DHANALAKSHMI SRINIVASAN
COLLEGE OF ARTS AND SCIENCE FOR WOMEN
PERAMBALUR – 621 212
(AUTONOMOUS)
(Affiliated to Bharathidasan University)
(Nationally Reaccredited with "A" Grade by NAAC)
(B.Sc., Chemistry Course Structure under CBCS)
(For the candidate admitted from the academic year 2021-2022 onwards)

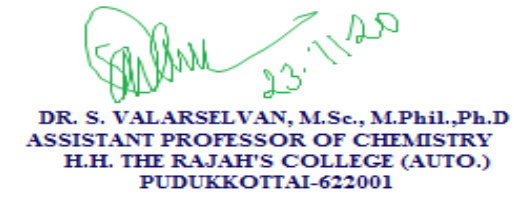
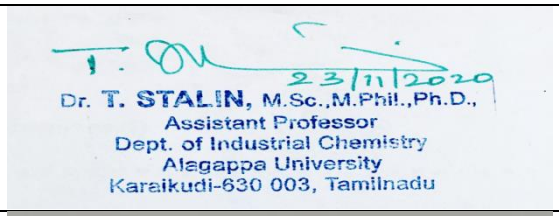
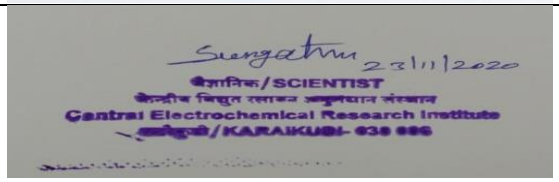
YEAR/SEM	PART	COURSE	COURSE TITLE	COURSE CODE	Inst Periods/Week	Credit	Exam Hours	Marks		Total
								Int	Ext	
I Year & I SEM	I	Language-I	Cheyyul(IkkalaIllakkiyam,) Sirukathai, IllakkiyaVaralaru / Hindi / French / Sanskrit / Arabic	21U1LT1/ 21U1LH1/ 21U1LF1/ 21U1LS1/ 21U1LA1	6	3	3	25	75	100
	II	English Language Course-I	English for Communication -I	21U1EL1	6	3	3	25	75	100
	III	Core Course-I	General Chemistry-I	21UCH1C1	6	5	3	25	75	100
	III	Core Course-II	Volumetric Analysis Practicals	21UCH1C2P	4	4	3	40	60	100
	III	Allied Course-I	Differential and Integral Calculus / Plant Biology-I	21UCH1A1A / 21UCH1A1B	4	3	3	25	75	100
	III	Allied Course-II	Analytical Geometry(3D) and Trigonometry / Plant Biology and Plant Biotechniques Practical	21UCH1A2A / 21UCH1A2BP	2	-	-	-	-	-
	I V	Environmental Studies	Environmental Studies	21U1EVS	2	2	3	25	75	100
TOTAL					**30**	**20**	**-**	**165**	**435**	**600**
I Year & II SEM	I	Language-II	Cheyyul(IdaikalaIllakkiyam), Puthinam / Hindi/ French / Sanskrit / Arabic	21U2LT2/ 21U2LH2/ 21U2LF2/ 21U2LS2/ 21U2LA2	6	3	3	25	75	100
	II	English Language Course-II	English for Communication -II	21U2EL2	6	3	3	25	75	100
	III	Core Course-III	General Chemistry-II	21UCH2C3	6	5	3	25	75	100
	III	Core Course-IV	Industrial Chemistry Practicals	21UCH2C4P	4	4	3	40	60	100

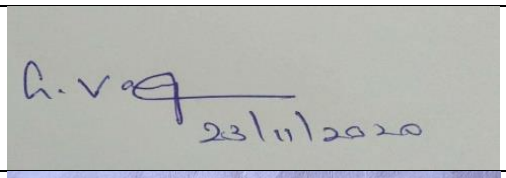
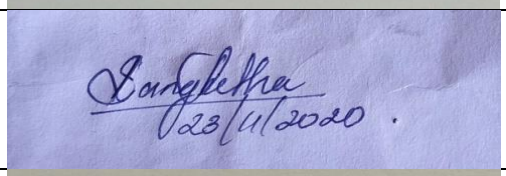
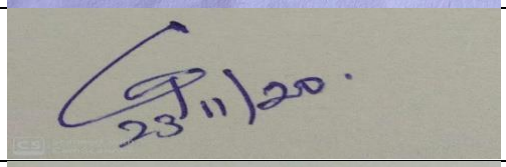
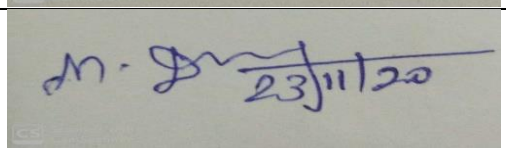
	III	Allied Course-II	Analytical Geometry (3D) and Trigonometry / Plant Biology and Plant Biotechniques Practical	21UCH1A2A/ 21UCH1A2BP	2	3	3	25 / 40	75 / 60	100
	III	Allied Course-III	Differential Equations , Laplace Transform and Vector Calculus / Plant Biology-II	21UCH2A3A / 21UCH2A3B	4	3	3	25	75	100
	IV	Value Education	Value Education	21U2VED	2	2	3	25	75	100
TOTAL					**30**	**23**	**-**	**190 /205**	**510 /495**	**700**
II Year / III SEM	I	Language III	Cheyyul (Kappiyangal), Urainadai / Hindi/ French / Sanskrit/ Arabic	21U3LT3/ 21U3LH3/ 21U3LF3/ 21U3LS3/ 21U3LA3	6	3	3	25	75	100
	II	English Language Course- III	English Through Literature	21U3EL3	6	3	3	25	75	100
	III	Core Course-V	General Chemistry-III	21UCH3C5	6	6	3	25	75	100
	III	Core Course- VI	Semi Micro Analysis Practicals	21UCH3C6P	4	4	3	40	60	100
	III	Allied Course- IV	General Physics-I	21UCH3A4	3	3	3	25	75	100
	III	Allied Course-V	General Physics Practical -I	21UCH3A5P	3	-	-	-	-	-
	I V	Non Major Elective -I	A)Chemistry in Everyday Life	21UCH3N1A	2	2	3	25	75	100
			B)Agricultural Chemistry	21UCH3N1B						
			C)Health Chemistry	21UCH3N1C						
TOTAL					**30**	**21**	**-**	**165**	**435**	**600**
II Year & IV Sem	I	Language- IV	PalantamilCheyulumNadakamum / Hindi / French /Arabic / Sanskrit	21U4LT4/ 21U4LH4/ 21U4LF4/ 21U4LS4/ 21U4LA4	6	3	3	25	75	100
	II	English Language Course- IV	English for Competitive Examination	21U4EL4	6	3	3	25	75	100
	III	Core Course-VII	General Chemistry-IV	21UCH4C7	6	5	3	25	75	100
	III	Core Course-VIII	Physical Chemistry Practicals	21UCH4C8P	4	4	3	40	60	100
	III	Allied Course-V	General Physics Practical –I	21UCH3A5P	3	3	3	40	60	100
	III	Allied Course -VI	General Physics-II	21UCH4A6	3	3	3	25	75	100
	I	Non Major	A) Food and Nutrition	21UCH4N1A	2	2	3	25	75	100

	V	Elective -II	B) Nanoscience and its Applications	21UCH4N1B						
			C)Chemistry for Life Science	21UCH4N1C						
TOTAL					**30**	**23**	**-**	**205**	**495**	**700**
III Year & V Sem	III	Core Course-IX	Inorganic Chemistry-I	21UCH5C9	5	5	3	25	75	100
	III	Core Course-X	Organic Chemistry-I	21UCH5C10	5	5	3	25	75	100
	III	Core Course-XI	Physical Chemistry-I	21UCH5C11	5	5	3	25	75	100
	III	Core Course -XII	Organic Qualitative Analysis Practicals	21UCH5C12P	5	4	3	40	60	100
	III	Major Based Elective -I	A)Analytical Chemistry	21UCH5M1A	4	4	3	25	75	100
			B)Material &NanoChemistry	21UCH5M1B						
			C)Importance of Bioinorganic Chemistry	21UCH5M1C						
	I V	Skill Based Elective-I	A)Fundamental Aspects of Electro analytical Techniques	21UCH5S1A	2	2	3	25	75	100
			B) Water Quality Analysis	21UCH5S1B						
			C) Medicinal Chemistry	21UCH5S1C						
	I V	Skill Based Elective-II	A)Clinical Chemistry	21UCH5S2A	2	2	3	25	75	100
			B)Chemistry of Natural Products	21UCH5S2B						
			C) Dyeing Techniques and Water Treatments	21UCH5S2C						
	I V	Soft Skills Development	Soft Skills Development	21U5SS	2	2	3	25	75	100
TOTAL					**30**	**29**	-	215	585	**800**
III Year & VI Sem	III	Core Course-XIII	Organic Chemistry-II	21UCH6C13	6	5	3	25	75	100
	III	Core Course -XIV	Physical Chemistry-II	21UCH6C14	6	5	3	25	75	100
	III	Core Course-XV	Gravimetric Analysis Practicals	21UCH6C15P	6	4	3	40	60	100
	III	Major Based Elective- II	A)Nuclear and Industrial Chemistry	21UCH6M2A	6	4	3	25	75	100
			B)Organometallic Chemistry	21UCH6M2B						
			C)Essential Molecules for Life	21UCH6M2C						
	III	Major Based Elective -III	A) Polymer Chemistry	21UCH6M3A	5	4	3	25	75	100
			B)Pharmaceutical Chemistry	21UCH6M3B						

			C)Photochemistry and Radiation Chemistry	21UCH6M3C						
	I V	Gender Studies	Gender Studies	21U6GS	1	1	3	25	75	100
	V	Extension Activity	Extension Activity	-	-	1	-	-	-	-
Total					**30**	**24**		165	435	**600**
Grand total					**180**	**140**				**4000**

Board Members

S No	Name	Signature
1	**Dr.VALARSELVAN,** Assistant professor, Dept of chemistry, H.H The rajah's Government College (AUTONOMOUS), Pudhukottai – 622 001.	
2	**Dr, T,STALIN,** Assistant professor Department of industrial chemistry, Alagappa University, Karaikudi.	
3	**Dr. S. VENKATESAN,** Scientist, Electro – inorganic chemical Division, CSIR – CECRI, Karaikudi.	
4	**Mrs. A. ATHEESWARI,** Assistant professor, Department of chemistry Bharathidasan Constitution college, Kurumbalur	
	CHAIRMAN	
5	**Dr. K.PALANISAMI** Head&Assistant professor, Department of chemistry, DSCASW(Autonomous)	
	MEMBER	

6	**Mrs. G. VANAJA**, Assistant professor , Department of chemistry, DSCASW(Autonomous	
7	**Mrs. V.S.SANGEETHA,** Assistant professor Department of chemistry, DSCASW(Autonomous)	
8	**Mrs. C.UMA,** Assistant professor , Department of chemistry, DSCASW(Autonomous)	
9	**Mrs. DEEPA,** Assistant professor, Department of chemistry, DSCASW(Autonomous)	

PROGRAMME OUTCOMES

- ❖ Curriculum enhances the basic concepts, skills in problem solving, critical thinking and analytical reasoning in chemistry.
- ❖ Explore the new area of research with innovative ideas in novel chemistry and other scientific fields.
- ❖ Specific placement in R &D, chemical, pharmaceuticals, food products and life oriented material industries.
- ❖ Crop up all the competitive group examinations.
- ❖ Imbibed behavioural , moral and ethical values in personal life leading to highly cultured and civilized personality.

CORE COURSE-I
GENERAL CHEMISTRY-I

Semester-I **Marks: 75**
Course code: 21UCH1C1 **Credits: 5**
Total periods : 90 **Exam Hours: 3**

OBJECTIVES

- To learn the periodic properties and atomic structure of elements .
- To understand the reaction inter mediates and reaction mechanism of organicreactions.
- To leant about chemistry of alkanesalkenes and alkynes.
- To study about gaseous and liquid states.

UNIT - I: ATOMIC STRUCTURE AND PERIODIC PROPERTIES (18periods)

Atomic orbitals, quantum numbers, shapes of s, p and d orbitals. Aufbau principle, Pauli exclusion principle-Hund's rule-Electronic configuration of atoms-Screening effect-Effective nuclear charge. Calculation of effective nuclear charge using Slater rules. Periodic classification of elements based on electronic configuration. Atomic and ionic radii. Ionization energy, Electron affinity and Electronegativity along the periods and groups. Trends in periodic table.

UNIT- II: STUDY OF S &P BLOCK ELEMENTS (18periods)

S-Block: General characteristics of s-block elements – Comparative study of elements alkali metals and their hydroxides - oxides and halides - Alkaline earth metals and their oxides - carbonates and sulphates. Diagonal relationship of Li & Mg, Be & Al.

P-Block: General characteristics of p-block elements. Comparative study of elements of III A & their compounds. Compounds of boron –boric acid – borax borazole.Chemistry of oxides of carbon – CO, CO_2. Allotropic forms of carbon. Compounds of Nitrogen and Phosphorous NH_2-NH_2 , H_2NOH ,Hydrazoicacid . PH_3 and P_2O_5.

UNIT- III: ELECTRON DISPLACEMENT AND INTERMEDIATES (18periods)

Types of hybridization of carbon. Structures of Methane, Ethane, Ethylene and Acetylene. C-C bond lengths in Ethane - Ethylene and Acetylene. Inductive effect – resonance – hyperconjugation – aromaticity - classification of organic compounds. Types of organic reactions. Types of intermediates like Carbocation - Carbanions ,Carbenes and Nitrene. Factors influencing the stabilities of intermediates.

UNIT - IV: ALKANES, ALKENES AND ALKYNES (18periods)

Alkanes: Nomenclature-Methods of preparations– Physical properties and Chemical reactions of Alkanes and its series. Mechanism of free radical halogenations of Alkanes – reactivity and Regioselectivity.

Alkenes: Nomenclature - petroleum sources of alkenes - General methods of preparation of alkenes-Physical and Chemical properties- Markonikof's rule- Mechanism of Dehydration of alcohols and Dehydrohalogenation of alkyl halides. Saytzeff rule and Hofmann's rule. Hydroboration ,Epoxidation, Ozonolysis , Hydroxylation,Oxidation, Reduction and Polymerization. Uses of Ethylene and Propene. Cumulative, Conjugated and Isolated double bonds .

Alkynes: Nomenclature-Methods of preparations– Physical properties and Chemical reactions of alkynes and its series.

UNIT - V: GASEOUS AND LIQUID STATES (18periods)

Kinetic molecular theory of gases. Deviation of gases laws- Maxwell's distribution of molecular velocities (derivation no need)-Types of molecular velocities – Collision diameter, Mean free path and Collision number- Transport properties- Thermal conductivity, Viscosity and Diffusion- Law of equipartition of energies- Degree of freedom-Real gases- vander Waals equation of states- Derivation- signification of critical constants - Laws of corresponding states-Compressibility factor.

TEXT BOOKS AND REFERENCE BOOKS

1.R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000.

2. P.L. Soni – "Text book of Inorganic Chemistry. S. Chand & Co., New Delhi (1999

3.P.L. Soni – "Text book of organic Chemistry. S. Chand & Co., New Delhi (1999)

4. B.S. Bahl and AmnBahl, Advanced Organic Chemistry, S. Chand & Co. Ltd, New Delhi (1996).

5. B. R. Puri, L. R. Sharma and M. S. Pathania, "Principles of Physical Chemistry", Vishal Publications, Jalandhar, 2002.

6. Glasstone S. and Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co Ltd.

7. J. D. Lee, Concise Inorganic Chemistry, Blackwell Science Ltd., London (2006).

8. Puri, Sharma and Kalia, Principles of Inorganic Chemistry, ShobanLal Nagin Chand & Co, New Delhi (1995).

9. Morrison R.T. and Boyd R.N., Bhattacharjee S. K. Organic Chemistry (7th edition), Pearson India, (2011).
10. M.K. Jain – "Organic Chemistry" – 12th Ed., (2003) Sulthan and Chand Company, New Delhi.
11. K.S. Tewari, N.K. Vishil and S.N. Mehotra. A text book of Organic Chemistry, 1st edition, Vikas Publishing House Pvt Ltd, 2001, New Delhi.
12. 7.D.N.Bajpai, "Advanced Physical Chemistry" S.Chand and Company Ltd., New Delhi.
13. Ira. N. Levine, Physical Chemistry, Mc Graw Hill, (1995).
14. J. N. Gurtu and A. Gurtu, "Advanced Physical Chemistry", PragathiPrakashan, 2007.
15. Maron and Prutton, Principles of Physical Chemistry, Mac. Milan, (1990)

COURSE OUTCOMES

CO	CO Statement	Knowledge level
CO1	Leaner's will be able to draw atomic structure of periodic elements.	KI
CO2	Capacity to write mechanism of organic reaction.`	KI
CO3	Understood chemistry of Alkanes alkenes and alkynes.	KI
CO4	Learners can able to explain theories of gases.	K2
CO5	Capacity to explain structure of organic molecules	K1

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	M
CO2	S	S	M	S	S
CO3	M	S	S	S	S
CO4	S	S	M	S	S
CO5	M	S	S	M	S

S- STRONG M-MEDIUM

CORE COURSE-II

VOLUMETRIC ANALYSIS PRACTICALS

Semester-I **Marks: 60**
Course code: 21UCH1C2P **Credits: 4**
Total periods : 60 **Exam Hours: 3**

OBJECTIVES

- To learn the techniques of titrimetric analyses.
- To know the estimation of several cations and anions

Quantitative Analysis

1. Estimation of Hcl Vs NaOH using a standard oxalic acid solution
2. Estimation of Na_2CO_3 Vs Hcl using a standard Na_2CO_3 solution
3. Estimation of Oxalic acid Vs $KMnO_4$ using a standard oxalic acid solution
4. Estimation of Iron (II) sulphate by $KMnO_4$ using a standard Mohr's salt solution.
5. Estimation of Ca (II) Vs $KMnO_4$ using a standard oxalic acid solution.
6. Estimation of $KMnO_4$ Vs thio using a standard $K_2Cr_2O_7$ solution.
7. Estimation of Fe (III) by using $K_2Cr_2O_7$ using a standard Mohr's salt solution using internal and external indicators.
8. Estimation of copper (II) sulphate by $K_2Cr_2O_7$ solution
9. Estimation of Mg (II) by EDTA solution
10. Estimation of Ca (II) by EDTA solution

Scheme of Valuation Max. Marks

Record - 5 (marks)
Procedure Writing - 10 marks
Results
< 1 % - 45 marks
1-2 % -35 marks
2-3 % -25 marks
3-4 % -15 marks
> 4 % - 10 marks

REFERENCES

1. V. Venkateswaran, R. Veerasamy, A.R. Kulandaivelu, Basic principles of Physical Chemistry Second edition, Sultan Chand & Sons, New Delhi, 1997.
2. Vogel, Text Book of Quantitative Chemical Analysis, 5th edition, ELBS/ Longman England, 1989

COURSE OUTCOMES

CO	CO Statement	Knowledge level
CO1	• Students will be able to do volumetric analysis systematically .	K2
CO2	• Compare the hardness present drinking water.	K2
CO3	• On the successful completion of the course able to handle weighing machine.	K2

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	M
CO2	S	S	M	S	S
CO3	M	S	S	S	S

S- STRONG M-MEDIUM

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CORE COURSE-III
GENERAL CHEMISTRY-II

Semester-II **Marks: 75**
Course code: 21UCH2C3 **Credits: 5**
Total periods : 90 **Exam Hours: 3**

OBJECTIVES

- To understand the chemistry of d &f block elements and metallurgy
- To understand chemistry of benzene , benzenoid compounds, and abotalcohole and phenols
- To know the basics of thermodynamics
- To Learn theory of chemical kinetics and catalysis

UNIT-I: d AND f BLOCK ELEMENTS (18periods)

General characteristics of d-block elements, Comparative study of zinc group elements, Extraction of Mo & Pt - Alloys of Copper, Amalgams and Galvanization. Evidences for the existence of ions Hg_2^{2+} ions.

General characteristics of f-block elements – Lanthanide contraction and its consequences. Extraction of Thorium.

Acid and Bases **:** Bronsted definition, Lewis definition, Lux-Flood definition ,Usanovich's , Bronsted acids and bases. Relative strengths of Bronsted acids and bases- pH of Buffer solution- Henderson's equation. Theory of acid base indicators.

UNIT – II: CHEMISTRY OF BENZENE AND OTHER BENZENOID COMPOUNDS
(18 periods)

General methods of preparation of Benzene – Chemical properties – Uses- Electrophilic substitution mechanism. Orientation and reactivity in substituted benzene Types of Polynuclaear aromatic compounds – Nomenclature – naphthalene form coal tar and petroleum- Laboratory preparation- Structure of naphthalene- Aromatic character- Physical and Chemical properties- Uses- Mechanism of aromatic electrophilic substitution- Theory of orientation and reactivity.

UNIT- III: ALCOHOLS AND PHENOLS (18periods)

Alcohols: Classification and Nomenclature -Monohydric alcohols – Methods of formation by reduction of Aldehydes, Ketones, Carboxylic acids and esters. Hydrogen bonding. Acidic nature. Reactions of alcohols- Dihydric alcohols – Nomenclature, Methods of formation, Chemical reactions of Vicinal Glycols. Glycerol – Manufacture, Properties, Chemical reactions and Uses.

Phenols: Nomenclature, Structure and Bonding. Preparation, Physical and Chemical properties and Acidic character. Comparative acidic strengths of Alcohols and Phenols, Resonance stabilization of Phenoxide ion. Reactions – Electrophilic aromatic substitution.

UNIT- IV :CHEMICAL KINETICS (18periods)

Rate of a chemical reaction - Factors influencing rates of chemical reactions- Rate of reactions- Rate law and the rate constant units of rate constant- Order and Molecularity. Rate equation for zero, first, second and third order reactions. Half life time of a reaction. - Methods for determination of order of reaction- Methods of following kinetics by titrimetric catalysed hydrolysis of ester and iodination of Arrhenius equation- Effect of temperature on reaction rates. Concept of Activation energy - Simple Collision theory.

UNIT – V: THERMODYNAMICS I (18periods)

Definition and terms: System, Surroundings. Types of systems- Intensive and Extensive properties. State and Path functions and their differentials. Thermodynamic process. Concept of heat and work.

