Department of chemistry

FATIMA COLLEGE (AUTONOMOUS)

Re-Accredited with "A" Grade by NAAC (3rd Cycle)

74th Rank in India Ranking 2020 (NIRF) by MHRD

Maryland, Madurai- 625 018, Tamil Nadu, India

NAME OF THE DEPARTMENT: CHEMISTRY

NAME OF THE PROGRAMME : B.Sc.,

PROGRAMME CODE : UACH

ACADEMIC YEAR : 2020-2021

FATIMA COLLEGE (AUTONOMOUS), MADURAI-18

DEPARTMENT OF

For those who joined in June 2019 onwards

PROGRAMME CODE : UACH

PART – I – TAMIL / FRENCH / HINDI– 12 CREDITS

PART – I – TAMIL

Offered by The Research Centre of Tamil

S. NO	SEM.	COURSE CODE	COURSE TITLE	HRS	CREDIT	CIA Mks	ESE Mks	TOT. MKs
1.	I	19TLC1	Language-Modern Literature	5	3	40	60	100
2.	II	19TLC2	Language - Bakthi Literature	5	3	40	60	100
3.	III	19TLC3	Language- Epic Literature	5	3	40	60	100
4.	IV	19TLC4	Language-Sangam Literature	5	3	40	60	100
			Total	20	12			

PART – I – FRENCH

Offered by The Department of French

S. NO	SEM.	COURSE CODE	COURSE TITLE	HRS	CREDIT	CIA Mks	ESE Mks	TOT. MKs
1.	I	19RLC1	PART 1 LANGUAGE FRENCH	5	3	40	60	100
2.	II	19RLC2	PART 1 LANGUAGE FRENCH	5	3	40	60	100
3.	III	19RLC3	PART 1 LANGUAGE FRENCH	5	3	40	60	100
4.	IV	19RLC4	PART 1 LANGUAGE FRENCH	5	3	40	60	100
			Total	20	12			

PART – I – HINDI

Offered by The Department of Hindi

S. NO	SEM.	COURSE CODE	COURSE TITLE	HRS	CREDIT	CIA Mks	ESE Mks	TOT. MKs
1.	I	19DLC1	PART 1 LANGUAGE HINDI	5	3	40	60	100
2.	II	19DLC2	PART 1 LANGUAGE HINDI	5	3	40	60	100
3.	III	19DLC3	PART 1 LANGUAGE HINDI	5	3	40	60	100
4.	IV	19DLC4	PART 1 LANGUAGE HINDI	5	3	40	60	100
			Total	20	12			

PART – II -ENGLISH – 12 CREDITS

Offered by The Research Centre of English

S. NO	SEM.	COURSECODE	COURSE TITLE	HRS	CREDIT	CIA Mks	ESE Mks	TOT. MKs
1.	**I**	19E1LB1	BASIC COMMUNICATIVE ENGLISH	5	3	40	60	100
2.		19E1LI1	INTERMEDIATE COMMUNICATIVE ENGLISH	5	3	40	60	100
3.		19E1LA1	ADVANCED COMMUNICATIVE ENGLISH	5	3	40	60	100
4.	**II**	19E2LB2	ENGLISH COMMUNICATION SKILLS (BASIC)	5	3	40	60	100
5.		19E2LI2	ENGLISH FOR EMPOWERMENT (INTERMEDIATE)	5	3	40	60	100
6.		19E2LA2	ENGLISH FOR CREATIVE WRITING (ADVANCED)	5	3	40	60	100
7.	**III**	19ELC3	ENGLISH FOR DIGITAL ERA	5	3	40	60	100
8.	**IV**	19ELC4	ENGLISH FOR INTEGRATED DEVELOPMENT	5	3	40	60	100
			Total	**20**	**12**			

PART – III -MAJOR, ALLIED & ELECTIVES – 95 CREDITS

MAJOR CORE COURSES INCLUDING PRACTICALS : 60 CREDITS

S.NO	SEM.	COURSECODE	COURSE TITLE	HRS	CREDIT	CIA Mks	ESE Mks	TOT. Mks
1.	I	19C1CC1	ATOMIC STRUCTURE, PERIODIC TABLE, ACID AND BASES, NON-AQUEOUS SOLVENTS AND S-BLOCK ELEMENTS	5	4	40	60	100
2.		19C1CC2	REACTION MECHANISM, ALKANES, CYCLOALKANES AND ALKYL HALIDES	4	3	40	60	100
3.		19C1CC3	VOLUMETRIC ANLAYSIS-I	3	2	40	60	100
4.	II	19C2CC4	THEORIES OF HARD AND SOFT ACIDS –BASES, CHEMICAL BONDING AND CHEMISTRY OF GROUP III, IV, V & VI ELEMENTS.	5	4	40	60	100
5.		19C2CC5	ALKENES,ALKYNES,ALKADIENES, ORGANO METALLIC COMPOUNDS, ALCOHOLS AND ETHERS	4	3	40	60	100
6.		19C2CC6	VOLUMETRIC ANLAYSIS-II	3	2	40	60	100
7.	III	19C3CC7	AROMATIC HYDROCARBONS, AROMATIC ELECTROPHILIC, NUCLEOPHILIC SUBSTITUTION, CHEMISTRY OF VII GROUP, D-BLOCK ELEMENTS	5	4	40	60	100
8.		19C3CC8	GASEOUSSTATE,SOLUTIONSDILUTE SOLUTIONS, RADIOACTIVITY & NUCLEAR TRANSFORMATIONS AND NUCLEAR CHEMISTRY	4	3	40	60	100
9.		19C3CC9	INORGANIC QUALITATIVE ANALYSIS	3	2	40	60	100

10.	IV	19C4CC10	COORDINATION CHEMISTRY	5	4	40	60	100
11.		19C4CC11	CHEMICAL KINETICS, SOLID STATE AND DISTRIBUTION LAW	4	3	40	60	100
12.		19C4CC12	ORGANIC QUALITATIVE ANALYSIS	3	2	40	60	100
13.	V	C5CC13	ALDEHYDES AND KETONES, CARBOXYLIC ACIDS AND THEIR DERIVATIVES, STEROISOMERISM, AMINES AND DIAZO COMPOUNDS AND CARBOHYDRATES	6	4	25	75	100
14.		C5CC14	THERMODYNAMICS, PHASE RULE & GROUP THEORY	6	4	25	75	100
15.		C5CC15	GRAVIMETRIC PRACTICALS	4	2	25	75	100
16.		C5CC16	GREEN CHEMISTRY PRACTICALS	4	2	25	75	100
17.	VI	C6CC17	POLYNUCLEAR HYDROCARBONS, HETEROCYCLIC COMPOUNDS, AMINO ACIDS AND PROTEINS	5	4	25	75	100
18.		C6CC18	ELECTROLYTIC CONDUCTANCE AND ELECTROCHEMISTRY	5	4	25	75	100
19.		C6CC19	PHYSICAL PRACTICALS	3	2	25	75	100
20.		C6CC20	ORGANIC ESTIMATIONS	3	2	25	75	100

ELECTIVES-15 CREDITS

S.No	SEM.	COURSECODE	COURSE TITLE	HRS	CREDIT	CIA Mks	ESE Mks	TOT. Mks
1.	V	C5ME1/ C5ME2	SPECTROSCOPY/ BIO-CHEMISTRY	5	5	25	75	100
2.	VI	C6ME3 / C6ME4	ADV. ORGANIC CHEMISTRY/ POLYMER CHEMISTRY	5	5	25	75	100
3.		C6ME5 / C6ME6	ADV. PHYSICALCHEMISTRY /BIOINORGANIC CHEMISTRY	5	5	25	75	100

PART – IV – 20 CREDITS

- **VALUE EDUCATION**
- **ENVIRONMENTAL AWARENESS**
- **NON MAJOR ELECTIVE**
- **SKILL BASED COURSES**

S. No	SEM.	COURSECODE	COURSE TITLE	HRS	CREDIT	CIA Mks	ESE Mks	TOT. Mks
1.	I	19G1VE	Value Education (Including Meditation in Action Movement)	1	1	40	60	100
2.		19C1NME	Non Major Elective (Offered to other major Students)	2	2	40	60	100
3.	II	19G2VE	Value Education	1	1	40	60	100
4.		19C2NME	Non Major Elective (Offered to other major Students)	2	2	40	60	100
5.	III	19C3EE	Environmental Education	1	1	40	60	100
6.		19C3SB1	Skill based	2	2	40	60	100
7.	IV	19C4EE	Environmental Education	1	1	40	60	100
8.		19C4SB2	Skill based	2	2	40	60	100
9.	V	C5SB3	Skill based	2	2	25	75	100
10.		C5SB4	Skill based					
11.	VI	C6SB5	Skill based	2	2	25	75	100
12.		C6SB6	Skill based	2	2	25	75	100

PART – V – 1CREDIT

OFF-CLASS PROGRAMME

ALL PART-V

Shift I

- Physical Education
- NSS
- NCC
- Women Empowerment Cell
- AICUF

Shift II

- Physical Education
- Rotaract
- Women Empowerment Cell
- AICUF
- Youth Red Cross / NSS

Kindly retain your respective Part V

OFF-CLASS PROGRAMME

ADD-ON COURSES

Courses	Hrs.	Credits	Semester in which the course is offered	CIA Mks	ESE Mks	Total Marks
COMPUTER APPLICATIONS (offered by The department of PGDCA for Shift I)	40	2	I & II	40	60	100
ONLINE SELF LEARNING COURSE- Foundation Course for Arts	40	3	I	50	-	50
ONLINE SELF LEARNING COURSE- Foundation Course for Science	40	3	II	50	-	50
ETHICAL STUDIES- Value Education	15	2	III-VI	50 each Semester	-	100
HUMAN RIGHTS	15	2	V	-	-	100
OUTREACH PROGRAMME- Reach Out to Society through Action **ROSA**	100	3	V & VI	-	-	100
PROJECT	30	4	VI	40	60	100
READING CULTURE	10/Semester	1	II-VI	-	-	-
MOOC COURSES(Department Specific Courses) * Students can opt other than the listed course from UGC-SWAYAM UGC / CEC	-	Minimum 2 Credits	-	-	-	
TOTAL		22 +				

I B.Sc. CHEMISTRY

SEMESTER –I

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UACH	**19C1CC1**	**INORGANIC CHEMISTRY-I** (Atomic Structure, Periodic Table, Acid and Bases, Non-Aqueous Solvents and s-Block Elements)	**Lecture**	**4**	**4**

COURSE DESCRIPTION

This course deals with the basics of chemistry required for UG programme

COURSE OBJECTIVES

To comprehend the fundamental properties of atoms, molecules, and the various states of matter and to understand the periodic table and their trends in physical and chemical properties. It also deals with study to acquire the knowledge of properties, characteristics and application of non-aqueous solvents.

UNIT –I ATOMIC STRUCTURE (12 HRS.)

Planck's quantum theory of radiation-Bohr's theory- origin of Hydrogen spectrum-sommerfelds extension of Bohr's theory-The dual nature of electrons-Heisenberg's uncertainity principle- Pauli's exclusion principle- Quantum numbers- Zeeman effect - Sequence of energy levels- Slater's rule-problems related to slater's rule.

UNIT –II PERIODIC TABLE (12HRS.)

The long form of periodic table- periodic law and electronic configuration of elements - causes of periodicity-division of s, p,d and f block elements-Horizontal and vertical relationship. Atomic properties- Size of atom- Atomic volumes-Vander waals radius-Ionic radius-Ionisation energy- electron affinity-Electronegativity-Different stakes- Diagonal relationship-factors influencing

electronegativity- applications of elcetronegativities.

UNIT –III ACIDS AND BASES (12 HRS.)

Arrhenius concept-Lowry Bronsted –Lewis concepts-Lux Flood -solvent system concepts-Usonowich concept. Effect of solvents on the relative strength of acids and bases-leveling effect-Factors influencing the acidic and basis properties(steric effect and solvation effect, electron releasing or electron withdrawing nature of substituents-charge on the species-hydration and other energy factors-resonance effect and electronegativity effect) . Oxo acids and strength of oxo acids.

UNIT –IV NON AQUEOUS SOLVENTS (12 HRS.)

General properties-liquid ammonia, liquid sulphur dioxide, liquid hydrogen fluoride, anhydrous sulphuric acid and liquid Dinitrogen tetraoxide. Chemistry of the above mentioned solvents-advantages and disadvantages.

UNIT –V s-BLOCK ELEMENTS (12HRS.)

General discussion – electronic configuration – flame colour & spectra lattice energy and solubility in liquid ammonia-ionic conductance – diagonal and anomalous behaviour – Chemistry of $LiAlH_4$, comparative study of oxides, super oxides and hydroxides-wrap around complexes (crowns and crypts) – compounds of Be(Beryllium oxide, beryllium chloride, Basic Beryllium acetate structure, basic Beryllium Nitrate)– Biological importance of I & II elements.

REFERENCES: .

1. J.D.Lee, Concise Inorganic Chemistry, Wiley India, 9th Edition, 2009.
2. James.E.Huheey, Inorganic Chemistry, pearson publications, 4th edition, 2008.
3. R.D.Madan, Modern Inorganic Chemistry, S.Chand and company, Reprint, 1994.
4. Satya Prakash, tuli, Basu, Madan, Advanced Inorganic Chemistry, S.Chand and company, Reprint, 1992.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	To comprehend the fundamental properties of atoms, molecules, and energy , radius relationship for atom
CO 2	To describe the periodic table as a list of elements arranged so as to demonstrate trends in their physical and chemical properties.
CO 3	To acquire the knowledge of properties, characteristics and application of non-aqueous solvents
CO 4	To recognize the anomalous properties of Li and compares the properties Li with those other alkali metals
CO 5	To illustrate the factors affecting the strength of acid and bases

I B.Sc. CHEMISTRY

SEMESTER –I

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UACH	19C1CC2	REACTION MECHANISM, ALKANES, CYCLOALKANES AND ALKYL HALIDES	Lecture	5	4

COURSE DESCRIPTION

This course helps the students to acquire a thorough knowledge of the basics of organic chemistry related to reaction mechanism and alkanes and their derivatives.

COURSE OBJECTIVES

This paper deals with electron displacement effects, Fundamentals of reaction mechanism, Conformation and free radical substitution reactions in alkane and chemistry of alkyl halides with special emphasis to aliphatic nucleophilic substitution.

UNITS

UNIT –I ELECTRON DISPLACEMENT EFFECTS (15 HRS.)

Inductive effect and its applications– Delocalized bonds –Delocalisation of pi electrons through p-π and π-π overlap - Resonance effect – rules of resonance structures – resonance energy – steric inhibition of resonance – hyper conjugation – Electromeric effect – Effect of substituents on the dissociation constant of acids – hydrogen bonding – Effects of hydrogen bonds on physical properties-Effect on melting and boiling points , Effect on solubility , Effect on strength of carboxylic acids.

Self study -Effect of substituents on the dissociation constant of bases.

UNIT –II REACTION MECHANISM: (FUNDAMENTAL ASPECTS) (15 HRS.)

Homolytic and heterolytic cleavage of bonds – Attacking reagents – nucleophiles, electrophiles, free radicals – Reactive intermediates – carbocations, free radicals and carbenes – their formation, stability and structure – activation energy – Exergonic and endergonic reactions – Energy profile diagrams for concerted and two step reactions – transition state – intermediates – Hammonds postulate – Principle of microscopic reversibility – Kinetic and thermodynamic control of reactions.

