B.Sc. Chemistry

Programme Code - UCH

(Aided & SF)

Revised III year syllabi for 2020-2023 batch

Programme outcome (PO) Bachelor of Science (B.Sc.)

PO1 Scientific Knowledge and Critical Thinking:

Apply the knowledge of Life Science, Physical and Chemical Science, Mathematics, statistics, Computer science and humanities for the arrangement of solutions to the problems that come across in our day-to-day life/activities

PO2 Problem Solving:

Identify and analyse the problem and formulate solutions for problems using the principles of mathematics, natural sciences with appropriate consideration for the public health, safety and environmental considerations.

PO3 Communication and Computer Literacy:

Communicate the fundamental and advanced concepts of their discipline in written and oral form. Able to make appropriate and effective use of information and information technology relevant to their technique.

PO4 Life-Ling Learning:

Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PO5 Ethical, Social and Professional Understanding:

Commitment to principles, codes of conduct and social responsibility in order to behave consistently with personal respect. Acquire the responsibility to contribute for the personal development and for the development of the community. Respect the ethical values, social responsibilities and diversity.

PO6 Innovative, Leadership and Entrepreneur Skill Development:

Function as an individual and as a member or leader in diverse teams and in multidisciplinary settings. Become an entrepreneur by acquiring technical, communicative, problem solving and intellectual skills.

DEPARTMENT OF CHEMISTRY

Vision : To train our students as scientifically literate professionals with a sense of social responsibilities.

Mission: (i)To make our students to understand the advancement of chemistry in all of its branches through education and research.

- (ii)To provide students with community need based research and outreach opportunities.
- (iii)To strive for an ideal balance between creation and knowledge dissemination in the Chemical sciences.
- (iv)To train our students to succeed in this competitive world.

BACHELOR OF CHEMISTRY (PROGRAMMING CODE: UCH)

Program Educational Objectives (PEOs)

The objectives of the B.Sc Chemistry programme is to prepare-equip the students.

PEO1	To pursue further studies and succeed in academic and research careers.
PEO2	To develop productive employees in chemical, petrochemical and allied
	industries.
PEO3	As all rounded professionals in terms of effective communication, skillful
	execution, good leadership qualities and teamwork.
PEO4	To provide solutions for societal issues such as environmental protection,
	occupational health and safety, resource management and appropriate business
	skills.
PEO5	To develop life-long learning skills and abilities.

Program Specific Outcomes (PSOs)

On the successful completion of B.Sc Chemistry program students will be able

PSO1	To get a firm foundation in the fundamentals and applications of chemical and
	scientific theories including environmental and biological Chemistry.
PSO2	To carry out scientific experiments with the help of laboratory and analytical
	instruments, as well as accurately record and analyze the results of such experiments.
PSO3	To develop skills in problem solving, critical thinking and analytical reasoning as
	applied to chemistry related problems.
PSO4	To find the solution for the ethical, historic, philosophical, economical and
	environmental dimensions of problems and issues facing chemists
PSO5	To pursue post graduate program in higher educational institutions and also to get
	suitable employment opportunities in industries and academic institutions.

THIAGARAJAR COLLEGE, MADURAI- 9 (Re-Accredited with "A⁺⁺" Grade by NAAC) DEPARTMENT OF CHEMISTRY BACHELOR OF SCIENCE (B.Sc.,) CHEMISTRY (w.e.f 2020 batch onwards) Programme Code - UCH COURSE STRUCTURE Semester – I

Course	Code No	Subject	Hrs/	Cred	Total	Max	Max	Total	
			Week	•	Hrs	Mark	Marks		
						CA	SE		
Part I	U20TM11	Tamil	6	3	90	25	75	100	
Part II	U20EN11	English	6	3	90	25	75	100	
Core 1	UCH20C11	Fundamental Concepts in Organic Chemistry	3	3	45	25	75	100	
Core 2	UCH20C12	Fundamental concepts in Inorganic & Physical Chemistry	3	3	45	25	75	100	
Core Lab –1	UCH20CL11	Organic qualitative analysis	4	2	60	40	60	100	
Generic Elective	UPH20GE11 C	Physics – I	4	4	60	25	75	100	
Gen.ele. lab	UPH20GL21 C	Physics practical–I	2	-	30	-	-	-	
AECC (I)	U20ES11	Environmental Science	2	2	30	15	35	50	

Semester – II

Course	Code No	Subject	Hrs/ Week	Cred.	Total Hrs	Max Marks CA	Max Marks SE	Total
Part I	U20TM21	Tamil	6	3	90	25	75	100
Part II	U20EN22	English	6	3	90	25	75	100
Core 3	UCH20C21	Basic concepts and Main group elements-I	3	3	45	25	75	100
Core 4	UCH20C22	Essential Concepts in Physical Chemistry	3	3	45	25	75	100
Core lab- 2	UCH20CL21	Inorganic Qualitative Analysis	4	2	60	40	60	100
Generic elective	UPH20GE21 C	Ancillary Physics –II	4	4	60	25	75	100
Generic elective Lab	UPH20GL21C	Ancillary physics practical	2	2	60	40	60	100
AECC (II)	U20VE21	Value Education	2	2	30	15	35	50
			30	22	450	-	-	-

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Course	Code No	Subject	Hrs/ Week	Credits	Total Hrs	Max Marks CA	Max Marks SE	Total
Part I	U20TM31	Tamil	6	3	90	25	75	100
Part II	U20EN31	English	6	3	90	25	75	100
Core 5	UCH20C3 1	Main group elements-II, Acid-Base Concepts and Non-Aqueous solvents	3	3	45	25	75	100
Core 6	UCH20C3 2	Chemistry of Aliphatic compounds-I	3	3	45	25	75	100
Core lab-3	UCH20CL 31	Inorganic volumetric analysis - lab	4	2	60	40	60	100
Generic Elective	UMA20 GE31 C /UMB20 GE31 C	Ancillary Maths/Zoology -I	4	4	60	25	75	100
Generic lab	UMB20 GL41 C	Ancillary Zoology practical	2	-	30	-	-	-
Non- Major Elective	UCH20 NME31	Chemistry in day-to-day life	2	2	30	15	35	50
		Total	30	20	450	-	-	-

Semester – III

Course	Code No	Subject	Hrs/ Wee k	Cre dits	Total Hrs	Max Mark CA	Max Marks SE	Total
Part I	U20TN41	Tamil	6	3	90	25	75	100
Part II	U20EN41	English	6	3	90	25	75	100
Core 7	UCH20C41	Chemistry of Aliphatic compounds – II	3	3	45	25	75	100
Core 8	UCH20C42	Thermodynamics and Equilibria	3	3	45	25	75	100
Core lab-4	UCH20CL4 1	Estimation and Preparation of organic compounds – lab	4	2	60	40	60	100
Generic elective	UMA20/U MB20 GE41 CAZ41	Ancillary Maths/Zoology –II	4	4	60	25	75	100
Generic ele.lab	UMB20 GL41 C	Ancillary Zoology practical – I	2	2	30	40	60	100
Non Major elective II	UCH20NE4 1	Processing of consumer products –Lab	2	2	30	15	35	50
Total			30	22	450	-	-	-

Semester – IV

Semester	_	V	
		•	

Course	Code	Subject	Hrs/ Week	Cre dits	Total Hrs	Max Mark CA	Max Marks SE	Total
Core 9	UCH20C5 1	Transition, Inner – Transition Elements and Co-ordination Chemistry	5	5	75	25	75	100
Core 10	UCH20C5 2	Chemistry of aromatic compounds and photochemical reactions	5	5	75	25	75	100
Core11	UCH20C5 3	Quantum Mechanics and Kinetics	5	5	75	25	75	100
Core lab-5	UCH20CL 51	Inorganic Estimation and Preparation	4	2	60	40	60	100
Core lab-6	UCH20CL 52	Analytical techniques – Lab	4	4	60	40	60	100
Core elective -1	UCH20CE 51(A/B)	Group theory and Spectroscopy/Medic inal Chemistry	5	5	75	25	75	100
SEC(I)	UCH20 SE51 (A/B/C)	Agricultural Chemistry/ Dairy Chemistry/ Forensic Chemistry	2	2	30	15	35	50
Total			30	28	450	_	-	-
	UCH20IN	Internship	-	2	-	15	35	50

Semester –	VI

Course	Code	Subject	Hrs/ Week	Credits	Total Hrs	Max Mar ks	Max Marks SE	Total
Core 12	UCH20 C61	Advanced inorganic chemistry	5	5	75	25	75	100
Core 13	UCH20 C62	Green Chemistry, Biomolecules and organic spectroscopy	5	5	75	25	75	100
Core 14	UCH20 C63	Energetics and Surface chemistry	5	5	75	25	75	100
Core lab-7	UCH20 CL61	Experiments in Physical Chemistry lab	5	1+2 (*1L:0T :4P)	75	40	60	100
Core lab-8	UCH20 CL62	Water analysis lab	3	1+1 (*1L:0T :2P)	45	40	60	100
Core. Elective II	UCH20 CE61 (A/B)	Industrial chemistry /Bioinorganic Chemistry	5	5	75	25	75	100
SEC (II)	UCH 20SE6 (A/B/C)	ICT tools in Chemistry / Food Chemistry/ Polymer Chemistry	2	2	30	15	35	50
Part V			-	1	-	-	-	-
Total			30	28	450	-	-	-

* Practical lecture

On the Job training will be undertaken by the students during the second year summer vacation after the fourth semester. Out of the maximum of 50 marks allotted for the **on the training**, report submitted by the student carries 35 marks and the other 15 marks, viva-voce examination will be conducted by the department (internal evaluation).

Training should be of minimum 10 working days at a reputed industry, research lab or medical centre.

A) CONSOLIDATION OF CONTACT HOURS AND CREDITS: UG

Semester	Contact	Credits
	hours	
Ι	30	20
II	30	22
III	30	20
IV	30	22
V	30	28
VI	30	27
Part - V	-	01
Total	180	140
	Internship	2
	(Additional	
	credit)	
	Self study	5
	paper (Additional credit)	

THIAGARAJAR COLLEGE (Autonomous), MADURAI-625 009 (Re-Accredited with 'A⁺⁺' Grade by NAAC) Department of Chemistry

(For those joined B.Sc., Chemistry on or after June 2020) Programme Code: UCH

Course Code	Course title	Category	L	Т	Р	Credit
UCH20C51	Transition, Inner – Transition Elements and Co-ordination Chemistry	Core 9	5	-	-	5

Year	Semester	Int. Marks	Ext. Marks	Total
III	V	25	75	100

Preamble

This course explain the structural characteristics, basic theories and applications of transition, inner

transition elements and Co-ordination chemistry

Course Outcome

#	Course Outcome	Expected course proficiency	Expected course attainment
CO1	Understand the structure and characteristics of transition	85%	80%
CO2	Name the basic fundamentals terms in coordination compounds.	80 %	75%
CO3	Explain the theories of co-ordinations compounds	80 %	76%
CO4	Illustrate the reaction mechanism involved in coordination compounds	70 %	65%
CO5	Describe the general properties and important compounds of F-Block elements	80 %	78%
Mapp	ing of COs with Pos		

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	М	S	S	L
CO2	S	L	М	S	S	L
CO3	S	L	М	S	S	L
CO4	S	М	М	S	S	L
CO5	S	S	М	S	S	L

Mapping of COs with PSOs

			1505	1304	PS05
CO1	S	L	М	L	S
CO2	S	М	М	L	S
CO3	S	М	L	М	S
CO4	S	М	М	М	S
CO5	S	S	S	S	S

S-Strong; M-Medium; L-Low

Bloom's Taxanomy Assessment Pattern

Bloom's Taxonomy	СА		End of Semester
	First	Second	
Knowledge (40%)	40	40	40
Understand (40%)	40	40	40
Apply (20%)	20	20	20

Unit I: Transition Elements

General characteristics - electronic configuration, metallic character, ionization energy, variable valencies, reducing property, colour, magnetic property, non-stoichiometric compounds, catalytic properties and tendency to form complexes. Preparation, properties and uses of potassium permanganate, V₂O₅, Ni(DMG)₂, CrO₃, potassium dichromate, potassium ferrocyanide and Nessler's reagent.

