔH and Ea- Transmission co-efficient; ARRT of termolecular reactions – Unimolecular reactions - Lindemann, Hinshelwood, RRKM and Slater treatments. –solution kinetics – ARRT of reaction in solution – Influence of ionic strength on the rates of ionic reactions (salt effects).

UNIT-II **(12 hrs)**

CHEMICAL KINETICS-II

Fast reactions-flow and relaxation techniques, Temperature Jump and pressure jump method - complex reactions – opposing, consecutive and parallel reactions; Chain reaction – kinetics and general characteristic – H_2 - Br_2 reaction, Rice – Herzfeld mechanism for decomposition of acetaldehyde & ethane – Branched chain reaction – study of H_2-O_2 explosive reaction-homogeneous catalysis – acid, base catalysis.

UNIT-III **(12 hrs)**

PHOTOCHEMISTRY

Physical properties of the electronically excited molecules – radiationless transitions – Jablonski diagram-Internal conversion and intersystem crossing – Stern-Volmer equation and its application – radiative transition – fluorescence, phosphorescence and other deactivation processes; Effect of temperature on emission process – photosensitization and Chemiluminescence; Experimental techniques in photochemistry, chemical actinometers.

photochemical Kinetics of H_2-X_2 reactions – Photolysis of acetaldehyde Photodimerisation of anthracene – Photoequation of $[Cr(NH_3)_5NCS]^{2+}$ and photo isomerisation of Cis-bis glycinato Pt(II); Applications of photochemistry – Solar energy conversion and storage – photo synthesis- excited state acidic property and energy transfer.

UNIT-IV **(12 hrs)**

SURFACE CHEMISTRY

Physisorption and Chemisorption – adsorption isotherm – derivation of Langmuir and Freundlich, derivation of B.E.T equation of multilayer adsorption – application of BET equation to surface area determination, derivation of Gibbs adsorption isotherm. Heterogeneous catalysis and their kinetics – chemical reactions on solid surfaces - Mechanism & Kinetics of unimolecular and bimolecular surface reactions – Langmuir – Hinshelwood, Langmuir –Ridel mechanism, ARRT of surface reactions; Basic concepts of Micelles and Reverse Micelles.

UNIT-V **(12 hrs)**

POLYMER CHEMISTRY

Introduction of Polymers – Classification-Tacticity - Polymerisation - Addition, Co-polymerisation and Condensation polymerisation – Kinetics of polymerization-Free radical Chain polymerization-Cationic- anionic polymerization- Molecular weight determination – Osmotic pressure methods- Light Scattering method-Ultra Centrifuge and Viscosity methods; Classification of Plastics-Thermosetting & Thermoplastic resins-Adhesives-Compounding of Plastic - Fabrication - compression moulding, injection moulding, extrusion moulding and Blow moulding.

Industrially important polymers – Preparation, Properties and uses of (LDPE & HDPE), Polystyrene, polyester, acrylo polymer, Teflon, Phenolic resins, amino resins and epoxy resins, Polyvinyl acetate-composites of Resins-ABS-Conducting Polymers-Polyacetylene, Polyaniline, Inorganic polymer-Silicone and Biopolymers-cellulose.

Text Books:

1. Glasstone S., 1974, Textbook of Physical chemistry, III Edition McMillan, Alasca.
2. Daniels F., Alberty, R.A. 1974, Physical Chemistry, John willey and sons , UK.
3. Moore, W.J. 1972, Physical Chemistry, V Edition, Orient Longman, UK.
4. Billmeyer Jr F.W., 1984, A text book of Polymer Chemistry – III edition, John Willey and Sons, UK.
5. Gowarikar V *et al*., 1986, Polymer Science, Willey Eastern Limited, New York.
6. Rodriguez F., 1987, Principles of polymer chemistry, Tata McGraw- Hill Publishing Co. Ltd., New Delhi, India.