Self study – carbanions- their formation, stability and structure.

UNIT –III ALKANES (15 HRS.)

Introduction-IUPAC Nomenclature-Isomerism-Free rotation about carbon – carbon single bond, Conformations – Ethane and n-butane – Definition and distinction between configurational and conformational isomers. Classes of carbon atoms and hydrogen atoms. Industrial source - preparation – Hydrogenation of alkenes, Reduction of RX, coupling of RX with Lithium dialkyl copper (R2CuLi). Reactions – halogenation (mechanism, orientation, relative reactivity of alkanes, reactivity and selectivity).

Self study-combustion – pyrolysis.

UNIT –IV CYCLOALKANES (15 HRS.)

Introduction**,** IUPAC nomenclature, General methods of preparation – Freund's method, Dieck mann's method, Simmon – Smith reaction, Thorpe – Ziegler reaction, Preparation from Cyclopentanone, Aromatic hydrocarbons, Salts of dicarboxylic acids, Active methylene groups, Alicyclic compounds, Alkenes, Grignard reagents. Chemical properties- oxidation, reaction with halogens, halogen acids and hydrogen. Relative stabilities of cycloalkanes- Baeyer's strain theory and its limitations, Sachse - Mohr theory, Relative stabilities of cyclopropane, cyclobutane, cyclopentane and cyclohexane.

Self study-Physical properties of cycloalkanes.

UNIT –V ALKYL HALIDES (15 HRS.)

Introduction-Classification-Preparation from alcohols, alkenes, alkynes and alkanes- Physical properties-Chemical Reactions- Nucleophilic aliphatic substitution – Reduction reactions. Detailed Mechanism of nucleophilic substitution-Alkaline hydrolysis of methyl bromide (S_N2)- Factors influencing rates of nucleophilic substitution reactions and their stereochemistry. S_N2 vs. S_N1. Relative stability of the carbocations, rearrangement of carbocations – neighbouring group participation .

Self study- IUPAC Nomenclature, Alkaline hydrolysis of tert-butylbromide (S_N1).

REFERENCES:

1. Jain. M.K., & Sharma. S.C., Modern Organic Chemistry, 1st Edition, Vishal Publishing Co., New Delhi, 2017.
2. Bahl. B.S., & Arun Bahl, Organic Chemistry, 22nd Edition, S.Chand & Company Ltd., New Delhi, 2017.
3. Finar. I. L, Organic Chemistry,Volume 1, The Fundamental Principles, 6th Edition, ELBS & Longman group Pvt., Ltd., 2005.
4. Morrison. R.T & Boyd, Organic Chemistry, 6th Edition, Prentice-hall of India Pvt, Ltd., New Delhi, 2005.
5. Jerry March, A, Advanced Organic Chemistry, 6th Edition, John Wiley and sons reprint, 2008.
6. Bhupinder Mehta & Manju Mehta, Organic Chemistry, 6th Edition, PHI Learning Pvt Ltd., New Delhi, 2011.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	Gain a thorough knowledge about the chemistry of aliphatic saturated compounds
CO 2	Analyze the behaviour of an organic compound through electron displacement effects
CO 3	Describe the structure and stability of different types of intermediates involved in reaction mechanism.
CO 4	Know the nomenclature, classification of alkanes, alkyl halides.
CO 5	To derive and familiarise the mechanisms of nucleophilic substitution reactions of organic compounds.

I B.Sc. CHEMISTRY

SEMESTER –I

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UACH	19Z1ACC1/ 19N1ACC1	Allied Chemistry	LECTURE	3	3

COURSE DESCRIPTION

This paper gives a basic understanding of chemistry to other major students as allied paper.

COURSE OBJECTIVES

This paper deals with the concept of chemical bonding **–** detailed study of VB Theory & MO Theory. Types of Organic Reactions **-** Substitution, Elimination, Addition and Polymerization reactions. Carbohydrates **–** preparation, structure, properties and uses of glucose, fructose, sucrose, starch and tests for carbohydrates. Theory behind Volumetric Analysis.

UNITS

UNIT –I Chemical bonding - VB Theory (9 HRS.)

Chemical bonding - V.B.Theory, Types of overlapping (S-S, S-P and P-P overlapping), Sigma and pi bonds, Hybridisation**-** SP_3, SP_2, and SP Hybridisation in acetylene, ethylene & Methane, shapes of covalent molecules using VSPER theory ($BeCl_2$, BF_3, CH_4, H_2O,PCl_5 and SF_6).

UNIT –II Chemical bonding - MO Theory (9 HRS.)

MO theory **-** Introduction (LCAO Method not required) ,Relative order of energies of molecular orbital's, Bond order, Stability and Bond length of molecules, Paramagnetic & Diamagnetic character of molecules, electronic

configuration of Homonuclear diatomic molecules (H_2 , He_2, Li_2, B_2, N_2O_2, F_2& Ne_2 Only).

UNIT –III Types of Organic Reactions (9 HRS.)

Substitution Reactions - Introduction, Free radical, Nucleophilic& Electrophilic Substitution reactions, Elimination reactions, Addition reactions - Electrophilic addition reactions, Nucleophilic addition reactions, Polymerization reactions – Addition Polymerization & Condensation Polymerization reactions {(only examples),(Mechanism not required)}.

UNIT –IV Carbohydrates (9 HRS.)

Classification of Carbohydrates, Preparation, Chemical properties, Haworth structure and uses of glucose, fructose, sucrose & starch. Tests for Carbohydrates - Molish's test, Fehling's solution test, Barfoed's test, Benedict's test, Osazone Formation. Conversion of glucose to fructose & fructose to glucose (Structural elucidation not required).

UNIT –V Theory behind volumetric Analysis (9 HRS.)

Normality, Molarity, Molality, Principles of volumetric analysis, Equivalent mass of

(i) An acid (HCl, H_2SO_4, $(COOH)_2$), (ii) A base(NaOH, KOH, $Ba(OH)_2$), (iii) An oxidizing agent ($KMnO_4$,$K_2Cr_2O_7$), (iv) A reducing agent ($FeSO_4.7H_2O$, FAS) and (v) Acidic salt/Basic salt (Na_2CO_3). Acid-base Titrations, Permanganametric Titrations, Iodometric Titrations and Iodimetric Titrations, Indicators- Phenophthalein, Methyl Orange, $KMnO_4$ (Self), & Starch (Theory of Indicators not required).

REFERENCES:

Text Books:

1. R.D.Madan, Modern Inorganic Chemistry, S.Chand and company, Reprint, 2012.

2. V.Venkateswaran, R.veeraswamy&A.R.Kulandaivelu, Basic Principles of practical chemistry, 3rd Edn, 1992.

3. B.R.Puri, L.R.Sharma&S.Pathania, Principles of physical chemistry, 47thEdn,

2015-2016.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	To predict the geometry of any molecule with the help of VB and VSEPR theory
CO 2	To construct M.O diagram for homonuclear diatomic molecule
CO 3	To categorize the types of organic reactions
CO 4	To describe the chemistry of carbohydrates.
CO 5	To classify the chemical reactions involved in volumetric analysis

I B.Sc. CHEMISTRY

SEMESTER –I

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UACH	19C1NME/ 19C2NME	PROFITABLE HOME INDUSTRIES	UG Core	2	2

COURSE DESCRIPTION

This course is designed for the students to become self-employed by training them in the preparation of household articles.

COURSE OBJECTIVES

This paper is specially designed for the non chemistry students to give an exposure on topics such as Food chemistry, Dairy Chemistry, Soap & detergents and cosmetics and to understand the basic principles behind them. With an aim to make each student an entrepreneur, we give hands on training to the students for the small scale preparation on the house hold items such as Ink, phenoyl, candle, detergent powder, washing powder, shampoo, liquid soap, incense stick, tooth powder and computer sambirani.

UNITS

UNIT –I FOOD CHEMISTRY (6 HRS.)

History of food chemistry- Water in food systems- Carbohydrates- Lipids- Food proteins-Enzymes- Vitamins- Minerals -Color- Flavors-Food additives-Food adulterants and their detection in various food items.

UNIT –II DAIRY CHEMISTRY (6 HRS.)

Definition - composition of milk – Constituent of Milk – factors affecting quality and quantity of milk- Nutritive value of milk – Metals and non- metals

used in Dairy Industry

UNIT –III SOAPS AND DETERGENTS (6 HRS.)

Manufacture of soaps, formulation of toilet soaps –different ingradients used-Soft soaps, shaving soaps and creams.

UNIT –IV COSMETICS (6 HRS.)

Shampoos –different kinds of shampoos –anti dandruff, anti lice, herbal and baby shampoos

hair dye –manufacture of conditioners -skin preparation –skin powder, nail polish, lipsticks.

UNIT –V PRACTICALS (6 HRS.)

Ink,phenoyl,candle,detergentpowder,washingpowder,and computer sambirani.

Determination of – Fat content – Acidity , pH of different branded milks.

REFERENCES:

1.Jayashree Gosh, Textbook of Pharmaceutical Chemistry, S.Chand&Chand publications New Delhi (1997).

2. Finar I L, Organic Chemistry Volume I and II, Sixth Edition, ELBS withLongmann, Singapore (1997).

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	Recognize the important nutrients present in food
CO 2	Gain knowledge about the fundamental chemistry involved in dairy products
CO 3	Determine the manufacture and functions of various soaps and creams
CO 4	Learn the ingredients required for the preparation of various types of shampoos, skin powder, nail polish
CO 5	Demonstrate the preparation of some home products like candle.detergent powder,soap oil,ink ,phenoyl and computer sambirani

I B.Sc. CHEMISTRY

SEMESTER –I

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UACH	19C1CC3	VOLUMETRIC ANALYSIS – I	UG Core	3	2

COURSE DESCRIPTION

This course trains the students to prepare the solutions of different oncentrations and to estimate quantitatively by different techniques.

COURSE OBJECTIVE

This practical paper deals with the principles of volumetric analysis, classification of reactions in volumetric estimations, (Neutralisation- acidimetry and alkalimetry, Redox reaction –Permanganometry, Dichrometry- Iodometry and Iodimetry titrations)

List of titrations involved in volumetric analysis

- Estimation of Potassium Permanganate
- Estimation of Ferrous Ammonium Sulphate
- Estimation of Ferrous Sulphate
- Estimation of Oxalic Acid
- Estimation of Sodium Hydroxide
- Estimation of Sodium Carbonate
- Estimation of Potassium Dichromate

Reference Book

V.Venkateswaran,R.veeraswamy&A.R.Kulandaivelu,Basic Principles of practical chemistry, 3rdEdn, 1992

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	To prepare solutions of desired concentrations.
CO 2	To apply the principles of volumetric analysis in acid base, permanganometry and iodometric titrations.
CO 3	To compare the principles behind all types of titrations
CO 4	To identify suitable indicators for a particular reaction.

I B.Sc., Chemistry

SEMESTER –II

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UACH	19N1ACC2 / 19Z1ACC2	VOLUMETRIC ANALYSIS	PRACTICAL	3	2

Course Description
This course trains the students to estimate the solutions quantitatively by different techniques.

Course Objective: This paper deals with volumetric law, volumetric principle and procedure for various titrimetric methods such as permanganometry, acidimetry and iodometry.

Permanganonometry
1.Estimation of Potassium Permanganate
2.Estimation of Ferrous Ammonium Sulphate
3.Estimation of FerrousSulphate
4.Estimation of Oxalic Acid

Acidimetry-Alkalimetry
5.Estimation of Sodium Hydroxide 6.Estimation of Sodium Carbonate

Iodometry
6.Estimation of Potassium Dichromate
7.Estimation of Copper sulphate
8.Estimation of Potassiumpermanganate

Reference Book
Venkateswaran, R.veeraswamy&A.R.Kulandaivelu,Basic Principles of practicalchemistry, 3rd Edn, 1992.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	describe the principles and procedures of various titrimetric methods
CO 2	identify suitable indicators for a particular reaction
CO 3	know the various terms such as standard solution, normality, molality, molarity, equivalent weight and molecular weight
CO 4	select the specific titric method to estimate the amount of analyte present in the given solution.
CO5	Apply the expressions and equations to calculate the strength of solutions

I B.Sc., Chemistry

SEMESTER –II

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UACH	19C2CC4	THEORIES OF HARD AND SOFT ACIDS –BASES, CHEMICAL BONDING AND CHEMISTRY OF GROUP III, IV, V & VI elements.	Lecture	5	5

COURSE DESCRIPTION : This paper deals with the theories of bonding and the chemistry of III, IV, V & VI group elements.

COURSE OBJECTIVES :

- To focus on Valence bond theory, molecular orbital theory, VSEPR theory and its' applications.
- To study the general characteristic features of group III, IV, V & VI group elements.

UNITS

UNIT –I Hard and soft acids and Theory of bonding – I: (12Hrs)

Hard and Soft Acids and Bases-HSAB principle – pearson concept of acids and bases – classification – application – Rationalisation of existence of ores, prediction of chemical reactions, coordination behaviour of ambidentate ligands.

Ionic bonding – Radius ratio rule and its Applications- variable electrovalency – lattice energy – Born Haber cycle – Factors affecting Lattice energy – Properties of ionic crystals on the basis of lattice energy – solubility of ionic crystals in various solvents – stability of ionic compounds.

Self Study: Rationalisation of existece of ores

UNIT –II Theory of bonding - II: (12Hrs)

Covalent bonding – VB theory – concept of hybridisation involving d orbitals – VSEPR theory – Merits and demerits of VB and VSEPR theory - Linear combination of atomic orbitals(LCAO) – Molecular orbital theory (M.O) - Comparison of M.O and V.B theory - MO diagrams – homo & hetero nuclear molecules – O2,O^{2-},$O2^{2-}$,CO,CN,NO – bond order, magnetic properties, electronic configuration.

Self Study: MO diagrams –,NO

UNIT III : Chemistry of III and IV Group elements (12Hrs)

General characteristics of III group elements. Reactions of the elements with acids alkalies. Compounds of boron- borax and borane. Qualitative analysis of boron compounds. Alumina, qualitative analysis of Aluminium, Amphoteric behavior of Aluminates, Tri halides of Aluminium, Organometallic compounds of Boron and Aluminium – Diagonal relationship of B and Si

General characteristics of IV group elements. Compounds of carbon- Carbides, oxides and Carbonates.Oxides of silicon, silicates – structure of ortho, pyro and chain silicates-silicones and their applications.

Self Study: Silicates

UNIT IV : Chemistry of Vgroup elements (12Hrs)

General characteristics of V group elements – Unique features of Nitrogen – Main differences between N and other family members -Chemistry of hydrazine and hydroxylamine. Oxides, halides and Oxyacids of nitrogen and phosphorus. Nitrogen cycle and Fixation of nitrogen. Phosphazines and cyclophosphazines.

Self Study: Chemistry of hydroxylamine.

UNIT V :Chemistry of VI group elements(12Hrs)

General characteristics of VI group elements. Anamolous behavior of oxygen- Chalcogens. Acid rain, Allotropy of oxygen and sulphur. Chemistry of ozone and and it's depletion. General properties of oxides. (No specific oxides). Oxoacids of sulphur-H2SO4, H2SO5, H2S2O8 . Comparison between Caro's acid and Marshall's acid, structure of S4N4 and S2N2, Oxyhalides - SOCl2 and SO2Cl2.