Unit II: Coordination Chemistry-I

Introduction: Double salts and coordination compounds-coordination numberoxidation number- types of ligands. Abbreviations for ligand names-Nomenclature of metal complexes. Chelates-Importance of chelates in biology and analytical chemistry.

Isomerism: ionization, hydrate, ligand, linkage, coordination, position, geometrical and optical isomerisms.

Stability of complexes-overall and stepwise formation constants-Factors affecting stability-Determination of stability constant by Job's and Bjeruum's method.

Unit -III: Coordination Chemistry-II

Theories of coordination compounds: Werner's theory - Sidgwick's concept - EAN rule-VB theory- hybridization, geometry, magnetism, orbital contribution to magnetic moment, quenching of orbital contribution, Gouy's method - drawbacks of VBT.

CFT-shapes of d orbitals, assumptions of crystal field theory, crystal field splitting in different geometries, high-spin and low-spin complexes, CFSE and factors affecting it, consequences of CFSE-Limitations of CFT. Effect of ligand field strength on colour of complexes-visible spectrum of aqueous Ti (III) ion-Jahn teller distortion and its consequences-spectroscopic evidence of Jahn-teller distortion (Copper Complexes and CoF_{6}^{3-}).

Unit –IV: Coordination Chemistry-III

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(15 hrs)

(15 Hrs)

(15 hrs)

(15 hrs)

Lability and inertness-Ligand substitution reactions in octahedral complexes-basic concepts of dissociation, association (S_N1, S_N2) and S_N1CB mechanism-substitution reactions in square planar complexes – Trans-effect - theories and applications of trans-effect. Electron transfer reactions-basic concepts of outer sphere and inner sphere mechanism- factors affecting the rates of outer sphere electron transfer reactions.

Unit- V: Inner Transition Elements

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

Text Books:

- 1. J. D. Lee, A New Concise Inorganic Chemistry, Blackwell Science Ltd., ELBS 5th Ed., London (2002).
- 2. R. D. Madan, Modern Inorganic Chemistry, S. Chand & Company, 2nd edition, New Delhi (2002).
- 3. B. R. Puri, L. R. Sharma and K. C. Kalia, Principles of Inorganic Chemistry, 28th edition, Vallabh Publication, New Delhi (2004).
- 4. W. U. Mallik, G.D. Tuli, R.D. Madan, Selected topics in Inorganic Chemistry, S. Chand and Co., New Delhi (1992).

Reference Books:

- 1. K.F. Purcell and J.C. Kotz, Inorganic Chemistry WB Saunders Co., USA (1977).
- 2. F. A. Cotton, 1998, Advanced Inorganic Chemistry, Geofferey Wilkinson, Carlos, Murillo, Manfred Bochmann, John Wiley & Sons, Inc. New York (1998).
- 3. J. E. Huheey and A. Ellen Keiter, L. Richard Keiter, Inorganic Chemistry, 4th edition, Pearson Education Pvt. Ltd, Harper Collins College Publishers, Singapore (2004).
- 4. Mark Weller, Tina overton, Jonathan Rourke, Inorganic Chemistry 7th Edition, Oxford University Press, US (2018).
- 5. Gary Wulfsberg, Foundation of Inorganic Chemistry 1st Edition, Mill valley, California (2018).

Web Source:

1. https://edu.rsc.org/experiments/transition-elements-and-complexcompounds/518.article

- 2. https://edu.rsc.org/resources/transition-metal-games-16-18-years/4013804.article
- 3. https://global.oup.com/uk/orc/chemistry/keeler2e/chapters/ch17
- 4. https://www.ionicviper.org/resources/teaching- resources? taxonomy vocabulary 3 target id%5B0%5D=6
- 5. https://onlinecourses.nptel.ac.in/noc19_cy19/preview

Course designers:

Dr. A. Suganthi Dr.A.Elangovan Dr.D.S.Bhuvaneshwari Dr.K.Selvakumar Dr.S.Pitchaimuthu Dr.N.Sudhan

(15 hrs)

H15

THIAGARAJAR COLLEGE (Autonomous), MADURAI-625 009 (Re-Accredited with 'A++' Grade by NAAC) Department of Chemistry (For these ising d P.Se., Chemistry on or often June 2020)

(For those joined B.Sc., Chemistry on or after June 2020) Programming Code: UCH

Course Code	Course title	Category	L	Т	Р	Credit
	Chemistry of aromatic	Core-10	5	0	_	5
UCH20C52	compounds and photochemical reactions					

L - Lecture T - Tutorial P – Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
III	V	25	75	100

Preamble

The course explains the concept of aromaticity and chemical properties of aromatic carbonyl compounds and nitrogen containing compounds. Also, it describes the principle and the mechanism of photochemical reactions.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected proficiency	Expected attainment
CO1	Explain the aromaticity of organic molecules and predict the reactivity and orientation of electrophiles during the chemical reactions and identify the chemistry of polynuclear hydrocarbons.	85 %	80 %
CO2	Predict the reaction products of aldehydes and ketones with various reagents and propose the mechanism of rearrangement reactions.	75 %	70 %
CO3	Explain the chemistry of aromatic nitrogen containing compounds	75 %	70 %
CO4	Recall the chemistry of heterocyclic compounds and organic dyes	75 %	70 %
CO5	Compare thermal and photochemical reactions.	80 %	75 %

Mapping of CO with Pos

#	PO1	PO2	PO3	PO4	PO5	PO6
C01	S	Μ	М	L	L	S
CO2	S	L	L	М	L	Μ
CO3	S	L	L	Μ	L	Μ

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Mapping of CO with PSOs

S

S

CO4

CO5

C				1
3	L	Μ	L	S
S	Μ	Μ	L	S
S	Μ	L	L	S
S	Μ	L	L	S
S	Μ	Μ	Μ	S
	S S S S	SLSMSMSMSM	SLSMSMSMSMSM	SLMLSMMLSMLLSMLLSMMM

L

Μ

L

Μ

L

L

Μ

L

S-Strong; M-Medium; L-Low

Bloom's Taxonomy and Assessment Pattern

Bloom's Taxonomy	CA		End of Semester
	First	Second	
Knowledge (40%)	40%	40%	40%
Understand (40%)	40%	40%	40%
Apply (20%)	20%	20%	20%

L

S

Course Title: Chemistry of aromatic compounds and photochemical reactions UNIT-I (15 Hrs)

AROMATIC HYDROCARBONS

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.

Polynuclear Hydrocarbons: Electrophilic and nucleophilic substitution reactions of naphthalene and anthracene

UNIT – II

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-Hoesch synthesis.

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

UNIT – III

AROMATIC COMPOUNDS CONTAINING NITROGEN

(15 Hrs)

(15 Hrs)

Methods of preparation and properties of Nitro benzene – reduction products of nitrobenzene – T.N.T. – picric acid - differences between nitro toluene and phenylnitromethane.

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

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

$\mathbf{UNIT} - \mathbf{IV}$

HETROCYCLIC COMPOUNDS AND DYES

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

Introduction to organic dyes – colour and constitution – Classification based on structure and applications – preparation and applications of the following dyes: Methylorange, Congored, Malachite green, Flourescein, Phenolphthalene and Indigo.

UNIT – V

(15 Hrs)

PHOTOCHEMISTRY

Introduction to photochemical reaction – photochemical reactions of carbonyl compounds: Norrish type I and II reactions, Paterno-Buchi reaction – photo reductions of aromatic hydrocarbons – photo oxidations of alkenes and polyenes – Cis-trans isomerisation – Photo rearrangements – Cyclisation: Diels-Alder reaction (theory not required).

Text Books

- 1. Bhupinder Mehta, Manju Mehta, 2015, Organic Chemistry, 2nd Edition, Prentice Hall of India Pvt Ltd,. New Delhi.
- 2. B.S. Bahl and Arun Bahl, 2020, Advanced Organic Chemistry, 1st edition, S. Chand and Company Ltd, New Delhi.
- Jagdamba Singh, Jaya Singh, 2012, Photochemistry and Pericyclic Reactions, 3rdedition, New Age International Publishers, New Delhi

Reference Books

- 1. I.L.Finar, 2012, Organic chemistry Vol I, 6th edition, Pearson Plc., New Delhi.
- 2. I.L. Finar, 2019, Organic Chemistry, Vol. II, 5th Edition, Pearson Plc., New Delhi.
- 3. R.T. Morrison; R.N. Boyd; S.K. Bhattacharjee, 2020, Organic chemistry, 7th edition, Pearson Plc., New Delhi.

Web Resource

- 1. <u>https://youtu.be/us8ehnzmQjo</u>
- 2. <u>https://byjus.com/chemistry/tests-for-aldehydes-and-ketones/</u>
- 3. https://nptel.ac.in/courses/104103022
- 4. https://www.britannica.com/science/heterocyclic-compound
- 5. https://nptel.ac.in/courses/104105038

Course designers

- 1. Dr. P. Tharmaraj
- 2. Dr. P. Prakash
- 3. Dr. R. Mahalakshmy
- 4. Dr. A. Tamil Selvi
- 5. Mrs. P. Rajam

(15 Hrs)

Thiagarajar College(Autonomous), Madurai – 625 009 (Re-Accredited with A⁺⁺ Grade by NAAC) Department of Chemistry

(For those joined B.Sc., Chemistry on or after June 2020) Programming Code: UCH

Course Code	Course title	Category	L	Т	Р	Credit
UCH20C53	Quantum Chemistry and	Core 11	5	-	-	5
	Chemical Kinetics					

Year	Semester	Int. Marks	Ext. Marks	Total
III	V	25	75	100

Preamble

The course enables the students to gain knowledge on quantum mechanics, photo and kinetics.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected	Expected
		Proficiency	attainment
CO1	Summarise the fundamentals of quantum theory.	75%	72%
CO2	Make use of the applications of quantum chemistry.	78%	75%
CO3	Spell the basic concepts of photokinetics	80%	75%
CO4	Explain the basics of chemical kinetics.	75%	72%
CO5	Apply the concepts of chemical kinetics	78%	74%

Mapping of COs and Pos

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	Μ	S	Μ	L
CO2	S	S	Μ	S	Μ	L
CO3	S	Μ	Μ	S	Μ	Μ
CO4	Μ	Μ	Μ	S	Μ	Μ
CO5	S	S	Μ	S	Μ	Μ

Mapping of COs and PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	Μ	Μ	S
CO2	S	Μ	S	L	S

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CO3	S	Μ	Μ	L	S
CO4	S	Μ	Μ	L	S
CO5	S	Μ	L	L	S

S-Strong; M-Medium; L-Low

Bloom's Taxonomy and assessment pattern

Bloom's Taxonomy	(End of Semester	
	First Second		(%)
	(%)	(%)	
Knowledge	40	40	40
Understand	40	40	40
Apply	20	20	20

UNIT – I **QUANTUM CHEMISTRY-I**

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 – II

QUANTUM CHEMISTRY-II 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.

