

## DEPARTMENT OF CHEMISTRY

### PREAMBLE

**UG:** Course profile, list of courses offered to other departments and the syllabi of courses offered in the first two semesters along with evaluation components III and IV (with effect from 2018-2019 batch onwards) and

**PG:** Course profile, list of courses offered to other departments and the syllabi of courses along with evaluation components III and IV (with effect from 2018-2019 batch onwards) are presented in this booklet

### COURSE PROFILE B.Sc. CHEMISTRY

**PSO1:** Development of the skills in handling various chemicals, apparatus and instruments.

**PSO2:** Application of the principles of thermodynamics and chemical kinetics in chemical reactions

**PSO3:** Acquiring the knowledge on heterocyclic compounds and natural products

**PSO4:** Ability to apply the basic principles of various spectroscopic, electro and thermo analytical methods to characterize the compounds

**PSO5:** Industrial insights on polymers, textile dyes, fibre and medicinal chemistry.

Semester	Part	Category	Course code	Course Title	Contact Hrs/ Week	Credits	
						Min	Max
I	I	Tamil/Hindi/French	UTAL105/ UTAL106/ UHIL101/ UFRL101	Basic Tamil-I/ Advanced Tamil-I/ Hindi-I/ French-I	4	2	3
	II	English	UENL107/ UENL108	General English-I/ Advanced English-I	5	3	4
	III	Core I	UCHM104	Fundamentals of Chemistry	2	1	1
		Core II	UCHM105	General Chemistry –I	4	4	4
		Core III	UCHM106/UCHM107	Analytical Chemistry	4	4	4
		Core Practical I	UCHR204/UCHR205	Volumetric Analysis	3	-	-
		Allied I	UPHA101	Allied Physics - I	3	3	3
		Allied Practical I	UPHR102	Allied Physics Practical-I	3	2	2
	IV	Value Education			2	1	1
	<b>Total</b>					<b>30</b>	<b>20</b>
II	I	Tamil/Hindi/French	UTAL205/ UTAL206/ UHIL201/ UFRL201	Basic Tamil-II/ Advanced Tamil-II/ Hindi-II/ French-II	4	2	3
	II	English	UENL207/ UENL208	General English-II/ Advanced English-II	5	3	4
	III	Core IV	UCHM202	General Chemistry –II	6	6	6
		Core Practical I	UCHR204/UCHR205	Volumetric Analysis	3	4	4
		Allied II	UPHA201	Allied Physics II	3	3	3
		Allied Practical I	UPHR202	Allied Physics Practical-II	3	2	2
	IV	NME			4	2	2
		Soft skill			2	1	1
	V	Extension Programme/ Physical Education/NCC			-	1	2
	<b>Total</b>					<b>30</b>	<b>24</b>

III	I	Tamil/Hindi/French	UTAL305/ UTAL306/ UHIL301/ UFRL301	Basic Tamil-III/ Advanced Tamil-III/ Hindi-III/ French-III	4	2	3	
	II	English	UENL307/ UENL308	General English-III/ Advanced English-III	5	3	4	
	III	Core V		UCHM303	General Chemistry –III	5	5	5
		Core Practical II		UCHR404/UCHR405	Semimicro Qualitative Inorganic Analysis	3	-	-
		Core VI		UCHM304	Separation & Purification Techniques	3	3	3
		Core VII			Online Course (NPTEL/ST)	3	1	2
	IV	Allied		UMAA306	Algebra, Differential Calculus and Trigonometry	5	5	5
		Value Education				2	1	1
<b>Total</b>					<b>30</b>	<b>20</b>	<b>22</b>	
IV	I	Tamil/Hindi/French	UTAL405/ UTAL406/ UHIL401/ UFRL401	Basic Tamil-IV/Advanced Tamil-IV/ Hindi-IV/ French-IV	4	2	3	
	II	English	UENL407/ UENL408	General English/ Advanced English	5	3	4	
	III	Core VIII		UCHM403	General Chemistry –IV	5	5	5
		Core Practical II		UCHR404/UCHR405	Semimicro Qualitative Inorganic Analysis	3	4	4
		Core IX		UCHM404	Instrumental Method of Analysis	4	4	4
		Allied		UMAA406	Integral Calculus, Laplace Transform & Ordinary Differential Equation	5	5	5
		Core X Project/ paper		UCHP501/UCHM604	Project/Dairy Chemistry	2	-	-
	IV	Soft skill		USKS401		2	1	1
	V	Extension Programme/ Physical Education/NCC				-	-	2
	<b>Total</b>					<b>30</b>	<b>24</b>	<b>28</b>
V	III	Core XI	UCHM504	Inorganic Chemistry – I	5	4	4	
		Core XII	UCHM505	Organic Chemistry –I	6	5	5	
		Core XIII	UCHM506	Physical Chemistry –I	5	4	4	
		Core Practical III	UCHR501	Gravimetric Analysis	4	4	4	
		Core Practical IV	UCHR605	Physical Chemistry Practical	4	-	-	
		Core X Project/ paper	UCHP501/ UCHM604	Project/Dairy Chemistry	4	4	4	
	IV	Value education				2	1	1
<b>Total</b>					<b>30</b>	<b>22</b>	<b>22</b>	
VI	III	Core XIV	UCHM607	Inorganic Chemistry II	4	4	4	
		Core XV	UCHM608	Organic Chemistry II	4	4	4	
		Core XVI	UCHM609	Physical Chemistry II	4	4	4	
		Core XVII	UIDM610	Physical Chemistry III	4	4	4	
		Major elective	UCHO602 UCHO603 UCHO604 UCHO605	Polymer Chemistry Medicinal Chemistry Forensic Chemistry Chemistry of Dye	4	4	4	
		Core Practical IV	UCHR605	Physical Chemistry Practical	4	4	4	
		Core Practical IV	UCHR606	Organic Analysis and Preparation	4	4	4	

		Viva –Voce	UCHM605	Comprehensive Viva-Voce	-	1	1
	IV	Soft Skill	USKS601		2	1	1
	V	Extension Programme/ Physical Education			-	-	2
<b>Total</b>					<b>30</b>	<b>30</b>	<b>32</b>
<b>Grand Total</b>					<b>180</b>	<b>140</b>	<b>154</b>

## LIST OF COURSES OFFERED TO OTHER DEPARTMENTS

### ALLIED COURSES

Semester	Part	Category	Course code	Course title	Contact hrs per week	Credits	
						Min	Max
I	III	Allied- I	UCHA102	Allied Chemistry I	5	4	4
IV	III	Allied- II	UCHA402	Allied Chemistry II	3	3	3
I/IV	III	Allied Practical	UCHR103/ UCHR403	Volumetric and Organic Analysis	3	2	2

### NON- MAJOR ELECTIVE COURSES

Semester	Part	Category	Course code	Course title	Contact hrs per week	Credits	
						Min	Max
II	IV	Non major elective	UCHE206	Cosmetics and Detergents	4	2	2
			UCHE207	Green Chemistry	4	2	2
			UCHE204	Food Chemistry	4	2	2
			UCHE205	Health and Hygiene	4	2	2
			UCHE208	Health Chemistry	4	2	2

### EXTRA CREDIT EARNING PROVISION

Semester	Category	Course code	Course title	Hrs per week	Credits	
					Min	Max
II	Core	UCHI201	Internship	-	-	1
IV	Core	UCHI401	Internship	-	-	1
V	Core	UCHM507	Green Chemistry (Self Study Paper)	2	-	1
				-	-	1

## UCHM104 FUNDAMENTALS OF CHEMISTRY

<b>Semester</b>	<b>: I</b>	<b>Credit</b>	<b>: 1</b>
<b>Category</b>	<b>: Core I</b>	<b>Hours/Week</b>	<b>: 2</b>
<b>Class &amp; Major</b>	<b>: I B. Sc Chemistry</b>	<b>Total Hours</b>	<b>: 26</b>

### Objectives

#### To enable the students

- Acquire knowledge and calculate the equivalent weight of the molecules
- Classify acid, base and chemical bonding
- Formulate the organic reactions and solutions

### UNIT-I ATOMS AND MOLECULES 6 Hrs

Mass and radius of an electron. Properties of an electron, proton and neutron. Atom, molecule. Atomic number, atomic weight. Oxidation, reduction, oxidation state of the ion, oxidizing and reducing agent. Equivalent weight. Calculation of equivalent weight. Molecular weight, mole concept- stoichiometry.

### UNIT-II ACIDS AND BASES 5 Hrs

Arrhenius concept, proton transfer theory- conjugate acids and bases, Lewis concept. Dissociation of a weak acid. Dissociation of a weak base, ionic product of water- the pH scale. pH of the solution. Buffer solution, Common ion effect.

### UNIT-III CHEMICAL BONDING 6 Hrs

Types of bonds-ionic, covalent, co-ordinate bond and metallic bond. Hydrogen bond, Vander Walls interaction. Hybridization, VSEPR Theory- Shapes of H<sub>2</sub>O, NH<sub>3</sub>.

### UNIT-IV BASIC CONCEPTS OF ORGANIC MOLECULES 4 Hrs

Electrophile, nucleophile, free radical. Types of organic reactions addition substitution, elimination, rearrangement reactions. Carbocation, carbanion, nitrene.

### UNIT-V SOLUTIONS 5 Hrs

Electrode, anode, cathode, electrolyte, electrolysis. Solid, liquid, gas, Solution-saturated, unsaturated solution. Homogeneous and heterogeneous solution. Phase, component. Intensive and extensive properties. Process-reversible and irreversible, System, Surrounding.