Self Study: Allotropy of oxygen.

REFERENCES:

TEXT BOOK

Puri, B.R., Sharma, L.R., & Kalia., Principles Of Inorganic Chemistry., 13th Edition., Vishal Publishing House., New Delhi., 2009.

REFERENCE BOOKS

1. Huheey, J.E., Ellen. A., Keiter., Richard. I., Keiter., Inorganic Chemistry, 4th Edition, Pearson Education(Singapore) Pvt. Ltd., New Delhi, 2004.
2. Wahid, U. Malik, G.D. Tuli Madan, R.D., Selected Topics in Inorganic Chemistry,4th
3. Lee, J. D., Concise Inorganic Chemistry, 5th Edition, Black Well Science Ltd., Noida, 1996.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	To categorize the soft, hard and border line acids and bases.
CO 2	To compare Valence bond theory and molecular orbital theory
CO 3	To understand the synthetic importance of organo metallic compounds of Al, B and Si
CO 4	To criticize the chemistry of hydrazine and hydroxyl amine
CO 5	To draw the structure of oxo halides and oxo acids of sulphur.

I B.Sc. CHEMISTRY

SEMESTER –II

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UACH	19C2CC5	Alkenes,alkynes, alkadienes, organo metallic compounds, alcohols and ethers	Lecture	5	4

COURSE DESCRIPTION

This paper deals with the chemistry of alkenes, alkadienes, alkynes and organometallics with special emphasis on their synthetic applications,and also provides the study of preparation and properties of alcohols and ethers

COURSE OBJECTIVES

- To distinguish the substitution and elimination reactions
- To understand the basic rules in writing the mechanisms of chemical reactions
- To construct the structures of isomeric compounds
- To identify the functional groups in organic compounds
- To compare the properties of various compounds

UNIT I- ALKENES-I (15HRS)

Alkenes – IUPAC Nomenclature-Isomerism-Structure of Ethylene – Preparation by dehydration of alcohols,dehydro halogenation of alkyl halides, dehalogenation of vicinal dihalides and reduction of alkynes.–

Mechanism,evidences and Orientation of E1and E2,Saytzeff rule and Hoffmann rule -orientaiton, Reactivity with mechanism.E2 Vs E1,

Self Study: Elimination Vs Substitution

UNIT II- ALKENES- II (15 HRS)

Reactions of Alkenes – Hydrogenation, determination of stability of alkenesby Heat of hydrogenation.Addition of HX – Markovnikov's rule and mechanism.Addition of HBr – peroxide effect – mechanism.Addition of H_2SO_4 and H_2O. Electrophilic addition – Orientation,Mechanism and rearrangement.Addition of halogens – Mechanism and Stereochemistry of addition.Halohydrin formation, oxymercuration and demercuration, hydroboration, hydroxylation, ozolysis,oxidation,reduction and polymerisation

Self Study: Test for alkenes.

UNIT III- ALKADIENES & ALKYNES (15 HRS)

Classification of dienes,-IUPAC Nomenclature-isomerism-Preparation of conjugated diene by dehydration of alcohols,dehydrohalogenation of dihalides and selective reduction of triple bond.Structure and stereochemistry of conjugated dienes.Determination of Stability of dienes by heat of hydrogenation– – Thieles theory of partial valency. Electrophilic addition – 1,2 and1,4- addition of Br_2 and HBr. 1,2 adduct Vs 1,4 adduct. Rate Vs equilibrium.

Structure,preparationof alkynes by dehydrohalogenation of alkyl dihalides and using metal acetylides. Reactions – Addition of H_2 and hydration -tautomerism. Acidity of alkynes –Tests for alkynes.

Self Study: Resonance in alkadienes.& ozonolysis in alkynes.

UNIT IV- ORGANOMETALLIC COMPOUNDS (15 HRS)

Preparation and synthetic application of Grignard reagent – synthesis of Hydrocarbons, primary, secondary and tertiary alcohols, ethers, aldehydes, ketones, acids, esters, and primary amines-Reformatsky reaction-Gilman reagent-preparation and applications

Self Study:. Tetra ethyl lead- preparation and application

UNIT V- ALCOHOLS AND ETHERS (15HRS)

a) Alcohols

Structure and isomerism-Physical properties, industrial source, preparation of alcohols by reduction of carbonyl compounds, acids and esters. Reactions of alcohols – reactions involving R-OH bond cleavage with HX, PCl_5, $SOCl_2$ and dehydration. – reactions involving O-H bond cleavage with metals,acids $ArSO_2Cl$ and oxidation. Distinction between primary,secondary and tertiary alcohols-Lucas test and Victor Meyer's test

Self Study: Alcohols as acids and bases.

b)Ethers

Structure and isomerism-Preparation of ethers by Williamson's synthesis and alkoxymercuration – demercuration method. Reactions of ethers – with strong inorganic acids, dilute H_2SO_4, HI, Cl_2, O_2, PCl_5. Crown ethers – host – guest relationship. Epoxides – Preparation, Reactions of epoxides – Acid catalysed cleavage.

Self Study: Reactions of epoxides – base catalysed cleavage

Text Books:

1. Jain M.K.& Sharma.S.C,Modern Organic Chemistry,1st Edition,Vishal Publishing Co. New Delhi., 2017.

2. Bahl B.S. & Arun Bahl.Organic Chemistry,22nd Edition., S.Chand & Company Ltd New Delhi., 2017.

3. Finar I. L.Organic Chemistry,Volume1; The Fundamental Principles 6th Edition,ELBS &Longman group Pvt., Ltd., 2005.

References:

1.Morrison,R.T & Boyd,Organic Chemistry,6th Edition.,Prentice-hall of India Pvt, Ltd, New Delhi., 2005

2.Jerry March,A, Advanced Organic Chemistry, 6th Edition,John Wiley and sons reprint, 2008.

3.Bhupinder Mehta & Manju Mehta., Organic Chemistry., 6th Edition., PHI Learning Pvt Ltd., New Delhi., 2011

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	Gain a basic knowledge about elimination reactions to prepare alkenes
CO 2	describe the chemical reactions and structure of alkenes
CO 3	classify the alkadienes and alkynes
CO 4	Choose the specific reagents to prepare various organic compounds from GR
CO 5	Compare the properties of alcohols and ethers

I B.Sc. CHEMISTRY

SEMESTER –II

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UACH	19C2CC6	VOLUMETRIC ANALYSIS – II	PRACTICALS	3	2

COURSE DESCRIPTIVE

This course trains the students to prepare the solutions of different concentrations and to estimate quantitatively by different techniques.

COURSE OBJECTIVE

This practical paper deals with the principles of volumetric analysis of calcium– precipitation method - Argentimetric titrations, complexometric titrations and basic principles involved in organic estimations of phenol & aniline.

Experiments

1. Estimation of Ferrous Sulphate - External Indicator Method
2. Estimation of Aniline
3. Estimation of Phenol
4. Estimation of Calcium
5. Estimation of Potassium Chloride Using Silver Nitrate (Demonstration)
6. Estimation of Ethylmethyl ketone
7. Estimation of CuSO4
8. Complexometric Titrations- EDTA titration

Reference Book

V.Venkateswaran,R.veeraswamy&A.R.Kulandaivelu,Basic Principles of practical chemistry,3rd Edn, 1992.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	To apply the principles of volumetric analysis in various estimations.
CO 2	To estimate the amount of calcium using permanganometric method
CO 3	To estimate the amount of calcium and magnesium using EDTA method.
CO 4	To apply the principle of Argentimetry in the estimation of chloride ions.
CO 5	To understand the principles behind the estimations of phenol & Aniline iodometrically.

I B.Sc. CHEMISTRY

SEMESTER –II

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
	19C2NME	**PROFITABLE HOME INDUSTRIES**	**UG Core**	**2**	**2**

COURSE DESCRIPTION

This course is designed for the students to become self-employed by training them in the preparation of household articles.

COURSE OBJECTIVES

This paper is specially designed for the non chemistry students to give an exposure on topics such as Food chemistry, Dairy Chemistry, Soap & detergents and cosmetics and to understand the basic principles behind them. With an aim to make each student an entrepreneur, we give hands on training to the students for the small scale preparation on the house hold items such as Ink, phenoyl, candle, detergent powder, washing powder, shampoo, liquid soap, incense stick, tooth powder and computer sambirani.

UNITS

UNIT –I FOOD CHEMISTRY (6 HRS.)

History of food chemistry- Water in food systems- Carbohydrates- Lipids- Food proteins-Enzymes- Vitamins- Minerals -Color- Flavors-Food additives-Food adulterants and their detection in various food items.

UNIT –II DAIRY CHEMISTRY (6 HRS.)

Definition - composition of milk – Constituent of Milk – factors affecting quality and quantity of milk- Nutritive value of milk – Metals and non- metals used in Dairy Industry

UNIT –III SOAPS AND DETERGENTS (6 HRS.)

Manufacture of soaps, formulation of toilet soaps –different ingradients used-Soft soaps, shaving soaps and creams.

UNIT –IV COSMETICS (6 HRS.)

Shampoos –different kinds of shampoos –anti dandruff, anti lice, herbal and baby shampoos

hair dye –manufacture of conditioners -skin preparation –skin powder, nail polish, lipsticks.

UNIT –V PRACTICALS (6 HRS.)

Ink,phenoyl,candle,detergentpowder,washingpowder,and computer sambirani.

Determination of – Fat content – Acidity , pH of different branded milks.

REFERENCES:

1.Jayashree Gosh, Textbook of Pharmaceutical Chemistry, S.Chand&Chand publications New Delhi (1997).

2. Finar I L, Organic Chemistry Volume I and II, Sixth Edition, ELBS withLongmann, Singapore (1997).

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	Recognize the important nutrients present in food
CO 2	Gain knowledge about the fundamental chemistry involved in dairy products
CO 3	Determine the manufacture and functions of various soaps and creams
CO 4	Learn the ingredients required for the preparation of various types of shampoos, skin powder, nail polish
CO 5	Demonstrate the preparation of some home products like candle.detergent powder,soap oil,ink ,phenoyl and computer sambirani

IB.Sc. HOME SCIENCE/ ZOOLOGY

SEMESTER –II

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UACH	19N2ACC3/ 19Z2ZCC3	THEORY BEHIND CHEMICAL BONDING, AND ORGANIC QUALITATIVE ANALYSIS, KINETICS OF CHEMICAL REACTIONS AND CATALYSIS	LECTURE	3	3

COURSE DESCRIPTION :

This paper deals with the concepts of various theories of coordination chemistry, qualitative analysis of organic compounds, kinetic studies of chemical reactions and general characteristic features of a catalyst.

COURSE OBJECTIVES :

- To study the basic concepts of theories of coordinationchemistry and principles involved in organic analysis.
- To focus on kinetic studies,theories and types of catalysis.

UNITS

UNIT –I INORGANIC CHEMISTRY-I (9 Hrs)

Coordination Chemistry-I: Introduction, Shapes of d-orbitals, theories of coordination compounds, werner›s theory, Sidgwick's theory, Pauling's theory, Crystal field and Ligand field theories (Introduction idea only) and EAN rule.

Coordination Chemistry-II: Nomenclature of complexes, Chelation, metal complexes in biological systems, Chlorophyll, Heme proteins.

UNIT –II:THEORY OF ORGANIC QUALITATIVE ANALYSIS - I: (9 Hrs)

Detection of elements- N,S and Halogens, preparation of Lassiange's extract and the reactions involving the extract. Distinction of Mono and Dicarboxylic acids – solubility, reaction with $NaHCO_3$ and soda lime. Formation of phenolphalein and fluorescein. Reactions of alcohols and phenol -solubility reaction with NaOH and neutral $FeCl_3$.

UNIT III: THEORY OF ORGANIC QUALITATIVE ANALYSIS - II: (9 Hrs)

Reactions of Carbonyl compounds-Solubility –Tollen's reagent test, Borches test, Formation of hydrazone and oxime.Reactions of mono and disaccharides-solubility, reaction with conc.H_2SO_4, Molisch's test, Fehling's solution test, Barfoed's test and Benedict's test. Reaction of 1^0, 2^0 and 3^0 amines- solubility- reaction with HNO_2. Diazotisation -Coupling reaction - Monoamide and Diamides-solubility, action of heat, reaction with NaOH and Biuret test.

UNIT IV : .CHEMICAL KINETICS (9 Hrs)

Chemical Kinetics-Introduction-reaction rate,order and molecularity of a reaction, first order reaction, second order reactions; test for a second order reactions and examples of second order reaction. Zero order reactions-effect of temperature on reaction velocity,energy of activation.

UNIT V : CATALYSIS (9 Hrs)

Introduction, general characteristics of catalysed reactions,types of catalysis,theories of catalysis,catalytic poisoning, auto catalysis.

REFERENCES:

TEXT BOOK

R.D.Madan, Modern Inorganic Chemistry, S.Chand and company, Reprint, 1994.

REFERENCE BOOKS

1. R.D.Madan, Modern Inorganic Chemistry, S.Chand and company, Reprint, 1994.
2. V.Venkateswaran, R.veeraswamy&A.R.Kulandaivelu,Basic Principles of practical chemistry, 3rd Edn, 1992.
3. B.R.Puri, L.R.Sharma&S.Pathania, Principles of physical chemistry, 33rdEdn,

1992.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	Apply the rules for naming the coordination complexes and to illustrate the applications of metal complexes in biological systems.
CO 2	To analyze the various organic compounds qualitatively
CO 3	To understand the procedure involved in detection ofelements.
CO 4	To explain the kinetics of a chemical reaction and to calculate the order of a particular reaction
CO 5	To evaluate the types of catalysis and theories of catalysis

II B.Sc. CHEMISTRY

SEMESTER –II

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UACH	19N2ACC4/ 19Z2ACC4	QUALITATIVE ANALYSIS	PRACTICALS	5	4

COURSE DESCRIPTION:

This course gives lab experience on organic qualitative analysis.

COURSE OBJECTIVE:

This course gives lab experience on organic qualitative analysis by simple chemical reactions.

Organic qualitative analysis

The anaysis involving the detection of following characteristics of the given organiccompound

1.Whether given organic compound is aliphatic or aromatic

2.Whether given organic compound is saturated or unsaturated

3.Any one of the following functional groups

1.Carbohydrate
2.Aldehyde
3.Ketone
4.Phenol
5.Amide
6.CarboxylicAcid
7.Amine

Reference Book

V.Venkateswaran, R.veeraswamy&A.R.Kulandaivelu,Basic Principles of practical chemistry, 3rdEdn, 1992.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	Gain the knowledge of appearance, colour, physical state,andodour of organic substances.
CO 2	Distinguish whether the given compound is Aliphatic or Aromatic and Saturated or Unsaturated.
CO 3	Perform the confirmatory test for various functional groups present inthe given organic compound.
CO 4	Recognize the usage of apparatus and laboratoryreagents.
CO 5	Relate the experimental observations with theory behindpracticals.

II B.Sc. CHEMISTRY

SEMESTER –III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UACH	19C3CC7	ORGANIC & INORGANIC CHEMISTRY	Lecture	5	4

COURSE DESCRIPTION

This paper deals with the concept of aromaticity and detailed study of electrophilic and nucleophilic substitutions in aromatic compounds. The inorganic chemistry part of the paper deals with the general characteristics of, VII group elements,d- block elementsandPrinciples of InorganicQualitative and Quantitative Analysis.