UNIT – III PHOTOCHEMISTRY

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

CHEMICAL KINETICS-I

Rate constant, order and molecularity - factors influencing the rate of reaction concentration, pressure, temperature, light, catatyst-integrated rate expression – Derivation of I order, II order (reactants of same and different) and zero order - pseudo order reactions (Concept only) -Half life period - methods of determining order of the reaction: differential rate expression method-integral rate expression method-half-life method- isolation methods.

(15 hrs)

(15 hrs)

(15 hrs)

(15 hrs)

UNIT – V CHEMICAL KINETICS-II

Simple collision theory and Transition state theory. Unimolecular theory: Lindemann mechanism. Complex reactions: The equilibrium approximation and steady state approximation - derivation of kinetics of opposing (reversible) and parallel (counter) reactions.

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. Prasad R K, 2001, Quantum chemistry, Second edition, New age international pvt., Ltd., \

publishers, New Delhi.

- 3. Kapoor K L, 2020, A text book of Physical Chemistry volume 4, sixth edition, McGraw Hill education Pvt. Ltd, India.
- 4. Atkins P., Paula J.D., 2002, Physical chemistry, 7th edition, Oxford University Press, Indian edition.

Reference Books

- 1. Laidler K.J., 2005, Chemical Kinetics, 2nd edition, TaTa Mc Graw Hill, UK.
- 2. Chandra A.K., 2003, Introductory quantum chemistry, 4th edition, McGraw Hill publishing company limited, New Delhi.
- 3. Rahatgi Mukherjee, 2017, volume 6, Fundamentals of Photochemistry, New age international,

New Delhi.

4.Tandon O.P, Singh A.S., 2015, A Text book of Physical Chemistry for Competitions, 14th edition, G. R. Bathla Publications Pvt. Ltd., Delhi, India.

E-Resources

https://www.khanacademy.org/science/chemistry/electronic-structure-of-atoms https://www.youtube.com/watch?v=Yf_4Qv-A55Q&list=PLbMVogVj5nJRiUhnP3bleX5Kp3ljZaX1C https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=13G8VouhmrFfuhs6rkiyTA==

Course Designers

- 1. Dr. R. Sayee Kannan
- 2. Dr. A. R. Ramesh
- 3. Dr. T. Arumuganathan
- 4. Dr. M. Sathiya
- 5. Dr. A. Jeevika
- 6. Dr. Sribharani

Thiagarajar College (Autonomous), Madurai – 625 009 (Re-Accredited with A⁺⁺ Grade by NAAC) Department of Chemistry

(For those joined B.Sc., Chemistry on or after June 2020) Programming Code: UCH

Course Code	Course title	Category	L	Т	Р	Credit
UCH20CL51	Inorganic Estimation	Core Lab -	*1	-	4	3
	and Preparation	5	(Practical			
			lecture)			

Year	Semester	Int. Marks	Ext. Marks	Total
III	V	40	60	100

Preamble

This lab course enables the students to acquire practical knowledge on quantitative estimation of

inorganic metal ions by gravimetric and colorimetric methods. Also enhances the laboratory skill of preparing simple inorganic complexes.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected	Expected
		Proficiency	attainment
CO1	Estimate inorganic metal ions such as lead as lead	75%	70%
	chromate nickel a nickel –DMG complex		
CO2	Estimate the amount of zinc and magnesium as their	78%	75%
	oxinate by gravimetric estimation.		
CO3	Prepare potassium cupric sulphate and Potassium	80%	75%
	trioxalatoaluminate complexes.		
CO4	Prepare coordination complexes such as	75%	72%
	Hexathioureaplumbusnitrate, Tetrammine		
	Copper (II) sulphate and Ferrous/Ferric oxalate in the		
	laboratory.		
CO5	Explain the principle and application of chromatorgraphy	78%	75%
	and UV-Vis specrophotometric techniques.		

Mapping of COs and POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	М	S	М	L
CO2	S	S	М	S	М	L
CO3	S	М	М	S	М	М

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CO4	М	М	М	S	М	М
CO5	S	S	М	S	М	М

Mapping of COs and PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	М	S	М	М	S
CO2	М	S	М	S	S
CO3	М	S	М	М	S
CO4	М	S	L	L	S
CO5	S	S	М	L	S

I. Gravimetric Analysis: (Any THREE)

- a) Estimation of lead as lead chromate
- b) Estimation of Nickel as Ni-DMG
- c) Estimation of Magnesium as Magnesium oxinate
- d) Estimation of Zinc as Zinc oxinate
- e) Estimation of calcium as Calcium oxalate

II. Preparation: (Any FOUR)

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

Course Designers

- Dr. A. R. Ramesh
- Dr. T. Arumuganathan
- Dr. S. Pitchaimuthu

Thiagarajar College(Autonomous), Madurai – 625 009 (Re-Accredited with 'A++' Grade by NAAC) Department of Chemistry

(For those joined B.Sc., Chemistry on or after June 2020) Programming Code: UCH

Course Code	Course title	Category	L	Т	Р	Credit
UCH20CL52	CH20CL52 Analytical Techniques		-	-	4	4
	(Lab)					
L - Lecture	T - Tutorial	P - Practicals				

Year	Semester	Int. Marks	Ext. Marks	Total
III	V	40	60	100

Preamble

The students will get exposed to quantitative estimation/determination/separation and purification of organic/inorganic compounds.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected course proficiency	Expected course attainment
CO1	Estimation of saponification, Iodine value, acid value and RM value of oil	85%	80%
CO2	Determining the concentration of an organic compound by UV-Vis spectroscopy.	85%	80%
CO3	Estimation of organic/ inorganic compounds using paper, TLC and column chromatography	82%	75%
CO4	Determination of Complex formation by Job's method	75%	70%
CO5	Determination of percentage of Ca in commercial milk powder by EDTA titration method	80%	75%

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	М	S	S	М
CO2	S	L	М	S	S	М
CO3	S	L	М	S	S	М

CO4	S	S	М	S	S	М
CO5	S	S	М	М	L	L

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
C01	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	М	Μ	S
CO4	L	S	L	М	S
CO5	S	S	М	М	S

S-Strong; M-Medium; L-Low

EXPERIMENTS / LAB EXERCISES

The students will get exposed to various analytical methods such as chemical, spectroscopic and chromatographic techniques (any **SIX**)

- 1. Estimation of Saponification value of oil.
- 2. Determination of Iodine value, acid value and RM value of vegetable oils.
- 3. Determining the concentration of an organic compound by UV-Vis spectroscopy.
- 4. Estimation of food colourants (by colorimetric method).
- 5. Determination of RF values of chemical constituents in food colors by Paper Chromatography.
- 6. Determination of distribution coefficient of metals by paper chromatography.
- 7. Separation of amino acids by Thin Layer Chromatography.
- 8. Purification of organic compounds by column chromatography.
- 9. Determination of Complex formation by Job's method (with ethylene diamine).
- 10. Determination of percentage of Ca in commercial milk powder by EDTA titration method.

Course Designers

Dr. A. Elangovan Dr. R. Mahalakshmy Dr. D. S. Bhuvaneshwari Dr. A. Tamil Selvi

THIAGARAJAR COLLEGE (Autonomous), MADURAI-625 009 (Re-Accredited with 'A++' Grade by NAAC) Department of Chemistry

(For those joined B.Sc., Chemistry on or after June 2020)

Programme code UCH

Course Code	Course title	Category	L	Т	Р	Credit
UCH20CE51 (A)	Group theory and Spectroscopy	Core elective -1 (Option A)	5	-	-	5

L - Lecture T - Tutorial P – Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
III	V	25	75	100

Preamble

This course enables the students to gain knowledge on fundamentals of group theory and spectroscopy.

Course Outcomes

On the completion of the course the student will be able to

	Course outcome	Expected	Expected
		proficiency	attainment
CO1	Tell the theory of symmetry behaviour of simple molecules	85 %	80 %
CO2	Summarize the theory and applications of microwave and electronic spectroscopy	75 %	70 %
CO3	Explain the working principle and applications of IR spectroscopy	75 %	70 %
CO4	Compare IR and Raman spectroscopy and their applications	75 %	70 %
CO5	Apply theory and applications of NMR and ESR spectroscopy	80 %	75 %

Mapping of COs with Pos

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	L	L	L	L	S
CO2	S	L	L	М	L	Μ
CO3	S	Μ	L	L	L	Μ
CO4	S	L	L	L	L	Μ
CO5	S	S	Μ	Μ	L	L

Mapping of COs with PSOs

#	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	L	-	-	S
CO2	S	М	L	-	S
CO3	S	М	-	L	S
CO4	S	М	S	L	S
CO5	S	Μ	S	L	S
C Stuamar	M Madium	TTOT			

S-Strong; M-Medium; L-Low

Bloom's Taxonomy and Assessment Pattern

Bloom's Taxonomy	CA		End of Semester	
	First	Second		
Knowledge (40%)	40%	40%	40%	
Understand (40%)	40%	40%	40%	
Apply (20%)	20%	20%	20%	

UNIT – I GROUP THEORY

(i) Introduction - Symmetry elements and symmetry operations - Definition of mathematical group – four cardinal properties of a group – closure, associative, identity and inverse rule – cyclic group – Abelian group (H₂O only) and non-abelian group (NH₃ only) – Group multiplication table- C_2v and C_3v ; subgroup – similarity transformation – class of group – Point group – Assignment of point group of simple molecules – H₂O, NH₃, HCl and H₂.

(ii) Matrix representation of the symmetry operations: Identity (E), Proper axis of rotation (C_n), Vertical reflection (σ_v), Improper axis of rotation (S_n) and Inverse (i) – reducible and irreducible representations of a group.

UNIT-II

MOLECULAR SPECTROSCOPY

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

Microwave spectra – Types of rotating 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 Condon principle – dissociation constant of a diatomic molecule – factors affecting band position and intensities.

UNIT-III INFRA-RED SPECTROSCOPY

15 hrs

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15 hrs

15 hrs

Thiagarajar College, Madurai. 41st ACM - Department of Chemistry- Syllabus 2020 H31

IR spectra - range - theory of IR spectroscopy- selection rule – Hook's law – Problems associated with force constant and bond strength – Instrumentation –vibrating diatomic molecule – simple harmonic and 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, combination band – Fermi resonance.