First law : Statement, Definition of Internal energy and Enthalpy, Heat capacity, Heat capacities at constant volume and pressure and their relationship. Joule's law, Joule-Thompson coefficient and Inversion temperature. Calculation of w, q, dU&dH for the expansion of Ideal gases under Isothermal and Adiabatic conditions for reversible process.

TEXT BOOKS AND REFERENCES BOOKS

1. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000.
2. Puri, Sharma and Kalia, Principles of Inorganic Chemistry, ShobanLal Nagin Chand & Co, New Delhi (1995).

3. V. K. Ahluwalia "Text book of organic chemistry" Vol-I & Vol-II (2010) Ane's Student edition, New Delhi.
4. B.S.Bahl and AmnBahl, Advanced Organic Chemistry, S.Chand&Co.ltd, New Delhi.(1996).
5. Rajaram and J.C.Kuricose, Thermodynamics for students of Chemistry, ShobanLal Nagin Chand & Co, New Delhi (1986)
6. S.Glasstone, Thermodynamics for Chemists, Affiliated East Press (1974).
7. Puri, Sharma and Kalia, Principles of Inorganic Chemistry, ShobanLal Nagin Chand & Co, New Delhi (1995)
8. Gurdeep Raj, „Advanced Inorganic Chemistry", 20th revised edition, Sultan Chand & Sons, 2000.
9. I.L. Finar, Organic Chemistry, Volume 1, (Sixth Ed.) Longman Scientific and Technical, England (1973)
10. J.March, Advanced Organic Chemistry, John Wiley, (1994)
11. Laidlier, Chemical Kinetics, Tata Mc.Graw Hill (1973)
12. Agarwal, Basic Chemical Kinetics, Tata, Mc Graw Hill, (1990)
13.Puri, Sharma and Pathania,principles of Physical Chemistry, shobanLal Nagin Chand &Co, New Delhi. (1995)

COURSE OUTCOMES

CO	CO Statement	Knowledge level
CO1	Capacity to explain chemistry of d and f block elements and its metallurgy.	K1
CO2	Understood chemistry of benzene , benzenoid compounds, and about alcohol and phenols.	K1
CO3	Understood acidic strength of alcohols and phenols.	K1
CO4	Leaner's can explain the basics of kinetics and catalysis.	K1
CO5	Able to explain laws of thermodynamics	K2

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	S
CO2	S	S	M	S	S
CO3	M	S	S	S	S
CO4	S	S	M	S	M
CO5	M	S	S	M	S

S- STRONG M-MEDIUM

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CORE COURSE-IV
INDUSTRIAL CHEMISTRY PRACTICALS

Semester-IIMarks: 60
Course code: 21UCH2C4P **Credits: 4**
Total periods : 60 **Exam Hours: 3**

OBJECTIVES

*To compare the experimental and standard values of certain commercial substances and followed by checking the purity of some samples.

1. Estimation of total hardness of water using EDTA
2. Determination of Iodine value of oil by Hanus method.
3. Determination of saponification value of an oil
4. Estimation of ascorbic acid (Vitamin - C)
5. Determination of percentage purity of washing soda
6. Estimation of available chlorine in bleaching powder
7. Determination of percentage of calcium in lime stone
8. Determination of acid value of edible oil

Scheme of Valuation Max. Marks

Record - 5 (marks)

Procedure Writing - 10 marks

Results

< 1 % - 45 marks

1-2 % -35 marks

2-3 % -25 marks

3-4 % -15 marks

> 4 % - 10 marks

TEXT AND REFERENCE BOOKS

1. Venkateswaran V. Veerasamy R. KulandaiveluA.R.,Basic principles of PracticalChemistry, 2nd edition, New Delhi, Sultan Chand & sons(1997).

2.2. Vogel, Text Book of Quantitative Chemical Analysis, 5th edition, ELBS/ Longman England, 1989.

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Students will be able to carry out advanced industrial chemistry practical's.	K2
CO2	Learners can able to determine the saponification value .	K2
CO3	Understood the percentage of chlorine in bleaching powder.	K2

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	S
CO2	S	M	S	S	S
CO3	M	S	S	S	M

S- STRONG M-MEDIUM

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CORE COURSE-V
GENERAL CHEMISTRY-III

Semester-IIIMarks: 75
Course code: 21UCH3C5 **Credits: 6**
Total periods : 90 **Exam Hours: 3**

OBJECTIVES

- To learn about Basic concepts regarding atomic structure, bonding concepts, ionic & covalent bond, VB and MO theories
- To understand organometallic compounds and its chemical properties
- To learn about Aldehyde, ketons and carboxylic acids
- To know about solid state and semiconductors.

UNIT - I : IONIC AND COVALENT BONDING (18periods)

Ionic bond – formation, variable electrovalency – Lattice energy - Covalent bond – formation - variable covalency - maximum covalency - covalent character in ionic bond – FajansRule.Valence Bond theory and its limitations – Directional characteristics of covalent bond. Types of hybridization and shapes of simple inorganic molecules.Valance shell electron pair repulsion theory and its applications to simple molecules NH3, BeH_2 ,BCl_3, PF_5, SF_6, IF_7 and H_2O. MO theory and its application to H_2, N_2, O_2 and Calculation of bond order. Unstability of He_2.

UNIT- II : CHEMISTRY OF ORGANOMETALLIC COMPOUNDS (18 periods)

Introduction – preparation of organomagnesium compounds- physical and chemical properties- uses. Organozinc compounds – general preparation, properties and uses. Organolithium, organocopper compounds – preparation, properties and uses.

Organolead, and organoboron compounds– preparation, properties and uses (Two examples from each types)

UNIT - III : ALDEHYDES , KETONES AND ETHERS(18periods)

.

Preparation of ethers: dehydration of alcohols, Williamson's synthesis – silyl ether. epoxides from peracids - sharpless asymmetric epoxidation – reactions of epoxides – uses – introduction to crown ethers – structures – applications Properties and General methods of preparation of epoxides. Nomenclature of aldehydes and ketones. Important methods of preparation of aldehydes and ketones Physical and chemical properties of of formaldehyde - acetaldehyde - benzaldehyde - acetone - acetophenone and benzophenone.

UNIT - IV : CARBOXYLIC ACIDS AND THEIR DERIVATIVES (18periods)

Nomenclature. Relative strengths of acids. Important methods of preparation of carboxylic acids. Comparative study of strength of mono ,di,and tri halo substituted carboxylic acids preparation and reactions of chloroacetic acid. Hydroxyacids: glycollic acid - lactic acid - tartaric acid. Preparation and properties.Preparation - properties and of acetyl chloride and acetic anhydrideUnsaturated acids: Cinnamic acid Introduction to Dicarboxylic acids: oxalic acid - succinic acid and phthalic acid.

UNIT - V : SOLID STATEAND SEMICONDUCTORS (18 periods)

Classification of solids- Isotropic and anisotropic crystals- elements of symmetry- basic seven crystal systems- laws of crystallography- representation of planes- miller indices, space lattice and unit cell - X-ray diffraction- derivation of Bragg's equation- determination of structures of NaCl by Debye Scherrer (powder method) and rotating crystal methods. Defects of crystals Frenkel and Schottkey defects

Types of crystals, close packing of identical solid spheres, interstitial sites, limiting radius ratios (derivation not needed), radius ratio rule and shapes of ionic crystals, structures of NaCl, CsCl and ZnS. Semiconductors- intrinsic and extrinsic semi conductors- n and p-type semiconductors.

TEXT BOOKS AND REFERENCES

1. Inorganic Chemistry, Puri and Sharma, Shobanlal Nagin chand and Co, 1989.
2. Inorganic Chemistry, J.D.Lee, Black w9ell Science ltd, London, 1999
3. Basic inorganic chemistry, 3rd edition, A. Cotton, G. Wilkinson and P.L. Gaus, 2004.
4. Organic Chemistry, I.L. Finar, Vol 1 & 2, Longman Scientific Technical, New york, 19739
5. Organic Chemistry, Morrison &Byod.
6. Bahl, B.S. and Bahl, A., Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (2010).
7. Principles of Physical Chemistry, Puri, Sharma, Pathina, Shobanlal Nagin Chand and Co,198

8.Glasstone S. and Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co Ltd
9. complexes with transition metal-carbon -bonds, Bockmann, Oxford science publications, Oxford, 1996. 2. Organometallics
10. complexes with transition metal-carbon -bonds, Bockmann, Oxford science publications9, Oxford, 1996.

COURSE OUT COMES

CO	**CO Statement**	**Knowledge level**
CO1	Students will be able to understand atomic structure, bonding, VB and MO theories.	K1
CO2	Leaner's can able to write preparations of organometallic compounds .	K2
CO3	Capacity to explain structure and nomenclature of Aldehyde, Ketone .	K2
CO4	Able to understand about solid state and semiconductors.	K1
CO5	Capacity to explain comparative study of carboxylic acids.	K2

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	S
CO2	S	S	S	S	M
CO3	M	S	S	S	S
CO4	S	S	M	S	M
CO5	S	S	S	S	S

S- STRONG M-MEDIUM

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CORE COURSE-VI
SEMIMICRO INORGANIC QUALITATIVE ANALYSIS

Semester-IIIMarks: 60
Course code: 21UCH3C6P **Credits: 4**
Total periods : 60 **Exam Hours: 3**

OBJECTIVES

- To learn the techniques of semi micro qualitative analysis of inorganic salt mixtures.

SEMIMICRO INORGANIC QUALITATIVE ANALYSIS

Analysis of a mixture containing two cations and two anions of which one willbe an interfering acid radical. Semi micro methods using the conventionalscheme with hydrogen sulphide may be adopted.

Cations to be Studied: lead, copper, bismuth, cadmium, iron, aluminium,zinc, manganese, cobalt, nickel, barium, calcium, strontium, magnesium andammonium.

Anions to be studied: Carbonate, , Sulphate, nitrate, chloride, fluoride, borate, oxalate and phosphate.

TEXT AND REFERENCE BOOKS

1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry, 2nd edition, New Delhi, Sultan Chand & sons (1997)

Note:
Internal Marks: 40 External marks : 60

Marks Distribution for external : Practical - 55 marks
Record : 5 marks
Total : 60 marks
4 radicals correct with suitable tests : 50 marks
3 radicals correct with suitable tests ; 40 marks
2 radicals correct with suitable tests: 30 marks
1 radical correct with suitable tests : 15 marks
Spotting : 5 marks

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Students can able to analyse the cations and anions present in the mixture.	K2
CO2	Learners able to distinguish common and rare cations.	K2
CO3	capacity to eliminate interfering acid radicals.	K2

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	S
CO2	S	M	S	S	S
CO3	M	S	S	S	M

S- STRONG M-MEDIUM

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NON MAJOR ELECTIVE I (A)
CHEMISTRY IN EVERY DAY LIFE

Semester-IIIMarks: 75
Course code: 21UCH3N1A **Credits: 2**
Total periods : 30 **Exam Hours: 3**

OBJECTIVES

- To learn the scientific and chemical principles underlying in water chemistry
- To understand the concepts of agricultural chemistry
- To know about the preservation techniques in food industry
- To learn the chemistry of cosmetic and other materials such asdrugs, polymers, fibers and dyes.

UNIT-I : POLYMER CHEMISTRY (6 periods)

Polymers: definition, uses and examples for thermo setting and thermo plastic polymers – Vulcanization of rubber - Fibers: Natural fibers (cellulosic and protenious) –Semi synthetic (Rayon) -Synthetic fibers (Poly ester, Nylon and Acrylic) –Pretreatment of fibers (Sizing, Desizing, Bleaching).

UNIT-II : WATER CHEMISTRY (6 periods)

Water – Characteristics of water - soft water and hard water. Removal of hardness -Purification of water by ion exchange and reverseosmosis methods -Water pollution: Sources and effects of water pollution -Domestic,Industrial, Agricultural -Eutrophication.Source Heavy metals pollutants such as Hg, Cr, Cd, Z, Cu andPb.

UNIT-III :AGRICULTURAL CHEMISTRY (6 periods)

Plant nutrients –Requisites of good fertilizers - Effect of Nitrogen on plant growth - deficiency symptoms - examples for nitrogenous fertilizers: - Effectof Phosphorous and potassium on plant growth - deficiency symptoms – -examples forphosphorous and potassium fertilizers.Difference between fertilizer and manure . Biofertilizers: Rhizobium - Azatobacter - Cyano bacteria - Pesticides: safety measures while using pesticides. Fungicides – Herbicides- Acaricides- Rodenticides –epellents - Fumigants – Defoliants (Definitions and Examples).

UNIT-IV : FOOD CHEMISTRY (6 periods)

Introduction to food chemistry preservation techniques – canning – dehydration - freeze–drying – salting- pickling –pasteurizing - fermenting and carbonating.Biological functions of Ca, P,Fe, Cu, I and Zn. Food additives – colouring -Natural and synthetic colours -List ofpermitted colours - Cur cumin - Riboflavin -Beta-carotene - Plain Caramel and amaranth - description and uses.Flavouring agents – Anti oxidants – Emulsifiers- Acidulants and beverages.Soft drinks aerated water .

UNIT V : DYES,COSMETIC AND SOAPS (6 periods)

Requirement of a good dye-colour and constitution – theory - chromophore - and auxochrome, classification of dyes based on applications – acid base- direct-mordant, oxidation – ingrain - vat - disperse and azo dyes.hair dye – composition and side effects. Cosmetics – Face powder – constituents- uses - side effects. Nail polish - Tooth powder – composition and manufacture. Cleaning agents: Soaps- types and cleaning action – detergents —chemical definitions of shampoo- washing powder and bleaching powder.

TEXT AND REFERENCES BOOKS

1. K. Kumarasamy, A. Alagappa Moses and M. Vasanthy, “Environmentalstudies”, Bharathidasan University, Thiruchirappalli.
2. Alex Ramani, “Food Chemistry”, MJP publishers (2009), Chennai.
3. Jayashree Gosh, “Text book of Pharmaceutical Chemistry” New Delhi, S.Chand& C ompany Ltd.,(2003).
4. K. BagavathiSundari , “Applied Chemistry” MJP Publishers, (2006)Chennai.
5. A Thankamma Jacob (1979), A Text Book of Applied Chemistry, 1st edition,Mc Millan India Ltd.
6. Hesse P.R, A text book of soil chemical analysis John Murray, New York,1971.
7. Buchel K.H, Chemistry of Pesticides, John Wiley & Sons New York 1983.

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Leaner's can able to understand preparations of synthetic and natural polymers.	K1
CO2	Students will be able to explain concepts of water chemistry.	K2
CO3	Leaner's can distinguish pesticides ,Fungicides & Herbicides.	K2
CO4	Understood concepts of pasteurizing of food materials.	K1
CO5	Capacity to understand theories of dye.	K2

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	M
CO3	M	S	S	S	S
CO4	S	S	M	S	M
CO5	S	S	S	M	S

S- STRONG M-MEDIUM

NON MAJOR ELECTIVE I (B)
AGRICULTURAL CHEMISTRY

Semester-IIIMarks: 75
Course code: 21UCH3N1B **Credits: 2**
Total periods : 30 **Exam Hours: 3**

OBJECTIVES

- To learn about the chemical composition and physical properties of soil

- To understand the types of fertilizers and their mechanism of action
- To know about the different types of chemicals used in pest control.

UNIT – I : SOIL CHEMISTRY(6 periods)

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

UNIT- II : FERTILIZERS AND MANURES(6 periods)

Effect of Nitrogen, potassium and phosphorous on plant growth – commercial method of preparation of urea - triple superphosphate. Complex fertilizers and mixed fertilizers – their manufactureand composition. Secondary nutrients – micronutrients and their functions in plants. Use of fertilizers:urea - DAP- Super phosphate, Gypsum, NPK-mixed fertilizers, Optimal addition of Fertilizers to obtainestimated yield. Bulky organic manures – Farm yard manure – handling and storage, Oil cakes, Blood meal – fishmanures.

UNIT - III : PESTICIDES AND INSECTICIDES(6 periods)

Pesticides – classification of Insecticides - generalmethods of application and toxicity - Safety measures when using pesticides. Insecticides : Plant products – Nicotine - pyrethrin – Inorganic pesticides – borates. Organicpesticides – D.D.T. and BHC .9 Plant derivatives : pyrethrine - Nicotine and rotenone .

UNIT- IV :FUNGICIDES AND HERBICIDES(6 periods)

Fungicides: Inorganic (Bordeaux Mixture) and organic (dithiocarbamate) - Industrial fungicides:creosote fractions. Herbicides and weedicides: Selective and non-selective - 2, 4-Dicholorophenoxyacetic acid and 2 -Tricholorophenoxyaceticacid (structure and function) Intenerated pest management - Sex attractants for insect control - Sustainable agriculture.

UNIT- V: PLANT GROWTH REGULATORS(6 periods)

Indole acetic acid: naphthalene acetic acid: Ethepon (2-chloroethyl phosphoric acid): Alar(succinin acid-2, 2-dimethyhydrzine :) their function.Plant hormones. Gibberlin -Cyclocel - Phosphon- dwarfing compound (2-Chlorethyltrimethylammonium chloride). Defoliants

TEXT AND REFERENCE BOOKS

1. G.T. Austin ,Shreve's Chemical Process Industries-5th edition, Mc-Graw-Hill, 1984
2. B.A. Yagodin,. Agricultural Chemistry- Volumes I & II, Mir Publishers, Moscow, 1976

COURSE OUT COMES

CO	CO Statement	Knowledge level

CO1	Leaner's can able to understand chemical composition of soil.	K1
CO2	Understood the chemistry of fertilizers and their mechanism of action.	K2
CO3	Students can able to understand classification of insecticides.	K2
CO4	Able to understand structure and function of fungicides and herbicides.	K1
CO5	Students can able to understand types of plant growth regulators.	K2

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	M
CO3	M	S	S	S	S
CO4	S	S	M	S	S
CO5	S	S	S	S	S

S- STRONG M-MEDIUM

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NON MAJOR ELECTIVE -I
HEALTH CHEMISTRY

Semester-IIIMarks: 75
Course code: 21UCH3N1C **Credits: 2**
Total periods : 30 **Exam Hours: 3**

OBJECTIVES

- To know the essentials of health and drugs.
- To understand the functions of enzymes, hormones and body fluids
- To learn about common diseases and their treatment .

UNIT- I : HEALTH (6 periods)

Definition: Food, Food Pyramid - Health-Hygiene- mal, under and over nutrition, their causes and remedies, sanitation.

UNIT- II : DRUGS (6 periods)

Drugs - Types of drugs-depressant, anticonvulsant, narcotics, antipyretics, antibiotics, antiseptics, analgesics, muscle relaxants and cardiovascular and vasodepressants, steroids (Only Applications).

UNIT – III : BODY FLUIDS (6 periods)

Blood volume, groups, coagulation, blood pressure, anaemia, blood sugar, haemoglobin. Chemistry of urine.

UNIT – IV : ENZYMES AND HORMONES (6 periods)

Types of enzymes and enzyme action, Characters of hormones action, examples of essential hormones.

UNIT –V : COMMON DISEASES (6 periods)

Common diseases - Jaundice, vomiting, fever, night blindness, ulcer, and diabetes.

TEXT AND REFERENCE BOOKS

1. Alex V Ramani, Food Chemistry, MJP Publishers, Chennai, 2009
2. Deb A C, Fundamentals of Biochemistry, New Central Book Agency, Calcutta, 1994.
3. Satake M and Mido Y, Chemistry for Health Science, Discovery Publishing House, New Delhi, 2003.
4. Jayashree Ghosh, A Text book of Pharmaceutical Chemistry, S. Chand and Co.Ltd, 1999.
5. AshutoshKar, Medicinal Chemistry, Wiley Easterns Limited, New Delhi, 1993.

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Pupil will able to explain essentials of health.	K1
CO2	Learners will able to explain chemistry of drugs.	K2
CO3	Understand chemistry of BP ,HB & Blood sugur.	K2
CO4	Able to explain action of enzyme and hormones.	K1
CO5	Learners will able to find out the reasons for diseases.	K2

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	M	S	S	S	S
CO2	S	S	S	S	M
CO3	M	S	S	S	S

CO4	S	S	M	S	S
CO5	S	S	S	S	S

S- STRONG M-MEDIUM

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CORE COURSE-VII
GENERAL CHEMISTRY-IV

Semester-IVMarks: 75
Course code: 21UCH4C7 **Credits: 5**
Total periods : 90 **Exam Hours: 3**

OBJECTIVES

- To learn about Basic concepts of atomic structure and quantum mechanics.
- To know about nomenclature of coordination compounds compounds and hybridization,
- To understand properties of ideal and real solutions .
- To know about stereochemistry of organic compounds.

UNIT - I : ATOMIC STRUCTURE AND BASIC QUANTUM MECHANICS (18 periods)

Rutherford's and Bohr's model an atom- Bohr's theory and origin of hydrogen spectrum- Sommerfield's extension of Bohr's theory. Electromagnetic radiation- definitions for γ, υ and velocity. - Dualism of light -Particle nature of radiation- black body radiation and Planck‟s quantum theory- photoelectric effect and Compton effect of matter. De Broglie hypothesis and Davisson and Germer experiment- Heisenberg's uncertainty principle. Schrodinger wave equation (Derivation not needed). Physical significance of ψandψ^2

UNIT- II : COORDINATION COMPOUNDS (18 periods)

Introduction – Types of ligands , Unidentate,bidentate , polydentate ligands . Chelating ligand and chelation .IUPAC Nomenclature of coordination compoundsWerner's coordination theory. Sidgwick theory.Complexometric titrations using EDTA. Valance bond theory coordination compounds.Isomerism in coordination compounds: Structural isomerism, hydrate isomerism, coordination isomerism, ionisation isomerism, linkage isomerism, coordination position isomerism. Stereoisomerism: Geometrical isomerism of four and six coordinate complexes, optical isomerism of four and six coordinate complexes,

UNIT - III : STEREOCHEMISTRY OF ORGANIC COMPOUNDS (18 periods)

Asymmetric carbon. Optical activity and optical isomerism. Enantiomers. Fischer projection formula of representing enantiomers. R-S notation. Isomerism in compounds

with two asymmetric carbons. Meso and dl-forms of tartaric acid. Geometrical isomerism about C=C bond. . Geometrical isomerism of fumaric and maleic acids. E – Z notation.Atropisomerism - erythro and threo conventions – stereoselectivity, stereospecificity in organic reactions with examples. Resolution of racemic mixture – Walden Inversion – conformational analysis of ethane and cyclohexane - asymmetric induction.