COURSE OBJECTIVES

In this course the students are able to gain knowledge about aromaticity and able to apply the concept to other organic compounds, and they are exposed to electrophilic and nucleophilicmechanisms. Students are able to appreciatechemistry behind practicals of qualitative and quantitative analysis.

I. (a) Aromatic hydrocarbon (6Hrs)

The Concept of Aromaticity, Aromatic, Antiaromatic and non-aromatic compounds- Huckel's rule and applications of Huckel's rule,Structure of Benzene, Stability of Benzene ring - Heats of Hydrogenation and combustion, C-C Bond lengths, resonance structure of Benzene,Molecular orbital picture of benzene andNomenclature of Benzene derivatives.

(b). Electrophilic Aromatic Substitution (9Hrs)

Introduction, General mechanism of Nitration, SulphonationandDesulphonation, Halogenation, Friedal crafts alkylation and acylation.Limitations of Friedel-Crafts alkylation, Orientation effect of substituent

groups on further electrophilic aromatic substitution, Classification of substituent groups, Effect of Activating groups, Effect of deactivating groups, Steric factors in Electrophilic Aromatic Substitution, Introduction of a third substituent into the benzene ring.

II.(a) Nucleophilic Aromatic Substitution (3Hrs)

Activated Nucleophilic substitution, Benzyne mechanism and evidences in favour of benzyne mechanism

(b) Phenols (12Hrs)

Classification and Nomenclature, Preparation –General Physical properties,.Chemical properties– Acidic character of phenols, Electrophilic aromatic substitution reactions of phenol- Reaction with dilute nitric acid and con. Nitric acid, Sulphuric acid, Bromine, Nitrous acid, Alkyl halides and formaldehyde(LedererManasse Reaction), Coupling reaction, Kolbe reaction, Reimer Tiemann reaction, Reactins of OH group similar to alcohols-reaction with sodium, Esterification-Fries rearrangement, Etherification-Claisenrearrangementand Tests for phenol.

III. Chemistry of VII Group elements (15Hrs)

Group discussion, anomalous behavior of F, ionic-, covalent-,bridging halides, reactivity of halogens - reduction of halogens by thiosulfate and application to iodo/iodimetry, Comparison of Acid strength of HX.

Halogen oxides: oxygen difluoride, dioxygendifluoride, dichlorine monoxide, chlorinedioxide, dichlorinehexoxide, dichlorineheptoxide; bromine dioxide, iodine pentoxide.Oxoacids of halogens: hypohalous acid HOX, halous acid HXO_2, halic oxide HXO_3,perhalic acid HXO_4, strength of oxoacids.Interhalogen compounds: ClF, ICl; ClF_3, BrF_3, IF_3, ClF_5, BrF_5, IF_5 - structure-VSEPR Model.

IV Chemistry of d-block elements (15Hrs)

First, second and third transition series - General characteristics – Metalliccharacter, atomic and ionic radii – oxidation states, colour, complex formation, catalytic and magnetic properties-Non-stoichiometric compounds-Preparation, properties and uses of Importantcompounds of transitionmetals:Chromous Acetate, Potassium Ferocyanide, Potassium Ferricyanide, Prussian blue,Sodium nitro prusside, Nickel DMG complex, Wilkinson'sCatalyst, Hg_2Cl_2,$HgCl_2$,Hgl_2,$K_2Cr_2O_7$ and$KMnO_4$.

(V)Principles of Inorganic Qualitative and Quantitative Analysis (15 Hrs)

Qualitative analysis: Basic principles of chemical analysis-solubility product-definition-application of solubility product, Reactions of dilute and concentrated acids-preparation of Na_2CO_3 extract- Tests for interfering and non-interfering acid radicals.

Quantitative Analysis: Introductionto Gravimetric analysis, Precipitation methods of Gravimetric analysis, Mechanism of precipitation-Desirable properties of Gravimetric precipitates, Factors affecting the solubilities of precipitates, common ion effect, adverse ion effect-coprecipitation, post precipitation, Digestion of the precipitate, Washing and Filtration, Drying or Ignition, Errors in Gravimetry and scope of the technique,Inorganic and Organic precipitating agents.

Text Books

1. For Units I and II - M. K. Jain and S.C. Sharma- Modern Organic Chemistry, 4th(Reprint) Edn, Vishal Publishing Co., 2013.
2. For unit III, IV and V -B.R.Puri, L.R.Sharma&Kalia.- Principles of Inorganic chemistry –32ndEdn, Milestone publishers, 2018.

Reference Books

1. R.T.Morrison&R.N.Boyd, Organic chemistry 6thEdn, Prentice-hall of India private Ltd, 2005.
2. ArunBahl& B. S. Bahl, Advanced Organic chemistry, First Edition, Reprint, S.Chand& Co. 2005.
3. Jerry March, Advanced Organic Chemistry, 4th Edition, John Wiley, New York, 2005.
4. SatyaPrakash, G.D.Tuli, S.K.Basu, R.D. Madan, Advanced Inorganic Chemistry,Vol-I, Reprint, S.Chand& Co., 2016.
5. James E.Huheey, Inorganic Chemistry, Pearson publications, 4th edition, 2008.
6. F. A. Cotton, G. Wilkinson, C. Murillo & M. Bochman, Advanced Inorganic Chemistry,
   6thed., John Wiley, New York, 199

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	To interpret the concept of aromaticity and the main properties of aromatic compounds.
CO 2	To explore reactivity patterns of conjugated, aromatic molecules and to evaluate the kinetics and thermodynamics controlled reactions.
CO 3	Explain types of oxides and oxyacids, their structure and reactivity in halogens
CO 4	Discuss the properties d block elements & triads of transition elements.
CO 5	Recognize the role of oxidizing agents, reducing agents, group reagents andcomplexing agents, and inferences with theory behind practicals.

II B.Sc. CHEMISTRY

SEMESTER –IV

For those who joined in 2019 onwards

COURSE DESCRIPTION

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UACH	19C3CC8	Gaseousstate, Solutions,dilute solutions,radio activity & Nuclear transformations and nuclear chemistry	Lecture	4	3

This course provides a detailed study of Gaseous state, Solutions, Theory of dilute solutions ,Radio activity and nuclear chemistry.

COURSE OBJECTIVES

- Memorise the basic concepts and laws of gases state
- Understand the characteristics of various types of solutions
- Apply the various techniques to measure the colligative properties
- Analyse the properties of radioactive rays
- Examine the importance of nuclear chemistry

UNIT-I GASEOUS STATE (12 HRS.)

Kinetic theory of gases-gaseous laws-derivation of kinetic gas equation-Type of molecular velocities-average velocity-most probable velocity-RMS Velocity-Maxwell's distribution of molecular velocities-Effect of temperature on distribution of molecular velocities.Maxwells distribution of molecular energies –collision diameter-collision number-mean free path-viscosity of gases--viscosity in terms of momentum transfer-calculation of collision diameter and mean free path from viscosity measurement.

Real gases: Effect of temperature on deviation from ideal behaviour-Boyle temperature-Limitations of vanderwaals equation-Dieterici equation-Berthelot's equation-clausius equation

Self study : Derivation of Boyle temperature from vanderwaals equation.

UNIT-II SOLUTIONS: (12 HRS.)

Solution of liquids in liquids-Ideal and non-ideal solutions-Raoult's law-Vapour pressure-composition curve of ideal solutions-Vapour pressure-composition curve of non-ideal solutions- Type I, Type II and type III solutions. Vapour pressure-composition and boiling point-composition curves of completely miscible binary solutions –fractional distillation-Azeotropic distillation-Distillation of immiscible liquids-steam distillation. Solubility of partially miscible liquid pairs-Phenol-water system,Triethylamine-water system,Nicotine-water system.Effect of impurities on Critical solution temperature. Solution of gases in liquids - Absorption co-efficient of gases--Factors affecting the solubility of a gas in liquids-Nature of gas and solvent, and pressure -Henry's law

Self study : Relationship between Henry's law and Raoults law.

UNIT-III THEORY OF DILUTE SOLUTIONS (12 HRS.)

Relative lowering of vapour pressure-Derivation of molecular weight of a non-volatile solute from relative lowering of vapour pressure- Determination of relative lowering of vapour pressure by Ostwald walker's method

Osmotic pressure- -Laws of Osmotic pressure-derivation of molecular weight of a non-volatile solute from osmotic pressure- - Determination of osmotic pressure by Berkley and Hartley's method-Isotonic solutions-

Ebullioscopy:-Derivation of molecular weight of a non-volatile solute using vapour pressure-boiling point curve-Determination of boiling point elevation by Landsberg's method

Cryoscopy: Derivation of molecular weight of a non-volatile solute using vapour pressure-freezing point curve- Determination of freezing point depression by Beckmann method and Rast method

Self study -Vant't-Hoff factor-degree of dissociation and degree of association

UNIT-IV RADIOACTIVITY AND NUCLEAR TRANSFORMATIONS (12 HRS.)

Natural Radioactivity:-Properties of α,β and γ—rays-Detection and masurement ofradioactivity. G.M counter & Wilson cloud chamber-Derivation of decay constant and half life period –Radioactive equilibrium-Soddy-Fajan's group displacement law.

Theory of radioactivity: n/p ratio for stable and meta stable nuclei-radioactive

series-orbital electron capture-Internal Conversion-nuclear isomerism.

Artificial Radioactivity: Definition-different types of nuclear reactions with example-induced radioactivity.

Application of radioactivity-Medicine,agriculture and industry, as tracer elements in the elucidation of structure and investigation of reaction mechanism,.

Self study - Carbon dating

UNIT-V NUCLEAR CHEMISTRY (12 HRS.)

Nuclear Structure: Size of the nucleus- Nuclear forces-packing fraction-Mass defect-binding energy of the nucleus-Binding energy and stability of nuclei.

Nuclear models: Nuclear shell model-The liquid drop model

Nuclear fission: Calculation of energy released in nuclear fission, the fission chain reaction,atom bomb

Nuclear fusion: Stellar energy-Hydrogen bomb.

Self study -Nuclear reactors.

Text Books:

1.B.R.Puri, L.R. Sharma & M.S. Pathania, Principles of Physical Chemistry,"3rdEdn, Vishal Publishing House, 2010.

2.H.J. Arnicker, Essentials of Nuclear Chemistry, New Age International Pvt. Ltd. 2005.

Reference Books:

1.P.L.Soni, H.C. Sharma, Principles of Physical Chemistry, S.Chand &Sons, New Delhi, 1980

2.A.Singh & R. Singh, Text Book of Nuclear Chemistry, New Delhi, Campus Books International, 2006

3.Mahaling Ram Naresh, Basics of Nuclear Chemistry, New Delhi, Anmo Publications Pvt Ltd, 2009.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	Gain a basic knowledge about the kinetic theory of gases, gaseous laws,types of velocities and properties of gases
CO 2	Distinguish between ideal and non-ideal solutions
CO 3	Derive the relation between molar mass of a non-volatile solute and colligative properties
CO 4	calculate mass defect,packing fraction and binding energy for any nuclei
CO 5	Predict the growing rate,mechanism and age of plants using radioactive elements

II B.Sc. Chemistry

SEMESTER –II

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UACH	19C3CC9	INORGANIC QUALITATIVE ANALYSIS	PRACTICAL	3	2

COURSE OBJECTIVE: This paper Involves the analysis of inorganic mixtures an acid and basic radicals qualitatively.

Interfering Acid radicals

- Phosphate
- Borate
- Oxalate

Non interfering acid radicals

- Chloride
- Bromide
- Iodide
- Carbonate
- Sulphate
- Nitrate

Basic radicals of Group I to Group VI

Reference Book

V.Venkateswaran, R.veeraswamy&A.R.Kulandaivelu,Basic Principles of practical chemistry, 3rdEdn, 1992.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	To identify acid radicals and basic radicals present in the mixture
CO 2	To detect interfering and non-interfering acid radicals
CO 3	To find out the group of cations
CO 4	To confirm the given acid radicals by doing confirmatory test
CO 5	To confirm the given basic radicals by doing group analysis

II B.Sc CHMISTRY

SEMESTER –III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UACH	19C3SB1	Agricultural chemistry	LECTURE	2	2

COURSE DESCRIPTION

This course deals with the basic knowledge about the role of soils in the environment,their types and properties.This paper also provides a focus with special emphasis on importance of pesticides, organic manures,compost and fertilizers for better production of crops and also their impact

COURSE OBJECTIVES

- Aquire the basic knowledge about soils
- Recall the various types,of fertilizers
- Compare the various types of manures
- Analyse the methods of controlling pests
- Apply the estimation procedures to determine the amount of metal ions in soils

UNIT I SOILS (6 HRS.)

Soils- Introduction, Composition of soil-Organic and inorganicconstitutents, soil acidity, Alkalinity, buffering of soils, Soil fertility.

UNIT –II FERTILIZERS (6 HRS.)

Introduction,Use of fertilizers : urea, DAP, Super phosphate, Gypsum, NPK-mixed fertiizers, Optimal addition of Fertilizers to obtain estimated yields , Adverse effects of fertilizers

UNIT –III MANURES AND COMPOST (6 HRS.)

Farmyard manure, Compost, Reinforcing manure, green manure crops, Biogas production from biogas plant

UNIT –IV PESTICIDES (6 HRS.)

Pesticides –Introduction, classes of pesticides; Benefits and Adverse effects of pesticides, methods of pest control, methods of using pest control chemicals

UNIT –V PRACTICALS (6 HRS.)

Soil analysis – Determination of pH and estimation of Ca and Mg by complexometric titration

References

1.JeyashreeGhosh, Fundamental concepts of Applied Chemistry, S.Chand, 2006

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

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	Define the term soil
CO 2	describe the various types of fertilizers and their uses
CO 3	realise the requirements of manures and fertilizers for better production of various types of crops
CO 4	Examine the adverse effect of pesticides
CO 5	Calculate the amount of calcium and magnesium present in various types of soils

II B.Sc. PHYSICS

SEMESTER –II

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS /WEEK	CREDITS
UGACH	19P3ACC1	THEORY BEHIND CHEMICAL BONDING, QUANTITATIVE AND QUALITATIVE ANALYSIS, KINETICS OF CHEMICAL REACTIONS AND THERMODYNAMICS	Lecture	3	3

COURSE DESCRIPTION : This paper deals with theories of bonding, chemical kinetics, thermodynamics and theory behind the volumetric analysis.

COURSE OBJECTIVES :

- To learn the theories of bonding in coordination chemistry and basic concepts in organic analysis.
- To focus on kinetic studies, first law of thermodynamics and basic principles involved in potentiometric, acid base and complxometric titrations.

UNITS

UNIT –I INTRODUCTION TO BONDING AND SHAPES OF MOLECULES (9Hrs)

The V.B. Theory – Types of overlapping – s-s, s-p & p-p overlap, Sigma & pi bonds – Hybridization in Ethane, Ethylene & Acetylene respectively. Shapes of covalent molecules using VSEPR Theory [$BeC1_2$, $SnC1_2$, BF_3, NH_3, & H_2O Only].

UNIT –II PRINCIPLES OF VOLUMETRIC ANALYSIS (9Hrs)

Normality, Molarity, Molality, Volumetric principles, Acid base titrations permanganometric titration, iodo and iodimetric titration, Dichrometry, Argentimetry and EDTA titrations.