UNIT-IV

RAMAN SPECTROSCOPY

Introduction – Difference between IR and Raman spectra –polarization of light –Raman effect –Elastic scattering-Rayleigh scattering; In-elastic scattering- Strokes and antistrokes; Mutual exclusion principle – application in prediction of structure of CO_2 and N_2O ; Instrumentation -advantages and limitations of Raman spectroscopy.

UNIT-V

RESONANCE SPECTROSCOPY

NMR: Introduction – Nuclear spin and magnetic moment - theory of NMR spectroscopy – Basic instrumentation – Chemical shift – definition and factors affecting chemical shift – spin-spin splitting–shielding and deshielding – NMR spectrum of ethanol and acetone-coupling constant – factors affecting coupling constant.

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

Text Books:

- Puri B. R., Sharma L.R. 2003, Physical chemistry, 33rd edition, Vishal Puplications, New Delhi, India.
- Cotton F.A., 1999, Chemical applications of group theory, 3rd edition, John Wiley & Sons, New York.
- 3) Banwell C. M., 2005, Fundamentals of Molecular spectroscopy, 4th edition, TMH Company limited, 2005.

Reference Books:

- Gurudeep Chatwal R., Anand S. K., 2002, Spectroscopy, 5th edition, Himalaya Puplications, New Delhi, India.
- Raman K.V., 1990, Group theory, 1st edition, Tata McGraw Hill Publishing Limited, New Delhi, India.
- 3) V. Ramakrishnan and Gopinath, 1991, Group theory in chemistry, 2nd edn, Vishal publications.
- 4) G. Davidson, 1971, Introduction to Group theory for chemist, Applied science publishers Ltd, London
- 5) D. C.Harris and M.D. Bertolucci, 1978, Symmetry and spectroscopy An introduction to vibrational and electronic spectroscopy, Oxford University press, New York.
- 6) G.H. Barrow, Introduction to molecular spectroscopy, McGraw Hill

15 hrs

15 hrs

- 7) R. Chang, 1976, Basic principles of spectroscopy, McGraw Hill, London.
- 8) B.F. Straughan and S. Walker (eds)., 1976, Spectroscopy, Vol 1, 2 and 3, Chapman & Hall, London.
- 9) P.W. Atkins, 1990, Physical chemistry, 6th edn, Oxford University press, Tokyo.
- 10) A. Carrighton and A. D. McLachian, Introduction to Magnetic Resonance, Harper and Row.

E-Resources

- 1. <u>https://www.youtube.com/watch?v=WukUvN721Ag</u>
- 2. <u>https://www.youtube.com/watch?v=VNY066ZSeyM&list=PLEatHLzDX1xeOx1RqTnI8xCzc</u> <u>A55kLPMt</u>
- 3. <u>https://www.youtube.com/watch?v=2dQ2M3Z0les</u>
- 4. https://nptel.ac.in/courses/104101099
- 5. <u>https://www.youtube.com/playlist?list=PLo_wkpv7gAE1Z44eXKexcgcuDsYFbXPQT</u>

Course Designers:

- 1. Dr. A. Suganthi
- 2. Dr. A. Tamilselvi
- 3. Dr. T. Arumuganathan
- 4. Dr. J. Thiruppathi

THIAGARAJAR COLLEGE (Autonomous), MADURAI-625 009 (Re-Accredited with 'A⁺⁺' Grade by NAAC) Department of Chemistry

(For those joined B.Sc., Chemistry on or after June 2020) Programme code:UCH

Course Code	Course title	Category	L	Т	Р	Credit
UCH20CE51	Medicinal Chemistry	Core elective -1	5	-	-	5
(B)		(Option B)				

L - Lecture T - Tutorial P – Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
III	V	25	75	100

Preamble

This course enables the students to gain knowledge on fundamentals of medicinal chemistry

Course Outcomes

On the completion of the course the student will be able to

	Course outcome	Expected proficiency	Expected attainment
CO1	Tell the theory of pharmacokinetics models	85 %	80 %
CO2	Summarize the theory of drug design and discovery	75 %	70 %
CO3	Explain the relationship between physical parameters and drug activity	75 %	70 %
CO4	Study the psychoactive and cardiovascular drugs	75 %	70 %
CO5	Apply the synthetic methodologies of various types of drugs	80 %	75 %

Mapping of COs with Pos

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	L	L	L	L	S
CO2	S	L	L	М	L	М
CO3	S	Μ	L	L	L	Μ
CO4	S	S	L	L	L	Μ
CO5	S	S	Μ	М	L	L

Mapping of COs with PSOs

#	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	L	-	-	S
CO2	S	Μ	L	-	S
CO3	S	Μ	-	L	S
CO4	S	S	S	L	S
CO5	S	S	S	L	S

S-Strong; M-Medium; L-Low

Bloom's Taxonomy and Assessment Pattern

Bloom's Taxonomy	СА		End of Semester	
	First	Second		
Knowledge (40%)	40%	40%	40%	
Understand (40%)	40%	40%	40%	
Apply (20%)	20%	20%	20%	

UNIT – I

a) ADME Properties

The pharmacokinetics phase-Adsorption-Distribution, Metabolism-Elimination-Bioavailability of drug, pharmacokinetics models, Intra vascular and Extra vascular administration. The use of pharmacokinetics in Drug dsign.

b) Pharmacodynamics - Stereoelectronic structure.

UNIT-II DRUG DISCOVERY BY DESIGN

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 leadisosteres, bioisoteres.

UNIT-III a) Quantitative-structural Activity-Relationship (QSAR)

Partition parameters-partition coefficients(p), Lipophilic subtituents constants (π) Electronic parameters-The Hammett constants-Steric parameters-The Taft Steric parameters (Es), Molar

15 hrs

15 hrs

15 hrs

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 system computerised tagging. ii) Combinatorial synthesis in solution iii) Screening and deconvolution

UNIT-IV

a) Antineoplastic Agents:

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

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, Introduction to Medical Chemistry, Wiley – VCH, 2004.

2. Wilson and Gisvold's Text Book of Organic Medicinal and Pharmaceutical Chemistry, Ed.,

Robert F. Dorge, 2003.

3. S.S. Pandeya and J.R. Dimmock, An Introduction to Drug Design, New Age International, 2006.

15 hrs

4. Burger's Medicinal Chemistry and Drug Discovery, Vol-1 (Chapter-9 and Ch- 14) Ed., M.E.

Wolff, John Wiley, 2005.

- 5. Goodman and Gilman's Pharmacological Basis of Therapeutics, McGraw-Hill, 2006.
- 6. R.B.Silverman, The Organic Chemistry of Drug Design and Drug Action, Academic Press, 2006.

Reference Books:

- 1. D. Lednicer, Strategies for Organic Drug Synthesis and Design, John Wiley.
- 2. Gareth Thomas, Medicinal Chemistry, An introduction, John wiley & sons, Ltd., 2004.
- M.L Gangwal Medicinal chemistry Lectures on Drug design and Synthetic Drugs, Student publishing House, 2007.

Course Designers:

- 1. Dr. A. Suganthi
- 2. Dr. A. Tamilselvi
- 3. Dr. T. Arumuganathan
- 4. Dr. J. Thiruppathi
THIAGARAJAR COLLEGE (Autonomous), MADURAI-625 009 (Re-Accredited with 'A++' Grade by NAAC) Department of Chemistry

(For those joined B.Sc., Chemistry on or after June 2020)

Programme Code UCH

Course Code	Course title	Category	L	Т	Р	Credit
UCH20SE41(A)	Agricultural	SEC	2	-	-	2
	Chemistry	(OptionA)				

Year	Semester	Int. Marks	Ext. Marks	Total
III	V	15	35	100

Preamble

The course briefly outlines the composition of soil, soil acidity and the availability of nutrients to plants. It also explains the nature of different types of fertilizers, pesticides and their uses.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected	Expected
		proficiency	attainment
CO1	Name the organic and inorganic constituents present in the	80%	75%
	soil and availability of nutrients to plants.		
CO2	Classify the organic and chemical fertilizers	81%	76%
CO3	Classify the types of pesticides like insecticides funcicides	87%	77%
005	herbicides and weedicides	0270	1170
CO4	Make use of Bioinsecticides and Biofertilizers	80%	75%
CO5	Knowing the factors affecting the soil properties	86%	82%

Mapping of COs with Pos

PO1	PO2	PO3	PO4	PO5
S	S	S	S	S
М	S	S	S	S
М	S	S	М	S
М	S	S	S	S
S	S	S	Μ	L
	PO1 S M M M S S S	PO1PO2SSMSMSMSSS	PO1PO2PO3SSSMSSMSSMSSSSS	PO1PO2PO3PO4SSSSMSSSMSSMMSSSMSSMSSSM

S-Strong M-Medium L-Low

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	L	S	S
CO2	S	Μ	Μ	S	S
CO3	S	Μ	Μ	S	S
CO4	S	S	L	S	S
CO5	Μ	S	L	S	Μ

S-Strong M-Medium L-Low

Bloom's Taxonomy: Assessment pattern

Bloom's Taxonomy	CA		End of Semester
	First	Second	
Knowledge (40%)	40	40	40
Understand (40%)	40	40	40
Apply (20%)	20	20	20

UNIT 1: SOIL AND FERTILIZERS CHEMISTRY

(15 hrs)

Soil analysis: Composition of soil: Organic and Inorganic constituents. Soil acidity: bufferin 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 from gobar gas plants. Use of fertilizers: urea, DAP, Super phosphate, Gypsum, NPK-mixed fertilizers, 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.
- 2. Kim H.Tan, Principles of soil chemistry, 4thedition, 2010

Reference books

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

2. Richard pohanish 2- nd edition, Pesticides and agricultural chemicals, 2014.

Course Designers

Dr. A. Suganthi

Dr. R.Mahalakshmy

Dr. J. Thirupathy

Web resources:

1. https://www.slideshare.net/StefanieAragon/agricultural-chemicals-group-powerpoint

2. https://www.researchgate.net/publication/275885835 Agricultural Chemistry

THIAGARAJAR COLLEGE(Autonomous), MADURAI-625 009 (Re-Accredited with "A++" Grade by NAAC)

Department of Chemistry

(For those joined B.Sc., Chemistry on or after June 2020)

Programme Code:UCH

Course Code	Course title	Category	L	Т	Р	Credit
UCH20SE51(B)	Dairy	SEC	2			2
	Chemistry	(Option B)	2	-	-	Z

Year	Semester	Int. Marks	Ext. Marks	Total
III	V	15	35	50

Preamble

The course briefly outlines the composition, constituents and physical properties of milk, factors

affecting the composition of milk and microbiology of milk. It also explains the composition and

processing methods of major milk products such as butter, ghee and special milk and adulterants.