Reference Books:

1. Laidler K.J., 2005, Chemical Kinetics, II Edition, Tata McGraw Hill, UK.
2. Frost A.A., Pearson R.G., 1990, Kinetics and Mechanism, New York.
3. Wilkinson F., 2000, Chemical Kinetics and Reaction Mechanism, Var Nostrard Reinhold Co., New York.
4. Rohatgi-Mukherjee K.K., 1999, Fundamentals of Photochemistry, Wiley Eastern Ltd., Revised edition, New York.
5. Adamson A.M., 2002, Physical Chemistry of Surfaces, V.Edition, John Willey, UK.
6. Laider, K.S., 2005, Chemical kinetics, III Edition, TMH, New York.
7. Allcock H.R., Lampe W., 1991, Contemporary polymer chemistry, Prentice Hall UK.
8. Young, 2002, Polymer Chemistry II, Chapman Hall.
9. Arora Singh, 2001, Polymer Chemistry, Anmol Publications Pvt. Ltd.

Course Designers

1. Dr. R. Sayee Kannan
2. Dr. A. R. Ramesh 3. Dr. T. Arumuganathan

THIAGARAJAR COLLEGE, MADURAI- 9
(Re-Accredited with 'A' Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: M.Sc.Chemistry (Spl) (Core10 lab)	Int.Marks	: 40
Class	: II Year	Ext. Marks	: 60
Semester	: IV	Max. Marks	: 100
Sub. Code	: S4PCL1	Hours/Week	: 4
Title of the Paper	**: Organic Chemistry Lab 2**	**Credits**	**:4**

Course Outcomes:

On successful completion of the course students will be able to

- Prepare organic compounds in two steps.
- Do quantitative estimation of organic compounds.

DOUBLE STAGE PREPARATION

1. p-Nitroaniline
2. p-Bromoaniline
3. 1,3,5-Tribromobenzene
4. Benzanilide
5. m-Nitrobenzoic acid
6. p-Iodonitrobenzene (III stage)
7. 2,5-dihydroxy acetophenone

(any five preparations only)

ESTIMATION

1. Estimation of glucose – Lane and Eynon method
2. Estimation of glucose-Betrand method
3. Estimation of ethyl methyl ketone
4. Estimation of acetone
5. Estimation of glycine

Course Designers

1.Dr. P. Prakash

2.Dr. R. Mahalakshmy

THIAGARAJAR COLLEGE, MADURAI- 9

(Re-Accredited with 'A' Grade by NAAC)

DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc.Chemistry (Spl) (Core 11 lab)	Int.Marks	: 40
Class	: II Year	Ext. Marks	: 60
Semester	: IV	Max. Marks	: 100
Sub. Code	: S4PCL2	Hours/Week	:4
Title of the Paper	: **Inorganic Chemistry lab 2**	**Credits**	**:4**

I. Gravimetric Analysis:

a) Estimation of lead as lead chromate
b) Estimation of Nickel as Ni-DMG
c) Estimation of Magnesium as Magnesium oxinate

III. Preparation: (Any FOUR)

a) Potassium cupricsulphate
b) Potassium trioxalatoaluminate
c) Hexathioureaplumbusnitrate
d) Tetrammine copper(II)sulphate
e) Ferrous/Ferric oxalate

III. Colorimetry:

a) Estimation of Iron (III)
b) Estimation of Copper (II)

IV. Chromatography (Demo only NOT for the Exam)

a) Paper Chromatography: Chromatographic separation of a mixture of Co, Mn, Ni and Zn
b) Column Chromatography: Chromatographic separation of potassium permanganate and dichromate**.**

V. UV-visible spectrophotometer (Demo only NOT for the Exam)

Determination stability constant for a complex.

Course Designers
1. Dr. A. Suganthi
2. Dr. D.S. Bhuvaneshwari

THIAGARAJAR COLLEGE, MADURAI- 9

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DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc.Chemistry (Spl) (Spl. Lab 2)	Int.Marks	: 40
Class	: II Year	Ext. Marks	: 60
Semester	: IV	Max. Marks	: 100
Sub. Code	: S4PCL3	Hours/Week	: 4
Title of the Paper	: **Synthesis and Spectral Analysis**	**Credits**	**:4**