UNIT III : PRINCIPLES OF ORGANIC ANALYSIS (9Hrs)

Detection of elements – N.S. and Halogens – preparation of Lassaaigne's extract and the reactions involving the extract. Distinction between aliphatic and aromatic- saturated and unsaturated compounds. Reactions of mono and dicarboxylic acids – Solubility, Reaction with $NaHCO_3$ and soda lime, Formation of phenolphthalein and Resorcinol. Reactions of Carbony1Compounds–Solubility, Tollen's Reagent test, Borsche's test, Formation of hydrazones and Oxime. Reactions of mono and Disaccharides, Solubility, Reaction with conc. H_2SO_4,Molisch'stest, Fehlings solution test, Barfoed's test and Benedict's test. Reactions of primary, secondary and tertiary amines Solubility, Reaction with HNO_2, Diazotisation and coupling reaction, Formation of p-Nitroso tertiary amine. Reactions of monoamide and Diamide – Solubility, action of heat, reaction with NaOH and Biuret test. Reactions of alcohols and phenols – Solubility, Reaction with NaOH and neutral $FeC1_3$

UNIT IV : . CHEMICAL KINETICS (9Hrs)

Introduction, Rate equation. Order and molecularity of the reaction, pseudo unimolecular reaction, factors influencing the rate of the reaction, Derivation of rate constant for zero, first and second order reactions, Methods of determination of the order of the reaction – Arrhenius equation – Theories of reaction rates – collision theory and ARRT.

UNIT V : THERMODYNAMICS- I (9Hrs)

Thermodynamics- Importance, Limitations, terminology of thermodynamic – systems, macroscopic properties, state variables, state functions, path functions, thermodynamic equilibrium, isothermal, adiabatic, isochoric, reversible and irreversible process- nature of work and heat, law of conservation of energy, first law of thermodynamics- internal energy- enthalpy of a system, heat capacity, correlation between Cp and Cv.

TEXT BOOK

Puri, B.R., Sharma, L.R., & Kalia., Principles Of Inorganic Chemistry., 13th Edition., Vishal Publishing House., New Delhi., 2009.

REFERENCE BOOKS

1. For unit I –Puri,B. R, Sharma, L.R and Kalia, K.C. Principles of Inorganic Chemistry, 31st Edition' 2013.
2. For Unit III, & IV – Principles of physical chemistry - by B.R.Puri, L.R.Sharma&S.Pathania. 33rd Edition' 1992.
3. For Unit II "Basic Principles of practical chemistry" by V.Venkateswaran, R.veeraswamy& A.R.Kulandaivelu,3rd Edition' 1992.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	To comprehend the fundamental theories of Valence Bond, types of overlapping and VSEPR.
CO 2	To categorize the reactions involved in volumetric analysis
CO 3	To analyze the various organic compounds qualitatively
CO 4	To recognize the theories of chemical kinetics.
CO 5	To highlight the importance of thermodynamics and its related functions.

II B.Sc. Chemistry

SEMESTER –III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UACH	19P3ACC2	ALLIED CHEMISTRY PRACTICALS-I	PRACTICAL	5	3

COURSE DESCRIPTION

This course trains the students to estimate the solutions quantitatively by different techniques.

COURSE OBJECTIVE:

This paper deals with volumetric law, volumetric principle and procedure for various titrimetric methods such as permanganometry, acidimetry and iodometry.

Permanganonometry

1.Estimation of Potassium Permanganate
2.Estimation of Ferrous Ammonium Sulphate
3.Estimation of FerrousSulphate
4.Estimation of Oxalic Acid

Acidimetry-Alkalimetry

5.Estimation of Sodium Hydroxide
6.Estimation of SodiumCarbonate

Iodometry

7.Estimation of Potassium Dichromate

8.Estimation of Copper sulphate

9. Estimation of Potassiumpermanganate

ReferenceBook

Venkateswaran, R.veeraswamy&A.R.Kulandaivelu,Basic Principles of practicalchemistry, 3rdEdn,1992.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	Describe the principles and procedures of various titrimetric methods
CO 2	Identify suitable indicators for a particular reaction
CO 3	Know the various terms such as standard solution, normality, molality, molarity, equivalent weight and molecular weight.
CO 4	Select the specific titric method to estimate the amount of analyte present in the given solution.
CO 5	Apply the expressions and equations to calculate the strength of solutions

II B.Sc. Chemistry

SEMESTER –IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UACH	19C4CC10	Coordination Chemistry	Lecture	5	3

COURSE DESCRIPTION: The Course enables the students to gain knowledge on the chemistry of coordination compounds, carbonyl compounds and "F' block elements.

COURSE OBJECTIVES: This course provides an extensive study of coordination complexes, including their spectral and magnetic properties and 'F' block elements

UNITS

UNIT –I THEORIES OF COORDINATION – I (15HRS.)

a). Introduction – classification of ligands, nomenclature, preparation of complexes and detection of complexes using solubility,colour change,conductance measurements and visible absorption studies. Basis for isomerism in complexes and different types of isomerism.

b). Werner's theory –merits & demerits.Sidgwick's electronic concept of effective atomic number and EAN rule as applied to carbonyls

Self Study:Chemical test for distinguishing *cis-trans* isomers.

UNIT –II THEORIES OF COORDINATION – II (15HRS.)

a).Valence bond theory – Introduction, Hybridisation,sp^3, dsp^2, dsp^3, d^2sp^3, & sp^3d^2, merits & demerits.

b).Crystal Field theory – Introduction, crystal field splitting in octahedral, tetrahedral & square planar arrangement of ligands. Spectro chemical series, ligand field effect and colour, crystal field stabilization energy , factors affecting the magnitude of Δ_0 and

its application.Distortion of octahedral complexes and John-Teller theorem. Limitations of CFT.

c).M.O.Theory – M.O. Theory as applied to octahedral complexes, Pi- bonding and M.O. theory, Merits.

Self Study: Structure of Spinels

UNIT –III MECHANISM IN COORDINATION COMPLEXES (15 HRS.)

a).Kinetics of complexes – stability – Kinetic and thermodynamic stability – Factors affecting stability and lability Stepwise and over all stability constants (determination not required)

b) Mechanism of hydrolysis reactions in octahedral complexes.

c) Mechanism of ligand substitution reaction in square planar complexes, Trans effect, trans effect in synthesis, Mechanism of trans effect.

d)Spectroscopic states: L-S coupling & J-J coupling schemes, derivation of spectroscopic states for free C-atom.

Self Study: Mechanism of trans effect.

UNIT –IV ORGANOMETALLIC CHEMISTRY (15HRS.)

Preparation and structure of metal carbonyls – $Ni(CO)_4$, $Fe(CO)_5$, $[V(CO)_6]$ & $Mn_2(CO)_{10}$. Metal nitrosyls – sodium nitroprusside and nitoso ferrous sulphate.Ferrocene (structure based on VBT).

Self Study: $Co_2(CO)_8$and $Fe_2(CO)_9$

UNIT –V :'F' Block Elements **(15 HRS.)**

a). The lanthanide series electronic configuration, Oxidation states, spectral and magnetic properties of ce^{3+} and yb^{3+} , causes and consequences of lanthanide contraction - separation of lanthanides by fractional crystallization, solvent extraction, precipitation, change in oxidation state and Ion exchange chromatography.

b). Actinides The actinide series and electronic configuration.Extraction of Uranium from pitchblende.

Self Study: Extraction of thorium from monazite

REFERENCES:

1. R.D.Madan, Wahid U.Malik&G.D.Tuli, -*Selected topics in Inorganic Chemistry* - S.Chand& Company LTD. 2010 - For Units I, II and III
2. B.R.Puri, L.R.Sharma& K.C. Kalia. "*Principles of Inorganic Chemistry"*Milestone Publishers, 2014, For Unit IV.
3. James E HuheeyInorganic Chemistry, II Edn.,.Published by Dorling Kindersley (India) Pvt.Ltd. 2009 - For Unit III - (d)

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	Know the structure and bonding of important coordination compounds
CO 2	Apply the rules to calculate the magnetic properties of complexes and how magnetic moments can be employed for the interpretation of their structure
CO 3	Get an overview about the reaction mechanism of metal complexes
CO 4	Import the skills to elucidate the structure and mode of bonding in organometallic compounds
CO 5	Gain knowledge about the chemistry of Lanthanides and Actinides

II B.Sc. CHEMISTRY

SEMESTER –IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UACH	19C4CC11	Chemical Kinetics, Solid State and distribution Law	UG Core	4	3

COURSE DESCRIPTION

This paper focuses on all the important aspects of Physical concepts of chemical kinetics, solid state and distribution law.

COURSE OBJECTIVES

This course provides an elaborate study of chemical kinetics, solid state and distribution law.

UNITS

UNIT –I CHEMICAL KINETICS - I (12 HRS.)

a) Introduction, Rate of the reaction, the rate equation, Rate constant, order and molecularityof the reaction, methods of determining the rate of the reaction, factors that affect the rate of the reaction. Reactions of I order and pseudo first order reactions-Derivation of rate constant and Half life period – Decomposition of (1) Nitrous Oxide, (2) Hydrogen peroxide, (3) Ammonium nitrite and (4) Dinitrogen, pentoxide, Acid catalysed hydrolysis of ester, Inversion of sucrose and Hydrolysis of benzene diazonium chloride.

b) Reaction of second order – Derivation of rate expression and Half-life period – Reaction between Triethylamine and methyl iodide and saponification of ester.

c) Zero order-Examples-Derivation of rate constant and Half life period.

d) Methods of determining the order of the reaction, Effect of temperature on reaction rates – Concept of activation energy. Calculation of energy of activation – the Arrhenius equation, measurement of Arrhenius parameter.

e) Mechanism of enzyme reaction, determination of Michaelis constant, Effect of enzyme and substrate concentration, pH and temperature on the rate.

Self study–Effect of pH and temperature on the rate of the reaction.

UNIT –II CHEMICAL KINETICS-II (12 HRS.)

a) The theories of reaction rates – collision theory of bimolecular gaseous reactions, Activated complex theory. The Lindemann'stheory of unimolecular reactions.
b) Characteristics of complex Reactions – opposing or Reversible reactions, consecutive reaction, competing or parallel reactions and chain reactions (Derivations not required).
c) Diffusion controlled reactions in solution, the influence of ionic strength on the rate of the reactions, influence of solvent on reaction rates. (Derivations not required).

Self study–Influence of ionic strength and solvent on rate reaction.

UNIT –III SOLID STATE - I (12 HRS.)

a) Introduction, crystalline and amorphous solids-difference, size and shape of crystals, symmetry in crystal systems, space lattice and unit cell, Bravais Lattices, law of Rational indices, Miller indices, X-ray diffraction – Bragg's equation and experimental Techniques – X-ray diffraction on crystals and powder method.
b) Lattice energy – Born-Lande' equation,Cohesive energy and Fermi energy.
c) Close packing in solids-hexagonal close packing, cubic close packing and interstitial sites in Close packed lattices, Ionic radius, Radius ratio and shape of crystals.

Self study– Fermi energy.

UNIT –IV SOLID STATE - II (12 HRS.)

a) Types of crystals – Molecular, covalent, metallic and ionic crystals – structure of water and ammonia (molecular crystals), diamond and Graphite (covalent crystals), metallic bonds in metals (metallic crystals) Sodium Chloride, Potassium Chloride and Cesium Chloride (Ionic Crystals).
b) Conductors, Insulators and Semi-conductors, crystal defects.

c) Liquid Crystals – Classification, Smectic, Nematic and Cholesteric liquid crystals – Theories of liquid Crystals – The swarm Theory – Application of liquid Crystals.

Self study–crystal defects.

UNIT –V DISTRIBUTION LAW (12 HRS.)

The Distribution law, conditions for the validity of the distribution law, Thermodynamic derivation. Association, Dissociation of the solute in one of the solvents and solute enters into chemical combination with one of the solvents, Applications of distribution law.

Self study– Application of distribution law.

REFERENCES:

Text Book:

Puri, B.R, Sharma, L.R. and Pathania, M.S. Principles of Physical Chemistry, Vishal Publishing House, 47thEdn.,2016.

Reference Books:

1. Laildler, K. J, Chemical Kinetics, Pearson, 3rdEdn.,2012 or 2003.
2. Soni, P.L, Dharmarha O.P. and Dash U.N, Principles of Physical Chemistry, S.Chand& Sons, New Delhi, 2016.
3. Soni, P.L, Sharma, H.C, Principles of Physical Chemistry, S.Chand&Sons, New Delhi, 1980.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	To determine integrated rate expression for zero order, first order, second order reactions and their respective half-life period expressions with examples
CO 2	To study the various factors which affect the rate of a chemical reaction such as concentration, temperature, and solvent
CO 3	To learn the crystal diffraction and experimental techniques used to characterize the solid crystals
CO 4	To recognize and give the lattice parameter relationships for the seven crystal systems
CO 5	To value the Nernst distribution law - its thermodynamic derivation, modification of law when solute undergoes association, dissociation and chemical combination with one of the solvents

II B.Sc. CHEMISTRY

SEMESTER –IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UACH	**19C4CC12**	**ORGANIC QUALITATIVE ANALYSIS**	**Practicals**	**3**	**2**

COURSE DESCRIPTION

This course gives lab experience on organic qualitative analysis.

COURSE OBJECTIVES

This course gives lab experience on organic qualitative analysis by simple chemical reactions.

The analysis involving the detection of following characteristics of the given organic compound

1. Whether given organic compound is aliphatic or aromatic
2. Whether given organic compound is saturated or unsaturated
3. Detection of Elements: Nitrogen, Sulphur and halogens
4. Any one of the following functional groups
   - Carbohydrate
   - Aldehyde
   - Ketone
   - Phenol
   - Amides
   - Carboxylic Acids
   - Amines
   - Nitro compounds
5. Preparation of derivatives for the above functional groups.

REFERENCES:

1. V.Venkateswaran, R. veeraswamy & A.R.Kulandaivelu, Basic Principles of practical chemistry, 3rd Edn, 1992.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	Gain the knowledge of appearance, colour, physical state, and odour of organic substances
CO 2	Distinguish whether the given compound is Aliphatic or Aromatic,and Saturated or Unsaturated.
CO 3	Perform the confirmatory test for various functional groups present in the given organic compound.
CO 4	Recognize the usage of apparatus and laboratory reagents.
CO 5	Avoiding hazardous experiments by doing microlevel eco friendly experiments.

II B.Sc CHEMISTRY

SEMESTER –IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UACH	19C4SB2	NATURAL AND SYNTHETIC DYES	LECTURE	2	2

COURSE DESCRIPTION

This course gives an introduction to Natural and Synthetic Dyes and also highlights the uses of dyes in our day today life.

COURSE OBJECTIVES

- Recall thedefintion of dyes
- Understand the source of colour in different colouring chemicals available in market
- Apply the various methods tosynthesisethe dyes.
- Analyse theclour forming groups invairous types of dyes
- Examine the applications of dyes in various industries

UNIT I THEORY OF DYES (6 HRS.

Color and dyes: Color sensation, Dyes and dying color and chemical constitution-Witt theory and Modern theory of dyes. Nomenclature of dyes: Valance bond theory of color.

UNIT –II CLASSIFICATION OF DYES-I (6 HRS.)