Course Outcomes

On the completion of the course the student will be able to

	Course Outcomes	Expected proficiency	Expected attainment
CO1	Define milk and find composition and physical properties of milk.	85%	80%
CO2	Explain the factors which affect the composition of milk and destruction of micro-organism.	80%	78%
CO3	Illustrate the physico-chemical changes in milk due to processing, boiling and pasteurization.	75%	73%
CO4	List the milk products cream, butter and ghee its composition, estimation, adulterants added and their detection. Perceive about types of special milk and its nutritive value.	75%	76%
CO5	Explain the milk and milk products adulteration	85%	82%

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	S	S	S	М
CO2	S	М	М	S	S	М
CO3	S	М	М	М	М	S
CO4	S	S	М	S	S	S
CO5	S	L	М	S	М	S

S-Strong; M-Medium; L-Low

Bloom's Taxonomy: Assessment pattern

Bloom's Taxonomy	СА	End of Semester	
	First	Second	
Knowledge	40%	40%	40%
Understand	40%	40%	40%
Apply	20%	20%	20%

Course title: Dairy chemistry

UNIT-I: COMPOSITION AND PROCESSING OF MILK (15 hrs)

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 AND ADULTRANTS (15 hrs)

Cream-composition - Chemistry of creaming process-gravitational and centrifugal methods of separating cream-estimation of fat in cream. Butter–composition-desibutter-salted butter-stimation of acidity and moisture content in butter. Ghee-major constituents-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.

Definition of Adulteration-type of contamination- Economic adulteration-Microbial adulteration- Adulteration of Milk and Milk product-Detection of adulteration- conventional methods- Laboratory methods-adulteration of butter and Ghee-detection methods.

Reference book:

Robert Jenness and S. Patom, Principles of dairy chemistry, Wiley, New York.
 Text book:

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

 Course designer:

 K. Selvakumar
 M. Sathiya

THIAGARAJAR COLLEGE(Autonomous), MADURAI-625 009 (Re-Accredited with "A++" Grade by NAAC)

Department of Chemistry

(For those joined B.Sc., Chemistry on or after June 2019)

Programme Code:UCH

Course Code	Course title	Category	L	Т	Р	Credit
UCH20SE51(C)	Forensic	SEC	2	_	_	2
	Chemistry	(Option C)	2			2

Year	Semester	Int. Marks	Ext. Marks	Total
III	V	15	35	50

Preamble

The course briefly outlines the various drugs, figure print analysis, toxicology and forgery and counter fit notes in forensic studies.

Course Outcomes

On the completion of the course the student will be able to

	Course Outcomes	Expected proficiency	Expected attainment
CO1	Learn the principle, classification and analysis of drugs chemistry	75%	73%
CO2	Understand the types of finger prints and analysis	80%	75%
CO3	Identify the forgery in bank cheques /drafts and educational records.	75%	73%
CO4	Analysis and identification of toxic and poison in forensic studies	80%	86%
CO5	Analyze the alloys in coins, silver line watermark in currency notes. And also able to detect the purity of gold and diamond.	80%	78%

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	S	S	S	Μ
CO2	S	L	L	Μ	Μ	S
CO3	S	S	L	S	S	L
CO4	S	М	L	Μ	Μ	L
CO5	S	S	S	L	L	Μ

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	М	М	S	S
CO2	S	S	Μ	S	S

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CO3	S	L	S	L	Μ
CO4	S	1	S	S	S
CO5	S	S	L	М	S

S-Strong; M-Medium; L-Low

Bloom's Taxonomy and assessment pattern

Bloom's	CA	End of	
Taxonomy	First	Second	Semester
Knowledge	40%	40%	40%
Understand	40%	40%	40%
Apply	20%	20%	20%

UNIT I: FORENSIC DRUGS CHEMISTRY AND FINGERPRINT ANALYSIS (15 hrs)

Introduction-Forensic Science: Definition of forensic science, role of the forensic laboratory-Principle of forensic drugs chemistry-presumptive and confirmatory testing for drugs - Drug scheduling and classification - synthetic drugs - prescription drugs-Applications - collection of evidences - types of analysis.

Fingerprint- Introduction - Principles of fingerprint analysis types of fingerprints - Use of fingerprint analysis - collection of finger print analysis - dyes - lights and chemical developers- finger print analysis process - limitations.

UNIT II: FORENSIC TOXICOLOGY& FORGERY COUNTERFEITING (15 HRS)

Forensic Toxicology: Definition, Areas of Forensic Toxicology, Elements of Forensic Toxicology- Poisons: Definition of Poison, Toxin and Toxicant, Ideal Poison, Classification of poisons based on their origin and Chemical nature, mode of action.

Detecting forgery in bank cheques / drafts and educational records - mark lists, certificatesusing 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 ornamentsdetecting gold plated-jewels, authenticity of diamonds (natural, synthetic, glassy).

Text books

Javad I. Khan, Thomas J, Kennedy, Dobbell R, Christian Jr, 2011. Basic principles of Forensic Chemistry, Springer Science and Business media. Mathew E, Johll 2009, Investigating Chemistry: A Forensic Science Perspective, New York:

Mathew E. Johll, 2009. Investigating Chemistry: A Forensic Science Perspective, New York: W.H. Freeman and Co.,

Reference Book

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

Course Designers

Dr. R. Mahalakshmy Dr. K. Selvakumar Dr. M. Sathiya

THIAGARAJAR COLLEGE (Autonomous), MADURAI-625 009 (Re-Accredited with 'A++' Grade by NAAC)

Department of Chemistry

(For those joined B.Sc., Chemistry on or after June 2020) Programme code UCH

Course Code	Course title	Category	L	Т	Р	Credit
UCH20C61	Advanced Inorganic Chemistry	Core 12	5	-	-	5

Year	Semester	Int. Marks	Ext. Marks	Total
III	VI	25	75	100

Preamble

This course explains the advanced concepts of inorganic chemistry and detailed application of analytical chemistry.

Course Outcome

#	Course Outcome	Expected course proficiency	Expected course attainment
CO1	Detail study of basic concepts and types of solids	75 %	73%
CO2	Outline the bonding applications of metal carbonyls	70%	70%
CO3	Understand the structure and characteristics of Organometallic Compounds & Name the types of catalyst in transition metal compounds	85%	80%
CO4	Explain the concepts of bio inorganic chemistry	75 %	73%
CO5	Explain the applications of analytical chemistry	80%	76%

Mapping of COs with Pos

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	М	S	S	L
CO2	S	L	М	S	S	L
CO3	S	L	М	S	S	L
CO4	S	Μ	М	S	S	L
CO5	S	Μ	М	L	S	М

Mapping of COs with PSOs

PSO1 PSO2	PSO3	PSO4	PSO5
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CO1	S	L	L	М	S
CO2	S	М	S	L	S
CO3	S	М	L	М	S
CO4	S	М	М	L	S
CO5	S	S	S	S	S

S-Strong; M-Medium; L-Low

Bloom's Taxanomy and Assesment Pattern

Bloom's Taxonomy	С	End of Semester	
	First	Second	
Knowledge (40%)	40	40	40
Understand (40%)	40	40	40
Apply (20%)	20	20	20

Unit I: SOLID STATE CHEMISTRY

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

Crystal defects: Point defects-stoichiometric defects- Schottky and Frenkel defects and non-stoichiometric defects – colour centres — Line and plane defects.

UNIT II: Metal carbonyls

Metal carbonyls - EAN rule –classification, preparation-bonding in metal carbonyls– synergic effect-Preparation, properties, structure and bonding of mononuclear carbonyls of nickel, iron, vanadium, manganese and chromium - binuclear carbonyls of iron, cobalt and manganese and trinuclear carbonyls of iron and osmium- polynuclear carbonyl complex. – IR spectra of metal complexes/carbonyls in *cis* – *trans* isomerism – determination of bond order of CO – differentiating terminal and bridging CO.

UNIT III: A. ORGANOMETALLIC COMPOUNDS

Definition-Types - Alkene complexes - preparation and structural features of Zeise's Salt & Iron- Butadiene Complex - 18 - electron rule-16 electron rule – Hapticity - Ferrocene: preparation -Structure and Bonding.

B. TRANSITION METAL COMPOUNDS AS CATALYSTS

Mechanism and applications of Wilkinson catalyst (hydrogenation of olefins), Zeigler-Natta catalyst (propylene polymerization), Wacker's process (oxidation of olefins), Mansanto process (acetic acid synthesis), Hydroformylation process (linear/ branched chain aldehydes).

Unit IV: BIO –INORGANIC CHEMISTRY

Essential and trace elements in biological systems (Mg, Al, Si, P, Ca, V, Cr, Mn, Fe, Zn) – structural features of haemoglobin, chlorophyll, cyanocobalamin.

Biological role of cytochromes, blue copper proteins, carboxypeptidase A, peroxidases and catalases-nitrogen fixation.

(15 hrs)

(15 hrs)

(15 hrs)

(15 hrs)

Anti-cancer agents: cis-platin-chelation therapy–cancer treatment– Anti-arthritis drugs – Gadolinium MRI Imaging Agents. Metals in Medicine. Metal Poisoning.

Unit V: ANALYTICAL CHEMISTRY

(15 Hrs)

- i. Colourimetric 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- Spectrophotometric determination of Nickel (II) and Iron(III).
- ii. Principle, instrumentation and application of Cyclic voltammetry, TGA, DTA and DSC. Applications of TGA and DTA in determination of stability of Calcium oxalate monohydrate, Copper sulphate pentahydrate, Magnesium sulphate heptahydrate.

Text Books:

- 1. A. R. West, Basic solid state chemistry, John Wiley, (1991).
- 2. Azaroff, Solid State Chemistry, John Wiley.
- 3. B. E. Dogulas, D.H McDaniel's and Alexander, Concepts and Models of Inorganic Chemistry, Oxford IBH, (1983).
- 4. J.E. Huheey, Inorganic Chemistry Principles, Structure and Reactivity, Harper Collins, New York, IV Edition (1993).
- 5. F.A. Cotton and G. Wilkinson Advanced Inorganic Chemistry A Comprehensive Text, John Wiley and Sons, V Edition (1988).
- 6. K.F. Purcell and J.C. Kotz, Inorganic Chemistry WB Saunders Co., USA (1977)
- 7. W. U. Mallik, G.D. Tuli, R.D. Madan, Selected topics in Inorganic Chemistry, S. Chand and Co., New Delhi, (1992).
- 8. M.N. Hughes, The Inorganic Chemistry of Biological processes, Wiley London, II Edition (1982).
- 9. W. Kaim and B. Schwederski, Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life, an Introduction and Guide, Wiley, New York (1995).
- 10. S. J. Lippard and J. M. Berg, Principles of Bioinorganic Chemistry, University Science Books (1994).
- 11. I. Bertini, H. B. Grey, S. J. Lippard and J. S. Valentine, Bioinorganic Chemistry, Viva Books Pvt. Ltd., New Delhi (1998).
- 12. R. Gopalan, Text book of Inorganic Chemistry, University press (India) private Ltd.
- 13. Sharma, B. K. 2000. Instrumental Methods of Chemical Analysis, 5th edn. Goel publication, New Delhi.

Reference Books:

- 1. Alexander Frank Wells., 2014. Structural Inorganic Chemistry Revised Edition Oxford Classical Text in Physical Science, US.
- 2. Missler Gary L ., Donald A Torr., 2008 Inorganic Chemistry 3rd edition
- 3. Gary Wulfsberg 2018., Foundation of Inorganic Chemistry 1st Edition., Mill valley,

California.