UNIT- IV : SOLUTIONS (18 periods)

Raoult's law – Henry's law - Ideal and non-ideal solutions. Deviation from Raoult's law and Henry' law - Duhem-Margules equation. Theory of fractional distillation. Azeotropes- HCl – water and ethanol- water system. Dilute solutions- colligative properties, relative lowering of vapour pressure - osmosis - law of osmotic pressure - derivation of elevation of boiling point and depression in freezing point. Determination of molecular masses using colligative properties. - molecular dissociation- degree of dissociation

UNIT -V : COLLOIDAL STATE AND ADSORPTION (18 periods)

Definition of colloids. Classification of colloids.Solid in liquids (sols) . Kinetic , optical and electrical properties. Stability of sols. Protective action. Hardy-Schulze law. Gold number.Liquids in liquids (emulsions) . Types of emulsions. Preparation. Emulsifier. Liquids in solids (gels): classification, preparation and properties. Inhibition. General applications of colloids.Difference between adsorption and absorption. Physical and chemical adsorptions. Adsorption isotherm. Experimental curves. Freundlich adsorption isotherm and its experimental verification. Adsorption indicators.

TEXT AND REFERENCESBOOKS

1 .D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand &Company Ltd., 2000.

2. P.L. Soni, "Text book of Inorganic Chemistry", 20th revised edition, Sultan Chand & Sons, 2000.

3. Inorganic Chemistry, Puri and Sharma, Shabanlal Nagin chand and Co, 1989

4. Advanced organic Chemistry, J. March, John Wiley, 1994.

5. Stereochemistry of carbon compounds, E. C. Eliel, Tata Mc Graw Hill, 1960.

6. Organic Chemistry, Merrison&Byod,

7. Principles of Physical Chemistry, Puri, Sharma, Pathina, , ShobanlalNaginchand and Co, 1989.

8.Glasstone S. and Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co Ltd.

9. Puri B.R., Sharma L.R. and Pathania M.S. (2013) Principles of Physical Chemistry, (35th edition), New Delhi: ShobanLal Nagin Chand and Co

10. P. Atkins and J. Paula, Physical Chemistry, Oxford, New Delhi, 2002

COURSE OUT COMES

CO	CO Statement	Knowledge

		level
CO1	Capacity to describe concepts of atomic structure and quantum mechanics.	K2
CO2	Capacity to design structure of of coordination compounds and hybridization.	K2
CO3	Students will able to explain stereochemistry of organic compounds.	K1
CO4	Understood properties of ideal and real solution.	K1
CO5	Learns to explain adsorption isotherms	K1

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	S	S
CO2	S	S	S	S	M
CO3	M	S	S	M	S
CO4	S	M	S	S	S
CO5	S	S	S	S	S

S- STRONG M-MEDIUM

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CORE COURSE-VIII
PHYSICAL CHEMISTRY PRACTICALS

Semester-IVMarks: 60
Course code: 21UCH4C8P **Credits: 4**
Total periods : 60Exam Hours: 3

OBJECTIVES

- To learn the fundamentals of conductometrictitration.
- To carry outpotentiometric titrations.
- To understand the method of determination of molecular weight, CST, TT and rate constant.

LIST OF EXPERIMENTS:

1. Critical Solution Temperature
2. Effect of impurity on Critical Solution Temperature

3. Transition Temperature
4. Rast Method
5. Phase Diagram (Simple eutectic system)
6. Kinetics of Ester Hydrolysis
7. Partition Co-efficient of iodine between water and carbon tetrachloride.
8.Determination of cell constant
9.Conductometric Acid-Base Titration
10. Potentiometic Redox Titration
MARK DISTRIBUTION :
Internal : 40
Ext. Evaluation :60
Record :5
Procedure Writting with formula :10
Practicals:45

COURSE OUT COMES

CO	**CO Statement**	**Knowledge level**
CO1	Students can able to do conductometric titration, potentiometric titrations.	K2
CO2	Able to determine of molecular weight by Rast method.	K2
CO3	Able to carry out Partition Co-efficient of iodine.	K2

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	S
CO2	S	S	S	S	S
CO3	S	S	S	S	M

S- STRONG M-MEDIUM

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NON MAJOR ELECTIVE -II
FOOD AND NUTRITION

Semester-IVMarks: 75
Course code: 21UCH4N1A **Credits: 2**
Total periods : 30Exam **Hours: 3**

OBJECTIVES

- To learn the importance of food and nutrition.
- To know the chemical composition and importance of balanced diet.
- To learn the food adulterants and identification of them.
- To know about techniques of food preservation **(6 periods)**

UNIT – I : FOOD AND NUTRIENTS (6 periods)

Definition –classification and function – Energy yielding – Body building and protective foods – functions. Types of nutrients – Proteins- Carbohydrates – Fats- Minerals and Vitamins – Importance of nutrients.

UNIT – II : MINERALS AND VITAMINS (6 periods)

Dietary sources, functions, Effects of deficiency and requirements of calcium, phosphorous, iron, fluorine, iodine, sodium and potassium. Classification – vitamins – A, D, E, K, B_6, B_{12}, and C –Food sources, physiological functions, effects of deficiency and daily requirements.

UNIT – III : MEAL PLANNING FOR VARIOUS AGE GROUPS (6 periods)

Importance of meal planning –Importance of mother's milk – Diets for school children – adolescents - pregnant and lactating women. Diet during fever – dysentery - anemia - blood pressure - obesity and diabetes.

UNIT – IV : FOOD PRESERVATION (6 periods)

Definition, Principle and importance – Food Spoilage – Causes of food spoilage – Fermentation - rancidity - autolysis and putrefaction – food poisoning. Methods of food Preservation: Freezing - canning - pickling - salting - smoking - bottling - sterilization – refrigeration - dehydration - heating - radiation and preservative agents.

UNIT – V : FOOD ADULTERATION (6 periods)

Definition – Common adulteration in food and their ill effects – Intentional and incidental adulterants – Packing hazards.Practical rules for good sanitation of food**:** food laws and standards – Bureau of Indian standards – AGMARK – Consumer Protection act.

TEXT AND REFERENCE BOOKS

1. Dr.M. Swaminathan –"Handbook of food and Nutrition" 5th edition (2007), Bangalore printing and publishing Co Ltd., Bangalore.

2. B. Srilaksmi – "Food Science" – 3rd edition, (2005) New Age international (P) Ltd. – New Delhi.
3. JayashreeGhose – "Fundamental concepts of applied chemistry" – 1st edition (2006) S. Chand and Company (P) Ltd. –New Delhi.
4. Morris B. Jacobs – "The chemical analysis of foods and food Products" – 3rd Ed.,(1993), CBS Publishers and Distributors, New Delhi.
5. K. BagavathiSundari – " Applied Chemistry " - MJP publishers, Chennai, 1st Edition 2006.
6. M.Raheena Begum, A text book of Foods,Nutrition& Dietetics, Sterling publishers, Delhi,2010.

COURSE OUT COMES

CO	**CO Statement**	**Knowledge level**
CO1	Puplis understand basic concept about minerals and vitamins.	K1
CO2	understand the biological functions vitamins.	K2
CO3	Students can able to understand Diets for school children adolescents.	K2
CO4	Learners can able to explain food preservation techniques.	K2
CO5	Students can identifythe food adulterants.	K2

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Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	S	S
CO2	S	S	S	S	M
CO3	M	S	S	M	S
CO4	S	M	S	S	S
CO5	S	S	S	S	S

S- STRONG M-MEDIUM

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NON MAJOR ELECTIVE -II
NANO SCIENCE AND ITS APPLICATION

Semester-IV **Marks: 75**
Course code: 21UCH4N1BCredits: 2
Total periods : 30Exam Hours: 3

OBJECTIVES

- To introduce some of the fundamentals and current state-of-the-art in nanotechnology
- To get familiarized with the synthesis, characterization and applications of nanomaterials.

UNIT -I : INTRODUCTION TO NANOSCIENCE (6 periods)

Definition of terms-nanoscale - nanomaterials - nanoscience - nanotechnology-scale of materialsnaturaland manmade-nanoscience practiced during ancient and modern periods contributors to thefield of nanoscience.

UNIT - II : SYNTHESIS OF NANOMATERIALS (6 periods)

Top down and bottom up approaches-synthesis of carbon nanotubes - quantum dots - gold and silvernanoparticles.

UNIT- III : CHARACTERIZATION OF NANOMATERIALS (6 periods)

Electron microscopy techniques-scanning electron microscopy, transmission electron microscopy,atomic force microscopy.

UNIT- IV : APPLICATION OF NANOMATERIALS (6 periods)

Solar cells-smart materials-molecular electronics-biosensors-drug delivery and therapydetectionof cancerous cells.

UNIT - V :NANOTECHNOLOGY IN NATURE (6 periods)

The science behind the nanotechnology in lotus effect-self cleaning property of lotus -gecko footclimbingability of geckos-water strider-antiwetting property of water striders-spider silkmechanicalproperties of the spider silk.

TEXT BOOKS AND REFERENCE BOOKS

1. T.Pradeep, Nano: The Essentials: Understanding Nanoscience and Nanotechnology, McGraw-Hill Professional Publishing, 2008.
2. J.Dutta, H.F. Tibbals and G.L. Hornyak, Introduction to Nanoscience, CRC press, BocaRaton, 2008.

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Learners get the capacity to explain techniques of nano science and nanotechnology.	K1

CO2	Students will be able to describe the synthesis of nanomaterials.	K2
CO3	Understand charactersation of nano materials.	K2
CO4	Capacity to understand nanomaterials applications.	K2
CO5	Understand different filed of nanotechnology.	K2

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	M
CO3	S	S	M	M	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- STRONG M-MEDIUM

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NON MAJOR ELECTIVE -II
CHEMISTRY FOR LIFE SCIENCES

Semester-IV **Marks: 75**
Course code: 21UCH4N1C **Credits: 2**
Total periods : 30 **Exam Hours: 3**

OBJECTIVES

- To understand the chemistry of biomolecules
- To know the elementary concepts of chemical analysis
- To learn the principles of analytical techniques like chromatography and colorimetry.

UNIT– I : CHEMISTRY OF BIOMOLECULES (6 periods)

Classification of carbohydrates, glucose & fructose - preparation –properties – mutarotation - manufacture of sucrose - test for sugars.Amino acids – preparation and properties of glycine and alanine, peptides (elementarytreatment) - proteins-classification based on physical properties and biological functions- structureof proteins – primary and secondary –Test for proteins.Coordination compounds: biological role of haemoglobin and chlorophyll

UNIT–II : CHEMISTRY OF WATER (6 periods)

Water as a universal solvent – hardness of water- permanent and temporary hardness,disadvantage of hard water- DO, BOD and COD -definition, determination (any one method).Water Softening methods - zeolite process, reverse osmosisPreparation of Deionised water- Distilled water – Double Distilled water – Packaged drinking water.

UNIT–III :BASICS OF QUANTITATIVE ANALYSIS (6 periods)

Error analysis: accuracy – precision - determinate and indeterminate errors, relative error, absoluteerror. Quantitative analysis: Titrimetry- principle - acid-base titrations and redox titrations with examples End point and equivalence points.Theory of Indicators- Types of indicators - Quinanoid theory

UNIT-IV: ANALYTICAL TECHNIQUES (6 periods)

Chromatography-introduction-principle, sampling and applications of paper, thin layer and columnchromatography.Colorimetry: Beer-Lambert's Law, components of a colorimeter(Block diagram), application(estimation of iron).

UNIT- V :TYPES OF REACTIONS (6 periods)

Types of chemical reactions –substitution - Nucleophilic and electrophilic withmechanism any one example – Addition - Addition of HBr on alkenes – Elimination - Dehalogenation of alkyl halides –Condensation -formation of ester – Polymerisation - Formation of Poly vinyl Chloride – Reductionreaction -Hydrogenation of oil - Oxidation KMnO4 for conversion of benzaldehyde to benzoic acid . Types of intermediates- Electrophiles – nucleophiles – free radicals

TEXT BOOKS AND REFERENCE BOOKS

1. Tiwari K.S., Melhotra S.N., Vishnoi N.K, A Text book of Organic Chemistry, Vikas Publishing House Pvt. Ltd., New Delhi, 2006
2. R. Gopalan, P. S. Subramanian and K. Rengarajan, Elements of Analytical Chemistry, SultanChand and Sons, New Delhi, 1997
3. Puri B.R., Sharma L. R., Kalia K.K, Principles of Inorganic Chemistry-23 rd edition, New Delhi,ShobanLal Nagin Chand & Co, 1993
4. Puri B.R., Sharma L. R., Kalia K.K, Principles of physical Chemistry, 23 rd edition, New Delhi,ShobanLal Nagin Chand & Co, 1993
5. R.T. Morrison &R.N.Boyd, Study Guide to Organic Chemistry, Prentice Hall, New Delhi, 2000
6. R.L. Madan and G.D.Tuli, Inorganic Chemistry, S. Chand Co., Ltd., New Delhi, 2003
7. Gurdeep Raj, Advanced Physical Chemistry, Goel Publishing House, Meerut, 2000

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Capacity to deduce the structure of bimoleculs.	K1
CO2	Ability to understand DO, BOD ,COD.	K2
CO3	Ability to Explain error analysis.	K2
CO4	Capacity to derive Beer Lambert's law.	K2
CO5	Capacity to explain types of intermediates.	K2

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	M
CO3	S	S	M	S	S
CO4	S	S	S	S	S
CO5	S	S	M	S	S

S- STRONG M-MEDIUM

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COURSE-IX
INORGANIC CHEMISTRY- I

Semester-VMarks: 75
Course code: 21UCH5C9 Credits: 5
Total periods : 75Exam Hours: 3

OBJECTIVES

- To know about per acids and inter halogen compounds
- To understand the basic and theories of coordination chemistry
- To study the concepts of Nuclear

UNIT - I :PER ACIDS , INTERHALOGEN COMPOUNDS AND COMPOUNDS OF NITROGEN (15 periods)

Peracids of sulphur - Thionic acids - sodium thiosulphate – preparation – properties- structure and uses. Classification of oxides – acidic - amphoteric - neutral oxides - peroxides and superoxides.Oxyacids of phosphorous- ortho and pyro phosphoric acids, P2O5 .Interhalogen compounds –Pseudohalogens - Oxyacids of halogens- Polyhalides and basic nature of iodine. Preparation -properties and uses of hydrazine - hydrazoic acid - hydroxyl amine and liquid - ammonia.

UNIT II : NUCLEAR CHEMISTRY (15 periods)

Nuclear properties: Nuclear radii, Spin and moments - Nuclear structure: n-p ratio in stable and metastable nuclei, nuclear forces - Nuclear models: liquid drop, shell and collective models- Modes of radioactive decay: α and β decay-Radioactive decay constant. Radioactive equilibrium, Orbital electron capture, nuclear isomerism, internal conversion - Detection and

determination of radioactivity - Cloud chamber. Nuclear emulsion - Bubble chamber - Proportional counter - Geiger - Muller counter - scintillation and Cherankov counters - particle accelerators : linear - cyclotron -synchrotron-betatron and bevatron. Nuclear reactors in India.

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UNIT- III : COORDINATION CHEMISTRY – I (15 periods)

Types of ligands – definition and examples - IUPAC nomenclature - dsp2, andsp3d2 hybridisations with examples and limitations.Crystal field theory –shapes of d-orbitals-postulates- splitting of t_2g and eglevels - CFSE - octahedral tetrahedral and square planar splitting - with examples andlimitations.Molecular orbital theory – postulates - application to octahedral complexes only.

UNIT–IV: COORDINATION CHEMISTRY – II (15 periods)

Stability of complexes – factors affecting the stability of complexes.Unimolecular and bimolecular nucleophilic substitution reactions in octahedral and squareplanar complexes – Trans effect and its applications.Biologically important co-ordination compounds – chlorophyll - hemoglobin and vitamin B_{12}–theirstructure and application (Elucidation is not required)Application of co-ordination compounds .

UNIT-V:CARBONYLS AND BINARY METALLIC COMPOUNDS (15 periods)

Metal carbonyls : Mono and binuclear carbonyls of Ni, Fe, Cr, Co and Mn –preparation, structure, reactions, bonding and uses. Structure and bonding in Π-metal alkenyl and Π-metal alkynyl complexes of [PtCl3(C2H4)]– , [Co(CO)6(RC =CR)] and ferrocene. Binary metallic compounds : borides – carbides - hydrides and nitrides – classification - preparation properties and uses.

TEXT BOOK AND REFERENCES

1. Essential of nuclear Chemistry, H. J. Arnikar, New age international 1995
2. Source Book on Atomic energy, S. Glasstone, Affiliated Ease – West press, Third edition, 1967
3. Inorganic chemistry, J. E. Huheey, Addison – Wesley 1993
4. Advanced Iorganic Chemistry, F. A. Cotton and G. Wilkinson, Wiley-Eastern, 1988
6. Nuclear and Radio Chemistry – G. Friedlander, J. W. Kennedy and N. M. Miller John Wiley, 1981
7. Modern aspects of Inorganic Chemistry, H. J. Emeleus& A. G. Sharpe, ELBS
8.Gopalan R, Subraman
ian PS and Rengarajan K (1993) ``Elements of analytical chemistry"
second revised edition, Sultan Chand.
9. Gurdeep R Chatwal, Sham K. Anand (2005) ``Instrumental methods of chemical analysis", Himalaya publishing house.
10.Gurdeep Chatwal and M.S. Yadav , Coordination Compounds, Himalayan Publications,

2003.
11. Puri, Sharma and Kalia, Principles of Inorganic Chemistry, ShobanLal Nagin Chand & Co, New Delhi (1995)

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Ability to understand the oxyacids of halogens and interhalogen compounds.	K1
CO2	Students will able to explain the recent development inNuclear chemistry	K2
CO3	Learners can able to Write Cristal field splitting in tetrahedral and octahedral complexes	K1
CO4	Ability to understand factors effecting stability of complexes.	K2
CO5	Puplus understand metal alkynyl complexes.	K1

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	M
CO3	S	S	M	S	S
CO4	S	S	S	S	S
CO5	S	S	M	S	S

S- STRONG M-MEDIUM

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CORE COURSE-X
ORGANIC CHEMISTRY-I

Semester-V **Marks: 75**
Course code: 21UCH5C10 **Credits: 5**
Total periods : 75Exam **Hours: 3**

OBJECTIVES

- To enable the students to learn the principles of reaction mechanism and modern reagents used for various reactions.
- To understand chemistry of carbohydrates.
- To know about stereochemistry and conformational analysis.
- To learn chemistry of heterocyclic compound , alkaloids and terpenoids.

UNIT –I: MOLECULAR REARRANGEMENTS (15 periods)

Molecular rearrangements - types of rearrangement - nucleophilic and electrophilic rearrangements –mechanism with evidence for the following re-arrangements: pinacol – pinacolone. Benzil - benzilic acid, benzidine, Claisen, Fries, Hofmann. Curtius, Lossen, Beckmann and dienone – phenol rearrangements.

UNIT-II : CHEMISTRY OF CARBOHYDRATES (15 periods)

Carbohydrate - classification, properties of mono saccharides (glucose and fructose)- structure and configuration of mono saccharides - interconversion. - Ascending and descending series - muta rotation - epimerization- cyclic structure - determination of size of sugar rings. - Disaccharides – sucrose - maltose - structure elucidation - polysaccharide - starch and cellulose (elementary treatment)

UNIT - III: **STEREOCHEMISTRY AND CONFORMATIONAL ANALYSIS**
(15 periods)

Optical activity of compounds containing no asymmetric carbons. R - S Notation – Biphenyls - allenes and spiranes. Geometrical Isomerism - Cis-trans ,Syn – Anti and E - Z notations . Geometrical isomerisms of maleic and Fumaric acids and unsymmetrical ketoximes. Conformation Analysis **–**Definition . conformation and configuration .Conformations of ethane and n-butane – relative stability of diastereoisomers –Conformation of cyclohexane and its mono substituted derivatives. Newman projection and sawhorse formulae. Fischer and flying wedge formulae.

UNIT- IV: HETEROCYCLIC COMPOUND (15 periods)

Five membered heterocyclic compounds – Furan, thiophene and pyrrole – six membered heterocyclic compounds – pyridine – structure – source- electrophilic substitution - reactivity and orientation – nucleophilic substitution in pyridine.Comparison of basicity of pyridine,piperidine and pyrrole. Synthesis of quinoline,
isoquinoline and indole.

UNIT –V: ALKALOIDS AND TERPENOIDS (15 periods)

General methods of structure elucidation of alkaloids and terpenoids –classification of terpenoids – classification of terpenoids – isoperene rule – structure and synthesis of alkaloids. Piperine and nicotine. Structure elucidation and synthesis of terpenoids: Citral, Geraniol and α-terpineol.

TEXT BOOKS AND REFERENCES

1. The Modern Structural theory of Organic Chemistry. Ferguson
2. Organic Chemistry, Vol.1 & 2.I.L.Finar, ELBS.
3. Stereochemistry of Organic compounds, L.Eliel, Tata – Mc- Graw – Hill, 1962.
4. Organic reactions and their mechanism. P. S. Kalsi,

5. Stereochemistry of Organic Compounds, D.Nasipuri, New Age international, 1991.
6. Text book of Organic Chemistry, P.L.Soni, S.Chand publications, New Delhi.
7. Natural products Vol. I & II. O.P.Agarwal,
8. Organic Chemistry VI Edition, R.T.Morrison and R.N. Boyd.

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Capacity to understand molecular rearrangements.	K1
CO2	Students can able to draw the cyclic structure of mono Saccharides & di saccharides	K2
CO3	Learners will able to write conformations of organic compounds.	K1
CO4	Able to draw structure of heterocyclic compounds.	K2
CO5	Ability for the Structure elucidation of alkaloids and terpenoids	K1

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	M
CO3	M	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	M	S	M

S- STRONG M-MEDIUM

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CORE COURSE-XI
PHYSICALCHEMISTRY-I

Semester-V **Marks: 75**
Course code: 21UCH5C11 **Credits: 5**
Total periods : 75Exam Hours: 3

OBJECTIVES

- To know about electromagnetic spectra
- To learn the basic principles of photochemistry
- To understand chemistry of colloids and about nanotachnology
- To know the spectroscopic techniques such as IR, UV-visible, Raman and NMR

UNIT- I: SPECTROSCOPY I (15 periods)

Electromagnetic radiation, quantisation of energies in molecules(Translational, rotational, vibrational and electronic) – Microwavespectroscopy – condition – molecular rotation – theory of microwavespectroscopy – selection rule – effect of isotopic substitution – Calculationof μ and bond length of diatomic molecules. UV visible spectroscopy –conditions – theory of electronic spectroscopy -types of electronictransitions – Frank-Condon principle – Predissociation – Dissociationenergy – Applications.