### Text Books

- Bahl.S and Arunbahl, *Advanced Organic Chemistry*, Revised Edition, S.Chand and Company Ltd,Ram Nagar,New Delhi,2010.
- Madan.R.D, *Modern Inorganic Chemistry*, 3<sup>rd</sup> edition, Chand.S & Company Limited, New Delhi,2011
- Puri.B.R, Shaema.L.R & Pathania.M.S, *Principles of Physical Chemistry*, Millennium Edition, Vishal Publishing & Co, Jalandhar, 2011.

## Reference Books

- Soni.P.L, *Text Book of Physical Chemistry*, 22<sup>nd</sup> revised edition, Sultan Chand, New Delhi, 2011
- Puri.B.R, Sharma.L.R and K.C.KALLIA, *Inorganic Chemistry*, MilstonePublisher, New Delhi,2006
- Soni.P.L, *Text Book of Organic Chemistry*, 25<sup>th</sup> revised edition, Sultan Chand, New Delhi, 2011.

## UCHM105 GENERAL CHEMISTRY-I

<b>Semester</b>	<b>: I</b>	<b>Credit</b>	<b>: 4</b>
<b>Category</b>	<b>: Core II</b>	<b>Hours/ week</b>	<b>: 4</b>
<b>Class &amp; Major</b>	<b>: I B.Sc Chemistry</b>	<b>Total Hours</b>	<b>: 52</b>

### Objectives

#### To enable the students

- Recognize the modern periodic classification of element & states of matter
- Predict the Nomenclature of the organic compounds
- Evaluate the gaseous and thermo chemical equations

### UNIT –I ATOMIC STRUCTURE

**10 Hrs**

Bohr's model of atom- limitations of Bohr's model, Sommerfield's model, photoelectric effect, Compton effect, de-Broglie equation. Davisson and Germer experiment-Heisenberg's Uncertainty principle – Schrodinger's wave equation (statement only) Significance of wave functions.  $\psi$  and  $\psi^2$  - probability distribution of electrons-radial probability distribution curves-concept and shapes of orbitals.

### UNIT-II MODERN PERIODIC TABLE & ELECTRONIC CONFIGURATION

**11 Hrs**

Modern Periodic Table & Electronic Configuration of atoms- Aufbau Principle, Hund's rule of maximum multiplicity, stability of half-filled and completely filled orbitals. Shapes of s, p, d & f block elements. Classification & characteristic properties of s, p d & f block elements. Periodicity of Properties- Definition and periodicity of Atomic radii, Ionization potential, Electron affinity, and Electro negativity

### UNIT-III STRUCTURE AND BONDING

**12 Hrs**

Basics Concepts of Bonding in Organic Chemistry- Hybridization and geometry of molecules-Methane, ethane, ethylene, acetylene and benzene. Electron displacement effects-inductive, inductomeric, electromeric, mesomeric, resonance, hyperconjugative and steric effects. Cleavage of Bonds-Homolytic and heterolytic fission of carbon-carbon bond, reaction intermediates, carbocation, carbanion and free radicals – their stability .Classification and Nomenclature of organic compounds. Functional groups-homologous series- IUPAC recommendations for naming simple aliphatic, alicyclic and aromatic compounds- polyfunctional compounds and heterocyclic compounds.

#### UNIT-IV GASEOUS STATE

10 Hrs

Gas laws from the kinetic theory of gases – kinetic gas equation – derivation- kinds of velocities-mean, rms, most probable velocity. Calculation of molecular velocity .Maxwell's distribution of molecular velocity (no derivation). Experimental verification of velocity distribution- effect of temperature on velocity distribution –equipartition of energy – Virial equation of state - Boyle's temperature. Liquid State- Surface tension- effect of temperature on surface tension.Parachor- definitions and applications only- coefficient of viscosity- effect of temperature- effect of pressure.

#### UNIT-V BASIC CONCEPTS OF THERMOCHEMISTRY

9 Hrs

State function, path function. Extensive and intensive properties. Energy, Enthalpy, Entropy. System, surroundings. state variables. Thermodynamic process , first law of thermodynamics, Heat capacity. Expansion of an ideal gas and changes in thermodynamic properties, joule Thomson effect joule Thomson co-efficient.

#### Text Books

- Bahl.S and ArunBahl, *Advanced Organic Chemistry*, Revised Edition, S. Chand and Company Ltd, Ram Nagar, New Delhi, 2010.
- Puri.B.R, Sharma.L.R & Pathania.M.S, *Principles of Physical Chemistry*, Millennium Edition, Vishal publishing & Co, Jalandhar, 2006.
- Puri.B.R, Sharma.L.R and Kallia.K.C, *Inorganic Chemistry*, Milstone Publisher, New Delhi, 2006.

#### Reference Books

- Malik.W.U, Tuli.G.D and Madan.R.D, *Selected topics in inorganic chemistry*, 7<sup>th</sup> Edition, S.Chand Publications, New Delhi, 2012.
- Morrison.R.T and Boyd, *Organic Chemistry*, VI Edition, Prentice Hall of India, New Delhi, 2006.
- Soni.P. L, *Text book of physical chemistry*, 22<sup>nd</sup> Revised Edition, Sultan Chand, New Delhi, 2010.
- Soni.P. L, *Inorganic chemistry*, 20<sup>th</sup> Revised Edition, Sultan Chand, New Delhi, 2010.

### UCHM107 ANALYTICAL CHEMISTRY

Semester : I  
Category : Core III  
Class & Major : I B.Sc Chemistry

Credit : 4  
Hours/ week : 4  
Total Hours : 52

#### Objectives

##### To enable the students

- Understand the manipulating skills in handling apparatus & instruments
- Employ the first aid techniques in laboratory
- Formulate the theoretical aspects of qualitative, volumetric analysis & analytical techniques in chemistry

## **UNIT-I WORKING IN CHEMISTRY LAB**

**8 Hrs**

Introduction –personal protection – nature of chemicals- toxic, corrosive, explosive, inflammable, carcinogenic , other hazardous chemicals – safe storing and handling of chemicals – disposal of chemical wastes, glassware – handling of glassware – handling of different types of equipments like Bunsen burner, centrifuge, Kipp’s apparatus etc – ventilation facilities – philosophy of lab safety- first aid techniques – general work culture inside the chemistry lab- importance of wearing lab coat. Indian and International standards.

## **UNIT-II DATA ANALYSIS**

**10 Hrs**

Types of errors – idea of significant figures and its importance with examples-precision-accuracy-methods of expressing accuracy – error analysis – minimizing errors- methods of expressing precision – average deviation- standard deviation and confident limit. T-test and Q-test

## **UNIT-III THEORY OF INORGANIC QUALITATIVE ANALYSIS**

**8 Hrs**

Principles of acid –base equilibrium, common ion effect and solubility product and their applications in qualitative analysis. Reaction involved in the separation and identification of cations and anions in the analysis-spot test reagents- aluminon, cupferon-DMG, thiourea, magneson, alizarin & Nessler’s, reagent ,semi micro techniques.

## **UNIT-IV PRINCIPLES OF VOLUMETRIC ANALYSIS**

**15 Hrs**

Definitions of molarity, molality, normality & mole fraction. Definitions & examples for primary & secondary standards. Theories of acid-base, redox, complexometric, iodometric & iodimetric titrations. Calculations of equivalent weights. Theories of acid-base, redox, metal ion & adsorption indicators, choice of indicators.

## **UNIT-V PRINCIPLES OF GRAVIMETRIC ANALYSIS**

**11 Hrs**

Characteristics of precipitating agents, choice of Precipitants & conditions of precipitation-specific & selective precipitants-DMG, Cupferon, salicylaldehyde ,ethylene diammine, sequestering agents, precipitation from homogenous medium, co-precipitation ,post precipitation, peptisation-differences.

### **Text Books**

- Gopalan.R, Subramanian.P.S & Rengarajan.K, *Elements of Analytical chemistry*, 3<sup>rd</sup> Revised Edition, Sultan Chand & Sons, New Delhi, 2007.
- Sharma.B.K, *Instrumental methods of chemical analysis*, 12<sup>th</sup> Edition, Krishna Prakashan Media (P) Ltd, 2007.
- Gurdeep.R, Chatwal Sham.K., Anandh, *Instrumental methods of chemical analysis*, Himalaya Publishing House, 2005.

### **Reference Books**

- Janarthnam.P.B, *Physical - Chemical techniques of analysis*, Vol-I and II, Asian Publications,Mumbai, 2007.
- Skoog.A,West.M & Holler, *Fundamentals of Analytical chemistry*, 8<sup>th</sup> Edition, Saunders publication, Tokyo,2009.

- Skoog,A, *Instrumental methods of analysis*,7<sup>th</sup> sub Edition, Wadsworth publishing company,2008 .
- Vogel's, *Hand book of quantitative Inorganic Analysis*, 3<sup>rd</sup>Edition,Longman Publications, London, 2009.

## UCHA102 ALLIED CHEMISTRY - I

<b>Semester</b>	: I	<b>Credit</b>	: 4
<b>Category</b>	: Allied	<b>Hours/ week</b>	: 5
<b>Class &amp; Major</b>	: I B.Sc Biochemistry	<b>Total Hours</b>	: 65

### Objectives

#### To enable the students

- Acquire the basic concepts in structure and bonding in the molecular structure.
- Interpolate the concepts in co-ordination chemistry and Stereochemistry .
- Validate the thermodynamic derivations and biomolecular properties.

### UNIT-I CHEMICAL BONDING 10 Hrs

Types of bonds-ionic, covalent,co-ordinate bond and metallic bond. Hydrogen bond, vander Walls interaction.VSEPR Theory- Shapes of H<sub>2</sub>O, NH<sub>3</sub>.

### UNIT-II CO-ORDINATION CHEMISTRY 10 Hrs

Nomenclature. Of co-ordination compounds-werner theory –chelation –Functions and structure of Haemoglobin and Chlorophyll. Stereo isomerism- Elements of symmetry, optical activity- Isomerism of lactic acid and tartaric acid. Racemisation, Resolution, Geometrical isomerism of maleic acid and fumaric acid.