- 4. W. E. Addison, Structural principle in inorganic chemistry, Longman (1961).
- 5. D. M. Adams, Inorganic solids, John Wiley Sons (1974).
- 6. M. C. Day and J. Selbin, Theoretical Inorganic Chemistry, Van Nostrand Co., New York (1974).
- 7. N. Greenwood and A. Earnshaw, Chemistry of Elements, Pergamon, NY, (1984).

- 8. L. Stryer, Biochemistry, V Edition, Freeman & Co., New York (2002).
- 9. D. L. Nelson and M. M. Cox, Lehninger, Principles of Biochemistry, III edition, McMillan North Publication (2002).
- 10. Skoog. and West. 2004. Principles of instrumental analysis, 5th edn. Thomson Brooks Cole, Singapore.

Web Source:

- 1. https://nptel.ac.in/courses/104104101
- 2. https://www.classcentral.com/course/swayam-solid-state-chemistry-12917
- 3. https://nptel.ac.in/courses/104101079
- 4. https://nptel.ac.in/courses/104104109
- 5. https://www.digimat.in/nptel/courses/video/104101091/L28.html
- 6. https://chemistlibrary.files.wordpress.com/2015/05/cotton-wilkinson-advanced-inorganic-chemistry.pdf
- 7. https://www.elsevier.com/books/advanced-inorganic-chemistry/hosmane/978-0-12-801982-5
- 8. https://www.slideshare.net/422459/inorganic-chemistry-84051840
- 9. https://nptel.ac.in/courses/104105084

Course designers:

Dr. A. Suganthi Dr.A. Elangovan Dr.D.S. Bhuvaneshwari Dr.K. Selvakumar Dr.S. Pitchaimuthu Dr.N. Sudhan

THIAGARAJAR COLLEGE (Autonomous), MADURAI-625 009 (Re-Accredited with 'A++' Grade by NAAC) Department of Chemistry

(For those joined B.Sc., Chemistry on or after June 2020) Programme code UCH

Course Code	Course title	Category	L	Т	Р	Credit
UCH20C62	Green Chemistry, Biomolecules and organic	Core-13	5	-	-	5
	spectroscopy					

Year	Semester	Int. Marks	Ext. Marks	Total
III	VI	25	75	100

Preamble

Course Outcomes

The course explains the chemistry of aromatic acids and hydroxyl compounds, natural products, and biomolecules. The basic principles and applications of green chemistry and organic spectroscopy are also discussed in this course.

On th	he completion of the course the student will be able to						
#	Course Outcome	Expected proficiency	Course attainment				
CO1	Outline the principles and importance of green chemistry and make use of it in day today life.	80%	75%				
CO2	Gain the knowledge on the chemistry of aromatic sulphonic acids, hydroxy compounds and carboxylic acids.	80%	75%				
CO3	Explain the structural elucidation of alkaloids, structure and synthesis of terpenoids.	87%	85%				
CO4	Utilize the chemical properties of amino acids, peptides and proteins.	85%	80%				
CO5	Understand the principle and applications of UV-Visible, IR and Mass spectroscopy	85%	80%				

Mapping of COs with Pos

	PO1	PO2	PO3	PO4	PO5
CO1	S	S	Μ	Μ	Μ
CO2	S	S	Μ	Μ	Μ
CO3	S	S	Μ	Μ	Μ
CO4	S	S	М	S	S
CO5	S	S	М	S	S

Mapping of COs with PSOs

CO1SMSMSCO2SMSMSCO3SLMLSCO4SMSSS		PSO1	PSO2	PSO3	PSO4	PSO5
CO2SMSMSCO3SLMLSCO4SMSSS	CO1	S	М	S	М	S
CO3 S L M L S CO4 S M S S S	CO2	S	Μ	S	Μ	S
CO4SMSS	CO3	S	L	Μ	L	S
	CO4	S	М	S	S	S
CO5SSLSS	CO5	S	S	L	S	S

S-Strong; M-Medium; L-Low

Bloom's Taxonomy and assessment pattern

Bloom's Taxonomy	СА		End of Semester
	First	Second	
Knowledge (40%)	40%	40%	40%
Understand (40%)	40%	40%	40%
Apply (20%)	40%	40%	20%

UNIT – I

GREEN CHEMISTRY

Introduction – definition of green chemistry – need and basic principles of green chemistry. Solid state and solvent free organic reactions (using supported reagents) - Difference between microwave heating and conventional heating.

Microwave assisted reactions (correlating it with normal condition, any 4 examples) in aqueous media, supercritical CO_2 and ionic liquids.

UNIT – II

CARBOXYLIC ACIDS, SULPHONIC ACIDS AND HYDROXY COMPOUNDS

Aromatic Sulphonic Acids: Methods of preparation and reactions of benzene sulphonic acid, sulphanilic acid, saccharin, and chloramine -T.

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

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

Dicarboxylic acids: Phthalic acid and terephalic acid.

UNIT –III CHEMISTRY OF NATURAL PRODUCTS Alkaloids

Introduction - general characteristics, methods of structural determination - classification – Hofmann Exhaustive methylation

(15 Hrs)

(15 Hrs)

(15 Hrs)

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Sources, isolation, physiological activities, structure determination of piperine, nicotine, and atropine.

Terpenoids

Introduction and classification - isoprene rule – gem dialkyl rule – structure and synthesis of the following terpenoids – citral, menthol and camphor (structural elucidation not required).

UNIT – IV

AMINO ACIDS, PEPTIDES AND PROTEINS

Aminoacids: Classification – Synthesis: Strecker synthesis and Gabriel's phthalimide synthesis – Zwitterion – Isoelectric point and Electrophoresis – Protection of -COOH group and $-NH_2$ group – ninhydrin test.

Peptides and proteins: Classification of peptides – synthesis of dipeptides (using DCC) – primary, secondary, tertiary and quaternary structure of proteins – denaturation.

UNIT - V

ORGANIC SPECTROSCOPY

UV-Visible spectroscopy: Types of electronic transition - λ_{max} calculation for simple conjugated dienes (acyclic, homo and hetero annular)

IR spectroscopy: Application of IR towards organic molecules.

Mass spectrometry: Basic principle, instrumentation, molecular ion peak, base peak, isotopic peaks, metastable peak and their uses - fragmentation – nitrogen rule, McLafferty rearrangement, determination of molecular formula using mass spectral data - mass spectrum of simple organic compounds (alcohols, aldehydes, aromatic hydrocarbons).

Text Books:

- V. K. Ahluwalia, 2017, Green Chemistry: Environmentally Benign Reactions, 1st edition, Ane Books Pvt. Ltd., New Delhi.
- 2. Bhupinder Mehta, Manju Mehta, 2015, Organic Chemistry, 2nd edition, Prentice Hall of India Pvt. Ltd,. New Delhi.
- 3. Bahl, A. and Bahl, B.S. 2020, Advanced Organic Chemistry, S. Chand & Company Limited, New Delhi.
- 4. Y. R. Sharma, 2013, Elementary Organic Spectroscopy, 5th edition, S. Chand & Company Limited, New Delhi.

Reference books

- 1. K. R. Desai, 2005, Green Chemistry, Himalaya Publishing House, Mumbai.
- 2. I.L.Finar, 2012, Organic chemistry Vol I, 6th edition, Pearson Plc., New Delhi.
- 3. I.L. Finar, 2019, Organic Chemistry, Vol. II, 5th Edition, Pearson Plc., New Delhi.
- 4. R.T. Morrison; R.N. Boyd; S.K. Bhattacharjee, 2020, Organic chemistry, 7th edition, Pearson Plc., New Delhi.
- 1. Hermann Dugus, 2004, Bioorganic Chemistry, Springer International, 3rd Edition, New Delhi.

Web resources:

- 1. https://youtu.be/GI8g6x179t0
- 2. <u>https://www.britannica.com/science/carboxylic-acid/Aromatic-acids</u>
- 3. http://oms.bdu.ac.in/ec/admin/contents/1_16SCCCH8_2020051904202312.pdf(Alkaloids
- 4. https://nptel.ac.in/courses/104105040

(15 Hrs)

(15 Hrs)

5. https://nptel.ac.in/courses/104106122

Course designer

- 1. Dr. P. Tharmaraj
- 2. Dr. P. Prakash
- 3. Dr. R. Mahalakshmy
- 4. Dr. A. Tamil Selvi
- 5. Mrs. P. Rajam

Thiagarajar College(Autonomous), Madurai – 625 009 (Re-Accredited with "A⁺⁺" Grade by NAAC) Department of Chemistry

(For those joined B.Sc., Chemistry on or after June 2020) Programme code UCH

Course Code	Course title	Category	L	Т	Р	Credit
UCH20C63	Energetics and Surface	Core 14	5	-	-	5
	chemistry					

Year	Semester	Int. Marks	Ext. Marks	Total
III	VI	25	75	100

Preamble

To course explains the fundamental concepts, theories and applications of electro chemistry and Colloids. Also explains various processes and concepts of nano and surface chemistry.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected	Expected
		Proficiency	attainment
CO1	Explain the fundamental concepts of electrochemistry.	75%	74%
CO2	Tell the theories and applications of electrochemistry.	78%	75%
CO3	Recall their knowledge on surface chemistry concepts.	80%	75%
CO4	Identify the preparation, properties and applications of	75%	73%
	colloids.		
CO5	Apply the concepts of nano chemistry	78%	75%

Mapping of COs and POs

	PO1	PO2	PO3	PO4	PO5	PO6	
CO1	S	S	Μ	S	Μ	L	
CO2	S	S	Μ	S	Μ	L	
CO3	S	Μ	Μ	S	Μ	Μ	
CO4	Μ	Μ	Μ	S	Μ	Μ	
CO5	S	S	Μ	S	Μ	М	
Mapping of COs and PSOs							

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	Μ	Μ	L	S
CO2	S	Μ	L	L	S

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Thiagarajar College, I	Madurai. 41 ^{si}	ACM -	Department of	Chemistry-	Syllabus 2020	H54

Bloom's Taxonomy and Assessment pattern

-

Μ

Μ

S

Μ

S

Bloom's Taxonomy	C	End of Semester	
	First	Second	(%)
	(%)	(%)	
Knowledge	40	40	40
Understand	40	40	40
Apply	20	20	20

UNIT-I **ELECTRO CHEMISTRY – I**

(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)

L

Μ

Μ

L

L

Μ

S

S

S

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

UNIT-II

CO3

CO4

CO5

ELECTROCHEMISTRY - II

Electrode potential - EMF - measurement of Emf (Poggendorf's method) and its applications ---Electrochemical Cells: Thermodynamics -concentration cells-representation of cells-Nernst's equation, Galvanic cells - Leglanche's cell; lead storage battery, potentiometric titration (FAS Vs K2Cr2O7 only), fuel cells – hydrogen-oxygen fuel cell.

UNIT -III NANO CHEMISTRY

Definition of nanoscience, top-down and bottom-up approach, Sol-gel method; Characterization techniques - Scanning electron microscope (SEM) - transmission electron microscope (TEM), applications of nano materials in insulation materials, machine tools, phosphors, batteries and solar energy.