UNIT II: SPECTROSCOPY II(15 periods)

Infrared spectroscopy – condition – molecular vibration – modes of vibrationof linear and Non-linear molecules – Diatomic CO2 , H2O – stretching andbending vibrations – selection rules – calculation of force constant – isotopeeffect – Applications of IR spectra – (Group frequencies, finger printing andHydrogen bonding only) Raman spectroscopy – condition – Raleigh andRaman scattering – Stokes and Anti-stokes lines – Difference betweenRaman and IR spectroscopy – Rotational Raman spectra– Application tocovalent compounds – Mutual exclusion principle.

UNIT IIIPHOTOCHEMISTRY (15 periods)

Absorption and emission of radiation – Theories – Spontaneous and induced emission Physical properties of electronic excited state – Jablonski diagrams . Resonance emission – Selection rule . Fluorescence – Phosphorescence – Delayed fluorescence: E-Type and P-Type.Excimerand Exciplex complex formation . Stern-Volmer equation . Photosensitization and Chemiluminescence .Quantum yield - Experimental techniques – Actinometry – Chemical actinometry . Biochemiluminescence – Photochromism – Photostabilization – Photosynthesis – PS I and PS II – Photochemical energy-storage reactions.

UNIT-IV:COLLOIDS AND NANOTACHNOLOGY (15 periods)

Types of solutions – Types of colloidal solutions – Preparation of colloidal solutions – Condensation methods – Disintegraton methods – Purification of colloidal solutions – Dialysis – Ultrafiltration – Characteristics of colloidal solutions – Emulsions – Micelles.
Nanomaterials Preparation methods – Plasma arcing , Chemical vapour deposition , Sol gel, Electrodeposition , Ball filling. Preparation of nanomaterials – Silica gel , Zirconia ,Ytrium gel. Application of nano materials – Industrial and medicinal.

UNIT - V :COLLIGATIVE PROPERTIES (15 periods)

Theory of dilute solutions – colligative properties – lowering of vapour pressure-osmotic pressure- elevation of boiling point and depression of freezing point - basic

explanation Thermodynamic derivation of elevation of boiling point and depression in freezing point – determination of molecular mass from boiling point measurements, freezing point measurements and osmotic pressure measurements – abnormal molar mass and Van't Hoff factor – distribution law – distribution coefficient – condition for the validity of the distribution law and thermodynamic derivation – association and dissociation of the solute in one of the solvents.

TEXT BOOKS AND REFERENCES

1. Text book of Physical Chemistry, S.Glasstone, Mc Millan, 1956.
2. Principles of Physical Chemistry, Puri, Sharma and Pathania, ShobanLalNagin Chand and Co,1989.
3. Basic Physical Chemistry, W.J. Moore, Prentice Hall, 1986.
4. Physical Chemistry, N. Kundu and S.K. Jain, S. Chand and Co ltd., 1984
5. Rohatgi Mukherjee K.K.,"Fundamentals of photochemistry", New Age International Pvt. Ltd., New Delhi, 2009.,
6 Michael Wilson, KamaliKannangara, Geoff Smith, Michelle Simmons and Burkhard Raguse, "Nanotechnology – Basic Science and Emergin Technologies", Chapman & Hall (CRC), 2004.
7.P. Atkins and J. Paula, Physical Chemistry, Oxford, New Delhi, 2002

COURSE OUT COMES

CO	**CO Statement**	**Knowledge level**
CO1	Leaner's can explain about electromagnetic spectra .	K1
CO2	Able to understand Modes of vibration of linear and non linear molecules	K2
CO3	Students able to define about the fundamentals photochemistry.	K1
CO4	Capacity to explain importance of nanotechnology .	K2
CO5	Understand colligative properties	K1

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	S	S	S	S	S
CO3	S	M	S	S	S
CO4	M	S	S	S	S
CO5	S	S	S	M	S

S- STRONG M-MEDIUM

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CORE COURSE-XII
ORGANIC QUALITATIVE ANALYSIS PRACTICAL

Semester-V **Marks: 60**
Course code: 21UCH5C12P **Credits: 4**
Total periods : 75 **Exam Hours: 3**

OBJECTIVES

- To learn the methods of preparation of different organic compounds
- To carry out organic qualitative analysis

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ORGANIC QUALITATIVE ANALYSIS

1. Detect whether the compound is satured or unsaturated.
2. Detect whetherelements (N) present in the compound or not.
3. Detect whether the compound is aliphatic or aromatic.
3. Characterization of functional groups
4. Confirmation by preparation of solid derivatives

Note: Mono –functional compounds are given for analysis. In case of bi-functional compounds, students are required to report any one of the functional groups.

ORGANIC PREPARATION: (ANY FOUR)

Preparation of Organic Compounds involving the following chemical conversions.

1.Oxidation 2. Reduction 3. Hydrolysis 4. Nitration 5. Bromination 6. Diazotization 7. Osazone formation

MARK DISTRIBUTION:

Internal : 40 Ext. Evaluation : 60

Record :10
org. preparation : 10 Organic Analysis : 40
Armatic/ Alphatic :10
Sat/Unsat : 10
Spl. Element :10
functinonal group :10

REFERENCE

- Venkateswaran V, Veeraswamy R., Kulandaively A.R., Basic principles of practical chemistry, 2nd edition, New Delhi, sultan chand& sons, (1997)

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	capacity to carry out organic qualitative analysis	K1
CO2	Able to carry out organic preparation	K2
CO3	Capacity to distinguish between Aromatic and aliphatic compounds	K1

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	S
CO2	S	S	S	S	S
CO3	S	S	S	S	M

S- STRONG M-MEDIUM

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MAJOR BASED ELECTIVE –I(A)
ANALYTICAL CHEMISTRY

Semester-VMarks: 75
Course code: 21UCH5M1A **Credits: 4**
Total periods : 60 **ExamHours: 3**

OBJECTIVES

- To know the storage and handling of various chemicals and first aid
- To Learn data analysis, various separation techniques like gravimetric analysis thermo analytical methods
- To understand chromatography and separation techniques

UNIT – I : LABORATORY HYGIENE AND SAFETY (12 periods)

Storage and handling of chemicals-handling of ethers - toxic and poisonous chemicals - generalprecautions for avoiding accidents - first aid techniques - acid and alkali on eye - acid and

alkaliburn - bromine burns - cut by glasses - heat burns - Inhalation of toxic vapours.Poisoning - Treatment for specific poisons – acids – alkalis – acetone - arsenic and coppercompounds - cyanides – antidote – definition - universal antidotes.

UNIT- II : DATA ANALYSIS (12 periods)

The Mean-significant numbers, the median , precision, accuracy ,confidencelimits, standard deviation. Error – types of errors . method for improving accuracy . Rejection of data-presentation oftabulated data.Scatter diagram –method of least squares- S.I. units.

UNIT- III : GRAVIMETRIC ANALYSIS AND THERMO ANALYTICAL METHOD (12 periods)

Precipitation – Methods of obtaining the precipitate- condition of precipitate . Organic Precipitants - Types , Advantages and disadvantages of organic precipitants - chelating and ionassociating precipitants.Specifiand selective precipitants - Theories of precipitation-process of crystal growth. Co-precipitation and post-precipitation-precipitation from homogeneous solution - digestion filtration and washing-drying and ignition.Thermo analytical techniques – types-TGA principle-Instrumentation -TGA analysis of CaC_2O_4. H_2O. Differential thermal analysis-principle-DTA of $CaC_2O_4.H_2O$.-factorsaffecting TGA & DTA

UNIT-IV : CHROMATOGRAPHY AND SEPARATION TECHNIQUES (12periods)

Chromatography – definition, classification, paper chromatography – principle, types, techniques and applications. TLC - principle, plate and rate theory, techniques andapplications.. Column chromatography- Principle - types - techniques and applications.HPLC and ion - Exchange chromatography – principle – instrumentation - techniques applications.Electrophoresis- definition-principle-techniques-applications.

UNIT- V: ELECTROANALYTICAL TECHNIQUES (12periods)

Electro gravimetry –theory - electro gravimetric analysis of Fe and Cu. Electrolytic separation of metals: principle –separation of copper andnickel, Electro deposition- principle –overvoltage. Coulometry -Principle of coulometric analysis –coulometry at controlledpotential- apparatus and technique-separation of nickel and cobalt.Amperometry titrations-principle –Instruments –types-applications.Polorography - Principle

TEXT BOOKS AND REFERENCES

1. Gopalan R, Subramanian PS and Rengarajan K (1993) ``Elements ofanalytical chemistry" second revised edition, Sultan Chand.
2. Gurdeep R Chatwal, Sham K. Anand (2005) ``Instrumental methods of chemical analysis", Himalaya publishing house.
3. Vogel A.I. Text Book of Quantitative Inorganic analysis," The English Language Book Society, Fourth edition.
4. Douglas A. Skoog, Donald M. West and F. J. Holler, Fundamentals of

Analytical chemistry, 7thedition, Harcourt College Publishers.
5. Mendham J., Denny R. C., Barnes J.D., Thomas M., Vogel's Test book of Quantitative Chemical analysis 6th edition, Pearson education.
6. Sharma, B. K., Instrumental methods of chemical analysis, Goel Publishing House, Merrut (1997).

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Capacity to handle various chemicals in proper ways.	K1
CO2	Ability to carry out data analysis	K2
CO3	To explain various separation techniques	K1
CO4	Understood importance of chromatography and separation techniques	K2
CO5	Students able to explain theories of Electro gravimetry, Coulometry.	K1

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	S	S	S	S	S
CO3	S	M	S	S	S
CO4	M	S	S	S	S
CO5	S	S	S	M	S

S- STRONG M-MEDIUM

MAJOR BASED ELECTIVE I (B)
MATERIAL & NANO CHEMISTRY

Semester-VMarks: 75
Course code: 21UCH5M1B **Credits: 4**
Total periods : 60 **Exam Hours: 3**

OBJECTIVES

- To study the types of ionic crystals and types of ionic conductors
- To learn about carbon nanotubes, quantum dots, gold and silver nano particles
- To learn the applications of nanomaterials

UNIT-I :INTRODUCTION TO NANOSCIENCE AND SYNTHESIS OF NANOMATERIALS (12 periods)

Definition of terms-nanoscale – nanomaterials – nanoscience - nanotechnology-scale of materialsnaturaland manmade-nanoscience practiced during ancient and modern periods contributors to thefield of nanoscience.Top down and bottom up approaches-synthesis of carbon nanotubes - quantum dots - gold and silvernanoparticles.

UNIT - II : IONIC CONDUCTIVITY AND SOLID ELECTROLYTES (12 periods)

Types of ionic crystals – alkali halides – silver chloride-alkali earth fluovider –simple stoichiometric oxides. Types of ionic conductors – halide ion conductors – oxide ion conductors – solid electrolytes – applications of solid electrolytes. Electrochemical cell– principles – batteries,sensors and fuel cells –Inorganic solids – colour, magnetic andoptical properties.

UNIT – III: MODERN ENGINEERING MATERIALS AND SYNTHESIS OF NANOMATERIALS(12 periods)

Top down and bottom up approaches-synthesis of carbon nanotubes, quantum dots, gold and silver nano particles.Metallic glasses – introduction –composition, properties and applications. Shapememory alloys: introduction – examples – application of SMA – advantages anddisadvantages.Biomaterials :Introduction –metals and alloys in biomaterials –ceramic biomaterials, compositebiomaterials-polymer biomaterials.

UNIT -IV : CHARACTERIZATION OF NANOMATERIALS AND NANOPHASE MATERIALS (12 periods)

Electron microscopy techniques-scanning electron microscopy, transmission electron microscopy,atomic force microscopy.Introduction – techniques for synthesis of nanophase materials–sol-gel synthsiselectrodeposition–inert gas condensation-mechanical alloying and applications ofnanophase materials-composite materials: Introduction –types.

UNIT- V : NANO TECHNOLOGY (12 periods)

Introduction –importance –various stages of nanotechnology –nanotube technology – nanoparticles –fullerenes-nanodendrimers –nano pore channels, fibres and scaffolds –CVD dismond technology –FCVA technology and its applications – nano imagingtechniques.

TEXT AND REFERENCE BOOKS

1. Aathony R. West, Solidstate chemistry and its applications, john wiley&Sons(1989).
2. RaghavanV.R.,Materials Science and Engineering, Printice Hall (India) Ltd., (2001).
3. Kenneth J. Klabunde, Nanoscale materials in chemistry, A. John Wiley and Sons Inc. Publication.

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Students can understand Top down and bottom up approaches in Nanotechnology.	K1
CO2	Capacity to explain Types of ionic crystals.	K2
CO3	Ability to understand modern engineering materials and synthesis of Nanomaterials	K1
CO4	Capacity understand characterization of nanomaterials	K1
CO5	Capacity understand characterization of nanomaterials	K1

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	M	M
CO4	S	S	S	S	S
CO5	S	S	S	M	S

S- STRONG M-MEDIUM

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MAJOR BASED ELECTIVE I (C)
IMPORTANCE OF BIO-INORGANIC CHEMISTRY

Semester-VMarks: 75
Course code: 21UCH5M1C **Credits: 4**
Total periods : 60 **Exam Hours: 3**

. **OBJECTIVES:**

- To understand the role of various elements in the living systems
- To acquire basic knowledge about the structure and functions of certain metallo-enzymes
- To know about the mechanism of binding interactions of metal complexes with biomolecules and metal based drug action.

UNIT-I : METALS AND NON-METALS IN BIOLOGICAL SYSTEMS
(12 periods)

Metals and Non-metals in biological systems - Essential and trace elements - Role of different metal ions in biological systems - Sodium-Potassium pump - Ferritin - Transferrin- Blue copper proteins - Catecholase - Photosynthesis: Chlorophyll - Photosystem-I (PS-I) & II (PS-II) - Structure-function relationship.

UNIT - II :METALLOENZYMES (12 periods)

Metalloenzymes - Definition - Examples - Active site structure and mechanism of action of - Carboxy peptidase-A and Carbonic anhydrase - Structure and function of Superoxide dismutase (SOD) (Fe-SOD, Mn-SOD, Cu-Zn couple SOD ad Ni SOD) and catalase enzymes - Xanthine oxidase –Nitrogenase

UNIT – III : PHORPHYRIN SYSTEM (12 periods)

Phorphyrin system - Structure and functions of Hemoglobin and Myoglobin - Dioxygen binding, transport and utilization - Hemocyanin - Hemerythrin - Synthetic oxygen carriers - Vitamin B_{12} co-enzyme - Non-heme iron-sulphur proteins - Ferridoxins - Rubredoxins– Cytochromes

UNIT – III :BINDING OF METAL IONS TO BIOMOLECULES &(12 periods) CHEMOTHERAPY

Binding of metal ions and complexes to biomolecules- Types of binding - Nucleic acid structures - Fundamental interactions with nucleic acids - Binding interactions of tris-phenanthroline metal complexes with DNA - Techniques to monitor binding (Electronic absorption - Fluorescence and Circular dichroic spectral techniques - electrochemical behaviour, viscosity measurement and ploarimetry). Chemotherapy - Radio diagnostic agents - MRI scanning - Chelating Agents (with special reference to EDTA) and therapy based on in vivo chelation of radio nucleotides - Dosage and toxicity.

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UNIT - V : DRUG DISCOVERY AND DESIGN (12 periods)

Drug discovery and design - Therapeutic index and chemotherapeutic index - Structure -activity relationship - Factors governing drug design - Computer aided drug design - Bleomycin – Doxorubicin - Cancer chemotherapy - Bioinorganic chemistry of platinum and ruthenium anticancer drugs - Mechanism of action of cisplatin - Clinical trials and their significance - Applications of Coordination complexes in medicine

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TEXT BOOKS AND REFERENCES

1. I. Bertini, H.B. Gray, S.J. Lippard and J.S. Valentine, Bioinorganic Chemistry; University Science Books.
2. DrAsim R Dass, Bioinorganic Chemistry 2007, Books and Allied (P) Limited.
3. J.E.Huheey, E.A.Kieter, R.L.Keiter, Inorganic Chemistry 4th Edition, AddisionWesely Publishing Company.
4. Keith F. Purcell, John C. Kotz, Inorganic Chemistry .

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Capacity to explain structure and functions of certain metallo-enzymes	K1
CO2	Students can understand metalloenzymes.	K2
CO3	Understand about chemotheraphy.	K2
CO4	Leaners will be able to describe mechanism of binding interactions of metal complexes with biomolecules	K1
CO5	Capacity to explain and drug action in biological systems.	K2

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	M	M
CO4	S	S	S	S	S
CO5	S	S	S	M	S

S- STRONG M-MEDIUM

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SKILL BASED ELECTIVE I (A)
FUNDAMENTAL ASPECTS OF ELECTRO ANALYTICAL TECHNIQUES

Semester-VMarks: 75
Course code: 21UCH5S1A **Credits: 2**
Total periods : 30 **Exam Hours: 3**

OBJECTIVES

- To learn the concepts of polarography
- To understand the technique of potentiometry and amperometry
- To study about coulometry and electrogravimetry

UNIT – I :POLAROGRAPHY (6 periods)

Polarography- Principle – Instrumentation - polarographic measurements - dropping mercuryelectrode-merits and demerits, polarogram (current-voltage curve), half wave potential and itssignificance.Currents contributing to the polarographic waves- migration current. residual current - kineticcurrent - convection current and diffusion current. Ilkovic equation and its importance,polarographic maxima and its removal, advantages and applications of polarographydeterminationand separation of metals.

UNIT – II :POTENTIOMETRY (6 periods)

Potentiometer- principle, electrochemical cells, indicator electrode, reference electrode,calomel electrode, instrumentation, accuracy of direct potentiometric measurements. Potentiometric titrations- principle- advantages and procedure for potentiometric titrations,methods of end point location-derivative method - graphical method and direct titration tothe equivalence point, Types of potentiometric titrations- redox, neutralization, precipitationand complexometric titrations.

UNIT – III : AMPEROMETRY (6 periods)

Amperometry- principle - amperometric titration curves - amperometric indicators – instrumentation - procedure for amperometric titrations - advantages and applicationsBiamperometric titrations- theory - dead stop end point method- apparatus and procedure -advantages and applications.

UNIT –I V: COULOMETRY (6 periods)

Coulometry- principle, techniques and instrumentation of constant current coulometric analysisand controlled potential coulometric analysis - coulometer-water coulometer and iodinecoulometer.Coulometric titrations – Principle – advantages - applications and instrumentation forcoulometrictitrators.

UNIT – V :ELECTROGRAVIMETRY (6 periods)

Electrogravimetry- theory, important terms used in electrogravimetric methods- voltaic andelectrolytic cells, cathode, anode, polarized electrode, current density, current efficiency,decomposition potential and overpotential.Electrogravimetric methods, instrumentation, procedure of electrolysis, internal electrolysis,advantages and applications.

TEXT BOOKS AND REFERENCES:

1. H. Kaur – “Instrumental methods of Chemical Analysis”, PragathiprakasanPublications, Meerut,1987.
2. S. M. Khopkar, “Basic Concept of Analytical Chemistry”, Wiley Eastern Ltd., 1998.
3 . R. Gopalan, P. S. Subramanian, K. Rangarajan, “Elements of Analytical Chemistry”, SultanChand and Sons, 1995.

4. B. K. Sharma, “Instrumental methods of Analysis”, Geol Publications, 2000.
5. A. K. Srivastava and P. C. Jain, “Instrumental approach to Chemical Analysis’’, S. Chand Publications, 2007.

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Capacity to explain about various techniques like	K2
CO2	potentiometry	K2
CO3	amperometrycoulometry	K2
CO4	electrogravimetry	K2
CO5	polarography	K2

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	M	M
CO4	S	S	S	S	S
CO5	S	S	S	M	S

S- STRONG M-MEDIUM

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SKILL BASED ELECTIVE-I(B)

WATER QUALITY ANALYSIS

Semester-VMarks: 75
Course code: 21UCH5S2B **Credits: 2**
Total periods : 30 **Exam Hours: 3**

OBJECTIVES

- To give an in-depth understanding of water quality parameters
- To get knowledge about ground water and surfacewater pollution and its control measures
- To learn the water treatment methods, sewage and industrial effluent treatment methods andwater resources management.

UNIT- I : WATER QUALITY PARAMETERS AND THEIR DETERMINATION
(6 periods)

Physical, chemical and biological standards significance of these contaminants over the quality andtheir determinations - Electrical conductivity - turbidity – Ph - total solids - TDS - alkalinity - hardness - chlorides - DO - BOD- COD - TOC - nitrate – sulphate - fluoride.

UNIT- II :GROUND WATER AND SURFACE WATER POLLUTION AND CONTROL MEASURES(6 periods)

Surfacewater and ground water pollution - Harmful effects-pollution of major rivers – protectingground water from pollution - ground water pollution due to Fluoride – Iron - Chromium and Arsenicsources - ill effects and treatment methods.

UNIT- III :WATER TREATMENT METHODS(6 periods)

Treatment for community supply - screening, sedimentation, coagulation, filtration -removal ofmicro organisms – chlorination - adding bleaching powder - UV irradiation and ozonation.

UNIT- IV :SEWAGE AND INDUSTRIAL EFFLUENT TREATMENT(6 periods)

Sewage - characteristics - purpose of sewage treatment - methods of sewage treatment - primary -secondary and tertiary - Role of algae in sewage treatment. Types of industrial wastes treatment ofeffluents with organic and inorganic impurities.

UNIT -V : WATER MANAGEMENT(6 periods)

Water resources management - rain water harvesting methods - percolation ponds – check dams - roof top collection methods - water management in industries.

TEXT BOOK ANDREFERENC BOOKS

1. Chemical and Biological Methods for Water Pollution Studies, R.K. Trivedy and P.K. Goel,Environmental Publications, 1986.
2. Engineering Chemistry, P.c. Jain and Monica Jain, Dhanpat Rai and Sons, 1993

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	**Ability to** understand water quality measurements	K2
CO2	Capacity to explain the ground water and surface water pollution and its control measures.	K2
CO3	Leaners can explain water treatment methods	K2
CO4	Students understand industrial effluent treatment methods and water resources management	K2
CO5	Understand water resources managements.	K2

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	M
CO4	S	S	S	S	S
CO5	S	S	S	M	S

S- STRONG M-MEDIUM

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SKILL BASED ELECTIVE I (C)
MEDICINAL CHEMISTRY

Semester-VMarks: 75
Course code: 21UCH5S1C **Credits: 2**
Total periods : 30 **Exam Hours: 3**

OBJECTIVES

- To know about the basics of drugs
- To understand modes of actions of drugs
- To understand the common diseases and their remedies.