### UNIT-III KINETICS AND ELECTRO CHEMISTRY 15 Hrs

Chemical Kinetics- order and molecularity. First order rate equation–determination of rate constant of hydrolysis of ester. Catalysis- Catalyst- auto catalyst- enzyme catalyst – promoters- catalytic poisoning- active center-distinction between homogeneous and heterogeneous catalysis-industrial application of catalysts. Electro chemistry-Specific and equivalent conductivity- their determination effect of dilution of conductance.

### UNIT-IV SOLUTIONS 15 Hrs

Solutions: solute-solvent-types of solutions with one example each. - Strengths of solutions- Calculation of Equivalent weights- normality, molality, molarity, molefraction, percentage by weight & ppm. Preparation of standard solutions . First law of Thermodynamics-concept of internal energy, enthalpy. Thermochemistry- as applied to biochemical reactions-second law of thermodynamics- concept of entropy, free energy, criteria for spontaneity. Water and its effect on biomolecules– Introduction-water as solvent- proton mobility-ionic product of water-PH scale-buffering against PH changes in biological system- Henderson equation – biological buffers.

## UNIT –V BIOMOLECULES

15 Hrs

Polymer- types of polymerization- addition and condensation- thermosetting and thermoplastics- rubber-natural and synthetic fibers-nylon-6 and 66, polyesters, PE, PVC, polyvinyl acetate. Amino acids- Classification and sources of amino acids, preparation and properties of Glycine, Zwitter ion structure, isoelectric point.

### Text Books

- Bahl B.S and ArunBahl, *Advanced Organic Chemistry*, 14<sup>th</sup> Edition, S. Chand, New Delhi, 2010 .
- Madan R.D, *Modern Inorganic Chemistry*, 5<sup>th</sup> Edition, S.Chand& Company Limited, New Delhi, 2012.
- Puri B.R, Sharma L.R & Pathania M.S, *Principles of Physical Chemistry*, Millennium Edition, Vishal publishing & Co, Jalandhar, 2011.

### Reference Books

- Malik W.U, Tuli G.D and Madan R.D, *Selected Topics in Inorganic Chemistry*, 7<sup>th</sup> Edition, S.Chand Publications, 2012.
- Morrison R.T and Boyd, *Organic Chemistry*, VI Edition, Prentice Hall of India, New Delhi, 2011.
- Soni P.L, *Text book of physical chemistry*, 25<sup>th</sup> Revised Edition, Sultan Chand, New Delhi, 2011.

## UCHR103/UCHR403 VOLUMETRIC AND ORGANIC ANALYSIS

Semester	: I	Credit	: 2
Category	: Allied Practical	Hours/ week	: 3
Class &Major	: I B.Sc Biochemistry	Total Hours	: 39

### Objectives

#### To enable the students

- Identify the analyzing skills of Organic functional groups
- Standardize the volumetric analysis

### Volumetric Analysis

1. Estimation of sodium hydroxide standard sodium carbonate
2. Estimation of HCl . using standard oxalic acid
3. Estimation of oxalic acid by KMnO<sub>4</sub> using standard oxalic acid
4. Estimation of borax- std sodium carbonate
5. Estimation of Ferrous sulphate – Std – Mohrs salt solution

### Organic Analysis

#### Reaction of the following functional group

Aldehyde (Aromatic), ketone (Aliphatic & Aromatic), Carboxylic acid (mono & di), carbohydrate (reducing) & phenol, Aromatic primary amine, Amide & diamide. Systematic

analysis of organic compound containing one functional group & characterization by confirmatory tests or derivative.

### Reference Books

- Dr. Ramanujam V.V, *Inorganic Semi Micro Qualitative Analysis*, the National Publishing Company, 2009.
- Thomas A.O, *Practical chemistry*, 2nd edition, Scientific Book Center, Cannanore, 2006.
- Venkateswaran V, Veerasawamy R & Kulandaivelu A.R, *Basic Principles of practical Chemistry*, 2<sup>nd</sup> edition, Chand S & Sons Publications, New Delhi, 2005.

## UCHM202 GENERAL CHEMISTRY-II

<b>Semester</b>	<b>: II</b>	<b>Credit</b>	<b>: 6</b>
<b>Category</b>	<b>: Core IV</b>	<b>Hours/ week</b>	<b>: 6</b>
<b>Class &amp; Major</b>	<b>: I B.Sc Chemistry</b>	<b>Total Hours</b>	<b>: 78</b>

### Objectives

#### To enable the students

- Acquire the basics in acids& bases, solid state, s-block element and metallurgy.
- Developing the structure determination skills in conformational analysis
- Validate the properties of acids& bases, solid state, s-block element and metallurgy

### UNIT –I SOLUTIONS OF LIQUIDS IN LIQUIDS 16 Hrs

Raoult's law-Ideal solutions-deviations in ideal behaviors vapour pressure – composition and vapour pressure – temperature curves- fractional distillation of binary liquid solutions, azeotropic mixtures. Distillation immiscible liquids, solubility of phenol-water system, aniline – hexane system, triethylamine-water system, nicotine- water system. **Solutions of gases in liquids:** Factors influencing solubility of a gas-Henry 's law.

### UNIT-II STEREO ISOMERISM 16 Hrs

Definition –classification into optical and geometric isomerism. Optical isomerism: optical activity – optical and specific rotations–conditions for optical activity-asymmetric center-chirality- achiral molecules – meaning of (+) and (-) and D and L notations – Elements of symmetry. Conformational Analysis: Introduction of terms –conformers – configuration-dihedral angle-torsional strain-conformational analysis of ethane and n- butane including energy diagrams. conformers of cyclo hexane(axial and equatorial) mono and di substituted cyclo hexanes-1,2 and 1,3 interactions.

### UNIT-III ALKANES & CYCLOALKANES 15 Hrs

Methods of preparation of alkanes-chemical properties-Mechanism of free radical substitution in alkanes.Preparation of cycloalkanes using wurtz's reaction.Dieckman's ring closure & reduction of aromatic hydrocarbons. Substitution and ring opening reactions.

## UNIT-IV METALLURGY

15 Hrs

Extraction of metals- minerals-and ore difference-ore.dressing or concentration of ore-types of ore dressing-froth floatation- and magnetic separation refining of metals-types of refining electrolytic, Van Arkel and zone refining. Solid state: Crystal lattices-laws of crystallography-elements of symmetry-crystal systems-unit cell-space lattice-Bravais lattices-structure of NaCl-structure of CsCl-Miller's indices.

## UNIT-V PROPERTIES OF S – BLOCK ELEMENTS

16 Hrs

Periodic Properties of Alkali metals: Li, Na, K, Rb, Cs. Occurrence, comparative study of elements- oxides, halides, hydroxides and carbonates. Exceptional property of Li. Diagonal relationship of Li with Mg. Periodic Properties of Alkaline earth metals: Be, Mg, Ca, Sr, &Ba. Occurrence and comparative study of the elements.- oxides, hydroxides, halides, sulphates& carbonates. Exceptional properties of Be.Diagonal relationship of Be with Al.

### Text Books

- Bahl.S and ArunBahl, *Advanced Organic Chemistry*, Revised Edition, S. Chand and Company Ltd, Ram Nagar,New Delhi, 2010.
- Madan.R.D, *Modern Inorganic Chemistry*, 3<sup>rd</sup> Edition, S.Chand& Company Limited, New Delhi, 2011.
- Puri.B.R, Sharma.L.R & Pathania M.S, *Principles of Physical Chemistry*, Millennium Edition, Vishal publishing & Co, Jalandhar, 2011.

### Reference Books

- Malik W.U, Tuli G.D and Madan R.D, *Selected topics in inorganic chemistry*, 7<sup>th</sup> Edition, S.Chand Publications, New Delhi, 2012.
- Puri B.R, Sharma L.R, and Kallia K.C, *Inorganic Chemistry*, Milstone Publisher, New Delhi, 2006.
- Morrison R.T and Boyd, *Organic Chemistry*, VI Edition, Prentice Hall of India, New Delhi, 2006.
- Soni P.L, *Text book of physical chemistry*, 22<sup>nd</sup>Revised Edition, Sultan Chand, New Delhi, 2011.

## UCHR204/UCHR205 VOLUMETRIC ANALYSIS

<b>Semester</b>	<b>: I &amp; II</b>	<b>Credit</b>	<b>: 4</b>
<b>Category</b>	<b>: Core practical I</b>	<b>Hours/Week</b>	<b>: 3+3</b>
<b>Class &amp; Major</b>	<b>: I B.Sc Chemistry</b>	<b>Total hours</b>	<b>: 78</b>

### Objectives

#### To enable the students

- Estimate the presence of chemical substances using Volumetric analysis.

### Acidimetry

1. Estimation of sodium hydroxide – standard sodium carbonate.
2. Estimation of borax – std. sodium carbonate.
3. Estimation of bicarbonate and carbonate in a mixture.

### Permanganometry

1. Estimation of oxalic acid – standard – Mohr’s salt or ferrous sulphate.
2. Estimation of ferric ion.

### Iodimetry

1. Estimation of iodine Vs ascorbic acid.

### Iodometry

1. Estimation of copper.

### Complexometry

1. Estimation of zinc or magnesium using EDTA.
2. Estimation of Zinc using potassium ferrocyanide.
3. Estimation of Total hardness of water.