UNIT -IV COLLOIDS

Definition-Difference 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

(15 hrs)

(15 hrs)

(15 hrs)

(15 hrs)

(15hrs)

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; poisonous gas adsorption on gas masks, simple chromatography application, adsorption of sulphur on oil in froth floatation process, adsorption of dissolved gas in paint industry and hydrogen gas on platinum surface for heterogeneous catalysis.

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. Atkins P., Paula J.D., 2002, Physical chemistry, 7th edition, Oxford University Press, Indian edition.
- **3.** Kapoor K L, 2020, A text book of Physical Chemistry volume 4, sixth edition, McGraw Hill education Pvt. Ltd, India.

Reference Books

- Bokris J. O. M. and Reddy A. K. N., 1978, Modern Electrochemistry, Vol I and Vol II, Plenum Press, New York, USA.
- 2. Wilson M., Geolf Smith K.K., Simmons M., Raguse B., 2005, Nanotechnology,

Overseas

press, New Delhi, India.

E-Resources

- 1. <u>https://www.khanacademy.org/science/class-12-chemistry</u> india/x6a5fb67b43bb54b9:electrochemistry
- 2. <u>https://www.youtube.com/watch?v=teTkvUtW4SA</u>
- 3. <u>https://www.youtube.com/watch?v=meZqm7HznZg</u>
- 4. <u>https://www.youtube.com/watch?v=w1bi8nq63Ew</u>

Course Designers

- 1. Dr. R. Sayee Kannan
- 2. Dr. A. R. Ramesh
- 3. Dr. T. Arumuganathan
- 4. Dr. M. Sathiya
- 5. Dr. A. Jeevika
- 6. Dr. Sribharani

Thiagarajar College(Autonomous), Madurai – 625 009 (Re-Accredited with A⁺⁺ Grade by NAAC) Department of Chemistry

(For those joined B.Sc., Chemistry on or after June 2020)

Programme code: UCH

Course Code	Course title	Category	L	Т	Р	Credit
UCH20CL61	Experiments in Physical	Core Lab - 7	*1	-	4	3
	Chemistry		Practical			
			lecture)			

Year	Semester	Int. Marks	Ext. Marks	Total
III	VI	40	60	100

Preamble

This lab course develops the skill of doing potentiometric, conductometric, kinetics, phase rule colligative properties and colorimetry related experiments.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected	Expected
		Proficiency	attainment
CO1	Do the potentiometric and conductometric titrations.	75%	80%
CO2	Determine the molecular weight of a solute.	78%	80%
CO3	Apply phase rule to simple systems	80%	78%
CO4	Do experiment with CST of phenol – water system.	75%	70%
CO5	Determine the kinetics of ester hydrolysis reaction and	78%	80%
	colorimetric estimation of metal ions		

Mapping of COs and Pos

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	М	S	М	L
CO2	S	S	М	S	М	L
CO3	S	М	М	S	М	М
CO4	М	М	М	S	М	M
CO5	S	S	М	S	М	М

Mapping of COs and PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	L	L	S
CO2	S	S	L	L	S
CO3	S	S	М	М	S
CO4	S	S	М	L	S
CO5	S	S	М	М	S

S-Strong; M-Medium; L-Low

PHYSICAL CHEMISTRY EXPERIMENTS (ANY SEVEN)

- 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. Estimation of iron by colorimetry (Colorimetry)
- 7. Estimation copper by colorimetry (Colorimetry)
- 8. Ester hydrolysis using acid HCl (Chemical kinetics)
- 9. Critical Solution Temperature (CST) of Phenol-water system and effect of impurity on CST.

Course Designers

- 1. Dr. R. Sayee Kannan
- 2. Dr. A. R. Ramesh
- 3. Dr. T. Arumuganathan
- 4. Dr. M. Sathiya
- 5. Dr. A. Jeevika
- 6. Dr. S. Sribharani

THIAGARAJAR COLLEGE (Autonomous), MADURAI-625 009 (Re-Accredited with 'A++' Grade by NAAC) Department of Chemistry

(For those joined B.Sc., Chemistry on or after June 2020) Programme code UCH

Course Code	Course title	Category	L	Τ	Р	Credit
UCH20CL62	Water Analysis Lab	Core Lab-8	*1	-	2	2
			(Practical			
			lecture)			

Year	Semester	Int. Marks	Ext. Marks	Total
III	VI	40	60	100

Preamble

This lab course enhances the practical skill of analyzing the hardness of water, determination

of COD and BOD of water samples.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcomes	Expected course proficiency	Expected course attainment
CO1	Analyze the TSS, TDS and hardness of any water samples.	90 %	85 %
CO2	Check the alkalinity levels, turbidity levels, fluoride level of water samples.	90 %	85 %
CO3	Determine the pH and conductivity of water sample.	90%	87%
CO4	Detect Na by Flame photometric estimation.	90 %	80 %
CO5	Determine the COD and BOD of water samples.	75 %	70 %

Mapping of COs with POs

	PO1	PO2	PO3	PO/	PO5	PO6
	101	102	105	104	105	100
CO1	S	S	М	S	S	М
CO2	S	L	М	S	S	М
CO3	S	М	L	М	L	М
CO4	S	L	М	S	S	М
CO5	S	S	М	L	S	М

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	М	S
CO2	М	S	М	М	S
CO3	М	S	М	S	S
CO4	М	S	М	L	S
CO5	S	М	S	М	L

S-Strong; M-Medium; L-Low

Experiments (Any Eight)

- 1. Estimation of temporary, permanent and total hardness of water sample.
- 2. Estimation of chloride by Mohr's method.
- 3. Estimation of alkalinity in water sample.
- 4. Estimation of total suspended solids (TSS).
- 5. Estimation of total dissolved solids (TDS).
- 6. Determination of pH and conductivity of the water sample.
- 7. Estimation of dissolved oxygen (DO).
- 8. Determination of biological oxygen demand (BOD).
- 9. Determination of chemical oxygen demand (COD).
- 10. Spectrophotometric estimation of fluoride.
- 11. Flame photometric estimation of sodium/potassium.

Text Books:

- 1. Sharma. B .K., 1996, Instrumental methods of chemical analysis, 5th edition, Goel publication, Meerut.
- 2. Jain & Jain 2015, Engineering Chemistry. 16th Edition Paperback, Dhanpat Raj publishing company, New Delhi.

Reference Books:

1. Skoog D.A, James F. Hollar and Niemans T.A, 2004, Principles of industrial analysis, Thomson Books Cole, Singapore.

Course designer

Dr. P. Prakash Dr. D. S. Bhuvaneshwari Dr. M. Sathiya

Thiagarajar College(Autonomous), Madurai – 625 009 (Re-Accredited with A⁺⁺ Grade by NAAC) Department of Chemistry

(For those joined B.Sc., Chemistry on or after June 2020)

Programme code UCH

Course Code	Course title	Category	L	Т	Р	Credit
UCH20CE61	Industrial Chemistry	Core Elective -2	5	-	-	5
(A)		(Option A)				
L - Lecture	T - Tutorial	P - Practicals				

Year	Semester	Int. Marks	Ext. Marks	Total
III	VI	25	75	100

Preamble

The course explains transformation of chemical compounds into industrial materials for commercial applications

Course Outcome

On the completion of the course the student will be able to

#	Course Outcome	Expected course proficiency	Expected course attainment
CO1	Comprehend the classification, structure	80 %	75%
	characterization, effect of functional group in the		
	properties of polymers and the commercially viability of		
0.0.4	the polymer materials.	00.04	2 00/
CO 2	Acquire the knowledge on pharmaceutical,	80 %	78%
	pharmacopoeta and impact of small chemical molecules		
	on biological system.		
CO3	Archive the idea of preparation, classification and effect	80 %	78%
	of fertilizer, pesticides and insecticide of chemical		
	compounds in agro products.		
CO4	Compare and distinguish the chemistry involved in	75 %	73%
	cements, glass and ceramic materials.		
	Acquire the knowledge of fuels, classifications and their	75 %	80%
CO5	pollution effect on environmental and water bodies.		

Mapping of COs with Pos

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	М	М	L	S	L
CO2	S	S	М	S	S	S
CO3	S	L	М	S	S	L
CO4	S	S	М	L	М	S
CO5	S	S	М	S	М	S

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	М	М	М	S
CO2	S	М	М	S	S
CO3	S	М	L	L	S
CO4	S	М	М	М	S
CO5	S	S	L	S	L
0.04		тт	•		•

S-Strong; M-Medium; L-Low

Bloom's Taxanomy Assesment Pattern

Bloom's Taxonomy		CA	End of Semester
	First	Second	
Knowledge (40%)	40	40	40
Understand (40%)	40	40	40
Apply (20%)	20	20	20

Unit I: INORGANIC POLYMERS

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-comparison of polymer of boron nitride and graphite -Silicon polymers-linear polymer- cross linking polymer- copolymer-coordination polymers- classification, Ag, Au and copper based coordination polymers.

Unit II: PHARMACEUTICAL CHEMISTRY

Important aspects of pharmaceutical chemistry-sources and effects of impurities in pharmaceutical chemicals-Tests of purity-Buffer systems of body.

Gastrointestinal agents -dil.HCl-Antacids-Aluminium Hydroxide Tablets, Tribasic Calcium phosphate, Milk of magnesia, Milk of Bismuth, Sodium bicarbonate tablets. Astringents-Alum, sublimed sulphur. Antioxidants - Hypophosphorus acid and Sodium metabisulphite.

Anticaries agents - Role of fluoride-phosphate-mouth washes-cements and fillers-Alvelar analgesics. Antidotes in poisoning -Activated charcoal, Light kaolin.

Unit III: AGRICULTURAL CHEMISTRY

Fertilizers: Preparation and uses of urea, DAP, 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)- **Biopesticides**: Herbicides: Manufacture of 2,4-D and 2,4,5-T Fungicides: Preparation of Bordeaux mixture. Classification of fungicides with examples.

Unit – IV: Cement, Glass, Ceramics

(15 hrs)

(15 Hrs)

(15 Hrs)

(15 Hrs)

Cement- manufacture of Portland cement - composition - setting of cement - special cements - Aluminium cement - white Portland cement - water proof cement.

Glass – Raw materials and colouring agents - chemical reaction involved in glass manufacture - some special glasses (borosilicate, alkali silicate, optical glass, sodalime glass, their properties and applications)

Ceramics - various classes of ceramics, general properties, porous and non-porous wares, raw materials for ceramics and uses.

Unit-V: Industrial fuels, Pollution and Chemical toxicology

(15 Hrs)

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

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.

Text Books:

- 1. Puri. B. R., Sharma. L. R., and Kalia. K. C 2004. Principles of Inorganic Chemistry, 28th Edition, Vallabh Publication, New Delhi.
- 2. Jain & Jain 2015, Engineering Chemistry. 16th Edition Paperback, Dhanpat Raj publishing company, New Delhi.
- 3. Sharma. B.K., 1996, Instrumental methods of chemical analysis, 5th edition, Goel publication, Meerut.
- Lee, J. D, 2002, A New Concise Inorganic Chemistry, Blackwell Science Ltd., ELBS 5th Ed., London.