Classification according to application - direct or substantive dyes, mordent dyes, vat dyes, Ingrain or developed dyes, Disperse dyes, sulphur dyes, reactive dyes, oil and spirit soluble dye

UNIT –III CLASSIFICATION OF DYES-II (6 HRS.)

Classification according to chemical structure: a) Nitro and Nitroso dyes. b) Tripheyl methane dye malachite green, pararosaniline, crystal violet and its applications. c) Azo dyes – aniline yellow, butter yellow, methyl orange, methyl red, resorcin yellow and congo red. d) Phthalein and Xanthen – phenophthalein, fluorescein, eosin and rhodamine B.

UNIT –IV STRUCTURE OF DYES (6 HRS.)

Structure of Indigo, Alizarin, Raw material for the manufacture of dyes, non textile uses of dyes.

UNIT –V APPLICATIONS OF DYES (6 HRS.)

Applictions of dyes- in food industry, cosmetics, textiles and non textile industries

References

1.JeyashreeGhosh, Fundamental concepts of Applied Chemistry, S.Chand, 2006
2. B.A. Yagodin ,Agricultural Chemistry, Mir Publishers (Moscow), 1976.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	To know and comprehend the principle and theories of dyes
CO 2	To identify the chromophoric groups and auxochromes in dyes
CO 3	To classify the of dyes whether natural or synthetic
CO 4	To predict the structure of dyes
CO 5	To recognise the applications of dyes in various industries

II B.Sc. Physics

SEMESTER –IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UACH	19P4ACC3	Allied chemistry-II	PRACTICAL	45Hrs	3

COURSE DESCRIPTION

This course enables the students to get a thorough knowledge of periodic table and atomic properties, electro chemistry, catalysis, and photochemistry .

COURSE OBJECTIVES

This course deals with periodic table and its properties, Electro chemistry, catalysis, and photo chemistry.

UNITS

UNIT –I PERIODIC TABLE AND ATOMIC PROPERTIES (9HRS.)

Long from periodic table – Cause of periodicity – Division of Elements into s,p,d,&blocks – Atomic Properties – Size of atoms and ions – Covalent radius – Ionic radius – Ionization energy – Electro negativity (Scales and applications exclude).

Self-Study: Atomic PropertiesElectron affinity

UNIT –II ELECTRO CHEMISTRY – I (9HRS.)

Electrical conductance specific conductance molar conductance &Equivalent conductance, determination of conductance conductivity cells, cell constant variation of molar conductance and equivalent conductance with dilution, Kohlrausch's law and its applications, Applications of conductivity measurement – Conductometric titrations – Acid & Bases – Lowry – Brosted concept, Lewis concept, pH – buffer solutions.

Self-Study: Henderson equation

UNIT –III ELECTRO CHEMISTRY – II (9HRS.)

Electochemical cells Galvanic cells, Representation of an electrochemical cell, Elecrode potential, EMF of cell and its Measurment standard cell, Reversible and irreversible cell, Reversible electodes and their types – Metal - metal ion electrode, Gas electrode, Metal – Insoluble metal salt electrodes Oxidation – Reduction Electrodes. Relationship between free energy and electrical energy, Single electode potential – Hydroganelectode, refrence electrode – Hydrogen and calomel electrode, Electro chemical series. pH determination using EMF measurement – Hydrogen electode – Quinehydrone electrode.

Self-Study: Glass electrode

UNIT –IV CATALYSIS (9HRS.)

Catalysis types of catalysts – Promoters, Negative catalysts – Auto Catalysts – General Characteristics of catalytic reactions – Intermediate compound formation Theory Adsorption theory Acid – base catalysts.

Self-Study: Enzyme catalysts

UNIT –V PHOTOCHEMISTRY (9HRS.)

Photo chemistry Introduction, Laws of photochemistry – Lambert's Law, Beer's Law & Stark Einstein's Law of Photo Chemical Equivalence, Quantum yield, Photosenzation, Photo inhibitors, Chemiluminescence's – Fluorescence.

Self-Study: Phosphorescence.

REFERENCES:

TEXT BOOK

1. B.R.Puri, L.R.Sharma&S.Pathania Principles of physical chemistry,.33rdEdn' 1992.

REFERENCE BOOK

2. R.D.Madan, Modern Inorganic Chemistry, S.Chand and company,Reprint' 1994.

COURSE OUTCOMES

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

NO.	COURSE OUTCOMES
CO 1	Understand the periodicity in periodic table
CO 2	Understand the different types of condutances and their relations and the effect of dilution.
CO 3	Use Nernst equation to calculate the electrode potential and emf of electrochemical cells.Study the applications of electrochemical measurements
CO 4	Understand the basics of photochemistry using laws of photochemistry and Jablonsky diagram
CO 5	Derive the rate constants o certain photochemical reactions.

III B.Sc. CHEMISTRY

SEMESTER –V

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UACH	C5CC13	ALDEHYDES AND KETONES, CARBOXYLIC ACIDS AND THEIR DERIVATIVES, STEROISOMERISM, AMINES AND DIAZO COMPOUNDS & CARBOHYDRATES	Lecture	6	5

COURSE DESCRIPTION

This paper deals with comprehensive introduction about Carbonyl compounds, Carboxylic acids and their derivatives, Stereoisomerism, Amines and Diazo compounds & Carbohydrates

COURSE OBJECTIVES :

- To learn the synthesis of aldehydes, ketones, carboxylic acids, Amines and diazonium salts
- To focus on optical, geometrical and atropisomerism of compounds containing carbon
- To distinguish between Aldehydes and Ketones, Primary, secondary and tertiary amines & Monosaccharides and disaccharides.
- To understand and to elucidate the structure of glucose, fructose, sucrose and maltose.

UNITS

Unit I – ALDEHYDES AND KETONES (18hrs)

Structure – nomenclature, physical properties, preparation of aldehydes – oxidation of primary alcohols, oxidation of methylbenzenes, reduction of acid chlorides and from Grignard reagent. Preparation of ketones – oxidation of

secondary alcohols, reaction of acid chlorides with organo copper and Cadmium compounds and Friedel Crafts acylation.

Chemical properties of carbonyl compounds- Reactivity of carbonyl group, Reactions –nucleophilic addition – addition of HCN, addition of derivatives of ammonia, addition of alcohol, Cannizzaro reaction, addition of Grignard reagent, iodoform reaction, oxidation and reduction reactions, Reaction involving carbanions – Aldol condensation, dehydration of aldol products, crossed aldol condensation, Wittig reaction, Mannich reaction, Dieckmann condensation, Benzoin condensation, Perkin & Knovenagel reaction.

Unit II – CARBOXYLIC ACIDS AND THEIR DERIVATIES (18hrs)

(a) Aliphatic Acids

Structure – nomenclature, industrial source, preparation of mono & di - carboxylic acid – oxidation of primary alcohols, oxidation of alkyl benzenes, carbonation of Grignard reagents, hydrolysis of nitriles.

Reactions of mono & di carboxylic acids, Halogen substituted acids and Hydroxy acids – salts formation, acidity of carboxylic acids, effect of substituents on acidity, HVZ – reaction, Ascending and descending in carboxylic acid series.

(b) Substituted Aromatic Acids

Preparation and properties of Salicylic acid, Phthalic acid, Sulphanilic acid, Saccharin, choramine - T and dichloramine – T.

(c) Functional Derivatives of Carboxylic Acids

Nomenclature – nucleophilic acyl substitution – role of carbonyl group – nucleophilic substitution alkyl Vs acyl. Preparation and reactions of acid anhydrides, amides and acid chlorides. Reaction of esters – alkaline hydrolysis and acid hydrolysis, ammonolysis of esters, trans esterification, reduction of esters, Claisen condensation and crossed Claisen condensation,

(d) Reactive methylene compounds –

Preparation and synthetic applications of ethyl acetoacetate and diethyl malonate.

Unit III – STEROISOMERISM (18 Hrs)

Introduction, Configurational isomerism, concept of chirality, enantiomerism and diasteroisomerism, Fischer projection, Optical isomerism – optical activity, symmetry elements and optical isomerism in lactic acid, malic acid and tartaric acid, Relative (D- and L – configuration) and absolute configuration (R and S configuration), Specification of configuration, Resolution, Racemisation, Walden inversion and Asymmetric synthesis. Optical isomerism in allenes, spiranes and biphenyls. Optical activity of compounds other than Carbon Nitrogen and Sulphur compounds.

Geometrical isomerism -Distinction between Cis-Trans isomers- maleic and fumaric acid, aldoxime and ketoxime, Beckmann rearrangement, E, Z – Nomenclature.

Unit IV - AMINES AND DIAZO COMPOUNDS (18 Hrs)

(a). Amines

Aliphatic Amines: Classification, Basic nature, preparation of Primary, secondary and tertiary aliphatic amines, Separation of amine mixture – Hofmann's method and Hinsberg method, Physical properties, Chemical properties of amines – Basicity, Reaction with alkyl halides, acid chlorides,nitrous acid,carbon disulphide (Hofmann's mustard oil test), Carbylamine reaction, Quaternary ammonium compounds, Mechanism and stereochemistry of Hofmann elimination, Phase transfer catalyst, Distinction between Primary, secondary and tertiary amines.

Aromatic amine: Preparation, properties and uses of aniline

(b) Diazo Compounds

Preparation and Chemical properties of Diazomethane and Benzene diazonium salts.

Unit V – CARBOHYDRATES (18 Hrs)

Introduction and classification, Reducing and non-reducing sugars, Monosaccharides - Structural elucidation of Glucose and Fructose, Mutarotation, Epimerization, Osazone formation. Interconversion of glucose and fructose, Ascending the series of aldoses- Killiani-Fischer synthesis and descending the series of aldoses- Ruff degradation and Wohl's degradation. Disaccharides –

Structural elucidation of Sucrose and Maltose. Polysaccharides – Introduction to Starch and Cellulose (Structural elucidation not required), Preparation and uses of Cellulose nitrate, cellulose acetate and rayons.

Text Book:

Bhupinder Mehta and Manju Mehta, Organic Chemistry , PHI Learning Private Limited, 2010.

Reference:

1. For units I and II : R.T.Morrison & R.N.Boyd, Organic chemistry, PHI Learning Private Limited,6th Edition' 2005.
2. For unit III : i) P. S. Kalsi, Stereochemistry of carbon compounds, New Age International Publishers, 3rd Edition'1995.

   ii) P.Ramesh, Basic principles of Organic Stereochemistry, Meenu Publications. First Edition' 2010,
3. For units IV &V : I.L. Finar, Organic chemistry, Volume – I, ELBS & Longmann group Ltd, 60th Edition'1973

III B.Sc. CHEMISTRY

SEMESTER –V

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UACH	C5CC14	THERMODYNAMICS, PHASE RULE & GROUP THEORY	Lecture	6	4

COURSE DESCRIPTION

Objective: This course provides an elaborate study of the thermodynamics, Phase Rule and Group theory.

COURSE OBJECTIVES

- To understand the chemical and physical systems in thermodynamic sense
- To predict the feasibility of chemical reactions applying II law of thermodynamics
- To explain the absolute entropy of substances and to calculate it
- To interpret the phase diagrams of one and two component systems.
- To classify the molecules into different point groups
- To construct the character table for simple molecules like water and ammonia
- To study the applications of group theory in deducing the selection rules for IR and Raman spectroscopy

UNITS

UNIT – I – THERMODYNAMICS – I: (18 Hrs)

Definition and importance, energy and its units. Mechanical work and heat and its relation, Thermodynamic systems and their characteristics, state of a system, state function and its characteristics- thermodynamic function, thermodynamic processes, thermodynamic equilibrium, first law – statement, different forms, mathematical formulation – work of expansion at constant pressure.

Heat of reaction at constant volume E and constant pressure. H – Relation between H and E and their inter conversion. Heat capacities at constant volume, Cv.and at constant pressure, Cp. Relation between Cp and Cv - Application of first law to ideal gas and real gas obeying van-der waals equation of state - work done, heat absorbed and change in E during adiabatic and isothermal changes. Joule

Thomson expansion coefficient, inversion temperature and its significance, Equipartition energy.Thermodynamic equilibrium of state.

Thermo chemistry – Definitions and enthalpies of reaction, their determination and application, variation of enthalpies with temperature - Kirchoff equation.

Laws of thermo chemistry – (i) Lavoisier and Laplaces law (ii) Hess's law of constant heat summation – statement- thermodynamic derivation and application (iii) Law of Thermo – neutrality of solutions.

Bond Energies – definitions, calculation from thermo chemistry and applications
.

UNIT –II THERMODYNAMICS – II: (18 Hrs)

II Law of thermodynamics – importance, different ways of stating the II law and its significance.

Conversion of heat into work – Carnot's Theorem and cycle, Thermodynamic efficiency.Efficiency and thermodynamic scale of temperature.

Entropy – definition – dependence of entropy on variables of the system – entropy changes in ideal gases and mixing of gases, physical transformations in chemical reactions and in irreversible processes, Entropy and probability – physical significance.

Free energy functions:

(i) Helmoltz free energy (A) – definition and temperature dependence.

(ii) Gibbs free energy (G) - definition and temperature dependence, properties and significance. Relation between free and total energies – Gibbs Helmholtz equation and applications.Maxwell equation, derivation of state from Maxwell relation.

(iii) Partial molar quantities and chemical Potential, Physical equilibria involving pure substances.

(iv) Clapeyron equation – derivation and general form – applications to various physical equilibriaviz, melting, vapourisation, sublimation and transition.

(v) Clausius – Clapeyron equation – derivation and its applications.

UNIT III APPLICATIONS AND III LAW OF THERMODYNAMICS (18 Hrs)

Applications of thermodynamics to various types of equilibria – equilibrium constant and free energy changes. Reaction isotherm and Van't Hoff isochore – Thermodynamic interpretation of the law of mass action and Le Chatlier's principle -derivation.

Nernst heat theorem and its applications,

III law of thermodynamics. A simple treatment of the law, temperature dependence of the heat capacity and its use in the determination of absolute entropy, comparison between statistical(exception to III law) and III law entropy, Zeroth law of thermodynamics and its significance.

UNIT –IV GROUP THEORY (18 Hrs)

Introduction- symmetry elements and symmetry operations-groups-definitions and rules of a group-group multiplication table-classes, similarity transformation-point group classification.

Matrix representation of symmetry operations, rotation, reflection, reducible and irreducible representation- decomposition of reducible representations- other properties-notation-some theorems-projection operators- general theorems of representation theory problems.

Construction of character table $C_{2V,}$ $C_{3V,}$ - Direct product representation.- Chemical application of Group theory- normal mode analysis- selection rule for IR & Raman spectroscopy.

SELF STUDY: To predict the point groups of Naphthalene, ethylene and cis and trans dichloroethylene

UNIT V -PHASE RULE (18Hrs)

Definition of the terms- phase, component and degrees of freedom, Types of equilibrium and derivation of phase rule.

One component system – (e.g.) water system, Sulphur system, CO_2system, Effect of temperature and pressure on these systems

Two component system- (solid-liquid equilibrium):
Simple eutectic - (e.g.) Lead-Silver system.
Compound formation – General description
.
Solid-solid equilibrium: Salt hydrate- water system, incongruent melting point, Potassium iodide-water system, Ferric chloride – Water system, Sodium-Potassium system, Copper Sulphate – Water system. Transition temperature and its determination.
SELF STUDY: Zinc – Magnesium system

REFERENCES: .