### Dichrometry

1. Estimation of ferrous ion using diphenylamine I N or Phenyl anthranlic acid as indicator.

### Self-designing experiments:

1. Estimation of acids from various tablets
2. Estimation of calcium and Magnesium in water from different areas.
3. Estimation of carbonic acid from soft drinks

### Reference Books

- Vogel’s, “*Text book of Quantitative Chemical Analysis*”, 6<sup>th</sup> Edition, Pearson Education Ltd, New Delhi, 2008.
- Thomas A.O, “*Practical chemistry*”, 2<sup>nd</sup> Edition, Scientific Book Center, Cannanore, 2004.
- Venkateswaran.V, Veerasawamy.R & Kulandaivelu.A.R, “*Basic Principles of practical Chemistry*”, 2<sup>nd</sup> Edition, S. Chand & Sons Publications, New Delhi, 2004.

## UCHE204 FOOD CHEMISTRY

**Semester : II**  
**Category : NME**  
**Class & Major : I-UG**

**Credit : 2**  
**Hours/Week : 4**  
**Total Hours : 52**

### Objectives

#### To enable the students

- Acquire the knowledge in Chemistry involved in Foods
- Recognize the nutritional values of food
- Analyze the causes of food spoilage and adulteration

### UNIT-I FOOD

**8 Hrs**

Sources and types of food- Advantages and disadvantages - food preservation and storage. Calorific value of food.

## **UNIT-II ANALYSIS OF FOOD**

**10 Hrs**

Specification of drinking water- purification of water- zeolites, reverse osmosis – activated charcoal – chlorination – ozone – UV light disinfection – water borne- source and detection. Composition of Milk – fat content in Milk whole & skimmed – Pasturization – Dairy products – cheese, butter – ghee and kova.

## **UNIT-III CARBOHYDRATE**

**15 Hrs**

Carbohydrate: classification. Sources & properties of glucose, fructose & sucrose - Manufacture of refining of sugar- Role of insulin. Storage of carbohydrate in body – photosynthesis – Digestion of cellulose by animals. Fats and oil :Source of oil – production and refining of vegetable oils – saturated and unsaturated fatty acids- Iodine value – Role of MUFA and PUFA in preventing heart diseases. Food additives: Definition – artificial sweeteners – saccharin – food flavours – esters, aldehydes, heterocycles, compounds, - food colors – restricted uses. Emulsifying agents – baking powder – yeast – taste enhancer – MSG – Vinegar.

## **UNIT- IV FAST FOOD AND BEVERAGES**

**10 Hrs**

Modern foods: Ingredients – and disadvantages of snack food – fast food – instant food – dehydrated food. Beverages: Soft drinks – soda – fruit juices and alcoholic beverages (types and content of alcohol) e.g. carbonation and addiction to alcohol composition and health hazards of soft drink. PAF, FPO, FDA, Drug licenses, WHO, standard, ISI, Specification, Packing and label requirements.

## **UNIT-V FOOD ADULTTERATION**

**9 Hrs**

Definition, classification – Common adulteration in food and their ill effects – Packing hazards-food additives. Food laws and standards- Bureau of Indian Standards- AGMARK- Consumer protection act.

### **Text Books**

- Alex V. Ramani, *Food Chemistry*, MJP Publisher, 2009.
- Dr. Swaminathan M, *Handbook of food and Nutrition*, 5<sup>th</sup> Ed., Bangalore Printing and Publishing Co Ltd., Bangalore, 2007.
- Raheena Begum M, *A Text Book of Foods, Nutrition and Dietetics*, Sterling Publishers, Delhi, 2010.

### **Reference Books**

- Jayashree Ghose, *Fundamental Concepts of Applied Chemistry*, 1<sup>st</sup> Ed., CBS Publishers and Distributors, New Delhi, 2006.
- Chopra H.K and Panesar P.S, *Food Chemistry*, Narosa Publisher, 2010.

## UCHE205 HEALTH & HYGIENE

**Semester :II**  
**Category : NME**  
**Class & Major : I UG**

**Credit : 2**  
**Hours/ week : 4**  
**Total Hours : 52**

### Objectives

#### To enable the students

- To give in-depth knowledge related to nutrition and health.
- To provide information about the storage and preservation of food.
- To help the students to reach out to the community and create awareness about nutritional problems and their possible solutions.

### UNIT -I

**10 Hrs**

**Food, Nutrition and Health-** Food and its function, Meaning of Nutrition, Concept of Health, Meaning of Nutritional status, Inter relationship between Nutrition & Health. **Macro Nutrients** – Digestion, absorption & utilization

### UNIT-II

**10 Hrs**

**Vitamins & Minerals** – Fat soluble and water soluble vitamins. Minerals required in larger amount and minerals required in smaller amount.

**Concept of Balanced Diet** -Planning Balanced Diets, Guidelines for planning balanced Diet.

### UNIT-III

**8 Hrs**

**Food-selection** – Selection of Energy Giving Foods, Selection of Body Building Foods, Selection of Protective/Regulatory Foods, Selection of Food Accessories, Selection of Beverages, Role of Grades, Brands and Labels in Food selection.

### UNIT-IV

**12 Hrs**

**Food Storage** - Food spoilage – classification of Food Based on perish ability, Food storage. **Food preservation** – Principles and methods of Food preservation, Home scale Food preservation, maximization of Nutritional Benefits at low cost.

### UNIT-V

**12 Hrs**

**Common Food Borne Diseases-** Diarrhoea, Dysentery, Cholera and Typhoid – Causes, Symptoms, Complications, Prevention and Management. **Common Infectious Diseases** – Measles, Tuberculosis, Whooping cough, Diphtheria, Tetanus, Poliomyelitis and Malaria – Causes, Symptoms, Complications, Prevention and Management

### Text Books

- Srilakshmi “*Food and Nutrition*” (2002)

## Reference Books

- M.Swaminathan -“Advanced text book on Food and Nutrition “ Vol II – Applied aspects,(2003)
- L.H. Mayer - “Food Chemistry” - Affiliated East West Pvt.Ltd. 1973.
- Lillian Hoagland Meyer, “Food Chemistry”, CBS publishers & Distributor, New Delhi(1987).

## UCHE206 COSMETICS&DETERGENTS

**Semester :II**  
**Category : NME**  
**Class & Major: I UG**

**Credit : 2**  
**Hours/ week : 4**  
**Total Hours : 52**

### Objectives

#### To enable the students

- Develop the basic knowledge about commercial products
- Gain the practical training in commercial product analysis
- Be aware of the quality of the commercial product.

### UNIT – I

**10 Hrs**

House hold products- soaps – saponification of oils and fat. Manufacture of soaps .Formulation of toilet soaps. Different ingredients used. Their functions Medicated soaps . Herbal soaps. Mechanism of action of soaps .soft soap. shaving soaps& creams . ISI Specification . Testing procedure / limits  
Detergents - Anionic detergent – miniature of LAB( linear alkyl benzene sulphonatationon LAB – preparation of acid slurry . different ingredients in the formulation of detergent powder & soaps. Liquid detergents.foam boosters.AOS(alpha olefin sulphonates).,cleaning powder.

### UNIT-II

**12Hrs**

Cationic detergents-Examples. manufacture and applications. Non-ionic detergents- Examples manufacture of ethylene oxide condensater.Mechanism of action of detergents.Comparison of soaps and detergents.Biodegradation-environmental effects.ISI specifications/limits.

### UNIT-III

**15hrs theory + practical 8Hrs**

Preparations of cosmetics-manufacture of SLS and SLES. Ingradients. Functions Different kinds of shampoos-anti-dandruff, anti-lice,herbal and baby shampoos. Hair dye. Manufacture of conditions.Coco beraines or coco diethanolamides-ISI specifications. Testing procedures and limits.Face and skin powders-ingredients, functions. Differents types. Snows and face creams. Chemicalingredients used.Antirespriants. Sun screen preparations.UV absorbers. Skin bleaching agents.Depilatories. Turmeric and neem preparations. vitamin oil.nail polishes-nail polish removers.Article removers.lipstick,ronghes,eye brow pencils.ingredients and functions-hazards.ISI specifications.

#### UNIT-IV

7Hrs

Leading firms, brand names, choosing the right product. Packing regulations. Marketing. Licensing-drug license-legal aspects. GMP-ISO 9000/12000-consumer education. Evaluation of the product-advertisement.

#### Text Books

- Bhatia.S.C, *Perfumes, soaps, Detergents and cosmetics*, Vol.2, CBS Publishers and Distributors, 2001.
- Peter.H.Rossi, Lippy.W, Howard.E.freeman, *evaluation: A Systematic Approach*, 7<sup>th</sup> Edition, Sage publications, Inc, 2003.

#### Reference books

- *Hand books on soaps, Detergents and Slurry*, NIIR, 2<sup>nd</sup> Edition, 2008.
- Mithal, BM, saha, RN, VallabhPrakashan, *Handbook of Cosmetics*, New Delhi 2000.
- Milady, *Text Book of Cosmetology*, Milady publishing, 1994.

### UCHE207 GREEN CHEMISTRY

Semester : II  
Category : NME  
Class & Major: I UG

Credit : 2  
Hours/Week : 4  
Total Hours : 52

#### Objectives

##### To enable the students

- Focus on the principles of green chemistry..
- Enhance to aware of green chemistry by evaluating with examples.
- Apply the Principles about the future trends in green chemistry.

#### UNIT-I

10 Hrs

**Introduction-** The current status of chemistry and the environment-Evolution of the environmental movement-The role of chemists. **Green chemistry-** Definition- goals- The root of innovation-Limitations/obstacles.

#### UNIT-II

12 Hrs

**Principles of green chemistry** - prevent waste-synthetic methods to design - awareness of toxicity-chemical products- use of auxiliary system-energy requirements-a raw material or feedstock-unnecessary derivation-catalytic reagents- chemical products-analytical methodologies-minimize chemical accidents.

#### UNIT-III

10 Hrs

**Evaluating the effects of chemistry-**Evaluating feedstock's and starting materials-Evaluation of methods to design safer chemicals.