UNIT –I : INTRODUCTION (6 periods)

Common diseases – infective diseases – insect-borne - air-borne and water-borne-hereditarydiseases (3 examples for each) –Definition – drug – pharmacology- antimetabolites - and therapeuticindex. Receptor and drug action – Receptor concept - Receptor proteins and drug receptor interactions.Mechanism of drug action: agonism and antagonism (Basic concepts only).

UNIT –II : DRUGS (6 periods)

Various sources of drugs - pharmacologically active constituents in plants - Indian medicinal plants –tulsi- neem - keezhanelli-aloe vera – their importance. Manufacture of drugs (e.g. quinine, reserpine,atopsine and d – tubocurarine) from Indian medicinal plants. Drug metabolism – Oxidative reactions -Reductive reactions and conjugation reactions. Factors affecting metabolism of drugs (Basic Conceptsonly).

UNIT –III : CHEMOTHERAPY (6 periods)

Drugs based on physiological action, definition and two examples for Anesthetics - General and local– Analgesics (2 examples) – Narcotic analgesics (only morphine compounds) – Antipyretic analgesics(acetyl salicyclic acid, p-aminophenol derivatives). Muscle relaxants. Acting at neuromuscular junction(d–tubocurarine chloride) - Acting at spinal cord alone (glyceryl guaiacolate, diazepam) and Antibiotics– Penicillin – streptomycin -Antivirals (2 examples). AIDS - Cancer – symptoms - prevention and treatment(structure not required).

UNIT –IV : COMMON BODY AILMENTS (6 periods)

Diabetes – Causes, hyper and hypoglycemic drugs – Blood pressure - Systolic & Diastolic Hypertensivedrugs – Cardiovascular drugs –nitrates - beta blockers (propanalol and atinelol) and calcium channelblockers. Depressants (special reference to sedatives and hypnotics) – Lipid profile – HDL – LDL –Cholesterol - lipid lowering drugs (structure not required)

UNIT –V : HEALTH PROMOTING DRUGS (6 periods)

Medicinally important inorganic compounds of Al, P, As, Hg and Fe - examples and applications.Agents for kidney function (Aminohippuric acid) Agents for liver function (Sulfobromophthalein) –antioxidants - treatment of ulcer and skin diseases: Eczema, psoriasis and Acne (structure notrequired).

TEXT BOOKS AND REFERENCE BOOKS

1. S. Lakshmi, Pharmaceutical Chemistry, S.Chand& Sons, New Delhi,2004
2. V.K. Ahluwalia and Madhu Chopra, Medicinal Chemistry, Ane Books, New Delhi, 2008
3. P. Parimoo, A Text Book of Medicinal Chemistry, CBS Publishers, New Delhi, 2006
4. Satoshkar, Medicinal Chemistry, Wiley Eastern Ltd., New Delhi, 1993
5. RomasNogrady, Medicinal Chemistry, Oxford University Press, 1988Press, 1996
6. Indian Pharmacopoea, Govt. of India , Indian Pharmacopoean Commission, Vol.I,2010
7. N. Murugesan, A Text book of Pharmacology- 6th edition, Sathya Publishers, 2004
8. Alfred Burger, Medicinal Chemistry- 6th edition, Wiley – Interscience Publication,2003

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Capacity to explain common diseases .	K2
CO2	Ability to understand sources of drugs.	K2
CO3	Leaners can able to explain concepts of chemotherapy.	K2
CO4	Ability to understand causes of Diabetes	K2
CO5	Capacity to understand health promoting drugs.	K2

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	M	S
CO4	S	S	S	S	S
CO5	M	S	S	S	S

S- STRONG M-MEDIUM

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SKILL BASED ELECTIVE-II (A)
CLINICAL CHEMISTRY

Semester-VMarks: 75
Course code: 21UCH5S2A **Credits: 2**
Total periods : 30 **Exam Hours: 3**

OBJECTIVES

- To develop the basic knowledge on drugs and its applications
- To create the awareness about the diseases, causes and their prevention
- To understand the concepts of clinical chemistry
- To know about organic diagnostic agents

UNIT –I : DRUGS TERMINOLOGY (6 periods)

Drugs – Definition - source of drugs - important terminologies – pharmacy - chemotherapy-Pharmacology – pharmacodynamics – pharmacophore – metabolites – antimetabolites –virus – bacteria - fungi.Causes – symptoms - prevention and treatment of common diseases-Tuberculosis-asthmajaundice -leprosy and typhoid.

UNIT – II:ANTIBIOTICS (6 periods)

Antibiotics – Definition - structure and uses of penicillin - chloramphenicol, ampicillin – streptomycin - tetracycline and erythromycin.Sulpha drugs – Definition - preparation and uses of sulphadiazine – sulphapyridine -sulphathiazole and sulphafurazole.

UNIT – III :ANTISEPTICS AND ANASTHETICS (6 periods)

Antiseptics and Disinfectants – Definition - Differences between antiseptics and disinfectants-structure and uses of alkyl substituted phenols and chlorinated phenol - crystal violet -brilliant green - methylene blue - cationic surface active agent - benzalkoniumchloridecetrimide-

properties and uses. Anasthetics – Definition – classification - general volatile anaesthetics – ethers - nitrous oxide – chloroform - halothane-advantages and disadvantages. Intravenous anaesthetics – thiopentalsodium - methohexitone - local anaesthetics – cocaine - procaine - benzocaine - uses – advantages- disadvantages.

UNIT – IV : BLOOD (6 periods)

Blood – definition – composition - blood grouping - Rh factor - clotting of blood – mechanism - coagulants-vitamin K and protaminsulphate – anticoagulants - coumarine and heparin.Blood pressure – definition – hypertension - types and treatment.

UNIT – V : ORGANIC DIAGNOSTIC AGENTS (6 periods)

Organic diagnostic agents – definition - X-ray contrast media (radio opaque) - Iodipamide,Evan's blue, histamine and xylose - advantages. Qualitative test of blood samples- carbohydrates - Benedict's test- anthrone test and Fehlingtest. Proteins – ninhydrin and Biuret test. Fat - translucency – emulsification-iodineabsorption and sudan III tests.

TEXT BOOKS ANDREFERENCES:

1. Mathew George and Lincy joseph , Text book of pharmaceutical chemistry, 2009.
2. JayashreeGhose – Text book of Pharmaceutical chemistry, 2ndEdn., 2003.
3. Lakshmi.S., Pharmaceutical Chemistry, III Edn., Sulthan Chand and Sons, New Delhi,2004.
4. R. S. Satoskar and S.R.Bandarkar – Pharmocolgy and Pharmotherapeutics, popular prakashnan.
5. AlegGringaur, Introduction to Medicinal Chemistry, Sharma Printers, Delhi, 2011.
6. D.Sriram and P.Yogeshwari, Medicinal Chemistry, 2nd edition-2008.
7. Ashutoshkar , Medicinal chemistry, revised and expanded edition, International Publishers, 2010.
8. V.N. Rajasekaran, Vol. I and Vol.II, Pharmaceutical Chemistry, Sun publications Chennai. 4thEdn., 2003.
9. V. K.Ahluwalia and Madhu Chopra, Medicinal chemistry, Ane books private Ltd., New Delhi,1st Edition, 2008.
10. Marlin Herbert, Pharmacology, Ashton NanyDarkson, Jones and Bartlett India Pvt.Ltd. 11thEdition, 2010.
11. J.C. Kuriacose, J.Rajaram – "Chemistry in Engineering and Technology – Vol– 2. Tata McGraw- Hill Publishing Company Limited – New Delhi – 1994.
12. P. C. Jain & Monika Jain – "Engineering Chemistry", 15 thEd., Dhanpath Rai, Publishing Company, New Delhi, 2005.

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Leaner's get the ability to understanddrugs terminology	K2
CO2	Capacity to define the terms antibiotics	K2
CO3	Able to define antiseptics and anesthetics	K2
CO4	Capacity to understand composition of blood.	K2
CO5	Able to explain organic diagnostic agents	K2

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	S	S	S	S	S
CO3	M	S	S	S	S
CO4	S	S	M	S	S
CO5	S	S	S	M	S

S- STRONG M-MEDIUM

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SKILL BASED ELECTIVE-II (B)
CHEMISTRY OF NATURAL PRODUCTS

Semester-VMarks: 75
Course code: 21UCH5S2B **Credits: 2**
Total periods : 30 **Exam Hours: 3**

OBJECTIVE:

- To enable the student to develop aknowledgeabout amino acids and proteins.
- To understand chemistry of DNA and RNA
- To understand about enzyme, vitamins and carbohydrates

UNIT-I : AMINO ACIDS AND PROTEINS: **(6 periods)**

Classification of amino acids: Definition of Essential and non–essential amino acids.Preparation and properties of glycine and alanine. Zwitter ions, isoelectric points, polypeptides,End group analysis by Sanger's method.Proteins – classification based on physical and chemical properties

and on physiological functions-Primary, secondary and tertiary structures of proteins-Denaturation of proteins.

UNIT-II :NUCLEI ACIDS (6 periods)

Types of nucleic acid - DNA and RNA - bases– nucleosides and nucleotidespolynucleosides – Waston and crick model of DNA - biological functions nucleic acids.

UNIT-III :CARBOHYDRATES (6 periods)

Classification, structural elucidation of glucose and fructose, Reactions ofglucose and fructose - osazone formation - mutarotaion and its mechanism -Inter conversion ofaldoses and ketoses .Disaccharides – structure, properties and uses of maltose and sucrose. Polysaccharides – structure,properties and uses of starch and cellulose.

UNIT-IV :VITAMINS (6 periods)

Classification- water soluble – fat soluble vitamins – Deficiency diseases- RDA– Estimation of vitamin B1 and vitamin C.

UNIT-V : ENZYME (6 periods)

Chemical nature of enzymes – Nomenclature – Classification of enzymes –Properties of enzymes – Mechanism of enzyme action – action of co- enzymes.
Hormones:Introduction – Properties and function of hormones – Chemical nature of hormones structureandphysiological functions of some hormones – adrenaline – thyroxin – oxytocin – Insulin –the sex hormones.

TEXT BOOKS AND REFERENCES

1. Lehninger, Principles of Biochemistry, Fourth Edition, by David L. Nelson and Michael M. Cox, Worth Publishers, New York, 2005.
2. L. Veerakumari, Biochemistry, MJP publishers, Chennai, 2004.
3. LubertStryer, Biochemistry, W. H. Freeman and company, New York, 1975.
4. Robert L.Caret, Katherine J. Denniston, Joseph J. Topping, Principles and Applications of organic and biological chemistry, WBB publishers, USA, 1993.
5. J. L. Jain, Biochemistry, Sultan Chand and Co.1999
6. A. Mazur and B. Harrow, Text book of biochemistry, 10th Edition, W.B. Saunders Co.,Philadelphia, 1971

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Ability to explain chemistry of amino acids and proteins.	K2
CO2	Capacity to draw structure of nucleic acids.	K2
CO3	Students can understand classification of carbohydrates.	K2
CO4	Leaner's will be able to explain about vitamins	K2
CO5	Capacity to understand mechanism of enzyme action	K2

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	S	S	S	S	M
CO3	S	S	S	S	S
CO4	S	S	M	S	S
CO5	M	S	S	S	S

S- STRONG M-MEDIUM

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SKILL BASED ELECTIVE-II (C)
DYEING TECHNIQUES AND WATER TREATMENT

Semester-VMarks: 75
Course code: 21UCH5S2C **Credits: 2**
Total periods : 30 **Exam Hours: 3**

OBJECTIVES

- To understand the water qualities and treatments
- To develop the skills in dyeing.
- To know the sewage treatments

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UNIT-I : TEXTILE CHEMISTRY (6 periods)

Textile fiber pretreatments: Sizing and desizing, purpose, desizing methods(Hot water, Acid and enzymatic) - their merits and demerits - Scouring:classification , method of Kier boiling process.Dye chemistry: Witt's theory of colour –important dye stuff intermediatestheir

names- Difference between dye and pigments.Chromophore – auxo chromes –batho chromic shift and hypso chromicshift -classification of dyes based on application.

UNIT-II : DYEING MACHINERIES (6 periods)

Technical terms in dyeing: M.L. ratio – % of shade – % of exhaustion –equilibrium absorption.Dyeing machineries: Description and uses of Padding mangle and Jigger.Textile dyeing processes I: Direct cotton dyeing – effect of temperature,Acid dyeing – effect of electrolytes in acid dyeing.

UNIT-III: DYEING PROCESSES (6 periods)

Textile dyeing processes II : Vat dyeing - Pre – mordant dyeing - Post -mordant dyeing. Fastness properties – Definition of Light - Washing Rubbings - Perspirationand sublimation fastness - Evaluation procedures for Light and Washingfastness.

UNIT-IV :WATER TREATMENTMETHODS (6 periods)

Sewage & Domestic wastes and their effectsconcepts of BOD and COD. Eutrophication and their effects - Biological magnification. Water treatment methods: General methods of water treatment – Sewagetreatment methods: preliminary, Primary, Secondary, Tertiary treatments.

UNIT-V: INDUSTRIAL WASTEWATER TREATMENT (6 periods)

Industrial effluents: Nature of effluents of Chemical, Food, Drug andmaterial industries. Industrial waste water treatment: preliminary, Primary, Secondary(Biological) treatment. Aerobic process (Lagooning, Trickling Filters,activated Sludge, oxidation ditch).Anaerobic digestion – advantages of Anaerobic process – Disposal of sludge - draw backs and effective steps and Tertiary treatments (adsorption, ionexchangeand ultra-filtration).

REFERENCES

1. Venkataraman . K. The chemistry of synthetic dyes Vol, I, II, III & IV-,Academic Press N.Y., 1949.
2. Shenai, V.A. ,Chemistry of Textile fibres, vol.I, Sevak publication , Mumbai
3. Shenai, V.A. ,Chemistry of Dyes and Principles of dyeing , vol.II, Sevakpublication, Mumbai
4. H.Kaur “Environmental Chemistry” 7th Edition, PragatiPrakashan publisher, 2013
5. A.K.De “Environmental Chemistry” 3rd Edition ,New Age International (P) Ltd.Publisher,1997.

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Ablity to understand chemistry of dye and pigments.	K2
CO2	Able to understand dyeing techniques.	K2
CO3	Capacity to understand vat dye process.	K2
CO4	Capacity to discuss sewage treatment methods.	K2
CO5	Learners can able to industrial waste water treatment.	K2

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	M	S	S	S	S
CO3	S	S	S	M	S
CO4	S	S	M	S	S
CO5	S	S	S	S	M

S- STRONG M-MEDIUM

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CORE COURSE-XIII
ORGANIC CHEMISTRY-II

Semester-VIMarks: 75
Course code: 21UCH5C13 **Credits: 5**
Total periods : 90 **Exam Hours: 3**

OBJECTIVES

- To enable the students to learn the principles of reaction mechanism and modern reagents used for various reactions
- To enable the students to learn the chemistry of proteins and vitamins
- To learn about organic spectroscopic techniques

UNIT - I :REAGENTS FOR OXIDATION AND REDUCTION (18 periods)

Oxidation: Osmium tetroxide – Chromyl chloride – Ozone – DDQ – Dioxiranes. Lead tetraacetate - selenium dioxide – DMSO either with Ac_2O or oxalyl chloride – Dess-Martin reagent. Reduction: Catalytic hydrogenation using Wilkinson Catalyst – Reduction with $LiAlH_4$, $NaBH_4$, tritertiarybutoxy aluminum hydride, $NaCNBH_3$, hydrazines.

UNIT- II : SUBSTITUTION AND ELIMINATION REACTIONS (18 periods)

Aliphatic nucleophilic substitutions – mechanism of SN1 - SN2 and SNi reactions - stereochemistry aspects involved in S_{N1} - S_{N2} and S_{Ni}.Elimination reactions–Hoffmann and

Saytzeff's eliminations–trans elimination: Mechanism of $E_1$and E_2 reactions.Aromatic Nucleophilic substitution reactions mechanisms – Benzyneand intermediate complexformation mechanism.Aromatic Electrophilc substitution reactions-Nitration, Bromination, Sulphonation.

UNIT -III : CHEMISTRY OF PROTEINS AND VITAMINS (18 periods)

Amino acids – Zwitter ion – isoeletric point - general methods of preparation and reactions of amino acids. Peptides - Peptide linkages – proteins - classification of proteins.
Structure of proteins - primary structure - end group analysis - Edman method - secondary structure - tertiary structure - denaturation - colour reactions of proteins. Nucleic acids - elementary treatment of DNA .

UNIT -IV :ORGANIC SPECTROSCOPY (18 periods)

UV - VIS spectroscopy - types of electronic transitions – Instrumentation- solvent effects on λ max - Woodward - Fieser rules for calculation of λ max : bathochromic shift and hypsochromic shift. IR spectroscopy - number and types of fundamental vibrations – selection rules- modes of vibrations and their energies. position of IR absorption frequencies for functional groups like aldehyde, ketone, alcohol, acid, amine and amide. NMR spectroscopy - principle - chemical shift- factors affecting the chemical shift - inductive effect and hydrogen bonding - TMS, delta scales, splitting of signals - spin-spin coupling, NMR spectrum of EtOH, n -propyl bromide and isopropyl bromide.

UNIT- V : SYNTHETIC DRUGS (18 periods)

Sulpha drugs – Definition - preparation and uses of sulphadiazine – sulphapyridine - sulphathiazole and sulphafurazole– Hypnotcs, phenobarbitol – pethidine – analgesics and sedatatives – Aspirin, paracetamol – codeine (structure only) stimulants – caffeine (structure only). Amphetamine and methylamphetamine.Antibiotics – Definition - structure and uses of penicillin - chloramphenicol, ampicillin – streptomycin - tetracycline and erythromycin.

TEXT BOOKS AND REFERENCES

1.Finar I.L., Organic Chemistry, Vol 1&2, (6th edition) England, addison Wesley Longman Ltd. (1996).
2. Morrison R.T. and Boyd R.N., Bhattacharjee S. K. Organic Chemistry (7th edition), Pearson (India)., (2011)
3. Bahl B.S. and Bahl A., Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (2010)
4. Pine S.H., Organic Chemistry, (5th edition) New Delhi, McGraw – Hill International Book Company (1987)
5. Seyhan N. Ege, Organic Chemistry, (5th edition) New York, Houghton Mifflin Co., (2005)
6. William Kemp, Organic Spectroscopy, 3rd edition, ELBS.
7. Introduction to Spectroscopy by Pavia, D. L. Lampman, G. M, Kriz, G. S, Vyvyan, J. A. 5th edition, Cengage Learning, (2015)

8. Spectroscopy identification of Organic compounds, Silverstein, R. M, Webster, F. M 7th edition, CRC Press, (2015)
9. P.L.Soni Organic Chemistry, S.Chand& Co, New Delhi.
10. Text Book Organic Chemistry, S. Chand & Co, New Delhi

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Learners will be able to write reaction mechanism & molecular rearrangements	K2
CO2	Capacity to Write the mechanism of organic reaction.	K2
CO3	Students will be able to explain chemistry of of proteins and vitamins	K2
CO4	Understand basic principle of spectroscopy.	K2
CO5	Ability to discuss analgesics and sedative.	K2

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	S	S	S	S	M
CO3	S	S	S	S	S
CO4	S	S	M	S	S
CO5	M	S	S	S	S

S- STRONG M-MEDIUM

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CORE COURSE-VII
PHYSICAL CHEMISTRY II

Semester-VIMarks: 75
Course code: 21UCH6C14 **Credits: 5**
Total periods : 90 **Exam Hours: 3**

OBJECTIVES

- To learn the basic concepts of quantum mechanics
- To know the various concepts of electrochemistry
- To understand second and third law of thermodynamics
- To know about phase rule and its application.

UNIT- I:QUANTUM MECHANICS (18 periods)

Black body radiation - Planck's radiation law - photoelectric effect - Compton effect - Bohr's model of hydrogen atom (no derivation) . De Broglie hypothesis - sinusoidal wave equation - Scrodinger's time independent wave equation - physical – interpretation of the wave function. Wave equation for a particle in a one-dimensional box and its solution – Hamiltonian operator as eigen operator - energy values as eigen values and wave function as eigen function – Particle in one and three-dimensional box .

UNIT –II : ELECTROCHEMICAL CELLS (18 periods)

Electrolytic and galvanic cells–Reversible and irreversible cells. Conventional representationof electrochemical cells. Electromotive force of a cell and its measurements – Computation of celle.m.f.- Calculation of thermodynamic quantities of cell reactions (ΔG, ΔH, ΔS and K) .Derivation of Nernst equation- single electrode potential and Applications of Nernst equationstandard electrode potentials- Electrochemical series and its significance. Types of reversibleelectrodes – construction- cell reaction with Nernst equation - Reference electrodes-standardhydrogen electrode and calomel electrode- construction and cell reaction with Nernst equation .

UNIT–III : PHASE RULE AND ITS APPLICATIONS (18 periods)

Meaning of the terms – phase, component and degree of freedom- derivation of Gibb's phase rule.Phase equilibria of one component systems – CO_2, water and sulphur systems. Phase equilibria of twocomponent systems – simple eutectic systems – (Pb – Ag), Compound formation with congruentmelting point (Mg-Zn) and incongruent melting point (Na-K), Freezing mixtures. (NaCl – water) .Partially miscible liquid pairs - phenol-water, trimethylamine – water and nicotine-watersystems (systems with lower and upper CST), Effect of impurities on miscibility temperature –immiscible liquids – principle and application to steam distillation - Nernst distribution law(thermodynamic derivation) and its applications.

UNIT–IV : SECOND LAW OF THERMODYNAMICS (18 periods)

Second law of thermodynamics - need for the law – different statements of the law – cyclicprocess – heat engine – Carnot's cycle and its efficiency.Concept of entropy-definition-entropy as a function of P,V and T – entropychange in phase changes, entropy of mixing.Gibbs and Helmholtz functions - ΔA and ΔG as function of P, V and T. Maxwell's relations – Gibbs–Helmholtz equation and its applications – thermodynamic criteria for spontaneity and equilibrium.