Reference Books:

- 1. Madan.R.D.2002, Modern Inorganic Chemistry, S. Chand & Company, 2nd edition, New Delhi.
- 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. Skoog D.A, James F. Hollar and Niemans T.A, 2004, Principles of industrial analysis, Thomson Books Cole, Singapore.
- 4. G. R. Chatwal, 2022, Pharmaceutical chemistry- Inorganic, 5th edition, Himalaya Publishing House, Mumbai.

Web Source:

- 1. https://www.youtube.com/watch?v=1r4-csj89DQ
- 2. <u>https://www.youtube.com/watch?v=oEbeA68Wktl</u>
- 3. <u>https://www.library.qmul.ac.uk/subject-guides/chemistry/useful-websites/</u>
- 4. <u>https://www.youtube.com/watch?v=qSPCDV539Q4</u>

Course designers

- Dr. A. Suganthi
- Dr. A. Elangovan
- Dr. D. S. Bhuvaneshwari
- Dr. K. Selvakumar
- Dr. S. Pitchaimuthu
- Dr. N. Sudhan

Thiagarajar College (Autonomous), Madurai – 625 009 (Re-Accredited with A⁺⁺ Grade by NAAC) Department of Chemistry

(For those joined B.Sc., Chemistry on or after June 2020) Programme code: UCH

Course Code	Course title	Category	L	Т	Р	Credit
UCH20CE61(B)	Bioinorganic Chemistry	Core elective-2 (Option B)	5	-	-	5

Year	Semester	Int. Marks	Ext. Marks	Total
III	VI	25	75	100

Preamble

The course explains the role of metal ions in biology and medicine. Also explains the

Structure and properties of metallo enzymes and metallo proteins.

Course outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected course proficiency	Expected course attainment
CO1	Understand the role of metal ions in biological systems.	80 %	75 %
CO2	Explain the fundamentals of proteins and enzymes.	80 %	75 %
CO3	Gain knowledge on structure and functions of hemoglobin and myoglobin.	80 %	75 %
CO4	Acquire knowledge on copper enzymes and nitrogenase.	75 %	70 %
CO5	Comprehend the applications of metal ions in medicine.	75 %	70 %

Mapping of COs with Pos

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	М	М	L	S	L
CO2	S	S	М	S	S	S
CO3	S	L	М	S	S	L
CO4	S	S	М	L	М	S
CO5	S	S	М	S	М	S

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	М	М	S
CO2	S	S	М	S	S
CO3	S	М	М	L	S
CO4	S	М	L	М	S
CO5	S	М	М	М	S

S-Strong; M-Medium; L-Low

Bloom's Taxanomy Assesment Pattern

Bloom's Taxonomy	СА		End of Semester
	First	Second	
Knowledge (40%)	40	40	40
Understand (40%)	40	40	40
Apply (20%)	20	20	20

UNIT I: ROLE OF METALS IN BIOLOGY

Introduction - Essential Chemical Elements - Metals in Biological Systems - Biological Metal Ion Complexation - Electronic and Geometric Structures of Metals -Metals in Biological Systems – Metals containing proteins and enzymes.

UNIT II: BIOCHEMISTRY FUNDAMENTALS

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

Copper Enzymes: Occurrence – Structure – Function – Discussion of Specific Enzymes: Superoxide Dismutase – Hemocyanin.

Enzyme Nitrogenase: Iron–Sulfur Clusters – Fe–Protein Structure – Detailed Mechanistic

UNIT V: METALS IN MEDICINE

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

Studies.

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(15 hrs)

(15 hrs)

(15 hrs)

(15 hrs)

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. A. Suganthi
- 2. Dr. A. Elangovan
- 3. Dr. D. S. Bhuvaneshwari
- 4. Dr. K. Selvakumar
- 5. Dr. S. Pitchaimuthu
- 6. Dr. N. Sudhan

THIAGARAJAR COLLEGE(Autonomous), MADURAI-625 009 (Re-Accredited with "A⁺⁺" Grade by NAAC) Department of Chemistry

(For those joined B.Sc., Chemistry on or after June 2020) Programme Code:UCH

Course Code	Course title	Category	L	Т	Р	Credit
UCH20SE61(A)	ICT tools in Chemistry	SEC	-	-	2	2
		(Option A)				
L - Lecture	T - Tutorial	P - Practicals				_

Year	Semester	Int. Marks	Ext. Marks	Total
III	VI	15	35	50

Preamble

This lab course enables the students to build, optimize and to interpret the molecules and to

write C-programming for basic chemical formulas.

Course Outcomes On the completion of the course the student will be able to

#	Course Outcome	Expected	Expected
		course	course
		proficiency	attainment
CO1	Build molecules and optimize its geometry	85%	80%
CO2	Convert the molecules into various file formats	85%	80%
CO3	Conformational analysis in chem3D	82%	75%
CO4	Interpret the HOMO/LUMO of the molecule	75%	70%
CO5	Write C-program for determining various physical parameters	80%	75%

Mapping of COs with Pos

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	М	S	S	М
CO2	S	L	М	S	S	М
CO3	S	L	М	S	S	М
CO4	S	S	М	S	S	М
CO5	S	S	М	Μ	L	L

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	М	Μ	S
CO4	L	S	L	Μ	S
CO5	S	S	Μ	Μ	S

S-Strong; M-Medium; L-Low

EXPERIMENTS / LAB EXERCISES

- 1. Construction of molecules in MarvinSketch, ChemSketch and Chem Draw online, Raxsyssoftware
- 2. Converting the molecules into different file
- 3. Energy Optimization in Chem3D
- 4. Conformational analysis in chem3D Molecular dynamics in chem3D
- 5. Interpreting HOMO and LUMO orbitals using chem3D
- 6. Applying C-program in
 - Calculation of RMS and average velocities of O₂
 - Mean activity coefficient of an electrolyte
 - Calculation of pH of the given solution
 - Calculation of Normality, Molarity and molality of the given solution.

References

- 1. ChemDraw User's guide, 2016, Perkin Elmer Informatics Inc., USA
- 2. Chem3D User's guide, 2016, Perkin Elmer Informatics Inc., USA
- 3. E. Balaguruswamy, 2005, Programming in ANSI C, 3rd edition, Tata McGraw-Hill publishing Company Ltd., New Delhi.

Course Designers

- 1. Dr. A. Elangovan
- 2. Dr. R. Mahalakshmy
- 3. Dr. D. S. Bhuvaneshwari
- 4. Dr. A. Tamilselvi
- 5. Dr. M. Sathiy

THIAGARAJAR COLLEGE(Autonomous), MADURAI-625 009 (Re-Accredited with A⁺⁺ Grade by NAAC) Department of Chemistry

(For those joined B.Sc., Chemistry on or after June 2020) Programme Code:UCH

Course Code	Course Title	Category	L	Т	Р	Credit
UCH20SE61(B)	Food Chemistry	SEC (Option B)	2	-	-	2

Year	Semester	Int. Marks	Ext marks	Total
III	VI	15	35	50

Preamble

The course briefly outlines the basic knowledge in Food and Milk Chemistry and learns the

practical knowledge in food analysis.

Course Outcomes

On the completion of the course the student will be able to

	Course Outcomes	Expected	Expected
		course	course
		proficiency	attainment
CO1	Tell the functions of food group and its relation to	90 %	85 %
	health.		
CO2	Explain the composition and effectiveness of nutrition	90 %	85 %
	and balanced diet.		
CO3	Summarize the calorific value of food stuffs and	90 %	80 %
	factors affecting the basal metabolic rate (BMR).		
CO4	Analyse the energy requirements of individual	90 %	85 %
CO5	Make use of the nutritional value of proteins and	85 %	80 %
	carbohydrates.		

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	М	S	S	М
CO2	S	L	М	S	S	М
CO3	S	L	М	S	S	М
CO4	S	Μ	L	S	Μ	L
CO5	Μ	М	М	L	L	М

Mapping of COs with PSOs

CO1SMMSSCO2SMLSSCO3SMMMSCO4SMLSMCO5SMLSM		PSO1	PSO2	PSO3	PSO4	PSO5
CO2SMLSSCO3SMMMSCO4SMLSM	CO1	S	М	М	S	S
CO3SMMMSCO4SMLSM	CO2	S	М	L	S	S
CO4 S M L S M	CO3	S	М	Μ	М	S
	CO4	S	М	L	S	М
COS S M M S	CO5	S	М	Μ	М	S

S-Strong; M-Medium; L-Low

Bloom's Taxanomy Assesment Pattern

Bloom's Taxonomy	CA		End of Semester
	First	Second	
Knowledge (40%)	40	40	40
Understand (40%)	40	40	40
Apply (20%)	20	20	20

UNIT I: Introduction

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

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 book:

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 Dr. R. Mahalakshmy Dr. D. S. Bhuvaneshwari Dr. M. Sathiya

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(15 hrs)

(15 hrs)
THIAGARAJAR COLLEGE(Autonomous), MADURAI-625 009

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

Department of Chemistry

(For those joined B.Sc., Chemistry on or after June 2020) Programme Code:UCH

Course Code Т Course L Р Credit Category Title UCH20SE61(C) Polymer SEC 2 2 _ _ Chemistry (Option C)

Year	Semester	Int. Marks	Ext marks	Total
III	VI	15	35	50

Preamble

The course briefly outlines the classification of polymers, types of polymerization and plastics. It also explains the chemistry of commercial polymers viz., PVC, polystyrene etc.,

COURSE OUTCOMES

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

	COURSE OUTCOMES	Expected course proficiency	Expected course attainment
CO1	Classify different types of polymers and	90 %	85 %
	polymerization techniques.		
CO2	Distinguish between thermo and thermosetting	90 %	85 %
	plastics.		
CO3	Tell the knowledge on preparation, properties of	90 %	80 %
	important polymers.		
CO4	Examine the uses of commercial polymers such as	90 %	80 %
	Polythene, PVC, polystyrene and PAN.		
CO5	Apply the chemistry of polymers viz., Teflon,	75 %	70 %
	polyurethanes, phenol-formaldehyde composites		
	etc.		

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	М	S	S	М
CO2	S	L	М	S	S	М
CO3	S	L	М	S	S	М

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CO4	S	L	М	S	S	М
CO5	Μ	М	М	L	L	М

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	Μ	Μ	М	S
CO2	S	Μ	М	М	S
CO3	S	Μ	L	Μ	S
CO4	S	Μ	S	М	S
CO5	S	Μ	L	Μ	S
S-Strong;	M-Medium;	L-Low			

Bloom's Taxanomy Assesment Pattern

Bloom's Taxonomy	CA		End of Semester
	First	Second	_
Knowledge (40%)	40	40	40
Understand (40%)	40	40	40
Apply (20%)	20	20	20

UNIT-I

INTRODUCTION TO POLYMERS

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

UNIT-II

CHEMISTRY OF COMMERCIAL POLYMERS

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 Dr. D. S. Bhuvaneshwari Dr. M. Sathiya

(15 hrs)

(15 hrs)