**UNIT –IV** **10 Hrs**

**Examples of green chemistry-** green reactions-green reagents- green solvents and reaction conditions-green chemical products.

**UNIT – V** **10 Hrs**

**Future trends in green chemistry-**Oxidation reagents and catalysts- biomimetic-multifunctional reagents- combinatorial green chemistry-current pollution problems- energy focus-Non-covalent derivation

**Text Book**

- Kidwai, “*Green Chemistry theory & practice*”, Boston, December 1997.

**Reference Books**

- Collins .T.J. “ *Green Chemistry*” in Mac millan encyclopedia of chemistry, Mac Millan Inc., New York.
- Anastas .P.T. & Williamson .T.C. “*Green Chemistry*” 1996.
- Breslow.R, “*Chemistry Today and Tomorrow*”, American Chemical Society, Washington, DC.

**UCHE208 HEALTH CHEMISTRY**

**Semester : II**

**Category : NME**

**Class & Major: I UG**

**Credit : 2**

**Hours/Week : 4**

**Total Hours : 52**

**Objectives**

**To enable the students**

- Plan and apply the balanced diet for good health.
- Acquire knowledge on action of drugs and functions of enzymes and hormones present in the human body..
- know about the composition and pasteurization of milk.

**UNIT-I Food, Nutrition and Health** **8 Hrs**

Food and its function, Meaning of Nutrition, Concept of Health, Meaning of Nutritional status, Inter relationship between Nutrition & Health.

**UNIT -II** **10Hrs**

**Vitamins & Minerals** – Fat soluble and water soluble vitamins. Minerals required in larger amount and minerals required in smaller amount. **Concept of Balanced Diet** -Planning Balanced Diets, Guidelines for planning balanced Diet.

**UNIT-III** **10 Hrs**

**Chemistry of drugs** - Administration of Drug - Absorption of drugs - Elimination of drug by Kidney - Some important drugs - Antibiotics, Anti malarials, anti asthmatic drugs -

Anti bacterial drugs, anti septics, anesthetics, analgesics and anti pyretic drugs. (Role and examples in each type) - Misuse of drugs.

#### UNIT-IV

12 Hrs

**Biological Chemistry** - Elementary treatment of digestion and absorption of carbohydrates, proteins and fats. Elementary treatment of enzymes, coenzymes, Co-factors, prosthetic groups and theory of enzymes action. Physiological functions of adrenaline, thyroxin oxytocin, and insulin and sex hormones.

#### UNIT-V

12 Hrs

**Chemistry of milk-** Milk definition, general composition – physico – chemical changes taking place in milk due to boiling, pasteurization, sterilization and homogenization – explanation. Components of milk – lipids, proteins, carbohydrates, vitamins, ash and mineral matters – names and functions.

#### Text Books

- Srilakshmi “*Food and Nutrition*” (2002)

#### Reference Books

- J. Awapapa - “Introduction to biological chemistry” – prentice hall.(2003)
- Robert Jenness - “Principles of dairy chemistry”(2001)
- M.Swaminathan - “*Advanced text book on Food and Nutrition* “ Vol II – Applied aspects,(2003)

### III and IV Evaluation Component Of CIA

UG

Semester	Course Code	Course Title	Component-III	Component-IV
I	UCHM103	General Chemistry –I	Poster presentation	Open Book Quiz
	UCHM102	Analytical chemistry-I	Chart Preparation	You tube Presentation
	UCHF101	Fundamentals of Chemistry	Molecular Model Preparation	Fun with Chemistry Experiments
	UCHA102	Chemistry for bio-chemistry	Poster presentation	Open Book Quiz
II	UCHM201	General Chemistry –II	Poster presentation	Open Book Quiz
	UCHE204	Food Chemistry	Food Adulteration testing experiments	Case study
	UCHE205	Health and Hygiene	Assignment	Seminar
	UCHE206	Cosmetics and Detergents	Assignment	Seminar
	UCHE207	Green Chemistry	Assignment	Seminar
	UCHE208	Health Chemistry	Assignment	Seminar

## COURSE PROFILE M.Sc. Chemistry

Semester	Category	Course Code	Course Title	Contact Hrs/Week	Credits	
					Min	Max
I	Core-I	PCHM107/PCHM111	Organic Chemistry-I	5	4	4
	Core-II	PCHM108/PCHM112	Inorganic Chemistry-I	5	4	4
	Core-III	PCHM109	Physical Chemistry-I	5	4	4
	Core-IV	PCHM110	Nano Science and Nano Materials	5	4	4
	Core Practical-I	PCHR203	Organic Practical	5	-	-
	Core Practical-II	PCHR204	Inorganic Practical	5	-	-
<b>Total</b>				<b>30</b>	<b>16</b>	<b>16</b>
II	Core-V	PCHM204	Organic Chemistry-II	5	4	4
	Core-VI	PCHM205	Inorganic Chemistry-II	5	4	4
	Core-VII	PCHM206	Physical Chemistry-II	5	4	4
	Core Practical-I	PCHR203	Organic Practical	5	5	5
	Core Practical-II	PCHR204	Inorganic Practical	5	5	5
	Non-Major Elective			5	4	4
	Service Learning	PCHX201	Vermicomposting	-	1	1
<b>Total</b>				<b>30</b>	<b>27</b>	<b>27</b>
III	Core-VIII	PCHM301	Organic Chemistry-III	6	5	5
	Core-IX	PCHM302	Inorganic Chemistry-III	5	4	4
	Core -X	PCHM303	Physical Chemistry-III	6	4	4
	Core-XI	PCHI301	Sustainable Materials and Technologies	6	5	5
	Core Practical - III	PCHR401	Physical Chemistry Practical	5	-	-
	Core XII	PCHP401	Project	2	-	-
<b>Total</b>				<b>30</b>	<b>18</b>	<b>18</b>
IV	Core-XIII	PCHM404	Organic Chemistry-IV	6	5	5
	Core-XIV	PCHM402	Inorganic Chemistry-IV	5	4	4
	Core-XV	PCHM405	Physical Chemistry-IV	5	4	4
	Core-XVI	PCHM305/PCHM407	Research Methodology	5	4	4
	Core Practical - III	PCHR401	Physical Chemistry Practical	5	6	6
	Core XVII	PCHP401	Project	4	6	6
<b>Total</b>				<b>30</b>	<b>29</b>	<b>29</b>
<b>Total</b>				<b>120</b>	<b>90</b>	<b>90</b>

## EXTRA CREDIT EARNING PROVISION

Semester	Category	Course code	Course Title	Hrs/per week	Credits	
					Min	Max
III	Self Study	PCHS306	Textile Chemistry	--	--	1

### PCHM107/PCHM111 ORGANIC CHEMISTRY- I

<b>Semester</b>	: I		<b>Credits</b>	: 4
<b>Category</b>	: Core I		<b>Hours/Week</b>	: 5
<b>Class &amp; Major</b>	: I M.Sc. Chemistry		<b>Total Hours</b>	: 65

#### Objectives

##### To enable the students

- Understand the structure and reactivity in organic reaction mechanisms.
- Develop the skill in writing reaction mechanism of aliphatic compounds.
- Deduce the structures of organic compounds in stereochemical aspects

#### UNIT-I REACTIVE INTERMEDIATES

**14 Hrs**

Nucleophiles and Electrophiles – Formation, structure and stability of free radical, carbocation, carbanion, carbenes and nitrenes - Types of organic reactions: Substitutions, addition, elimination and rearrangements - Methods used to determine reaction mechanisms: Product analysis, Isolation of intermediates, isotope labelling and stereochemical analysis

#### UNIT- II STEREOCHEMISTRY-I

**15 Hrs**

Definition: Stereoisomerism - Optical activity - Concept of chirality–Isomerism of biphenyls, allenes and spiranes – Properties of Enantiomers and Diastereomers – Enantiomeric excess –Fischer projections - R and S notations. E–Z notation of olefins containing one double bond - Stereospecific and stereoselective synthesis - Racemisation - Resolution

#### UNIT–III ALIPHATIC NUCLEOPHILIC SUBSTITUTION REACTION

**14 Hrs**

$S_N1$ ,  $S_N2$  and  $S_{Ni}$  reaction mechanisms- Nucleophilic substitution at an allylic carbon, vinylic carbon - Transesterifications, acyloxy-dehalogenation, alkylation of amines, transamination, amination of alkanes. Darkin reaction, Etard reaction, Stark Enamine reaction, Mannich reaction

#### UNIT–IV ELIMINATION REACTIONS

**12 Hrs**

$E_1$ ,  $E_2$  and  $E_1CB$  reaction mechanism, reactivity- substrate, attacking base, leaving group and medium. Mechanism and orientation of the pyrolytic and conjugate elimination. dehydrohalogenation, dehydrogenation, cleavage of ethers, quaternary ammonium hydroxide, elimination of boranes.

## UNIT-V CARBOHYDRATES

10 Hrs

Classification of carbohydrates – Preparation, properties and reactions of glucose and fructose – Structure of Glucose and Fructose – Mutarotation – Preparation, Properties, Structure and reactions of Starch and Cellulose

### Text Books

- M.K. Jain and S. C. Sharma, Modern Organic Chemistry, Vishal Publishing Co., 2018
- Bhupinder Mehta and Manju Mehta, Organic Chemistry, Second Edition, PHI learning Pvt. Ltd., 2013
- Finar. I.L, *Organic Chemistry Volume I & II*, 5<sup>th</sup> edition, ELBS Publication, 2009.
- Michael B. Smith and Jerry March., Wiley-Interscience A John Wiley & Sons, Inc., Publication (2007)

### Reference Books

- Peter Sykes, *a guide book to mechanism in organic chemistry*, 6<sup>th</sup> edition, Orient Longman, London, 2003.
- Kalsi. P.S, *Stereochemistry-Conformation & mechanism*, 7<sup>th</sup> Edn, Newage International publishers, Newyork, 2012.
- Nasi Puri.D, *Stereochemistry of Organic Compounds: Principles and Applications*, New Age International, 3<sup>rd</sup> Edition, 2004.