I. Characterization of the following complexes by electronic and IR spectral data.

(i) Tetraammine Copper (II) sulphate

(ii) Zinc-Oxine

(iii) Nickel-DMG

II. Study the folllowing reaction using IR and UV spectra.

(i) benzophenone → benzophenone oxime

(ii) acetone + benzaldehyde → dibenzalacetone

(iii) salicylic acid → aspirin

III. Study the Adduct formation using the spectral data.

(i) hydroquinone --- p-benzoquinone ---- anthracene adduct

(ii) urea-salicylic acid

IV. Compare the spectra of the following:

(i) $[Cu(NH_3)_4)]^{2+}$ of solution and solid-vapor process

(ii) Reaction between $CuSO_4$ and aniline under solution and solid-vapor process

Course Designers

1. Dr.A.Suganthi

2. Dr S. Pitchaimuthu

THIAGARAJAR COLLEGE, MADURAI- 9

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DEPARTMENT OF CHEMISTRY

(For those who join in 2017 and after)

Course	: M.Sc.Chemistry (Spl)	Int.Marks	: 40
Class	: II Year	Ext. Marks	: 60
Semester	: IV	Max. Marks	: 100
Sub. Code	: SPJ	Hours/Week	: 6
Title of the Paper	: **Project**	**Credits**	**: 3**

Course Outcomes

On successful completion of the course students will be able to

1. Get skills on developing new materials through new synthetic routes and

2. Characterize the material using different techniques.

2. Learn research methodologies along with literature survey.

Marks

External Examiner **:** Viva : 20
External Examiner **:** Evaluation of Project : 40
Internal Examiner **:** Evaluation of Project : 40

100

M. Phil., Chemistry

THIAGARAJAR COLLEGE, MADURAI- 9
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DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

M. Phil., PROGRAMME IN CHEMISTRY (SF)

Objectives of the Programme:

1. To develop research aptitude.
2. To equip the students with latest concepts and techniques in chemical research.
3. To enable the students to present their research work in conferences.
4. To encourage the students to publish research papers in reputed journals.
5. To facilitate students to acquire the Ph. D degree.

Course Structure
Semester - I

Course	Code No	Subject	Hrs/ Week	Total Hrs	Max Mark CA	Max Marks SE	Total
Core 1	S1MC1	Research methodology	6	90	100	100	200
Core 2	S1MC2	Course work	6	90	100	100	200
Core 3	S1MC3	In depth study	6	90	100	100	200
			18	270	300	300	600

Semester-II

Course	Code No	Subject	Hrs/ Week	Total Hrs	Max Mark CA	Max Marks SE	Total
Core 4	SMPJ	Project	6	90	*a(50+50)	*b100	200
		Total					

*b. Thesis evaluation by external examiner :100
*a Viva-voce (Project guide) : 50
*a Viva-voce (external examiner) : 50

Total : 200

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DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: M.Phil Chemistry(Core 1)	Int. Marks	: 100
Class	: I Year	Ext. Marks	: 100
Semester	: I	Max. Marks	: 200
Sub. Code	: S1MC1	Hours/Week	: 6
Title of the Paper	**: Research Methodology**		

Course Outcomes:
On the successful completion of the course, students will be able to

- Gain knowledge about general research methods and analytical skills required to carryout chemistry research projects with the help of latest web based chemical literature using chemical databases.

Unit I - Literature Survey: (18 hrs)

Searching the chemical literature, primary sources & secondary sources of literature survey – Importance of journals and patents, impact factor, h-index, i-index, ISSN, ISBN –Science Citation Index - chemistry journal index - choosing a problem - Computers in literature search using Internet websites- ACS-pubs, Royal Society, Springer link, science direct, Wiley - Interscience, search engines-Google, Yahoo, Alta Vista, etc., and Chemical Abstract Online.

Unit II - Computers in Chemistry: (18 hrs)

Desk-top chemical software: **Chemoffice:** Chemdraw, Chem 3D & Chem finder, Linear regression, Multi regression. MS Excel: Graph drawing and calculations -Origin.

Rasmol: Visualization of Protein molecules – highlighting amino acids, helices, beta sheets, non-hydrogen, hydrogen and sulphur bonds, identification of metal atoms and active sites.

Kinemages : Construction and visualization of one's own protein molecules

SHELX : Structure solving and refinement using Shelxs and Shelxl.