Text Book:

Unit I - III –Puri, Sharma &Pathania.- Physical chemistry by 3rdEdn, Vishal publishing Company.

Unit IV 1. V. Ramakrishnan& M.S. Gopinathan -Group theory -Vishal publishing House, 2ndEdn, 1991.

2. Barrow -Spectroscopy , Tata Mc-Graw Hall, 5thEdn, 1992.P.No. 104 & 105

III B.Sc CHEMISTRY

SEMESTER V

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UACH	C5CC15	INORGANIC CHEMISTRY PRACTICALS	PRACTICALS	5	2

COURSE OBJECTIVE: This paper deals with the preparation of some inorganic complexes and gravimetric estimation of metal ions

List of preparations and estimations

- Estimation of Lead as lead chromate.
- Estimation of chloride as silver chloride.
- Estimation of barium as barium chromate.
- Estimation of barium as barium sulphate.

Inorganic Complex preparations:

- Thiourea complex
- Tetrammine Cu complex
- Ferrous oxalate

References:

Venkatesan, Kulandhaivelu, “Practical chemistry”, 2002.

III B.Sc Chemistry
SEMESTER VI

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UACH	C5CC16	GREEN CHEMISTRY PRACTICALS-III	PRACTICALS	3	2

Objective: This paper includes the greener methods of preparation of Organic compounds and nano particles
After the completion of the course the students are able to

i) Greener methods of preparation of organic compounds

1. Preparation of bis-naphthol in solvent free conditions
2. Preparation of Aryl nitro compounds via micro wave irradiation
3. Preparation of imines using clay.(?)
4. Preparation of Pyrazolone derivatives using micro wave irradiation
5. Preparation of Adducts (Diels Alder)

ii) Greener methods of preparation of Nanomaterials (Demonstration)

1. Preparationof Silver nanoparticles from Silver nitrate
2. Preparation of Zinc oxide from Zinc acetate
3. Prepration of Titanium dioxide from Titanium chloride
4. Prepration of Cobalt from Cobalt nitrate
5. Prepration of Copper from Copper sulphate

III B.Sc. CHEMISTRY

SEMESTER –V

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UACH	C5ME1	SPECTROSCOPY	Lecture	5	5

COURSE DESCRIPTION

This course will focus on interpretation of spectra and application of these tools to address questions of structures.

COURSE OBJECTIVES

In this course the students are exposed to various spectroscopic techniques that are used in structural elucidation. This paper will be of much use of the students to take up higher studies.

UNITS

UNIT –I UV-VISIBLE SPECTROSCOPY (15HRS.)

Introduction, Absorption laws – instrumentation. Types of electronic transitions Absorption and intensity shifts – solvents effects.λmax calculation using Woodward rules for dienes (Open chain and alicyclic) and unsaturated carbonyl compounds.

Self Study: Applications of UV spectroscopy.

UNIT –II FT-IR SPECTROSCOPY (15HRS.)

Introduction, molecular vibrations vibrational frequency – Number of fundamental vibrations – Factors influencing vibrational frequencies – Instrumentation – Sampling technique Finger print region – skeletal and group vibrations.

Self Study: Applications of FT-IR spectroscopy.

UNIT –III ^{1}H-NMR SPECTROSCOPY (15HRS.)

Introduction, principle, Number of signals, position of signals(chemical shift) – shielding and deshielding effects. Factors influencing chemical shift. Instrumentation, Solvents used -peak area – splitting of the signals. Coupling constant (J) geminal Vicinal (cis&trans) and aromatic coupling (J- ortho, J- meta & J-para).

Self Study: Applications of ^{1}H-NMR spectroscopy.

UNIT –IV ^{13}C AND ESR SPECTROSCOPY (15HRS.)

Natural abundance of ^{13}C – Resolution, multiplicity – H_1 decoupling – Noise decoupling. NOE Signal enhancement -broad bands – off resonance – proton decoupling. Chemical shifts for ^{13}C in various kind of carbon. (sp^3,sp^2, sp, hybridized carbon and carbonyl carbon) comparison of ^{13}C NMR &PMR (elementary level).

Introduction, Hyperfine splitting in Hydrogen atom, CH_3 free radicals, Benzene anion radical, bis salicylaldimine Copper(II)Complex.

Self Study: Zero field splitting & Kramers's degeneracy.

UNIT –V MASS SPECTROSCOPY (15HRS.)

Basic principles, Instrumentation, Determination of molecular formula using nitrogen rule – Molecular ion peal – base peak (M+1), (M+2) peaks metastable peaks. General fragmentation modes, simple cleavage – Retro Diels Alder reaction. Hydrogen transfer rearrangements – McLafferty rearrangement, problems.

Self Study: Applications in Mass spectroscopy.

REFERENCES:

1. Y.R. Sharma, Organic Spectroscopy, Fourth revised and enlarged Edn., 2007, S. Chand & Co.
2. Puri, Sharma & Pathania, Principles of Physical Chemistry, 3rd Edn., Vishal publishing Company.
3. P. S. Kalsi, Stereochemistry of carbon compounds, 3rd Edn., New Age International Publishers, 1995.
4. R. S. Drago, *PhysicaI Methods in Chemistry*; Saunders: Philadelphia, 1977.
5. C. N. Banwell and E. M. Mc Cash, *Fundamentals of Molecular Spectroscopy*, 4th Edn., Tata Mc Graw Hill, New Delhi, 2000.

III B.Sc. CHEMISTRY

SEMESTER –V

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UACH	C5SB3	Medicinal chemistry	UG Core	2	2

COURSE DESCRIPTION

This paper focuses on all the important aspects of drugs, mechanism of drugs and also highlights the causes of common diseases, role of Indian medicinal plants and the importance of hormones.

COURSE OBJECTIVES

This course gives an introduction to the types of drugs and metabolism in the body. It also highlights the causes of common diseases, role of Indian medicinal plants and the importance of hormones.

UNITS

UNIT –I DRUGS (6 HRS.)

Drugs – Introduction – source, study, classification – Biological, Chemical and by Lay Public, Nomenclature of Drugs – IUPAC system, Heterocyclic systems and stereochemical system.

UNIT –II MECHANISM OF DRUGACTION (6 HRS.)

Mechanism of Drug action and metabolism of Drugs, Absorption of Drugs and Assay of Drugs.

UNIT –III COMMON DISEASES (6 HRS.)

Causes of common Diseases – Classification of diseases and their treatment.

UNIT –IV INDIAN MEDICINAL PLANTS (6 HRS.)

Indian Medicinal plants – tulsi, aloevera, basil, gotu kola, neem and their medicinal properties.

UNIT –V HORMONES (6 HRS.)

Definition, Classification, Hormones with special reference to Testosterone, Progesterone and Thyroxine (structural elucidations not necessary).

REFERENCES:

Test Books

1. J. Ghosh, A Textbook of Pharmaceutical Chemistry, New Delhi: S. Chand & Company,
1999.
2. P. Parimoo, A Textbook of Medical Chemistry, New Delhi: CBS Publishers.1995.
3. S. Ramakrishnan, K. G. Prasannan and R. Rajan, Textbook of Medical Biochemistry,
Hyderabad: Orient Longman. 3rd ed, 2001.

Reference Books

1. F. S. K. Barar, Essential of Pharmacotherapeutics, New Delhi: S. Chand & Company, 2000.
2. S. N. Pandeya and J. R. Dimmock, An Introduction to Drug Design, New Delhi: New Age International, 1997.
3. G. Patrick, Medical Chemistry, New Delhi: Viva Books, 2002.
4. Richard B. Silverman. The organic chemistry of drug design and drug action, 2nd ed.,Academic Press, 2004.

III B.Sc. CHEMISTRY

SEMESTER V

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UACH	C5SB4	NANO CHEMISTRY	Lecture	2	2

COURSE OBJECTIVES: This paper deals with study of synthesis, properties, structure and applications of nano particles.

Unit-I: BASICS OF NANOCHEMISTRY (6Hrs)

Basics of nanomaterials: Properties of nanomaterials, quantum confinement effect, surface properties of nanoparticles. Classification of the nano materials – zero dimensional, one dimensional, two dimensional and three dimensional nanostructures.

Unit-II: PROPERTIES OF NANOMATERIALS AND CNTS: (6Hrs)

Mechanical, optical, electronic, magnetic, thermal and chemical properties of nanomaterials.

Carbon nano structures: Introduction – Carbonmolecules – Carbon clusters, Carbon nanotubes – application of Carbon nano tubes.

Unit-III: SYNTHETIC TECHNIQUES (6Hrs)

Chemical methods: sol-gel synthesis, solvothermal synthesis, thermolysis route.

Physical methods: Pulsed laser deposition- Magnetron sputtering.

Unit-IV: APPLICATIONS OF NANOMATERIALS (6Hrs)

Application of nano materials as sensors, catalysts, and nano medicine.

.

Unit-V: Characterization Techniques (6Hrs)

X-ray diffraction(XRD) - Electron microscopes – scanning electron microscopes (SEM) –transmission electron microscopes (TEM) – scanning probe microscopy – atomic force microscopy (AFM) –**basic principles only.**

Text Books:

1. Introduction to nanotechnology – Charles P. Poole Jr, Frank J. Owens.

2. Understanding nanoscience and nanotechnology – T. Pradeep

Reference Books:

1. S.Shanmugam, Nanotechnology, , MJP Publishers, Chennai (2010).
2. Patrick Salomon , A Handbook on Nanochemistry,, Dominant Publishers and Distributers, New Delhi.
3. S. Balaji ,Nanobiotechnology, MJP Publishers, Chennai (2010).
4. CNR RaoThe Chemistry of Nanomaterial: Synthesis, Properties and Applications, Vol.
I and II, Springer (2006).
5. Nanotechnology: Basic Science and Emerging Technologies, Mick Wilson, Kamali
Kannangara, Geoff Smith, Michelle Simmons, BurkhardRaguse, Overseas Press, (2005).

III B.Sc. CHEMISTRY

SEMESTER –VI

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UACH	C6CC17	ORGANIC CHEMISTRY – IV	Lecture	5	4

COURSE DESCRIPTION

This paper includes the topics, Polynuclear Hydrocarbons, Heterocyclic Compounds, Amino Acids and Proteins, Terpenes and Alkaloids.

COURSE OBJECTIVES

In this course the students are exposed to develop efficient, synthetic methods in organic chemistry.And to be familiar with properties and reactions of most important poly nuclear hydrocarbons, heterocycliccompounds, amino acids, peptides, proteins. And gain advanced knowledge and understanding in aspect of alkaloids and terpenes.

UNITS

UNIT I. POLY NUCLEAR HYDROCARBONS (15 Hrs.)

Structure of Naphthalene, aromaticity, preparation-Haworth and Fitting's synthesis. Chemical properties- reduction, oxidation, electrophilic substitution.Derivatives of naphthalene 1- Naphthol and 2- Naphthol – Preparation and chemical properties.1-Naphthylamine and2-Naphthylamine, Preparation-Bucherer reaction, and Chemical properties. Naphthaquinone- Preparation and properties of 1, 2-Naphthaquinone, 1,4- Naphthaquinoneand 2,6-Naphthaquinone, Naphthoic acids.

Structure of Anthracene, aromaticity, preparation- Fridel-Crafts reaction.Chemical properties- Electrophilic substitution, oxidation, reduction and Diels –Alder reaction. Preparation and property of 9,10-Anthraquinone.

Preparation- Pschorr and Haworth synthesis and properties of Phenanthrene. Preparation and property and phenanthraquinone.

Fused polynuclear heterocyclic systems- Quinoline and Isoquinoline- Preparation of quinoline –Skraup's and Friedlander's synthesis, Chemical properties of quinoline- electrophilic, nucleophilic substitution, oxidation, and reductions reactions.Preparation of isoquinoline –Bischler-Napieralski reaction, and chemical properties.

UNIT II. HETEROCYCLIC COMPOUNDS (15 Hrs.)

Introduction,numbering the position in heterocyclic compounds.Five membered heterocyclic compounds of pyrrole, furan, thiophene.Structure and aromaticity,general methods of preparations ofpyrrole, furan, thiophene, Preparation of pyrrole (Knorr-pyrrole, Hanstzchsynthesis),Chemical properties of pyrrole, furan, thiophene- electrophilic substitution,reduction reactions, Kolbes-Schmitt reaction in pyrrole and Diels-Alder reaction of furan.Comparison of reactivity of furan, pyrrole and thiophene.

Six- membered heterocyclic compound – Pyridine- Structure aromaticity and basicity.Preparation andChemical properties of pyridine- electrophilic, nucleophilic substitution and reduction reactions.Indole- preparation- Fischer's indole, Madelung, Reissert synthesis.Electrophilic substitution and reduction reactions.Five membered heterocyclic containing two hetero atoms: Pyrazole

UNIT III. AMINO ACIDS AND PROTEINS (15 Hrs.)

Amino acids – Classification based on chemical structure and on nutrition importance,Stereochemistry of amino acids - methods of preparation- Perkin et al., Gabriel phthalimide, Strecker, Malonicester, The Darapsky, and Erlenmeyer azalctone synthesis. Physical properties - Zwitterions and isoelectric points. Chemical properties- Reactions due to amino groups, Reactions due to carboxylic group and reactions due to both -NH_2 and –COOH groups.

Peptides and their synthesis- Use of protecting group in synthesis of polypeptides, protection of amino group, synthesis of peptide using protected amino and carboxylic acid ends, and Merrifield solid phase polypeptide synthesis. End group Analysis - N- terminal - DNP, Dansyl methods and Edman's degradation. C- terminal- Carboxypeptidase and Kumpfs method. Primary,

Secondary and Tertiary structure of proteins.Colour reactions of proteins and denaturation of proteins – Fibrous & globular proteins.

UNIT IV.TERPENES (15Hrs.)

Introduction, Occurrence classification, Isolation, general properties, isoprene and special isoprene rule. Gem- dialkylerule.Structure,synthesis of Citral, Limonene and Camphor, Zingiberene.

UNIT V. ALKALOIDS (15Hrs.)

Definition, occurrence, extraction and general methods for determining the structure-functional nature of oxygen, Nitrogen, Herzigmayer and Kuhnroth method for estimation of C-methyl group.Degradation of alkaloids- Hofmann exhaustive methylation,Emde's degradation, Von Braun's.Reductive degradation,alkali fusion and oxidation.Structure and synthesis of Coniine, Piperine, Nicotine andQuinine.

Text Books

Unit I ,II andIII

1. I.L.Finar Organic Chemistry Vol II, 5thEdn, ELBS &Longmann group Ltd.
2. I.L FinarOrganic ChemistryVol. I –, 6thEdn., ELBS &Longmann group Ltd.
3. BhupinderMetha and Manjumetha – organic chemistry-Fifth printing Published by Asoke. K.Ghosh

Unit IV

1. GurdeepR.Chatwal Organic chemistry of Natural products Vol.II, 5thEdn, Himalaya publishing housePvt.ltd.

Unit V

1. Gurdeep .R.Chatwal Organic chemistry of Natural products Vol.I, 4thEdn, Himalaya publishing house Pvt.ltd.

III B.Sc. CHEMISTRY
SEMESTER –VI

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UACH	C6CC18	Electro and photochemistry	Lecture	5	4

COURSE DESCRIPTION

This course gives a detailed study of electrochemistry & photochemistry

COURSE OBJECTIVES

UNITS

UNIT –I ELECTROLYTIC CONDUCTANCE (15 HRS.)

a) Electrolytic Conductance –specific and equivalent conductance and their determination – effect of temperature, pressure, concentration, solvents and viscosity on conductance. Effect of dilution on specific and equivalent conductance.

b) Migration of ions – transport number and their determinations – Kohlrausch's law of ionic mobility and their application – absolute velocities of ions and their determination.

c) Theories of electrolytic dissociation – Grotthus theory- Arrhenius theory of electrolytic dissociation – defects of the theory – strong and weak electrolytes - Debye Huckel theory – Onsagar's equation.

d) Application of conductivity measurements – determination of degree of dissociation , solubility of a sparingly soluble salt , degree of hydrolysis&ionic product of water. Conductivity titrations-acid-base and precipitation titrations –.