UNIT-V: THIRD LAW OF THERMODYNAMICS AND APPLICATIONS (18 Hours)

Third law of thermodynamics – statement – evaluation of absolute entropy from heat capacity data -Exception to third law (CO, N_2O) – Nernst Heat theorem and its expression.Equilibrium

constant and standard free energy change -van't Hoff isotherm (van't Hoff equation) – Thermodynamic derivation of law of mass action-van't Hoff's isochore – Thermodynamic interpretationof Le Chatelier's principle.

TEXT BOOKS AND REFERENCES

1. Quantum Chemistry, W. Levine, Prentice – Hall 1994.
2. Introductory Quantum Chemistry, A.K. Chandra, Tata Mc Graw Hill, 1997.
3. Thermodynamics for chemists, S. Glasstone, Affiliated East Press, 1947.
4. Thermodynamics for students of chemsistry, Rajaram and Kuriakose, Shoban LalNagan Chand, 1986.
5. Basic physical chemistry, W.J. Moore, Prentice Hall, 1986.
6. B.R. Puri, L.R. Sharma and Madan S. Pathania, Elements of Physical Chemistry, Vishal Publishing Co., Jalandhar, 2008
7K.K.Sharma and L.K. Sharma, A Text Book of Physical Chemistry, 4th Edn., Vikas PublishingHouse (P) Ltd., New Delhi, 2002
8. K.L. Kapoor, A Text Book of Physical Chemistry, Macmillan, New Delhi, 2005
9. K. Kundu and S.K. Jain,Physical Chemistry, S.Chand Co. Ltd., New Delhi, 2003
10. B.S. Bhal, G.D. Tuli and ArunBhal, Essentials of Physical Chemistry,S. Chand and Co. Ltd.,New Delhi, 2004
11. P. Atkins and J. Paula, Physical Chemistry, Oxford, New Delhi, 2002

COURSE OUT COMES

CO	**CO Statement**	**Knowledge level**
CO1	On successful completion of the course the students should have learnt about the	K2
CO2	fundamentals of electrochemistry	K2
CO3	Learners will be able to explain concepts of quantum mechanics	K2
CO4	Capacity to define all fundamental thermodynamic properties	K2
CO5	Students can able to state and define phase rule.	K2

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	S	S	S	S	M
CO3	M	S	S	S	S
CO4	S	S	M	S	S
CO5	M	S	S	S	M

S- STRONG M-MEDIUM

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CORE COURSE-XV
GRAVIMETRIC ANALYSIS PRACTICALS (P)

Semester-VIMarks: 75
Course code: 21UCH6C15P **Credits: 4**
Total periods : 90 **Exam Hours: 3**

OBJECTIVES

- To learn the techniques of gravimetric analysis.
- To learn the techniques ofdetermination of physical constants

GRAVIMETRIC ANALYSIS

1. Estimation of Lead as lead chromate.
2. Estimation of Barium as barium chromate.
3. Estimation of Nickel as Nickel - DMG complex.
4. Estimation Calcium as calcium oxalate monohydrate
5. Estimation of Barium as barium sulphate.

ONLY FOR DEMONSTRATION

1. Estimation of Copper as copper (I) thiocyanate
2. Estimation of Magnesium as magnesium oxinate
3. Estimation of Iron as Iron (III) oxide.

DETERMINATION OF PHYSICAL CONSTANTS

Determination of boiling /melting points by semimicro method

REFERENCE

1. Venkateswaran V, Veeraswamy R., Kulandaively A.R., Basic principles of practical chemistry, 2nd edition, New Delhi, sultan chand& sons, (1997)
2. Vogel, Text Book of Quantitative Chemical Analysis, 5th Edition, ELBS / Longman, England,1989

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Students will able to carried out gravimetric analysis .	K2
CO2	Students will be able to find out melting /boiling point of given organic substance.	K2
CO3	Ability to candle sinterd and silica curcible	K2

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	M	S

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MAJOR BASED ELECTIVE II (A)
NUCLEAR & INDUSTRIAL CHEMISTRY

Semester-VIMarks: 75
Course code: 21UCH6M2A **Credits: 4**
Total periods : 90 **ExamHours:3**

OBJECTIVES

- To know the fundamentals and applications of nuclear chemistry
- To learn the concepts of Radioactivity
- To understand the concepts of industrial chemistry

UNIT- I : NUCLEAR CHEMISTRY I (18 periods)

Introduction, nuclear structure – composition of the nucleus, subatomic particles, nuclear forces, nuclear stability – mass defect and binding energy, whole number rule and packing fraction, n-p ratio, odd even rules, nuclear models – liquid drop and shell models, isobars, isotones and isomers. Isotopes – detection, physical and chemical methods of separation ,isotopic constitution of elements.

UNIT- II :NUCLEAR CHEMISTRY II (18 periods)

Detection and measurement of radioactivity – Wilson cloud chamber,Geiger – Muller counter. Particle accelerators – linear accelerator and cyclotron.Artificial radioactivity – nuclear transformation – classification of nuclearreactions, fission – atom bomb, fusion – hydrogen bomb, Stellar energy –nuclear reactor – atomic power projects in India. .

UNIT - III :RADIOACTIVITY (18 periods)

Radioactivity – introduction –disintegration theory - modes of decay-group displacement law, rate of integration and half-life period - Disintegration series.Applications of radioisotopes as

tracers in reaction mechanism – medicine- agriculture - industry and carbon dating. Hazards of radiations. Artificial radio activity

UNIT - IV :INDUSTRIAL METHODS (18 periods)

Leather industries-Curing, preservation and tanning of hides and skins, process of dehairing and dyeing. Treatment of tannery effluents. Electrochemical Industries-production of materials like chlorine, caustic soda - sodium chlorates, bleaching powder. Batteries- Primary and Secondary cells,solar cells and fuel cells. Chemical Explosive- Preparation - lead azide,nitroglycerine, nitrocellulose – TNT – RDX – Dynamite – coridite - picric acid - gun powder. Introduction to rocket propellents.

UNIT V :INDUSTRIAL CHEMISTRY (18 periods)

Cement : Manufacture- wet process and Dry process – types -analysis of major constituents - setting of cement- reinforced concrete. Cement industries in India. Glass: Composition and manufacture of glass- Types of Glass- optical glass- coloured glass and lead glassPaints and varnishes : Definition- types and composition. Primary Constituents of paints - Dispersion medium(solvents) binder-Pigments - formulations of paints and varnishes. Requirements for a good paints and its manufacturing process.

TEXT BOOKS AND REFERENCE BOOKS

1. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand &Company Ltd., 2000.
2. Gilreath, 'Fundamental concepts of Inorganic Chemistry', 18th Printing,McGraw Hill International Book Company, 1985.
3. S. Glasstone, 'Source book on Atomic Energy', East-West Press, 1967.
4. R.Gopalan, P.S. Subramanian and K. Rengarajan, 'Elements of Analytical Chemsitry', Sultan Chand & Sons, 2nd edition, 1991.
5. P.L.Soni, 'Text Book of Inorganic Chemistry', 20th revised edition, SultanChand& Sons, 2000.
6.B.K. Sharma, Industrial Chemistry, Goel Publishing Co

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Capacity to explain concepts of nuclear chemistry.	K2
CO2	Ability to understand chemistry of hydrogen bond	K2
CO3	Able to define radioactivity.	K2
CO4	Understand chemical explosives.	
CO5	Students can able to understand the basic concepts of industrial chemistry.	

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	S	S	S	S	M
CO3	M	S	S	S	S
CO4	S	S	M	S	S
CO5	M	S	S	S	M

S- STRONG M-MEDIUM

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MAJOR BASED ELECTIVE II (B)
ORGANOMETALLIC CHEMISTRY

Semester-VIMarks: 75
Course code: 21UCH6M2B **Credits: 4**
Total periods : 90 **Exam Hours: 3**

. **OBJECTIVES**:

- To Learn the detailed study of synthetic organometallic complexes
- To know the methods of preparation as well as their reactivity and application

UNIT – I : ORGANOMETALLIC COMPOUND (18 periods)

Definition of organometallic compound - 18 electron rule - effective atomic number rule - classification of organometallic compounds - the metal carbon bond types - ionic bond – sigma covalent bond - electron deficient bond - delocalised bond - dative bond - metal carbonyl complexes - structure and reactions of metal carbonyls - the nature of M- CO bonding- binding mode of CO and IR spectra of metal carbonyls - metal carbonyls- metal carbonyl anions - metal carbonyl hydrides - metal carbonyl halides - metal carbonyl clusters – Wade‟s rule and isolobal relationship

UNIT - II :METAL ALKYL COMPLEXES(18 periods)

Metal alkyl complexes - stability and structure - synthesis by alkylation of metal halides - by oxidative addition - by nucleophilic attack on coordinated ligands - metal alkyl and 18 electron rule - reactivity of metal alkyls - M-C bond cleavage reactions - insertion of CO to M-C bonds - double carbonylation - insertions of alkenes and alkynes - insertions of metals with C-H bonds - alkylidene and alkylidyne complexes - bonding in alkylidene complexes - synthesis and bonding in alkylidyne complexes .

UNIT – III :ALKENE COMPLEXES (18 periods)

Alkene complexes - synthesis of alkene complexes by ligand substitution - by reduction and by metal atom synthesis - bonding of alkenes to transition metals - bonding in diene complexes - reactivity of alkene complexes - ligand substitution - reactions with nucleophiles - olefin hydrogenation - hydrosilation - Wacker process - C-H activation of alkenes - alkyne complexes - bonding in alkyne complexes - reactivity of alkynes - alkyne complexes in synthesis - cobalt catalysed alkyne cycloaddition.

UNIT – IV: CYCLOPENTADIENYL COMPLEXES (18 periods)

Cyclopentadienyl complexes - metallocenes - synthesis of metallocenes - bonding in metallocenes - reactions of metallocenes - Cp_2Fe/Cp_2Fe^+ couples in biosensors - bent sandwich complexes - bonding in bent sandwich complexes - metallocene halides and hydrides - metallocene and stereospecific polymerisation of 1-alkenes - cyclopentadiene as a non-spectator ligand - monocyclopentadienyl (half-sandwich) complexes - synthesis and structures of allyl complexes - arene complexes .

UNIT – V:ORGANOMETALLIC COMPOUNDS IN CATALYTIC REACTIONS (18 periods)

Organometallic compounds in homogeneous catalytic reactions - coordinative unsaturation - acid-base behaviour reaction - migration of atoms or groups from metal to ligand - insertion reaction - reactions of coordinated ligands - catalytic reactions of alkenes - isomerisation of alkenes - hydrogenation - hydroformylation and hydrosilation of alkenes - alkyne polymerisation and oligomerisation - fluxional molecules

TEXT BOOKS AND REFERENCE BOOKS

1. Organometallics 1, complexes with transition metal-carbon -bonds, Bockmann, Oxford science publications, Oxford, 1996.
2. Organometallics 2, complexes with transition metal-carbon -bonds, Bockmann, Oxford science publications, Oxford, 1996.
3. Basic organometallic chemistry, J. Haiduc and J. J. Zuckerman, Walter de Gruyter, Brelin, 1985.
4. Inorganic Chemistry - Priciples of structure and reactivity, J. E. Huheey Harper International Edition, Harper and Rone New York, 1978.
5. Advanced Inorganic Chemistry, F. A. Cotton and G. Wilkinson, Fourth Edition.

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Students can able to understand chemistry of organo metallic compound.	K1
CO2	Able to illustrate the structure alkene and alkyne complexes.	K2
CO3	Understand reactivity of alkene and alkyne complexes.	K1
CO4	Ability to understand structure of cyclopentadiene complex.	K2
CO5	Students can able to understand types of catalysis.	K1

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	S	S	S	S	M
CO3	M	S	S	S	S
CO4	S	S	M	S	S
CO5	M	S	S	S	M

S- STRONG M-MEDIUM

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MAJOR BASED ELECTIVE II (C)
ESSENTIAL MOLECULES FOR LIFE

Semester-VI **Marks: 75**
Course code: 21UCH6M2C **Credits: 4**
Total periods : 90 **Exam Hours: 3**

OBJECTIVES

- To impart the knowledge on chemistry of proteins
- To learn about carbohydrates, vitamins, enzymes andnucleic acid
- To understand the importance of the enzymes and hormones

UNIT-I :AMINO ACIDS, PEPTIDES AND PROTEINS (18 periods)

Amino acids – nomenclature – classification - synthesis of α-amino acids - Zwitter ion -iso electricpoint - reactions of carboxyl group - amino group and both. Peptides –nomenclature - determination of structure-end group analysis - synthesis ofpeptidesSheehan method -solid-phase method.Proteins –classification – properties - colour tests – Biuret – ninhydrin – niroprussidetests. Structure-primary and secondary structures, uses of proteins.

UNIT-II :CARBOHYDRATES (18 periods)

Carbohydrates – classification - glucose- structure elucidation, cyclic structure - pyranose andfuranose forms, determination of ring size, muta rotation-mechanism, reactions of open chainaldehyde form and uses. Fructose –occurrence – preparation - structure elucidation - reactions and uses. Inter conversion ofaldoses to ketoses.Disaccharides - sucrose and maltose - properties, structure elucidation and uses. Polysaccharides-starch and cellulose - structure (elucidation not required) - properties anduses.

UNIT –III :VITAMINS (18 periods)

Vitamins –Introduction - source- pro-vitamin - general properties of vitamins, classification-source – properties- functions and deficiency symptoms of vitamins A, D, E, K,B1, B2, B3, B5, B6, B7, B9, B12, C and H. Structural elucidation of retinol – pyridoxine -niacin -ascorbic acid - biotin and phylloquinone.

UNIT – IV : ENZYMES AND HORMONES (18 periods)

Enzymes synthesis - enzyme commission and E.C. Number, classification of enzymes, chemical nature -factors affecting rate of enzyme action, specificity of enzyme action - mechanisms of enzyme action-lock and key- induced fit hypothesis -Co-enzymes - mechanism of co-enzyme action, classification,some common co-enzymes- NAD, FAD, CoA (structure is not required)Hormones - introduction, properties and functions, structure and physiological functions ofsome hormones – Adrenaline - oxytocin -insulin– andresterone-oestrone and progesterone.

UNIT – V:NUCLEIC ACIDS (18 periods)

Nucleic Acids - introduction carbohydrates and heterocyclic bases in nucleic acids, nucleosides,nucleotides, types of nucleic acids - Waston and Crick model of DNA, structural variation inDNA Replication of DNA - types of replication - semi conservative, conservative and dispersivemethods, enzymes involved in DNA replication – DNA polymerases, DNA ligase, functions ofDNA. RNA – Types of RNA- mRNA, tRNA and rRNA, functions of RNA, biological functions ofnucleic acids - comparision of DNA and RNA.

TEXT BOOKS ANDREFERENCES:

1. P. L. Soni, H. M. Chawla, Text book of organic chemistry, Sultan Chand and Sons, New Delhi, 1997.

2. O. P. A garwal, Chemistry of organic natural products, Goel publishing house, Meerut.
3. Dulsy Fatima, L.M.Narayanan, R.P.Meyyan, K.Nallasingam,S. Prasannakumar and N.Arumugam, Biochemistry, Saras Publication, Nagercoil, 2013.
4 B. S. Bahl and ArunBahl, Advanced organic chemistry, S. Chand & company, New Delhi, 1990.
5 . M.K. Jain, S. C. Sharma, Organic Chemistry, ShobanLal Nagin Chand & co., Jalandhar, 1998.

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Students can able to explain structure ofamino acids and proteins.	K1
CO2	Ability to undertstand types of carbohydrates.	K2
CO3	Learners can able to elucidate structure of vitamins.	K1
CO4	Learners can explain importance of the enzymes and hormones.	K1
CO5	Ability to undertstand structure of DNA & RNA	K1

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	M	M	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	M
CO4	S	S	M	S	S
CO5	M	S	S	S	S

S- STRONG M-MEDIUM

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MAJOR BASED ELECTIVE III (A)
POLYMER CHEMISTRY

Semester-VI **Marks: 75**
Course code: 21UCH6M3A **Credits: 4**
Total periods : 75 **Exam Hours: 3**

OBJECTIVES

- To know the chemistry of polymers
- To study polymerization and techniques.

UNIT-I :INTRODUCTION TO POLYMERS AND RUBBERS (15 periods)

Basics of polymers – monomers and polymers - definition .classification ofpolymers on the basis applications - thermosetting and thermoplastics -distinction among plastics. Functionality -. Copolymers. Degree ofpolymerization. Types of polymerization reactions – chain polymerization -freeradical and ionic polymerization – coordination and step polymerizationreactions- polyaddition and polycondensation – miscellaneous reactions: ringopeningand group transfer polymerization. Basics of rubbers: types -vulcanization of rubber-ebonite- uses of rubbers.

UNIT - II : PROPERTIES AND REACTIONS OF POLYMERS (15 periods))

Properties: Glass transition temperature (Tg) -definition – factors affecting Tg.Relationship between Tg and molecular weight. Importance of Tg. Molecularweight of polymers: number average (Mn) - weight average (Mw) -sedimentationand viscosity average molecular weights. Reactions: Hydrolysis – hydrogenation– addition – substitutions – crosslinking and cyclisations reaction. Polymerdegradation- thermal – photo and oxidationdegradation of polymers (basicsonly)

UNIT- III : POLYMERIZATION TECHNIQUES AND MOULDING TECHNIQUE (15 periods))

Polymerization techniques: bulk – solution – emulsion - melt condensation andinterfacial polycondensation polymerization. Moulding technique: Injection–compression - extrusion - rotational and calendaring.

UNIT- IV :CHEMISTRY OF COMMERCIAL POLYMERS (15 periods)

Preparation, properties and uses of the polymers: Polyethylene – polypropylene – polystyrene - PVC-teflon and polymethylmethacrylate - polycarbonate- polyurethanes-polyamides (Kevlar) - phenol-formaldehyde - urea-formaldehyde resin - epoxy resins - rubber-styrene and neoprene rubbers.

UNIT - V :ADVANCES IN POLYMERS (15 periods)

Biopolymers – biomaterials. Polymers in medical field - High temperature andfire – resistant polymers. Silicones - conducting polymers- carbon fibers.(basicidea only) and polymer composites.

TEXT BOOK AND REFERENCE BOOKS

1.Billmeyer F.W., Text book of polymer science, Jr. John Wiley and Sons, 1984.
2. Gowariker V.R., Viswanathan N.V. and JayaderSreedhar, Polymer Science,
Wiley Eastern Ltd., New Delhi, 1978.

3. Sharma, B.K., Polymer Chemistry, Goel Publishing House, Meerut, 1989.
4. Arora M.G., Singh M. and Yadav M.S., Polymer Chemistry, 2nd Revised edition, anmol Publications Private Ltd., New Delhi, 1989.

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Leaner's can able to understand chemistry of Rubbers.	K1
CO2	Ability to understand polymer degradation and polymer properties.	K2
CO3	Understand types of polymerisation.	K1
CO4	Students can able to understand synthersis of commercial polymers.	K1
CO5	Ability to understand to application of polymers.	K1

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Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	M
CO4	S	S	L	S	S
CO5	M	S	S	S	S

S- STRONG M-MEDIUM L-LOW

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MAJOR BASED ELECTIVE III (B)
PHARMACEUTICAL CHEMISTRY

Semester-VIMarks: 75
Course code: 21UCH6M3B **Credits: 4**
Total periods : 75 **Exam Hours:3**

OBJECTIVES

- To study the principles and functioning of drugs.
- To know about functioning of antibiotics , analgesic and antipyretics
- To learn the impact of poisons.

UNIT - I : DRUGS TERMINOLOGY (15 periods)

Terminology: Drugs- pharmacy –pharmacology - pharmacognosy -theraupties-toxicology - chemotherapy- pharmacopoeia - first aid for bleeding for blood,maintain breathing, Cut- Abrasions and Bruises- Fractures- Burns andFainting. First aid box for aceident -plaster of paris- Symptoms treatment forAnemi-Diapeties - T.B – Asthma- Jaundice – Typhoid – Malaria – Cholera -Filariasis. Medicinally important compound Aluminum - phosphorus -Arsenic-Mercury - Iron, Milk of maganesia-Aluminum Hydroxide gel.

UNIT - II : ANTIBIOTICS (15 periods)

Antibiotics: Introduction- classification – based on biological action, chemicalstructure-Biosynthesis and degradation of penicillin. an account of semisynthetic penicillin, different types of penicilium, SAR chloroamphenicol-synthesis - SAR and Assay – chloroamphenicol - Streptomycin – structure assay– structure Activity relationship.

UNIT - III :ANALGESIC AND ANTIPYRETICS (15 periods)

Analgesic and Antipyretics: Analgesic - Norcotic analgesics-syntheticanalegisespethidine and methadone- Narcotic antasonist –Nalarphine - Nonnarcotic-antipyreticanalgsesics. Pyrazole- salicylic acid- P- amino phenolderivativeasprin and Ibuprofen – Ketoprofen- Naproxen.

UNIT - IV : ANASTHETICS, ANTISEPTICS AND DISINFECTANTS (15 periods)

Anasthetics : Definition, classification of anesthetics, Ethers, Halohydrocarbons,chloroform Halo ethane, Ferqusen principle- Intravenous anesthetics.Structureofthiopental sodium – Local anesthetics – cocaine- source andstructure – preparation and usesof procaine. Amethocanie and Benzocaine.Antiseptics and Disinfectants – phenol co-efficient. Phenolic componenttransquilizers –definition and example. Pschodelic drugs. LSD and Marijuna,AIDS HIV, propagation prevention and treatment.

UNIT - V: POISONS (15 periods)

Poisons: Poison Investigation Definition kinds of poison – Accidental suicidalandomicidal death – action of poison – general condition that control action ofpoison – general condition that control action of poison Hints of Investigation -Industrial gases and volatile poison, synthetic gases – carbon di sulphide – petroleum distillate, aromatic compounds-chlorinated hydro carbons.