## PCHM108/PCHM112 INORGANIC CHEMISTRY– I

Semester : I

Credit : 4

Category : Core II

Hours/ week : 5

Class&Major : I M.Sc Chemistry

Total Hours : 65

### Objectives

#### To enable the students

- Concepts of ionic bonding and covalent bonding are learnt
- Interpolate the properties in bonding nature of the compounds.
- Assess the various types of coordination compounds using p- block element

## UNIT- I IONIC BONDING

15 Hrs

Effective nuclear charge –shielding -Slater's rule –Born-Lande equation –Born Haber cycle and its applications –Radius ratio –polarization-Fajan's rule –results of polarization. Electronegativity –determination – methods of estimating charges, electronegativity equalization –Types of chemical forces – effects of chemical forces -melting and boiling points, solubility and hardness

## UNIT–II COORDINATION CHEMISTRY-I

12 Hrs

Werner's Theory, EAN rule, VBT, Crystal Field Theory, crystal field splitting, application of d-orbital splittings to explain magnetic properties, low spin and high spin

complexes, crystal field stabilization energy, spectrochemical series, thermodynamic and related aspects of crystal fields, ionic radii, lattice energies, site preference energies.

### **UNIT-III COORDINATION CHEMISTRY-II 13Hrs**

MO theory of complexes (quantitative principles involved in complexes with no pi and with pi bonding) and ligand field theories and molecular symmetry, angular overlap model, Jahn Teller effect.

Electronic absorption spectroscopy: derivation of term symbols, micro states and spectra of Oh and Td complexes of d<sup>n</sup> metal ions, Orgel and Tanabe-Sugano diagrams. charge transfer and d-d transitions, nephelauxetic series.

### **UNIT-IV COORDINATION CHEMISTRY-III 12 Hrs**

Substitution reactions in square planar and octahedral complexes - the rate law for nucleophilic substitution in a square planar and octahedral complex, inert and labile compounds. The trans effect - theories of trans effect- mechanisms of redox reactions - outer sphere mechanisms - inner sphere mechanisms - mixed valence complexes. Stepwise and overall stability constant, Irving-Williams series, factors affecting the stability, determination of stability constant – spectrophotometric, solubility, electrochemical, polarographic and Job's method.

### **UNIT-V STRUCTURE AND PROPERTIES OF SOME COMPOUNDS OF P-BLOCK ELEMENTS 13 Hrs**

Synthesis, properties and structures of Boron hydrides (small boranes and their anions, B<sub>1</sub>-B<sub>4</sub>), boron nitride, borazines, carboranes, metalloboranes, metallocarboranes; silicates, silicones, diamond, graphite, zeolites. Nitrogen, Phosphorous, Sulphur and noble gas compounds- Hydrides, oxides and oxy acids of Nitrogen, Phosphorous, Sulphur and halogens. Phosphazines, Sulphur-Nitrogen (S<sub>4</sub>,N<sub>4</sub>) compounds, inter halogen compounds, pseudo halogens, noble gas compounds of Xenon.

#### **Text Books**

- Lee .J.D, *A New Concise Inorganic chemistry*, 5<sup>th</sup> Edition, ELBS, New Delhi, 2012.
- James .E. Huheey, *Advanced Inorganic Chemistry*, Harper & Collins, New York, Fourth Edition, 2005.
- R. S. Drago, *Physical Methods in Chemistry*; Saunders: Philadelphia, 1977.

#### **Reference Books**

- Purcell. K.F & Kotz. J.C, *Inorganic Chemistry*, W.B.Saunders Co, USA, 2012.
- Shriver .D.F, Atkins P.W, Langford C. H., *Inorganic Chemistry*, ELBS, New Delhi, 2009.
- Cotton .F.A. & Wilkinson.G, *Advanced Inorganic Chemistry, A Comprehensive Textbook*, Fifth Edition, John Wiley & Sons, 2011.
- A. B. P. Lever, *Inorganic Electronic Spectroscopy*, 2nd ed.; Elsevier: Amsterdam, 1984.

## PCHM109 PHYSICAL CHEMISTRY – I

**Semester** : I  
**Category** : Core–III  
**Class & Major** : I-M. Sc Chemistry

**Credit** : 4  
**Hours/ week** : 5  
**Total Hours** : 65

### Objectives

#### To enable the students

- Acquire the knowledge of thermodynamics, quantum and photochemical reactions.
- Deduce the Quantum mechanics & photo chemical reactions.
- Assess the properties of kinetic and photochemical reactions.

### UNIT-I QUANTUM CHEMISTRY–I

13 Hrs

Inadequacy of classical mechanics, Black body radiation, Planck's quantum concept, Photoelectric effect. Bohr's theory of hydrogen atom :Hydrogen spectra, Wave-particle dualism, Uncertainty principle, Inadequacy of old quantum theory. Schrödinger equation, Postulates of quantum mechanics. Operator algebra: operator, linear and hermitian, eigen functions and eigen values, angular momentum operator, commutation relations, related theorems.

### UNIT-II CLASSICAL THERMODYNAMICS

14 Hrs

Thermodynamics of systems of variable composition – partial molar properties – chemical potential, relationship between partial molar quantities - Gibb's Duhum equation– Calculation of partial molar quantities from experimental data. Thermodynamic properties of real gases, Fugacity concept – calculation of fugacity of real gas – activity and activity coefficient concept – definition – standard states and experimental determination of activity and activity coefficient of non-electrolyte Phase rule : Phase rule -three component system, systems of three liquids – solid, liquid systems(eutectic systems and two salts and water)

### UNIT-III STATISTICAL THERMODYNAMICS

13 Hrs

Bohr-Einstein, Fermi-Dirac, Maxwell-Boltzmann statistics and distribution, ensembles, partition functions and molecular partition functions, mean energy, residual entropy, heat capacity of mono and diatomic gases, chemical equilibrium, Einstein and Debye theories of heat capacity of solids. Non-equilibrium thermodynamics- Postulates and methodologies, linear laws, Gibbs equation, Onsager reciprocal theory.

### UNIT-IV CHEMICAL KINETICS

13 Hrs

ARRT, Potential energy surface – Partition function and activated complex – Eyring equation – calculation of free energy, enthalpy and entropy of activation and their significance. Kinetic isotopic effects – linear free energy relationship – Hammett and Taft equation. Kinetics of complex reactions, reversible reactions, consecutive reactions, parallel reaction, chain reactions, general treatment of chain reactions – chain length – Rice Herzfeld mechanism – Super fast reactions, relaxation method, stopped flow and flash photolysis.

### UNIT-V PHOTOCHEMISTRY

12 Hrs

Absorption & Emission of Radiation – Frank condum principle – Decay of electronically excited phosphorescence – Spin Forbidden radiative transition – Internal conversion & Intersystem crossing (ISC) – Energy transfer process – Excimers & exciplexes – Static &

Dynamic quenching – Stern-Volmer Equation. Quantum Efficiency and life time measurements – steady state principle – Quantum yield and chemical actinometry- kinetics of photochemical reactions – hydrogen and halogen reactions, photo redox , photo substitution, photo isomerization and photo sensitized reactions.

### Text Books

- Rajaram .J & Kuriacose .J.C, *Thermodynamics for Students of Chemistry*, LalNagin Chand, NewDelhi, 2005.
- Atkins P.W, *Physical chemistry*, Ninth Edition,Oxford University Press, 2010.
- Rohatgi.K.K, Mukerherjee, *Fundamentals of Photochemistry*, Wiley Eastern Ltd,New York, 2006.

### Reference Books

- Moore .W.J, *Physical Chemistry*, Orient Long man,London,2009.
- McClelland. B.C, *Statistical Thermodynamics*, Chapman& Hall,London,2006.
- P.W.Atkins., *Quantum Chemistry*,Oxford Chemistry Series,2004

## PCHM110 NANO SCIENCE AND NANO MATERIALS

<b>Semester</b>	<b>: I</b>	<b>Credit</b>	<b>: 4</b>
<b>Category</b>	<b>: Core IV</b>	<b>Hours/ week</b>	<b>: 5</b>
<b>Class &amp; Major</b>	<b>: I M.Sc Chemistry</b>	<b>Total Hours</b>	<b>: 65</b>

### Objectives

#### To enable the students

- To understand the fundamentals of Nanotechnology
- To give a general introduction to different classes of Nano materials
- To impart basic knowledge on various synthesis and characterization techniques involved in Nanotechnology

### UNIT I - BASICS OF NANOTECHNOLOGY

**12 Hrs**

Introduction – Scientific revolutions –Time and length scale in structures – Definition of a nanosystem –Dimensionality and size dependent phenomena – Surface to volume ratio - Surface energy and surface stress- surface defects-Properties at nanoscale (optical, mechanical, electronic,and magnetic).

### UNIT II - SYNTHESIS OF NANOMATERIALS

**14 Hrs**

Chemical Methods: Sol gel method - Solvo thermal Synthesis-Photochemical Synthesis - Sonochemical Routes- Chemical Vapor Deposition (CVD) – Metal Oxide - Chemical Vapor Deposition (MOCVD).Physical Methods:Ball Milling – Electrodeposition - Spray Pyrolysis - Flame Pyrolysis -DC/RF Magnetron Sputtering - Molecular Beam Epitaxy (MBE).