Molecular modeling:

Coordinate systems - Cartesian and internal coordinate systems-wire frame, ball and stick, space filling and surface models - potential energy surfaces – force fields in molecular mechanics and potential energy calculation. Optimization of small molecules using Gaussian software.

Unit III- Instrumental Methods of Chemical Analysis: (18 hrs)

Principle, instrumentation and applications of spectroscopic techniques - Flame Emission spectroscopy - Atomic absorption spectroscopy (AAS). Thermal analysis-Thermo Gravimetry (TGA), Differential Thermal Analysis (DTA) & Differential scanning calorimetry (DSC)- Scanning Electron Microscopy(SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM) and Scanning Tunneling Microscope (STM).

Principle, instrumentation and applications- HPLC, GC-MS and cyclic voltammetry-Spectrofluorimetry.

Unit IV- Laboratory techniques: (18 hrs)

Safety in chemical lab - explosion and fire hazards - hazards due to toxic chemicals - electrical safety - UV radiation - first aids for various kinds of accidents including toxic chemicals - preparation and purification of reagents - precipitation- filtration - evaporation- preparation of deionised water - choice of solvents and liquids - purification - distillation - steam and fractional distillation - solvents and reagents.

Unit V-Effective thesis writing: (18 hrs)

Thesis layout - preliminaries - title page - certificates - declaration- abstracts - preface - acknowledgements - table of contents - list of tables - figures and symbols - text of the thesis - chapter division - subdivision - heading - subheadings - pagination - margins - paragraph - format and conventions - use of tables and figures - numbering - captions - referencing- Reference Systems - documenting –appendices - use of appendix and its format - puntuation and mechanics - presenting a scientific seminar - art of writing a thesis- publication of research paper.

References:

1. Barbara Kasser, Using the internet, IV Edn., EE edition, New Delhi, 1998.
2. Jerry March, Advanced Organic Chemistry, John Wiley & Sons Ltd., IV Edn., New York, 2004.
3. Geffery, G. H., Basselt, J., Mendhan, J. and Denney, R. C., Vogel's Text book of Quantitative Chemical Analysis, V Edn., Longman Scientific and Industrial, UK, 1989.
4. D.A. Skoog, D.M. West & F.J. Holler, Fundamentals of Analytical Chemistry, VII Edn., Saunders College Publishing, New York, 1996.
5. Hobart H. Willard, Lynne L. Merritt,Jr., John A. Dean, Frank A. Settle,Jr, Instrumental Methods of Analysis, VII edition, CBS publishers and distributors, New Delhi, 1986.
6. R.M. Silverstein, G.C. Bassler & T.C. Morril, Spectrometric Identification of Organic Compounds, John Wiley & Sons, V Edn., New York, 2001.
7. R.S Drago, Physical Methods in Chemistry, Saunders College Publishing, Philadelphia, 1977.
8. Andrew R. Leach, Molecular Modeling Principles and Applications, II Edn., Dorset publishers, Dorchester, 2001.
9. J. Anderson, B.H. Durston and M. Poole, Thesis and Assigment Writing, Wiley Eastern Ltd., New Delhi,1997.
10. F.Abdul Rahim - Thesis Writing - A Manual Researcher, New age International Ltd., New Delhi,1996.
11. Bradley J. Holliday & Chad A. Mirkin, Strategies for the Construction of Supramolecular Compounds through Coordination Chemistry- Reviews, Angew. Chem. Int. Ltd., Ed., 2001, 40, 2022-2043., ~CHEMIE@WILEY-VCH
12. Mick Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons & Burkhard Raguse, Nanotechnology, Ist Indian Edition, New Delhi, 2005.

THIAGARAJAR COLLEGE, MADURAI- 9
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DEPARTMENT OF CHEMISTRY
(For those who join in 2017 and after)

Course	: M.Phil Chemistry (Core 2)	Int. Marks	: 100
Class	: I Year	Ext. Marks	: 100
Semester	: I	Max. Marks	: 200
Sub. Code	: S1MC2	Hours/Week	: 6
Title of the Paper	**: Course Work**		

Course Outcomes:
On the successful completion of the course, students will be able to

- do **Organic synthesis.**
- understand the concept and applications of **various spectral techniques**.
- derive advanced knowledge on **Polymer Chemistry**.
- set themselves exposed to **Nano / Green Chemistry**
- have an understanding of **Bio-inorganic Chemistry**.