TEXT BOOKS AND REFERENCES

1. Lakshmi S, pharmaceutical chemistry 2011.
2. Jaya shree Ghosh, A text book of pharmaceutical chemistry, 3rd ed.,
S.Chand& Company Ltd., New Delhi (2008)

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Ability to understand different types of disease.	K1
CO2	Leaner's can able to understand the biological actions of antibiotics.	K2
CO3	Students will be able to understand analgesic and antipyretics**.**	K1
CO4	Ability to distinguish between antiseptics and disinfectants	K1
CO5	Students will be able to understand impacts of poisons	K1

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	M
CO4	S	S	S	S	S
CO5	M	S	S	S	S

S- STRONG M-MEDIUM

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MAJOR BASED ELECTIVE III (C)
PHOTOCHEMISTRY AND RADIATION CHEMISTRY

Semester-VI **Marks: 75**
Course code: 21UCH6M3CCredits: 4
Total periods : 75 **Exam Hours: 3**

OBJECTIVE

- To understand the fundamentals of photochemistry
- To know about radiation chemistry

UNIT – I :PHOTOCHEMICAL REACTION I **(15 periods)**

Introduction – Photochemical reaction, thermal reactions –Differences between thermal andphotochemical reactions, Laws of photochemistry – Lambert law, Beer's law, Lambert – Beer'slaw, Grothus - Draper's law- Einstein's law of photochemical equivalence. Quantum yield –Experimental determination of quantum yield – High quantum yield reactions, low quantum yieldreactions. Primary and secondary process - reasons for High quantum yield.

UNIT – II : PHOTOCHEMICAL REACTION II (15 periods)

Jablonski diagram – Non radioactive transitition, radioactive transition – Luminescence – Fluorescence – phosphorescence - Application of Fluorescence and phosphorescence.Quenching offluorescence – Stern – Volmer equations. Factors affecting quenching of fluorescence,chemiluminescence, Bioluminescence.

UNIT-III:KINETICS OF SOME PHOTOCHEMICAL REACTIONS (15 periods)

Kinetics of some important photochemical reactions – Dissociation of HI -Formation of HCl - formation of HBr - photolysis of acetaldehyde -Dimerisation of anthracene (Derivations required).

UNIT-IV : PHOTOCHEMICAL REACTIONS (15 periods)

Photochemical reactions of transition metals.Substitutionreaction,redox reactions. Photo sensitization . Photosynthesis in plants . Excimers , Exciplexes - Atmospheric photochemistry - photochemistry formation of smog.

UNIT-V: RADIATION CHEMISTRY (15 periods)

Radiation chemistry **–** Definition – Examples - comparison of photochemistry and radiationchemistry – Source of high energy radiation with matter. UnitofRadiation energy **–** Curie - Rad – Gray – Rontgen - RBE. Chemical dosimeter – Fricke dosimeter, ceric sulphate dosimeter – Radiolysisof water – Ionic products – Free radical products – Hydrated electron – Properties of hydratedelectron.

TEXT BOOKS AND REFERENCES

1. B.R. Puri, L.R. Sharma, Madan S. Pathania, Principles of Physical Chemistry, Vishal Publications, Jalandhar, 2004.
2. N. Kundu and S.K. Jain, "Physical Chemistry", S. Chand & Company Ltd. 2000.
3.Gurdeep Raj "Photochemistry", Goel Publishing House, Meerut,2009.
4. B.S. Bahl, G.D. Tuli and ArunBahl, "Essentials of Physical Chemistry", S.Chand& Co., New Delhi, 1999.

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Capacity to explain Laws of photochemistry.	K1
CO2	Students will be able to discuss Fluorescence phosphorescence.	K2
CO3	Ability to understand kinetics of photochemical reactions.	K1
CO4	Learners able to understand chemistry of photosynthesis.	K1
CO5	Able to explain concepts of radiation chemistry	K1

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	M
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- STRONG M-MEDIUM

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DHANALAKSHMI SRINIVASAN
COLLEGE OF ARTS AND SCIENCE FOR WOMEN

PERAMBALUR – 621 212

(AUTONOMOUS)

(Affiliated to Bharathidasan University)

(Nationally Reaccredited with "A" Grade by NAAC)

(M.Sc., Chemistry Course Structure under CBCS)

(For the candidate admitted from the academic year 2020-2021 onwards)

SEM	COURSE	COURSE TITLE	COURSE CODE	Inst periods / week	CREDIT	EXAM HOURS	Marks		Total
							Int	Ext	
I	Core Course –I	Inorganic Chemistry- I	20PCH1C1	5	4	3	25	75	100
	Core Course –II	Organic Chemistry- I	20PCH1C2	5	4	3	25	75	100
	Core Course–III	Inorganic Chemistry Practical-I	20PCH1C3P	6	4	6	40	60	100
	Core Course -IV	Organic Chemistry Practical- I	20PCH1C4P	6	4	6	40	60	100
	Elective Course –I	A)Analytical Chemistry	20PCH1E1A	5	4	3	25	75	100
		B)Material Chemistry	20PCH1E1B						
	Application Oriented Course-I	Detergents and Fuels	20PCH1A1	3	3	3	25	75	100
			Total	**30**	**23**	**-**	**180**	**420**	**600**
II	Core Course –V	Inorganic Chemistry- II	20PCH2C5	5	4	3	25	75	100
	Core Course –VI	Organic Chemistry -II	20PCH2C6	5	4	3	25	75	100
	Core Course –VII	Inorganic Chemistry Practical- II	20PCH2C7P	6	4	6	40	60	100
	Core Course –VIII	Organic Chemistry Practical –II	20PCH2C8P	6	4	6	40	60	100
	Elective Course –II	A)Supra molecular Chemistry	20PCH2E2A	5	4	3	25	75	100
		B)Industrial Chemistry	20PCH2E2B						
	Application Oriented Course-II	Food and Drugs	20PCH2A2	3	3	3	25	75	100
			Total	**30**	**23**	**-**	**180**	**420**	**600**
III	Core Course –IX	Physical Methods in Chemistry	20PCH3C9	6	5	3	25	75	100
	Core Course –X	Bio-organic Chemistry	20PCH3C10	6	5	3	25	75	100
	Core Course –XI	Physical Chemistry -I	20PCH3C11	6	5	3	25	75	100
	Core Course-XII	Physical chemistry Practicals	20PCH3C12P	7	5	6	40	60	100
	Elective Course–III	a) Polymer chemistry	20PCH3E3A	5	4	3	25	75	100
		B)Chemistry of Nano science and Nano Technology	20PCH3E3B						

			Total	**30**	**24**	**-**	**140**	**360**	**500**
IV	Core Course – XIII	Physical Chemistry -II	20PCH4C13	6	5	3	25	75	100
	Project	Project Work	20PCH4PW	24	15	-	-	-	200
Total				**30**	**20**	**-**	**25**	**75**	**300**
Grand Total				**120**	**90**	**-**	**525**	**1275**	**2000**

PROGRAMME OUTCOMES

- Curriculum impart firm foundation in all areas of Chemistry and enhance the skills in problem solving and analytical reasoning.

- Inculcate research interest in emerging areas of chemical sciences andtransform it to the benefit of society.

- Ability to use technologies and instrumentation to collect and analyse the data.

- Capable to nurture the needs of R&D laboratories and industries and make them to cope with all the competitive examinations.

- Imbibed ethical, moral and social values in personal life leading to highly cultured and civilized personality.

CORE COURSE-I
INORGANIC CHEMISTRY-I

Semester - I **Marks: 75**
Course Code: 20PCH1C1 **Credit: 4**
Total Periods: 75 **Exam Hours:3**

OBJECTIVES:

- To impart the theories about bonding
- To learn about structure of various co-ordination Compounds
- To understand about calculation of magnetic moment of transition metal complexes
- To know about basics of reaction Mechanisms in coordination chemistry.

UNIT –I: COORDINATION CHEMISTRYBASIC PRINCIPLES (15 Periods)

Principle-:Studies of coordination compounds in solution - detection of complex formation in solution - stability constants - stepwise and overall formation constants. Factors affecting stability - statistical and Chelate effects - forced configurations.

Theories of Metal - Ligand bond. VB theory and its limitations - Crystal field theory - splitting of d-orbitals under various geometries – Factors affecting splitting - CFSE and evidences for CFSE (Structural and thermodynamic effects) . Spectrochemical series.Jahn-Teller distortion . Spectral and magnetic properties of complexes .Limitations of CFT . Ligand field theory -MO theory . Sigma – and pi-bonding in complexes . Nephelauxetic effect . The angular overlap model.

UNIT- II:REACTION MECHANISM IN COORDINATION COMPLEXES

(15 Periods)

Reaction Mechanism Kinetics and mechanism of reactions in solution - labile and inert complexes. Ligand displacement reactions in octahedral and square planar complexes. Acid hydrolysis, base hydrolysis and anation reactions . Trans effect - theory and applications. Electron transfer reactions - electron exchange reactions - complementary and non-complementary types . Inner sphere and outer sphere processes.

UNIT- III:ELECTRONIC SPECTRA OF TRANSITION METAL COMPLEXES (15 Periods)

Electronic Spectra of Transition Metal Complexes Spectroscopic ground states, correlation, crystal field theory and splitting in Oh, Td, Square planar, Trigonal bipyramidal systems, orgel and Tanabe-Sugano diagrams for transition metal complexes (d1 –d9),Calculation of Dq, B and β Parameters ,charge transfer spectra, spectroscopic method for assignment of absolute configuration inoptically active metal chelate and their stereochemical information.

UNIT- IV:**MAGNETIC PROPERTIES OF TRANSITION METAL COMPLEXES (15 Periods)**

Magnetic properties of transition metal complexes and lanthanides, spin-orbit coupling and susceptibility of transition metal ions and rare earths; magnetic moments of metal complexes with crystal field terms of A, E and T symmetry, T.I.P., intramolecular effects, antiferromagnetism and ferromagnetism of metal complexes, super paramagnetism. High and low spin equilibria, anamolous magnetic moments, magnetic exchange coupling and spin Crossover.

UNIT- V :INORGANIC MATERIALS(15 Periods)

Introduction to the solid state, metallic bond, band theory (zone model, brillouin zones, limitation of zone model): defects in solids, p-type and n-type, inorganic semiconductors (use in transistors, IC etc.), electrical, optical, magnetic and thermal properties of inorganic materials, superconductors, with special emphasis on the synthesis and structure of high temperature super conductors.

TEXT AND REFERENCES BOOKS

1. J. E. Huheey, Inorganic Chemistry, 3rd ed., Harper & Row Publishers, Singapore.
2. Purcell and Kotz, Inorganic Chemistry, Saunders Golden Sunburst Series, W. B. Saunders Company, Philadelphia.
.3. Magnetochemistry by R.L. Carlin.
4.Mabbs, F. E. & Machin, D. J. Magnetism and Transition Metal Complexes Chapman and Hall: U.K. (1973).
5. Cotton and Wilkinson, Advanced Inorganic Chemistry, 5th ed., Wiley Interscience Publication, John Wiley & Sons, New York, USA.
6. Keer, H.V. Principles of the solid state Wiley Eastern Ltd.: New Delhi (1993).
7. D.F. Shrivers, P.W. Atkins and C.H. Langfor 1990, Inorganic Chemistry,CH Langford,.
8. A.I. Vogel, 1985, 1976, Text Book of Qualitative InorganicAnalysis, ELBS III Edition, and IV Edition.
9. S. E. Kegley and A. R. Pinhas, Problems and Solutions in Organometallic Chemistry, University Science Books, Oxford University Press.
10. A. J. Pearson, Metalloorganic Chemistry,
11.K.F. Purcell and J.C. Kot, 1977, Inorganic Chemistry - WBSaunders Co., USA.
12. G.S. Manku, 1984, Inorganic Chemistry, TMG Co
13. P. Powell, Principles of Organometallic Chemistry, 2nd ed., Chapman and Hall, London.
14. B. Douglas, D. H. McDaniel and J. J. Alexander, Concepts and Models of Inorganic Chemistry, 2nd ed, John Wiley & sons, New York.
15. Oxford Chemistry Primers Series, No.
16. R. K. Sharma, Inorganic Reactions Mechanism; Discovery Publishing House, New Delhi, 2007.
17. F. Basolo and R. G. Pearson, Mechanism of Inorganic Reactions; 2nd Ed., John Wiley, New York, 1967
18. S. F. A. Kettle, Physical Inorganic Chemistry – A Coordination Chemistry Approach, Spectrum; Academic Publishers, Oxford University Press, New York, 1996.
19. M. C. Day and J. Selbin, Theoretical Inorganic Chemistry, Affiliated East West Press Pvt. Ltd. 2nd ed.,1985.

20. A.W.Adamson, Inorganic Photochemistry, John Wiley & Sons, New York.
21. S.F.A. Kettle, Physical Inorganic Chemistry – A Coordination Chemistry Approach, Spectrum Academic Publishers, Oxford University Press, 1996.

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

OUTCOMES

CO number	CO statement	Knowledge level
CO1	Leaner's can able to describe VB and CFSE theories	K2
CO2	Students get the ability to write reaction mechanisms in coordination compounds	K2
CO3	Gain knowledge about electronic spectra of transition metals and able to calculate microstate and term symbols.	K3
CO4	Capacity to draw calculate magnetic moment of transition metal complexes	K4
CO5	Students can analyse inorganic materials and its applications in metal complexes	K5

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Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	S
CO2	M	S	S	M	S
CO3	S	S	M	S	M
CO4	S	M	S	S	M
CO5	M	M	S	M	S

S-STRENGTH M-MEDIUM L-LOW

CORE COURSE-II
ORGANIC CHEMISTRY -I

Semester-I **Marks: 75**
Course code: 20PCH1C2 **Credits: 4**
Total Periods: 75 **Exam Hours: 3**

OBJECTIVES

- To understand the basic concepts in organic reaction mechanism and its Rearrangements
- To know the nomenclature of alicylic, bicyclic and tricyclic compounds.
- To understand about the oxidation and reduction**.**

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UNIT I: CONFORMATIONAL ANALYSIS (15 Periods)

Conformation in open chain system (with reference to 1,2-disubstituted ethane). Baeyer's strain theory of cyclic compounds, conformations and stability of cyclohexanes (mono-, di- and trisubstituted). Confomation of rings containing sp2 hybridized carbon atoms, conformation of sugars. Locking groups - t-butyl groups, decalins and steroids, Effect of conformation on reactivity.

UNIT II: NATURE OF BONDING IN ORGANIC MOLECULES (15 Periods)

Huckel's rule of aromaticity, annulenes, benzoid and non-benzoid aromatic systems; tropones, tropolones, azulene, pentalene and heptalene. Anti-aromaticity and Homo-aromaticity, PMO approach. Alternant and nonalternant hydrocarbons, Mesoionic compounds and squaric acid. Bonds weaker than covalent bonds, crown ether complexes and cryptands; inclusion compounds- Cyclodextrins, catananes and rotaxanes.

UNIT- III: INTRODUCTION TO REACTION MECHANISM (15 Periods)

Reaction intermediates – Free radicals, Carbenes, Nitrenes, Carbanions, Carbocations – Generation and stability of reaction intermediates, Correlation of reactivity with structure of reactive intermediates. free halogenation -NBS. Stereochemical aspects to be studied wherever applicable.Kinetic and Thermodynamic control of chemical reactions: Methods of determining reaction mechanism - kinetic methods – Primary and Secondary kinetic isotopic effects; Non-kinetic methods – Study of intermediates, Product analysis, isotope labelling, Stereochemical studies and cross over experiments; Principle of microscopic reversibility; Hammond postulate. Linear free energy relationship; Hammett equation – Significance of reaction and substituent constants (and); Taft equation.

UNIT IV: ADDITION TO CARBON-HETERO MULTIPLE BONDS (15 Periods)

Mechanism of metal hydride reduction of saturated and unsaturated carbonyl compounds, acids, esters and nitriles. Addition of Grignard reagents, Organozinc and Organolithium reagents to carbonyl and unsaturated carbonyl compounds. Wittig Reaction. Mechanism of condensation reactions involving enolates – Aldol addition/condensation, Knoevenagel condensation, Stobbe condensation, Claisen condensation, Mannich reaction, Benzoin condensation and Perkin reaction. Hydrolysis of esters and amides, Ammonolysis of esters.

UNIT – V:MOLECULAR REARRANGEMENTS(15 Periods)

Molecular rearrangements - intramolecular rearrangements - 1,2- shifts in carbonium ions - Wagner-Meerwin and related rearrangements - migration to carbonyl carbon - Neber rearrangement – Benzilic acid - rearrangements to electron deficient nitrogen and oxygen - dienone-phenone - Favorski - Wolf - Claisen - Cope rearrangement, Stork enamine, Mannich, Barton, Chichibabin and ene reactions; Sharpless asymmetric epoxidation.

TEXT AND REFERENCE BOOKS:

1. R.Bruckner, 2002, Advanced Organic Chemistry, Reaction Mechanism, Elsevier, New Delhi
2. F. A . Carey and R.J. Sundberg, 2001, Advanced Organic Chemistry,Part A and Part- B, 4th Edition, Plenum Press., New York
3. J.March, 2002, Advanced Organic Chemistry, 4th Edition, JohnWiley & Sons Singapore.
4. T.L. Gilchrist and C.W. Rees, Carbenes, Nitrenes and Arynes,Thomas Nelson and Sons Ltd., London.
5. W. Carruthers, 1993, Some Modern Methods of Organic Synthesis,3rd Edition, Cambridge University Press.186
6. I.L. Finar, Organic Chemistry, Vol. II, 6th edition, John Wiley and Sons, New York, 2000.
7. T.H. Lowry and K.S. Richardson, Mechanism and Theory in Organic Chemistry.
8. Jerry March, Advanced Organic Chemistry, John Wiley and Sons, 4th edition, 2004.

WEBSITES:

1. http :// info dome . sdsu, ./research/ guides/ science/ org chemistryblr. html
2. http :// www.liv.ac.uk/chemistry/links /reactions.html
3. http ://orgchem.chem..uconn.edu/namereact/named.html
4. www.gcocities.com/ chempen softwar4ee/reactions.html

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

COURSE OUTCOMES

CO number	CO statement	Knowledge level
CO1	Student will easily understand the molecular interconversion and predict symmetry element for given organic compound.	K2
CO2	Learners get the capacity to differentiate the aromatic, non aromatic and anti-aromatic compounds	K3
CO3	Students will be able to understand the organic reactions and its mechanism with stereochemical aspects.	K4
CO4	Students will be able to write the addition and their condensation reaction mechanisms	K4
CO5	Learners can identify the various molecular rearrangements	K5

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	M	S	S	M	S
CO3	S	M	M	S	M
CO4	S	M	S	S	M
CO5	M	M	S	M	S

S-STRENGTH M-MEDIUM L-LOW

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CORE COURSE-III
INORGANIC CHEMISTRY PRACTICAL-I

Semester-I **Marks: 60**
Course code: 20PCH1C3P **Credits:4**
Total Periods: 90 **Exam Hours:6**

OBJECTIVES

- To perform the semi-micro qualitative

- To carry out colorimetric analysis.

1. Semi-micro qualitative analysis of a mixture containing two common cations (Pb, Bi, Ca, Cd, Fe, Cr, Al, Co, Ni, Mn, Zn, Ba, Sr, Ca, Mg, NH4) and two less common cations (W, Tl, Se, Te, Mo, Ce, Th, Zr, Ti, V, U, Li).

2. Estimation of copper, ferric, nickel, chromium and manganese ions using photoelectric colorimeter

TEXT AND REFERENCE BOOKS:

1. V. V. Ramanujam, Inorganic Semimicro Qualitative Analysis; 3rd Ed., National Pubs, London, 1988.
2. G. Svehla, Text Book of Macro and Semimicro Qualitative Inorganic Analysis; 5th Ed., Longman group Ltd, London, 1987.
3. A. I. Vogel, Text Book of Quantitative Inorganic Analysis; 6th Ed., Longman, New Delhi, 2000.

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

COURSE OUTCOMES

CO number	CO statement	Knowledge level
CO1	Students get the ability to analyse common and rare cations present in a mixture	K3
CO2	Capacity to do colorimetric analysis	K4
CO3	Demonstrate and understand the cationic applications of industries .	K5

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	M	S
CO2	M	S	S	M	S
CO3	S	S	M	S	M

S-STRENGTH M-MEDIUM L-LOW

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CORE COURSE-IV
ORGANIC CHEMISTRY PRACTICAL -I

Semester-I **Marks: 60**
Course Code: 20PCH1C4P **Credits: 4**
Total Periods: 90 **Exam Hours: 6**

OBJECTIVES

- To perform the qualitative analysis of a given organic mixture
- To carry out the preparation of organic compounds.

1.QUALITATIVE ANALYSIS OF AN ORGANIC MIXTURE CONTAINING TWO COMPONENTS

Mixtures containing two components are to be separated (pilot separation) and purified (bulk separation) – The physical constants are to be reported (analysis).

2. PREPARATION OF ORGANIC COMPOUNDS (SINGLE STAGE)

1. Methyl-*m*-nitrobenzoate from methylbenzoate (nitration)
2. Glucose pentaacetate from glucose (acetylation)
3. Resacetophenone from resorcinol (acetylation)
4. Benzophenone oxime from benzophenone (addition)
5. *o*-Chlorobenzoic acid from anthranilic acid (Sandmayer reaction)
6. *p*-Benzoquinone from hydroquinone (oxidation)
7. Phenylazo-2-naphthol from aniline (diazotization)

TEXT AND REFERENCES BOOKS

1. J. Mohan, Organic Analytical Chemistry: Theory and Practice; Narosa, 2003.
2. V. K. Ahluwalia, P. Bhagat, and R. Agarwal, Laboratory Techniques in Organic Chemistry; I. K. International, 2005.
3. N. S. Gnanaprakasam and G. Ramamurthy, Organic Chemistry Lab Manual; S.V. Printers, 1987.
4. A. I. Vogel, A. R. Tatchell, B. S. Furniss, A. J. Hannaford and P. W. G. Smith, Vogel's Textbook of Practical Organic Chemistry; 5th Ed., Prentice Hall, 1989

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

COURSE OUTCOMES

CO number	CO statement	Knowledge level

CO1	Students get the ability to analyse the organic mixture containing two components.	K3
CO2	Students will be able to prepare the organic compounds.	K3
CO3	Learners will understand the pharmaceutical applications of organic compound	K4

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	S
CO2	M	M	S	M	S
CO3	S	S	M	S	M

S-STRENGTH M-MEDIUM L-LOW

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ELECTIVE COURSE-IA
ANALYTICAL CHEMISTRY

Semester-I **Marks:75**
Elective Course : 20PCH1E1A **Credits:4**
Total Periods: 75 **Exam hours:3**

OBJECTIVES

- To impart the knowledge of various instrumental techniques
- To understand about concepts data and error analysis
- To learn about principles of chromatographic techniques.

UNIT I: INSTRUMENTAL METHODS OF ANALYSIS (15 Periods)

Principles and applications of extended X-ray absorption fine structure (EXAFS) -surface extended X-ray absorption (SEXAFS)-atomic absorption spectroscopy (AAS) -flame emission spectroscopy (FES) -turbidimetry - theory and applications.