### **UNIT III - DIFFERENT CLASSES OF NANOMATERIALS**

**13 Hrs**

Classification based on dimensionality-Quantum Dots,Wells and Wires- Carbon-based nano materials (buckyballs, nano tubes, graphene)– Metal based nano materials (nano gold, nano silver and metal oxides) -Nano composites-Nano polymers – Nano glasses –Nano ceramics - Biological nano materials.

### **UNIT IV – CHARACTERIZATION OF NANOMATERIALS**

**13 Hrs**

Characterization: Field Emission Scanning Electron Microscopy (FESEM) – High resolution Transmission Electron Microscope(HRTEM) –Scanning Tunneling Microscope (STM)–Atomic Force microscopy (AFM) - Surface enhanced Raman spectroscopy (SERS)- X-ray Photoelectron Spectroscopy (XPS).

### **UNIT V – APPLICATIONS OF NANOMATERIALS**

**13 Hrs**

Solar energy conversion and catalysis - Molecular electronics and printed electronics - Nanoelectronics–Sensors – Ferro electric materials - Polymers with a special architecture - Liquid crystalline systems - Nanomedicine and Nanobiotechnology – Nanotoxicology.

#### **Text Books**

- Pradeep T., “A Textbook of Nanoscience and Nanotechnology”, Tata McGraw Hill Education Pvt. Ltd., 2012.
- Hari Singh Nalwa, “Nanostructured Materials and Nanotechnology”, Academic Press, 2002.

#### **References**

- Nabok A., “Organic and Inorganic Nanostructures”, Artech House, 2005
- Dupas C., Houdy P., Lahmani M., “Nanoscience: Nanotechnologies and Nanophysics”, Springer-Verlag Berlin Heidelberg, 2007.

## **PCHR203 ORGANIC PRACTICAL**

**Semester : I & II**  
**Category : Core Practical –I**  
**Class & Major : I-M.Sc Chemistry**

**Credit : 5**  
**Hours/Week : 5+5**  
**Total Hours : 130**

#### **Objectives**

##### **To enable the students**

- Acquire the skills in the Estimation & Preparation of organic compounds.
- Analyze the various isolation techniques

#### **I. Extraction**

1. Isolation of lactose from milk(Demo)
2. Isolation of caffeine from tea dust (Demo)
3. Isolation of citric acid from lemon.

## II. Qualitative Analysis

Identification of components in a two component mixture and preparation of the derivative.

## III. Functional group inter conversion

### a) Single stage

1. Hydrolysis.
2. Oxidation.
3. Reduction.
4. Nitration.
5. Acetylation

### b) Double stage

1. Hydrolysis
2. Nitration

## IV. Estimation

1. Estimation of Phenol.
2. Estimation of Aniline.
3. Estimation of Glucose.
4. Estimation of Ketone.
5. Estimation of Iodine, Saponification & Acetyl value of oil. (Demo)

## V. Chromatographic Separations (demo)

1. Column Chromatography- Separation of Anthracene and Picric acid from anthracene picrate.
2. TLC Separation of green leaf pigments

## VI. Determination of physical constants (Melting Point)

**Note: Two sets of Questions can be given for End Semester Examination as the following lot system**

1. Qualitative Analysis and preparation.
2. Estimation and preparation.

### Text Books

- Dr.Gnanaprasam.N.S and Ramamoorthy.G, *Organic Chemistry Lab Manual*, S.Viswanathan printers & Publishers Pvt.Ltd., 2008.
- Glasstone.S, *Statistical Thermodynamics*, Affiliated EastWest Press, NewDelhi, 2010.

### Reference Books

- Thomas .A.O, *Practical Chemistry*, Scientific Book Center, Cannanore,2005.
- Vogel's, *Text Book of Practical Organic Chemistry*, Longman, London,2009.

## PCHR204 INORGANIC PRACTICAL

Semester : I & II  
Category : Core Practical -II  
Class&Major : I M.Sc Chemistry

Credit : 5  
Hours/Week : 5 +5  
Total Hours : 130

### Objectives

#### To enable the students

- Formulate the preparation of inorganic complexes.
- Develop the skills to separate and analyze the inorganic compounds.
- Analyze the metal or ions present in the compound or substance by volumetrically or gravimetrically.

### I. Semi Micro Qualitative analysis of mixture containing two common and two rare cations.

The following are the rare cations to be included. W, Ti, Mo, Te, Se, U,Th, Ce, Zr, V, Li, & Be.

### II. Preparation of the following Complexes:

1. Potassium tris(oxalato) Chromate(III)
2. Bis(acetyl acetanato)copper (II)
3. SodiumBis (Thiosulphato)Cuprate( II)
4. Tris (thiourea) Copper(I)chloride

### III. Estimation of metal ions by Volumetric and Gravimetric analysis.

1. Estimation of copper and sulphate ion.
2. Estimation of Manganese and Nickel
3. Estimation of copper and Zinc.
4. Estimation of Calcium and Magnesium.

### IV. Spectro photometry (only for demonstration)

1. Estimation of Iron.
2. Estimation of Nickel.
3. Estimation of Copper.
4. Estimation of Manganese.

**Note: Two sets of Questions can be given for End Semester Examination as the following lot system**

1. Semi micro qualitative analysis and preparation.
2. Estimation of metals by Volumetry & Gravimetry and preparation.

### Text Book

- Ramanujam. V, *Inorganic Semi Micro Qualitative Analysis*, The National publishing Company, New Delhi, 2009.

### Reference Books

- Thomas A.O, *Practical Chemistry*, Second Edition, Scientific Book Center, Cannanore, 2005.
- Venkateswaran. V, Veerasawamy & Kulandaivelu.A. R, *Basic principles of Practical Chemistry*, S. Chand & Sons publications, New Delhi, 2010.

## PCHM204 ORGANIC CHEMISTRY- II

<b>Semester</b>	<b>: II</b>	<b>Credits</b>	<b>: 4</b>
<b>Category</b>	<b>: Core IV</b>	<b>Hours/Week</b>	<b>: 5</b>
<b>Class&amp;Major</b>	<b>: I-M.Sc Chemistry</b>	<b>Total Hours</b>	<b>: 65</b>

### Objectives

#### To enable the students

- Analyze the advanced reaction mechanism in aromatic compounds.
- Predict the chemistry of Hormones.
- Synthesize to extract terpenoids from natural products.

### UNIT-I AROMATICITY

**12 Hrs**

Huckel's and Craigs rule. Aromaticity of benzenoid, heterocyclic and non-benzenoid compounds, aromatic systems with pi electron compounds- other than six pi electrons, non-aromatic and anti aromatic systems, systems with more than 10 pi electrons-annulenes.

### UNIT-II AROMATIC NUCLEOPHILIC SUBSTITUTION REACTION

**13 Hrs**

Introduction – S<sub>N</sub>AR, Benzyne mechanism –Reactivity – Effect of substrate, structure, leaving group, attacking nucleophile and solvent. Reactions of hydroxy deamination, oxido-desulphanate substitution, alkoxy dehalogenation, amino dehydroxylation, Rosenmund, Vombrown reaction, amination by hydroxylamine, hydroxy deazotisation - Scheiman reaction, Bucherer reaction Goldberg reaction, Nencki reaction, Ullmann reaction and Chichibabin reaction.

### UNIT-III AROMATIC ELECTROPHILIC SUBSTITUTION REACTION

**13 Hrs**

The arenium ion mechanism. Orientation and reactivity (ortho, para and meta directing groups). Typical reactions-Sulphnation,Nitration, Halogenations,Fridel Craft Acylation and Alkylation, diazocoupling, Reimer- Tieman reaction, Vilmesyer – Hack, Gattermann – Koch and Kolbe reaction.

### UNIT-IV STEREOCHEMISTRY-II

**14 Hrs**

Conformation analysis of simple cyclic(chair and boat cyclohexanes) and acyclic(n-butane) systems, strain theories, conformation of simple 1,2-disubstituted derivatives—ethylene chlorohydrins and ethylene glycol, Conformational analysis and stereochemical aspects of mono and disubstituted cyclohexanes(1,2;1,3;1,4-dialkylcyclohexanes), conformation and stereochemistry of cis and trans decaline, effects of conformation on reactivity in acyclic and cyclohexanes. Optical rotatory dispersion and Circular Dichroism, Octant rule, Cotton effect.

## UNIT-V TERPENES AND STEROID

13 Hrs

Occurrence, Nomenclature, classification and isolation of terpenes, Isoprene rule, Gem dialkyl rule, General methods of structural elucidation. Structural elucidation of limonene, fenchone, Zingiberene. Nomenclature and classification of steroids and Hormones. Structural elucidation of Cholesterol (synthesis not required), ergosterol, stigmaterol.

### Text Books

- Ernest L.Eliel, *Stereochemistry of Carbon Compounds*, T.M.H Edition, TataMcGraw-Hill Publishing Company, New Delhi, 2011.
- Jerry March, *Advanced Organic Chemistry*, 7<sup>th</sup> edition, John Wiley & Sons, New York, 2012.
- Finar .I.L, *Organic Chemistry, Volume I & II*, 5<sup>th</sup> edition, ELBS Publication, 2007.

### Reference Books

- Kalsi P.S, *Stereochemistry-Conformation & mechanism*, 7<sup>th</sup> Edn, Newage International publishers, New York, 2012.
- Mukerjee .S.M and Singh .S.P, *Organic reaction mechanism*, McMillan India Ltd., Chennai, 2010.
- Ahluwalia .V.K., *Organic Reaction Mechanism*, 4<sup>th</sup> edition, Narosa Publishers, 2011.

## PCHM205 INORGANIC CHEMISTRY – II

Semester : II

Category : Core-V

Class & Major: I M.Sc Chemistry

Credit : 4

Hours/ week : 5

Total Hours : 65

### Objectives

#### To enable the students

- Recognize the bonding of inorganic & organo- metallic compounds.
- Interpret the arrangements of ions in the structure from various solid substances.
- Deduce the photochemistry of inorganic compound and function of bio-inorganic compounds.