UNIT I: Advanced Organic synthesis:

Importance of organic synthesis - Key intermediates – Synthon, Retron-synthetic equivalent- starting materials - Retro synthetic analysis- Guideline for best disconnection-synthesis involving functional group interconversion -chemo selectivity, regioselecitivity, stereo selectivity- two group C-X disconnection and synthetic strategies 1,2-1,3-1,4-1,5-1,6 difunctionalised disconnection- use of inclusion compounds such as cyclodextrin, calixarene- carbon-carbon bond forming reaction-suzuki coupling, Heck reaction, sharpless epoxidation.

UNIT II: Nano / Green Chemistry:

Nanoparticles and Carbon nanotubes (singlewalled and multiwalled carbon nanotubes) - Introduction - Methods of preparations – CVD, Laser ablation method – Uses – zinc Oxide, Cadmium sulphide, Titanium dioxide – Synthesis and characterization - Application of nanoparticles: Phosphors, Batteries - Information storage - Solar cells .

Need for Green Chemistry - Solvent free reactions - Microwave assisted synthesis - Role of ionic liquids in green chemistry - Cleaner technology with super critical fluids - Catalytic approach to green chemistry (use of Zeolites, clays, mesoporous materials).

UNIT III: Bio-Inorganic Chemistry:

Metalloproteins: Transport and storage protein: e.g Fe-S protein, Blue-copper protein, Ferritin, Transferritin, Hemocyanin and Heme erythrin. Metalloenzymes: Hydrolases (e.g. Carboxy peptidases and amino peptidases), Oxido reductases (e.g. Superoxide dismutase), Isomerases and Synthatases – (e.g. Vit B_{12}) - Nickel containing enzymes - Structure of DNA - types of Nucleic acid interactions - Coordination, intercalation and hydrogen bonding - Interactions of metal ion with Nucleic acid, Redox Chemistry, Hydrolytic Chemistry.

UNIT IV: Polymer Chemistry:

Polymer-Intoduction-Classification-Tactictity-Polymerization- Addition, Co-polymerisation and condensation – Mechanism of polymerization – Free radical mechanism, Ionic mechanism, Zeigler-Nata polymerization- Stucture-Property relationships in polymer-Classification of plastics- Thermosetting and Thermoplastic resins- Additives-Compounding of plastic-Fabrication-Compression moulding, Injection moulding, Extrusion moulding and Blow moulding- Molecular weight determination-Light scattering, viscosity, osmometry methods- Number average and Average number weight polymer.

Preparation, properties and uses of some important polymeric resins-PE (LDPE and HDPE), Phenol-formaldehyde resins, Silicon resins- composite-ABS, Cellulose-Bio-degradable plolymer.

UNIT V-Spectroscopy:

NMR Spectroscopy - Proton and ^{13}C- fluxional NMR, 2-dimensional NMR - uses of Shift reagents.

ESR spectroscopy - Hyperfine splitting -factors affecting 'g' value - anisotropy of 'g' and 'A' tensors - Zero field splitting - Krammer's degernacy - EPR spectra of Cu (II) Complexes. Jahn - Teller distortion in Cu(II) complexes. Evaluation of bonding parameters.

Analysis and Interpretation of Spectra of simple Aliphatic and Aromatic compounds using IR, UV, NMR, MASS, XRD techniques.

References:

1) Jerry March, Advanced Organic Chemistry, (Appendix A), IV edition, John Wiley and Sons, NewDelhi, 2000.
2) S. Warren, Organic Synthesis, The disconnection approach, John Wiley and Sons, U.K , 2004.
3) F. A. Carey and R. I. Sundburg, Advanced Organic Chemistry, plenum press, Newyork, 2000.
4) R. K. Mackie and D. M. Smith, Guide book to Organic Synthesis, Longman, Newyork, 1999.
5) V.R. Gowarikar, etal., Polymer Science I Edn., Wiley Eastern Ltd., New York,1986.
6) H. R. Allcock, Lampe, Contemporary, Polymer Chemistry, II Edn., Prentice Hall, New Jersey, 1990.
7) Fred. W. Billmeyer, JR, Text book of Polymer Science III Edition, John Wiley and Sons, NewYork.
8) James E. Huheey, Eller A. Keiter and Richard L. Keiter, Inorganic Chemistry, IV Edn., Harper Collins College Publishers, New York,1993.
9) Bertini I.G.,Bio-Inorganic Chemistry, Viva books private Limited,1998.
10) Lippard S.T., and Berg T.M., Principles of Bio-inorganic Chemistry, Panima Publishing Company, New York,1997.
11) K. Hussain Reddy, Bioinorganic Chemistry New Age Internation (p) limited, New Delhi-2003.
12) Kenneth, J. Klabunde, Nanoscale Materials in Chemistry, Wiley Interscience, New York, 2001
13) M.M. Srivastava, Green Chemistry, Rasshmi Singhi Narosa publishing House Pvt. Ltd., New Delhi, 2003.
14) K. R. Desai, Green Chemistry, Himalaya Publishing House, New Delhi, 2005
15) C.N.R Rao, A. Muller and A.K. Cheethar, The Chemistry of Nanomaterials-Synthesis, Properties and Applications Vol. 1 and 2, Wiley –VCH – Verlag GmoH & Co., Wilhelm, 2004.
16) Mick Wilson, Kamali Kannangara, Geolf Smith, Michelle Simmons, Burkhard Ragnse, Nanotechnology Overseas press, New Delhi-2005.
17) Charles P. Poole, Jr, Frank J. Owens, Introduction to NanoTechnology, John Wiley and Sons, Inc., New York , 2003.
18) R.S. Drago, Physical Methods in Chemistry, Saunders Golden Sunburst Series, W.B. Saunders Company, London, 1977.
19) Silverstein, Bassler and Morrill, Spectroscopic Identification of Organic Compounds, IV Edn., John Wiley and Sons, Inc., New York ,1991.

THIAGARAJAR COLLEGE, MADURAI- 9
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DEPARTMENT OF CHEMISTRY
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Course	: M.Phil (core 3)	Int. Marks	: 100
Class	: I Year	Ext. Marks	: 100
Semester	: I	Max. Marks	: 200
Sub. Code	: S1MC3	Hours/Week	: 6
Title of the Paper	**: In-Depth study**		

Course Outcomes:
On the successful completion of the course, students will be able to

This paper is based on the project work proposed by the guide for each student. Guide shall give **10-research articles** related to the project work from reputed international and other journals. For internal evaluation, a written test will be conducted for 2-**hours and will be evaluated by the guide**. The students are expected to give a seminar and assignment. The summative examination question papers will be set by the guide and one examiner will evaluate all the answer scripts.

Internal = 100 (Internal test: 60; Seminar:25; Assignment: 15)
External = 100

Total = 200

THIAGARAJAR COLLEGE, MADURAI- 9
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DEPARTMENT OF CHEMISTRY
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Course	: M.Phil Chemistry	Int. Marks	: 100
Class	: I Year	Ext. Marks	: 100
Semester	: II	Max. Marks	: 200
Sub. Code	: SMPJ	Hours/Week	: 6
Title of the Paper	**: Project**		

Dissertation work is a Two Semesters Sequential Course:

Course Outcomes:

On the successful completion of the course, students will be able to

1. Carry out the project selected in the first semester supplemented by experimental investigations.

Progress Report:

The first progress report should be presented to the Department before the 60th working day of the second semester.

Preview of dissertation:

The student will present the preview of the dissertation by the 75th working day of the semester to the Department.

Submission of dissertation:

The student has to submit four typed copies of dissertation by the 85th working day of the second semester to the department. A copy of this dissertation will be sent to the external examiner for review.

Evaluation of dissertation:

The Head of the PG department will be the chairman and the convener of the research committee. Internal valuation will be done by the guide. A public viva-voce examination will be conducted by a panel of examiners consisting of an external examiner who valued the dissertation and the guide.

Marks:

Thesis evaluation by external examiner	: 100
Viva-voce (Project guide)	: 50
Viva-voce (external examiner)	: 50

	200