SELF STUDY: Ohm's law, Faraday's law of electrolysis

UNIT –II IONIC EQUILIBRIUM (15HRS.)

Acids and bases.(Different concepts just mention) – dissociation of weak acids and bases, Dissociation constants of weak acid and base, relative strengths of weak acid and bases -ionic product of water, pH scale, common ion effect-Buffer solutions-mechanism of Buffer action-calculation of pH of Buffer mixtures.

Hydrolysis of salts-salts of strong acid and strong base, weak acid and strong base, strong acid and weak base and weak acid and weak base-Hydrolysis constants, Kh-. Indicators- Theory of acid –base indicators- Solubility product and its applications.

SELF STUDY: Acids and bases.(Different concepts)

UNIT –III ELECTRO CHEMISTRY - I (15HRS)

Galvanic cells and EMF – electrode reactions – electrode potentials and cell reactions – representations of electrodes – sign conventions , electrochemical series– measurements of EMF.

Thermodynamics of the reactions in a galvanic cells – Relation between EMF and ΔG, ΔH, ΔS electrode potentials – different types of electrode potentials – thermodynamics of reversible cells and reversible electrodes – EMF and equilibrium constant – Nernst equation – Standard electrode potential – electrochemical series – EMF of galvanic cells – the cell reactions – concentration cell – activity co-efficient-determination of activity by solubility.

SELF STUDY: redox indicators

UNIT –IV ELECTRO CHEMISTRY - II (15 HRS.)

Application of EMF measurements- determination of pH using quinhydrone and glass electrode - determination of transport number, solubility of sparingly soluble salt, degree of hydrolysis, ionic product of water- acid – base, oxidation – reduction and precipitation titration potentiometrically – free energy and EMF. Determination of the valency of an ion.

Polarisation – over voltage – decomposition potential and deposition potential-storage battery- Lead –acid battery, dry cells and fuel cells – electrochemical principles of corrosion and passivity – polarography –limiting diffusion current.

SELF STUDY: half wave potential

UNIT –V PHOTO CHEMISTRY: (15 HRS.)

Introduction - Laws of photo chemistry – Beer – Lamberts law, Grotthus Draper law and Stark Einstein law, Quantum efficiency and determination, Consequences of light absorption by atoms and molecules (Jablonsky diagram), Comparison between thermal and photochemical reactions.

Kinetics of photochemical reactions:

Gaseous reactions: Hydrogen – Halogen reaction (HCl, HBr and HI). Photolysis of ammonia and formation of $COCl_2$.

Reactions of liquid phase (in solution): Isomeric transformation of maleic to fumaric acid, polymerization of Anthracene.

Photochemical equilibrium – flash photolysis, photosensitization, chemiluminescenceBiological application – Photosynthesis.

Radiation Chemistry – photolysis of water

SELF STUDY: Hazards of radiation.

REFERENCES:

Text Book:

1. The principles of Physical chemistry by Puri, Sharma and Pathania.

Reference Book:

2. Introduction to Electrochemistry By Samuel Glasstone

III B.Sc. CHEMISTRY

SEMESTER –VI

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UACH	C6CC19	PHYSICAL CHEMISTRY PRACTICALS	LECTURE	6	4

COURSE OBJECTIVE:

This paper involves the experimental studies on Rast method, determination of transition temperature, phase diagrams, & electro chemistry.

COURSE OUTCOMES: After completion of the course the students should be able to:

List of experiments

1. Determination of molecular weight by Rast method.
2. Transition temperature.
3. Simple phase diagram.
4. Critical solution temperature.
5. Ester hydrolysis.
6. Heat of solution by solubility method.
7. Determination of coefficient of viscosity.
8. Partition or Distribution coefficient.
9. Conductometric titration.
10. Inversion of sucrose.

Reference Book

B.Viswanathan, P.S. Raghavan, Practical Physical Chemistry, 2005.

III B.Sc. CHEMISTRY

SEMESTER –VI

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UACH	C6ME3	ADVANCED ORGANIC CHEMISTRY (CONFORMATIONAL ANALYSIS, ORGANIC PHOTOCHEMISTRY AND MOLECULAR REARRANGEMENTS)	Lecture	5	5

COURSE DESCRIPTION

The course is offered to expose the advanced topics in the field of organic chemistry.

COURSE OBJECTIVES

This course helps the students to acquire a thorough knowledge of the advanced topics of organic chemistry related to conformational analysis of cyclohexanes, Photochemistry and molecular rearrangements.

UNITS

UNIT –I CONFORMATIONAL ANALYSIS- I (15 HRS.)

Stereoisomerism of ring systems- number and kind of stereoisomers- cyclopropane, cyclobutane, cyclopentane and cyclohexane. Conformations of ethane and n-butane-conformational energy diagram. Conformation of mono substituted cyclohexane-stability and optical activity-conformation of disubstitutedcyclohexanes-stability and optical activity and decalins their stability and optical activity.

UNIT –II CONFORMATIONAL ANALYSIS- II (15 HRS.)

Conformation and physical properties, and conformation and chemical reactivity-S_N1, S_N2, ionic eliminations, rearrangements, NGP, epoxide ring closure and ring opening reactions, addition to cyclohexene derivatives, pyrolysis of acetates, xanthates and amine oxides.

UNIT –III ORGANIC PHOTOCHEMISTRY (15 HRS.)

Organic photochemistry –Photochemical Elimination in carbonyl compounds and nitrites- Norrish type-I & Norrish type-II, Barton reaction. Photochemical reduction, oxidation and cis-trans isomerisation, Intermolecular cycloaddition (2π +2π) & (4π +2π) cycloadditions, supara and antara overlap-FMO approach, and electrocyclic reactions- 4n & 4n+2 systems. Conrotation, disrotation. FMO approach to predict stereochemistry.

UNIT –IV MOLECULAR REARRANGEMENTS-I (15 HRS.)

Rearrangement to electron deficient atom or nucleophilic rearrangements – Mechanism of Pinacol-Pinacolone, Wagner-Meerwin, Hoffman and benzilic acid rearrangement. Rearrangements to electron rich atom or electrophilic rearrangements – Stevens rearrangements. Aromatic rearrangements – Claisen, Benzidine and Fries rearrangement.

UNIT –V MOLECULAR REARRANGEMENTS –II (15 HRS.)

Favorski, Baeyer Villiger, Cope, Curtius and Beckmann rearrangements, Synthetic importance of N – Bromosuccinimide, Osmium tetroxide, Selenium dioxide, PyridiniumChloro Chromite, Lithium Aluminium Hydride and Sodium Boro Hydride.

REFERENCES:

1.Eliel- Stereochemistry of carbon compounds, Tata Mc-Graw Hill Edn, 1995.

2.Dr.P. Ramesh, Basic principles of Organic Stereochemistry, First Edn, Meenu Publications.

3.Morrison & Boyd, -Organic chemistry , 6th Edn, Prentice-hall of India pvt, Ltd, 2005.

4. Jagdamba Singh, Photochemistry and Pericyclic Reactions, New age international publishers, 2009.

5.I.L.Finar, Vol-I, Organic Chemistry, sixth Edn., ELBS & Longmann group Ltd.

6.V.K.Ahluwalia & R.K.Prashar, Organic Reaction Mechanism, First Edn, 2002, Narosa publishing House.

7. K. K. Rohatgi-Mukherjee, fundamentals of photochemistry, New age international publishers, 2006.

III B.Sc CHEMISTRY
SEMESTER VI

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UACH	C6ME5	ADVANCED PHYSICAL CHEMISTRY - (QUANTUM MECHANICS, PHYSICAL SPECTROSCOPY AND MACROMOLECULES	Lecture	5	5

COURSE OBJECTIVES: The course is offered to expose the advanced topics in the field of physical chemistry.

UNIT I : QUANTUM MECHANICS I 15 Hrs.

Operator algebra- Linear operators, commutation of operator. Hamiltonian operators, Expressions for operators- Postulates of quantum mechanics. The Schrödinger time independent wave equation- Eigen values and Eigen functions- significance of wave function ψ - statistical interpretation of ψ&ψ^2. Solutions of Schrödinger equation for simple systems, particle in one-dimensional and three – dimensional box, rigid rotator and hydrogen atom (discussion of results only- problems). Quantum numbers- probability distribution curves.

UNIT II: QUANTUM MECHANICS II 15 Hrs

Application of quantum mechanics to multi electron system – Approximation methods – variation and perturbation methods (elementary idea) – application of variation method to helium atom, symmetric and antisymmetric wave function, Pauli's exclusion principle.

UNIT III. SPECTROSCOPY-I 15 Hrs

Introduction to molecular spectroscopy,

Rotational spectroscopy (micro wave) spectra of diatomic molecules.Relative intensities of rotational spectral lines and application.

Vibrational spectra (IR) spectra of diatomic molecules, Rotational – Vibrational spectra of diatomic molecules, Vibrational spectra of polyatomic molecules.

Raman Spectroscopy – Selection rules, rotation vibration – Raman spectrum, mutual exclusion principle.

UNIT IV: SPECTROSCOPY –II 15 Hrs

(a) Electronic spectroscopy- Introduction- various transitions –Frank Condon principle (b) Nuclear Magnetic Resonance Spectroscop-nmr equation – Larmor frequency- chemical shift- simple problems

(c) Electron Spin Resonance Spectroscopy.- ESR spectrum of of an unpaired electron- Hyperfine structure in ESR spectra- Hydrogen atom,methyl radical,1,4-Benzosemiquinone radical anion, Naphthalene and anthracene negative ion, triphenylmethyl free radical,g factor-Applications..

UNIT V: MACROMOLECULES 15 Hrs

Types of macro molecules, classification of polymers, properties of polymers. Molecular weight of polymers – number average and weight average molecularweight , determination of molecular weight – osmotic pressure method, sedimentation velocity method and viscosity method, kinetics of free radical polymerization.

Text Books:

Units – III, IV and V:Puri, Sharma and Pathania., Principles of physical chemistry ,3rdEdn, Vishal publishing Company.

Units – I and II: A.K. Chandra -Quantum Mechanics, 4thEdn, tataMc-Graw hill, 1994 &B.K.Sen -Quantum Mechanics , Tata Mc-Graw Hill 2nd reprint 1995.

III B.Sc. CHEMISTRY

SEMESTER –VI

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UACH	C6SB5	COMPUTERS IN CHEMISTRY	Lecture	2	2

COURSE DESCRIPTION

The course is offered to expose the software applications in the field of chemistry.

COURSE OBJECTIVES

This course deals with the use of computers in molecular modelling and drug design, the use of internet and its application in data search. It also highlights the programming in C language and its applications.

UNITS

UNIT –I INTRODUCTION TO MOLECULAR MODELLING (6 HRS.)

Structure drawing by Chem Draw - Representation of molecules - Properties calculation – NMR analysis - Molecular mechanics and molecular dynamics – simulations - Docking of simple molecules.

UNIT –II APPLICATION OF MOLECULAR MODELLING (6 HRS.)

Elements of cheminformatics and drug design. Use of crystallographic and NMR data as inputs for computation. 3D data base searching.

UNIT –III INTERNET AND ITS APPLICATION (6 HRS.)

Data base search- chemical data bank, CCDC, PDB - 3D pharmacophore, Structure based drug design-De Nova drug design.

UNIT –IV PROGRAMMING IN C LANGUAGE (6 HRS.)

Introduction, Character set in C, Style of C Language – Identifiers and Key words – Constants, Variables and Data types, Operators in C. Input and Output in C, Control statements in C, Storage classes in C, Functions in C, Arrays and

pointers, Preprocessors in C, The type def statement and Files in C language.

UNIT –V APPLICATIONS OF C LANGUAGE IN CHEMISTRY (6 HRS.)

Writing the Program using the various features of C language – Determination of lattice energy of a crystal using Born-Lande equation, Determination of Normality, Molarity and Molality of solutions, Determination of half life of a radioactive nucleus and Calculation of Binding energy.

REFERENCES:

1. Molecular Modeling -Andrew R. Leach
2. Guide Book in Molecular Modeling in Drug Design- N. Claude Cohen
3. Programming in ANSI C - E. Balagurusamy
4. Computers in Chemistry - K.V. Raman

III B.Sc. CHEMISTRY

SEMESTER –VI

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UACH	C6SB6	GREEN CHEMISTRY	LECTURE	30	2

COURSE DESCRIPTION

This course highlights the need for green chemistry approach which is the need of hour to protect the environment from hazardous chemical pollution.

COURSE OBJECTIVES

- To understand the need for green chemistry and goals of Green Chemistry
- To apply Green Chemistry principles to organic synthesis
- To differentiate between yield and atom economy
- To interpret the concept of Stereo selectivity, Chemo selectivity and Regio selectivity
- To describe the uses of Microwave and ultrasonic radiations to carry our reaction.
- To explain solvent free reactions in green chemistry.
- To apply microwave assisted synthesis in organic reactions.
- To explain use of ionic liquids in organic synthesis.

UNIT IINTRODUCTION (6 HRS.)

Definition for Green Chemistry, Need for Green Chemistry- Goals of Green Chemistry – Obstacles and Advantages of Green chemistry, Progress of Green Chemistry- Twelve principles of Green Chemistry and Examples.

UNIT –IIYIELD AND ATOM ECONOMY (6 HRS.)

Concept of Yield and its calculation, Atom economy – Definition, Calculation of Atom economy in rearrangement, addition, substitution and elimination reactions.

UNIT –IIISELECTIVITY IN GREEN CHEMISTRY(6 HRS.)

Concept of selectivity, Types of selectivity -Chemo-, regio-, enantio- and diastereoselectivities, Reactions using Green solvents - Super critical CO_2-Cleaner technology with CO_2.Ionic liquids-Friedel-crafts reaction, halogenation &Diels- Alder reaction. and water.

UNIT –IVSOLVENT FREE REACTIONS (6 HRS.)

Organic synthesis in solid state-Thermal reactions, rearrangements &photochemical reactions. Mode of supplying energy-microwave and ultrasonic-Advantages of MW techniques.Reactiona like oxidation, reduction &rearrangements.

UNIT –VDESIGNING OF GREEN SYNTHESIS (6 HRS.)

Basic concepts in designing Green synthesis - choice of starting materials, reagents, catalysts-catalytic approach in green chemistry. and solvents with suitable examples

References

1. V.K. Ahluwalia and M.R. Kidwai, *New Trends in Green Chemistry*,Anamalaya Publishers, 2005.
2. P.T. Anastas, and J.K . Warner,:*Green Chemistry - Theory and Practical*, OxfordUniversity Press, 1998.