## UNIT- I CHEMICAL BONDING

13 Hrs

Hard and Soft acids and bases- classifications. Acid-base strength, hardness, symbiosis. Theoretical basis of Hardness and Softness, applications of HSAB. Polyacids, Isopolyacids of V, Cr, Mo and W. Heteropolyacids of Mo and W (only structural aspects). Chelate effects and factors affecting. Macrocyclic complexes and template effect.

## UNIT – II ORGANOMETALLIC COMPOUNDS

13 Hrs

Compounds with transition metal to carbon bonds: classification of ligands, nomenclature, 18 electron rule, transition metal carbonyls. Structure, bonding, preparation, reactions of organometallics (Fe, Zn, Cr, V, Mo). Metal alkyls, metal alkylidenes and metal alkylidynes - Structure and bonding.

### UNIT-III SOLID- STATE CHEMISTRY

12 Hrs

Defects in solids- Point defects, line defects and surface defects, Dislocations-Non-stoichiometric compounds. Solid state reactions – Types & examples. Magnetic properties of solids (low and high temperature), high temperature superconductors, use of X-ray powder data in identifying inorganic crystalline solids. Details for cubic systems. Structures of NiAs, CdI<sub>2</sub>, Perovskite, rutile, fluorite and antiferite, zinc blende and wurtzite.

### UNIT –IV PHOTOCHEMISTRY OF INORGANIC SYSTEMS

15 Hrs

Electronic transitions in metal complexes, Jablonski diagram, metal-centered and charge-transfer transitions – Various photophysical and photochemical processes of coordination compounds – Unimolecular charge-transfer photochemistry of cobalt (III) complexes. Mechanism of CTTM photoreduction. Ligand-field photochemistry of chromium(III) Complexes. Adamson's rules, photoactive excited states, V-C model – photophysics and photochemistry of ruthenium-polypyridine complexes, emission and redox properties – photochemistry of organometallic compounds, metal carbonyl compounds, compounds with metal-metal bonding Reinecke's salt chemical actinometer.

### UNIT-V BIOINORGANIC CHEMISTRY

12 Hrs

Transport proteins: Oxygen carriers, metalloenzymes, carbonyl peptidase, carbonic anhydrase, redox process, iron-sulphur proteins, chlorophyll, salient features of the photo synthetic process, vitamin B<sub>12</sub> role of sodium, potassium, calcium, zinc and copper; fixation of nitrogen cycle. Anti- cancer drugs and their mechanism of action,

#### Text Books

- James Huhey, *Inorganic Chemistry*, Fourth Edition, Harper & Collins, New York, 2005.
- Cotton .F.A. & Wilkinson.G, *Advanced Inorganic Chemistry, A Comprehensive Textbook*, Fifth Edition, John Wiley & Sons, 2011.

#### Reference Books

- Purcell. K.F & Kotz. J.C, *Inorganic Chemistry*, W.B.Saunders Co, USA, 2012.
- Powell. P, *Principles of Organometallic Chemistry*, Chappman & Hall, 2006.
- Manku.G.S, *Theoretical principles of Inorganic Chemistry*, McGraw Hill, Education, 2005.
- Shriver D.F, Atkins .P.W, Langford .C. H, *Inorganic Chemistry*, ELBS, New Delhi, 2009.

## PCHM206 PHYSICAL CHEMISTRY - II

Semester	: II	Credit	: 4
Category	: Core-VI	Hours/ week	: 5
Class & Major	: I M.Sc Chemistry	Total Hours	: 65

#### Objectives

##### To enable the students

- Understand the fundamentals of group theory and identify the point group in the molecules.

- Analyze different chemical reaction occurring in electrode and electrochemistry.
- Apply the wave mechanics to simple system..

### **UNIT-I QUANTUM CHEMISTRY II**

**13 Hrs**

Approximation methods – Perturbation and variation methods – application to hydrogen and helium atom- spin orbit interaction – LS coupling and JJ coupling- Term symbols and spectroscopic states. Ground state term symbols for simple atoms. Applications of wave mechanics to simple systems – particle in a box, one and three-dimensional box.

### **UNIT-II ELECTROCHEMISTRY**

**13 Hrs**

Introduction to electrochemistry- Mean ionic activity & Mean ionic activity co- efficient - determination of activity co-efficient. Debye- Huckel limiting law- verification and limitation of Debye –Huckel limiting law - Debye- Huckel- Bronsted equations. electrolyte interface-- electrical double layer – electro capillary phenomenon – Lippmann equation- structure of Helmholtz double layer – Guoy, Chapman & stern model of electrical double layers. Diffusion – Fick’s law of diffusion – effect of ionic association on conductance – electro kinetic phenomena – membrane potential.

### **UNIT-III KINETICS OF ELECTRODE PROCESSES**

**13 Hrs**

Essential of electrode reactions – current density – over potential, Tafel equation, Butler-Volmer equation. Standard rate constant ( $K_0$ ) and Transfer Co-efficient( $\alpha$ ), exchange current. Irreversible Electrode process- criteria for irreversibility, Information from irreversible wave. Determination of kinetic parameters by Koutecky and Goulet’s method.

### **UNIT- IV GROUP THEORY -I**

**13 Hrs**

Elements of group theory-Definition- symmetry elements and operations conjugate classes- conjugate and normal sub groups- -point group- group multiplication tables - assignment of point groups to molecules. Matrix representation of geometrical transformation and point groups. Reducible & Irreducible representations- properties of irreducible representation-direct product-symmetry adapted linear combinations-projection formula.

### **UNIT-V GROUP THEORY –II**

**13 Hrs**

Orthogonality theorem and its consequences-construction of character table for  $C_{2v}$  &  $C_{3v}$  hybrid orbitals in non-linear molecules ( $CH_4, XeF_4, BF_3, SF_6$  &  $NH_3$ ) Determination of representations of vibrational modes of non linear molecules ( $H_2O$ , and  $NH_3$ ). Symmetry selection rules of infra red and Raman spectra. Application of group theory in predicting the structure of the molecule.

#### **Text Books**

- Glasstone.S, *Introduction to Electrochemistry*, Affiliated EastWest Press, NewDelhi,2010.
- Chandra.A.K, *Fundamentals of Quantum chemistry*, Kluwer Academic publishers, 2011.Cotton. F.A, *Chemical Applications of Group theory*, John Wiley, NewYork,2011.

#### **Reference Books**

- Thinhnam.N., *Group Theory & Quantum Mechanics*, McGrawHill Book Company, NewYork, 2005.

- row D.R, *Principles & Applications to Electrochemistry*, Chappman& Hall,2008.
- Laidler .R.J, *Chemical Kinetics*, Harber & Row, NewYork, 2005.
- P.W.Atkins., *Quantum Chemistry*, Oxford Chemistry Series,2004

## **PCHX201 VERMICOMPOSTING**

<b>Semester</b>	<b>: II</b>	<b>Credit</b>	<b>: 01</b>
<b>Category</b>	<b>: Service Learning</b>	<b>Total Hours</b>	<b>: 40</b>
<b>Class &amp;Major : I- M.Sc Chemistry</b>			
<b>Target Group : Villagers in the age Group of 20-50yrs</b>			

### **Objectives**

#### **To enable the students**

- Create awareness about utilization of Natural fertilisers to the society.
- Implement Vermicomposting at a small scale.

### **UNIT – I INTRODUCTION 8 Hrs**

Definition – Usage – Advantage of Over Artificial Fertilisers,Ingredients **Activity:** Spreading awareness on Vermicomposting

### **UNIT–II BIO-DEGRADABLE & NON BIODEGRADABLE 8 Hrs**

Introduction,Organic waste , Difference in Biodegradable & non-biodegradableCommon items suitable for Biocomposting: Clean Paper, Dried net, Egg Shell, Leaves Garden Trimming, Fruits & vegetables wastes, Coffee & Tea extract. **Activity:** Separation & Collection of Biodegradable & non-Biodegradable.

### **UNIT–III VERMI GROWTH 8 Hrs**

Earthworm – Introduction-Nature of Soil required – Easily usable waste – Factors affecting growth of the Vermi.**Activity:** Vermi Growth in Soil-Earthworm

### **UNIT-IV VERMICOMPOSTING METHOD 8 Hrs**

Grub composting – Compost Tea – Humanure – Vermicompost – Bokashi composting Common. **Activity:** Carrying out the Methods & Identifying the most effective method to be used

### **UNIT–V FEEDBACK & RESULT FROM SOCIETY 8 Hrs**

Evaluation of Results & difference in Plant growth with Vermicompost oral & written feedback from Villagers. **Activity:** Measurement of Plant Growth Assessment of utilization of household waste.

### **Reference Books**

- Thompson. P.M, Das .S.A, K.C, *Bioresource Technology*, 2005.
- Nancarrow, Loren and Janet Hogan Taylor, *The Worm Book*, Ten Speed Press, 2007.
- Logsdon, Gene. *Worldwide Progress in Vermicomposting* Biocycle, October, 2009.

### III and IV Evaluation Component of CIA

Semester	Course Code	Course Title	Component-III	Component-IV
I	PCHM104	Organic Chemistry-I	Mechanism Writing	Power Point Presentation
	PCHM105	Inorganic Chemistry-I	Problem solving	Preparation of Question bank
	PCHM106	Physical Chemistry-I	Problem solving	Power Point Presentation
	PCHM110	Nano Science and Nano Materials	Assignment	Seminar
II	PCHM204	Organic Chemistry-II	Mechanism Writing	Paper presentation
	PCHM205	Inorganic Chemistry-II	Problem solving	Power Point Presentation
	PCHM206	Physical Chemistry-II	Problem solving	Power Point Presentation