UNIT II: DATA AND ERROR ANALYSIS (15 Periods)

Various types of error – accuracy, precision, significant figures – frequency distributions, the binomial distribution, the Poisson distribution and normal distribution – describing data, population and sample, mean, variance, standard deviation, way of quoting uncertainty, robust estimators, repeatability and reproducibility of measurements. Hypothesis testing, levels of confidence and significance, test for an outlier, testing variances, means t-Test, paired t-Test – analysis of variance (ANOVA) – correlation and regression.

Curve fitting, fitting of linear equations, simple linear cases, weighted linear case, analysis of residuals – general polynomial equation fitting, linearizing transformations, exponential function fit – r and its abuse – multiple linear regression analysis, elementary aspects.

UNIT III: CHROMATOGRAPHY (15 Periods)

Solvent extraction – principles of ion exchange, paper, thin-layer and column chromatography techniques – columns, adsorbents, methods, Rf values, McReynold's constants and their uses – HPTLC, HPLC techniques – adsorbents, columns, detection methods, estimations, preparative column – GC-MS techniques – methods, principles and uses.

UNIT IV: THERMOANALYTICAL METHODS AND FLUORESCENCE SPECTROSCOPY (15 Periods)

Principles – instrumentations and applications of thermogravimetry analysis (TGA), Differential Thermal Analysis (DTA) and Differential Scanning Calorimetry (DSC) – thermometric titrations – types – advantages. Basic aspects of synchronous fluorescence spectroscopy – spectral hole burning – flow cytometry – fluorometers (quantization) – instrumentation – applications.

UNIT V: ELECTRO ANALYTICAL TECHNIQUES (15 Periods)

Electrochemical sensors, ion-sensitive electrodes, glass – membrane electrodes, solid-liquid membrane electrodes – ion-selective field effect transistors (ISFETs) – sensors for the analysis of gases in solution. Polarography – principles and instrumentation – dropping mercury electrode – advantages – Ilkovic equation – applications of Polarography – Polarographic maxima – Oscillographic Polarography, AC Polarography – cyclic voltammetry – advantages over polarographic techniques – chronopotentiometry – advantages – controlled potential coulometry – amperometric titrations: principles – techniques – applications – estimation of lead.

TEXT AND REFERENCES BOOKS:

1. D. B. Hibbert and J. J. Gooding, Data Analysis for Chemistry; Oxford University Press, UK, 2006.
2. J. Topping, Errors of Observation and Their Treatment; 4th Ed., Chapman Hall, London, 1984.
3. A. Braithwaite and J. F. Smith, Chromatographic Methods; 5th Ed., Springer, Germany; 1995.
4. V. K. Srivastava and K. K. Srivastava, Introduction to Chromatography; 2nd Ed., Holden Day, New York, 1985.
5. H. H. Willard, L. L. Merritt, J. A. Dean and F. A. Settle, Instrumental Methods of Analysis; 6th Ed., CBS Publishers and Distributors, Chennai, 1986.
6. D. A. Skoog, D. M. West and D. J. Holler, Fundamentals of Analytical Chemistry, 7th Ed., Harcourt College Publishers, Singapore, 2004.
7. A. Sharma, S. G. Schulman, Introduction to Fluorescence Spectroscopy; Wiley- Interscience, New York, 1999.
8. C. N. Banwell and E. M. McCash, Fundamentals of Molecular Spectroscopy; 4th Ed., Tata McGraw-Hill, New Delhi, 1994.
9. A. I. Vogel, Text Book of Quantitative Inorganic Analysis; 6th Ed., Longman, New Delhi, 2000.
10. D. C. Harris, Quantitative Chemical Analysis; 4th Ed., W. H. Freeman Publications, New York, 1995.
11. S. C. Gupta, Fundamentals of Statistics; 6th Ed., Himalaya Publications, Delhi, 2006.

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

COURSE OUTCOMES

CO number	CO statement	Knowledge level
CO1	Students can get the capability to explain the spectroscopy techniques.	K3
CO2	Students will understand the mathematical applications of data and error analysis	K4
CO3	Leaner's can explain the different chromatographic methods.	K4
CO4	Students will the theoretically and instrumentation techniques of fluorescence spectra.	K5
CO5	Capacity to analyse the electro analytical techniques.	K6

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	S	S
CO2	M	S	S	M	S
CO3	S	S	M	S	M
CO4	M	M	S	S	M
CO5	M	M	S	M	S

S-STRENGTH M-MEDIUM L-LOW

ELECTIVE COURSE-I(B)

MATERIAL CHEMISTRY

Semester-I **Marks:100**
Elective COURSE : 20PCH1E1B **Credit:4**
Total Periods:75 **Exam Hours:3**

Objectives:

- To know about the synthesis of inorganic materials
- To understand about inorganic liquid crystals and superconductors
- To learn about principles of inorganic photochemistry.

UNIT-I SYNTHESISOF INORGANIC MATERIALS (15 Periods)

Synthesis of materials – the formation of bulk material – methods – direct synthesis –solution method – chemical depositionDefects and ion transport . extended defects – atom and ion diffusion.

Solid Electrolytes – cationic electrolytes- anionic electrolytes- Mixed ionic electronicconductors-properties, structure and uses.

UNIT-II SUPERCONDUCTORS AND INORGANIC PIGMENTS (15 Periods)

Superconductors – high temperature super conductors – meissner effect – types – superconducting oxides - properties – colossal magneto resistance – structure – properties – Rechargeable battery materials – $LiCoO_2$, $LiMnO_4$ – properties and uses.

Inorganic pigments: Coloured solids – inorganic phosphorous – Properties- uses – white and black pigments – properties and uses.

UNIT-III MOLECULAR MATERIAL CHEMISTRY (15 Periods)

Molecular material Chemistry – one dimensional metals – properties and uses – molecular inorganic magnetic materials – properties and uses..

Inorganic liquid crystals – types – calamitic –discotic – properties and uses Fullerides solid carbon C60 – properties and uses.

UNIT-IV INORGANIC PHOTOCHEMISTRY (15 Periods)

Inorganic Photochemistry: Electronic transitions in metal complexes, metal centred and charge transfer transitions- various photophysical and photochemical processes of coordination compounds. Unimolecular charge transfer photochemistry of cobalt (III) complexes- mechanism of CTTM, photoreduction- ligand field photochemistry of chromium (III) complexes- Adamson's rule, photoactive excited states, V-C model- photo physics and photochemistry of ruthenium- polypyridine complexes, emission and redox properties. Photochemistry of organometallic compounds- metal carbonyl compounds- compounds with metal-metal bonding- Reinecke's salt chemical actinometer.

UNIT-V X-RAY DIFFRACTION BY SINGLE CRYSTAL METHOD (15 Periods)

X-ray diffraction by single crystal method: Space groups- systematic absences in X-ray data and identification of lattice types- glide planes and screw axes- X-ray intensities- structure factor and its relation to intensity and electron density- phase problem- structure solution by heavy atom method and direct method- determination of absolute configuration of molecules-a brief account of Cambridge structural database (CSD) and protein data bank(PDB). Electron diffraction by gases- scattering intensity vs.scattering angle, wierl equation- measurement techniques. Neutron diffraction by crystals – magnetic scattering- measurements techniques- elucidation of structure of magnetically ordered unit cell.

TEXT AND REFERENCES BOOKS

1. Shriver and Atkins , Inorganic chemistry , 5th edn., Oxford university press, India , 2011.
2. A.W.Adamson, Concept of Inorganic Photochemistry; John Wiley and sons, New York, 1975.
3. A. Abdul Jameel – "Application of Physical Methods to Inorganic Compounds", Jan Publications, 2007.
4. Stuart Warren organic synthesis, methods and starting materials, the disconnections approach John, Wiley & sons-1992.
5. Futhrhop, Penzlin, organic synthesis concepts, methods and starting materials, Verlag

chemie 1983.
6. Shriver and Atkins, Inorganic chemistry, 5th edn., Oxford university press, India , 2011.

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

COURSE OUTCOMES

CO number	CO statement	Knowledge level
CO1	Learners will be able to explain the Inorganic pigments.	K3
CO2	Students will understand one dimensional materials and carbon compounds.	K4
CO3	Learners know the photochemical oxidation and reduction reactions	K4
CO4	Students can explain the x-ray diffraction by single crystal method	K5
CO5	Capability to recognise the Electronic transitions in metal complexes.	K5

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	S	M
CO2	M	S	S	M	S
CO3	S	M	M	S	M
CO4	S	S	M	S	M
CO5	M	M	S	M	S

S-STRENGTH M-MEDIUM L-LOW

APPLICATION ORIENTED COURSE-I

DETERGENTS AND FUELS

Semester-I **Marks: 75**
Course Code: 20PCH1A1 **Credits: 3**
Total Periods: 45 **Exam Hours: 3**

Objectives:

- To get knowledge about the preparation and uses of soaps and detergents
- To help students develop in the safety in laboratory and home.
- To understand about the fuels and fossil fuels.

UNIT-I : SOAPS (9Periods)

Soaps- Types of soaps- Manufacture of soaps- Kettle process and Mill's process- Quality analysis of soaps.

UNIT-II : DETERGENTS (9Periods)

Detergents – classification of detergents, anionic, cationic and non-ionic, amphoteric Detergents- Advantages over soaps- Limitations of using detergent as cleaning agent cleansing action of soaps and detergents.

UNIT-III : FUELS (9Periods)

Fuels- Definition, Classification, Characteristic of a good fuel- Fuels for home – calorific value of gaseous fuels- Advantages of gaseous fuels and imperative studies- Health Hazards of fuels.

UNIT-IV : FOSSIL FUELS(9Periods)

Fossil fuels: Petrol and Kerosene – LPG – Calorific intensity – Flame temperature, Flash point, Octane number and Cetane number – leaded petrol.

UNIT-V : FIRE PREVENTION AND PROTECTION IN HOMES(9 periods)

Fire prevention and protection in homes: Major causes of fire in home, fire prevention and fire fighting in home, methods of extinguishing fires, chemical fire – extinguishers – their relative merits and demerits, fire extinguishers for the home.

TEXT AND REFERENCES BOOKS

1. B.K.Sharma, Industrial Chemistry, Goel Publishing House, 1995.
2. K.Bagavathi Sundari, Applied Chemistry, MJP publishers Chennai, First Edition, 2006.
3. Thangammal Jacob, A textbook of applied chemistry, Mcmillan Company Ind. Ltd, 1979.
4. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, First Edition S.Chand Company Ltd – New Delhi, 2006

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

COURSE OUTCOMES

CO number	CO statement	Knowledge level
CO1	Students will be able to understand the steps in Manufacture of soaps	K2
CO2	Capacity to understand the classification and types of detergents	K3
CO3	Students acquire knowledge in hazards and health issues of fuels.	K3
CO4	Capabilty to get the knowledge about octane and cetane numbers	K4
CO5	Learners can get the knowledge of fire prevention and protection in homes.	K5

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	S
CO2	M	S	S	M	S
CO3	S	M	M	S	M
CO4	S	M	S	S	M
CO5	M	M	S	M	S

S-STRENGTH M-MEDIUM L-LOW

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CORE COURSE-V
INORGANIC CHEMISTRY-II

Semester-II **Marks: 75**
Course code: 20PCH2C5 **Credits: 4**
Total Periods: 75 **Exam Hours: 3**

OBJECTIVES

- To understand the role of metal ions in biological process
- To know Principle of catalysis
- To learn reaction mechanisms of organometallic compounds.

UNIT - I :ORGANOMETALLIC CLUSTERS
(15 Periods)

Inorganic chains - rings - cages and clusters - catenation - boron and borane, higher boranes, carboranes, - borazines - phosphazenes - phosphazene polymers - ring compounds of sulphur and nitrogen - homocyclic inorganic systems - cages - boron cage compounds - metal clusters - dinuclear clusters - trinuclear clusters - tetranuclear clusters - hexanuclear clusters - structural prediction of organometallic clusters. Nitrides – Chemistry of silicon – silanes, higher silanes, multiple bonded systems,disilanes, silicon nitrides.

UNIT II: ORGANOMETALLICS, REACTIONS AND CATALYSIS
(15 Periods)

The 18 electron rule – applications and limitations – isolable concept and its usefulness – uses of typical Organometallics such as metal alloys and organometallic hydrides in organic synthesis.

Reactions and Catalysis by Organometallics:Organometallic reactions – ligand association and dissociation – Reactions of coordinated ligands in Organometallics – hydrogenation, hydroformylation, epoxidation, metathesis. Polymerization of olefins, olefin oxidation (Wacker process) and carbonylation of methanol. Homogeneous catalysis- oxidative addition – reductive elimination – insertion reaction – Wilkinson catalyst, Wacker process and hydroformylation.Heterogeneous catalysis – Ziegler-Natta polymerization. Cyclo oligomerisation of acetylenes

UNIT III: CHEMISTRY OF METAL ALKYL COMPLEXES(15 Periods)

Complexes of π-acceptor ligands -Introduction – EAN rule ant its correlation to stability.Metal alkyl complexes - stability and structure - synthesis by alkylation of metal halides - oxidative addition - nucleophilic attack on coordinated ligand -reactivity of metal alkyls - M-C bond cleavage reactions - insertion of CO to M-C bonds -double carbonylation- insertions of alkenes and alkynes - insertions of metals with C-H bonds-

Alkylidene and Alkylidyne complexes - synthesis of alkylidene complexes in low oxidation states and in high oxidation states, bonding in alkylidene complexes - reactivity of alkylidene and alkylidene complexes.

UNIT - IV: CHEMISTRY OF ALKENES AND ALKYNES COMPLEXES (15 Periods)

Alkenes complexes - synthesis of alkene complexes by ligand substitution, by reduction and by metal atom synthesis; bonding of alkenes to transition metals - bonding in diene complexes; reactivity of alkene complexes; ligand substitution reactions with nucleophiles

Alkynes complexes - bonding in alkyne complexes, reactivity, alkyne complexes in synthesis - Cobalt catalysed alkyne cycloaddition.

UNIT V: METALLO ENZYMES AND METALLOPROTEIN (15 Periods)

Heme and non-heme protiens- haemogolobin and myoglobin - oxygen transport and storage - electron transfer and oxygen activation- cytochromes , ferredoxins and rubredoxin - model systems, mononuclear non-heme iron enzymes. Copper containing protiens - classification and examples - electron transfer- oxygen transport -oxygenation - oxidase and reductase- superoxide dismutase (Cu, Zn)- nickel containing enzyme: urease.

TEXT AND REFERENCE BOOKS

1. J. E. Huheey, Inorganic Chemistry; 4th Ed., Harper and Row publisher, Singapore, 2006.
2. F.A. Cotton and G.W. Wilkinson, 1999, Advanced Inorganic Chemistry-A Comprehensive Text; John Wiley & Sons.
3.W.U. Mallik, G.D. Tul, R.D. Madan, 1992, selected topics in Inorganic Chemistry,S. Chand & Co., New Del
4. M. Adams, 1974, Inorganic Solids, John Wiley Sons.190
5. R. C. Mehrotra and A. Singh, Organometallic Chemistry; 2nd Ed., New Age International Ltd. New Delhi, 2014.
6. B.R. Puri, L.R. Sharma and K.C. Kalia ,Principles of Inorganic Chemistry – Vishal Publishing Co., Jalandhar, 2007.

7. S. F. A. Kettle, Physical Inorganic Chemistry – A Coordination Chemistry Approach, Spectrum; Academic Publishers, Oxford University Press, New York, 1996.2. 13.B.N. Figgis, 1966, Introduction to Ligand Fields, Interscience.
8 M.N. Hughes, 1982, The Inorganic Chemistry of Biological processes, II Edition, Wiley London
9. M.C. Shrivers, PW. Atkins, CH Langford, 1990, Inorganic Chemistry,
10. R. K. Sharma, Inorganic Reactions Mechanism; Discovery Publishing House, New Delhi, 2007.
11. P. Powell, Principles of Organometallic Chemistry; 2nd Ed., Chapman and Hall, London, 1988.
12.A. J. Pearson, Advances in Metal-Organic Chemistry, Vol. 1; Jai Press, Inc.,Greenwich, 1989.

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

COURSE OUTCOMES

CO number	CO statement	Knowledge level
CO1	Capability to get the knowledge of organometallic clusters.	K3
CO2	Learners will be able to understand theEAN –rule	K3
CO3	Students will be able to analyse the mechanisms of organometallic compounds	K4
CO4	Students can easily focused reactivity of alkene and alkyne complexes	K4
CO5	Acquire knowledge about metallo enzymes and proteins of biological applications	K5

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	M	S
CO2	M	S	S	M	M
CO3	S	S	M	S	M
CO4	S	M	S	S	M
CO5	M	M	S	M	S

S-STRENGTH M-MEDIUM L-LOW

CORE COURSE-VI
ORGANIC CHEMISTRY-II

Semester-II **Marks: 75**
Course code: 20PCH2C6 **Credits: 4**
Total Periods: 75 **Exam Hours: 3**

OBJECTIVES

- To understand the nucleophilic and Electrophilic substitution reactions
- To study the chemistry of pericyclic reactions and stereochemistry.
- To know about the concept of organic photochemistry.

UNIT -I: STEREOCHEMISTRY (15 Periods)

Stereoisomerism: Classification, optical activity and chirality resolution of racemic mixture, molecules with one, two or more chiral centres; Projection formulae – Wedge – Fischer - Sawhorse and Newmann., Relative and absolute configurations, D L, R S, and E Z system of naming. Stereochemistry due to the presence of perpendicular dissymmetric planes in allenes, spiranes, biphenyls and binaphthols. Chirality due to helical shape, Optical purity, % enantiomeric excess (ee), Enantiotopic and Diastereotopic atoms groups and faces, Stereospecific and stereoselective syntheses. . Erythro and threo nomenclature. Configuration – determination of configuration. Cahn, Ingold and Prelog system (R-S) of designation of configuration.

UNIT–II:NUCLEOPHILICSUBSTITUTIONREACTIONS (15 PERIODS)

Nucleophilic- Study of reaction mechanisms. SN1, SN2, SNi and neighbouring group mechanisms - kinetics - effects of structure - solvent and leaving and entering group - stereochemistry - hydrolysis of esters - Wurtz reaction - Claisen and Dieckmann condensation -

Williamson reactions. Different mechanisms of aromatic nucleophilic substitution - Ziegler alkylation - Chichibabin reaction - Cine substitution - diazonium group as leaving group.

UNIT–III :ELECTROPHILIC SUBSTITUTION REACTIONS

Electrophilic- SE_1 and SE_2 reactions - mechanisms and reactivity - typical reactions involving migration of double bond - keto-enol tautomerism - halogenation of carbonyl compounds - Stork enamine reactions - decarboxylation of aliphatic acids - Friedel Crafts acylation of olefinic carbon. Aromatic electrophilic substitution - reactivity - orientation and mechanisms - nitration - halogenation and sulphonation - Friedel Crafts alkylation - Friedel Crafts arylation and acylation .

Elimination reactions: α-Elimination, β-elimination, E1, E2 and E1CB mechanism – stereochemistry of elimination .Effect of changes in the substrate, base, leaving group and medium on E1, E2, E1CB reactions – elimination *vs* substitution .Bredt's rule.

UNIT-IV : ORGANIC PHOTOCHEMISTRY(15 PERIODS)

Organic photochemistry- fundamental concepts- energy transfer- characteristics of photoreactions – photoreduction and photooxidation, photosensitization- Photoreactions of ketones and enones - Norish Type-I and II reactions – Paterno Buchi reactions- photo-Fries rearrangement - photochemistry of alkenes, dienes and aromatic compounds- di- π - methane rearrangement. Reactions of unactivated centres- photochemistry of α,β- unsaturated carbonyl compounds- photolytic Cyclo additions and photolytic rearrangements - photo additions - Barton reaction.Ulmann reaction,Mack Merric coupling.

UNIT - V: PERICYCLIC REACTIONS (15 Periods)

Classification , electrocyclic, sigmatropic, cyclo addition, chelotropic and ene reactions- Concerted reactions – Woodward and Hoffmann rules – frontier molecular orbital approach and orbital symmetry – correlation diagram – examples highlighting pericyclic reactions in organic synthesis such as Claisen - Cope - Diels alder and ene reactions(Stereochemical accepts). Introduction to dipolar cycloaddition.

TEXT AND REFERENCE BOOKS:

1. I.L. Finar, Organic Chemistry, Vol. II, 6th edition, John Wiley and Sons, New York, 2000.
2. P. S. Kalsi, Stereochemistry; Wiley eastern limited; New Delhi, 1993.
3. D. Nasipuri, Stereochemistry of Organic Compounds - Principles and Applications; 2nd Ed., New Age International, New Delhi, 1994.
4. E. L. Eliel, and S. H. Wilen, Stereochemistry of Organic Compounds; John Wiley, New York, 1994.

5. Jerry March, Advanced Organic Chemistry, John Wiley and Sons, 4th edition, 2004
6. Reinhard Bruckner, Advanced Organic Chemistry , Reaction Mechanisms, Academic press, 2002.
7. F.A.Carey and R.J. Sundberg, Advanced Organic Chemistry, Part B, 5th edition, plenum Publishers, 2008.
8. S. H. Pine and J. B. Hendrickson, D. J. Cram and G. S. Hammond, Organic Chemistry; 5th Ed., McGraw Hill, Noida, 1987.
9. T. H. E. Lowry and K. S. Richardson, Mechanism and Theory in Organic Chemistry; 3rd Ed., Benjamin-Cummings Publishing, USA, 1997.
10. Ahluwalia V K, Organic Reaction Mechanism, Narosa Publication, 2010.
11. S.M. Mukherji and S.P. Singh, Reaction Mechanism in Organic Chemistry, Macmillan India Ltd., Patna, 1990.
12.Ratan Kumar Kar, Frontier Orbital and Symmetry Controlled Pericyclic Reactions, Books and Allied Ltd,2009.
13. Jagadamba Singh, Photochemistry and Pericyclic Reactions, New age, third edition
14. S. Sankararaman, Pericyclic Reactions - A Textbook: Reactions, Applications and Theory; Wiley-VCH, New York, 2005.

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

COURSE OUTCOMES

CO number	CO statement	Knowledge level
CO1	Students can get the knowledge of concept of chirality and isomerism	K3
CO2	Learners will be able to write the aliphatic and aromatic nucleophilic substitution.	K3
CO3	Learners can understand the effect of changes in medium on E1 ,E2& E1CB	K4
CO4	Learners to get knowledge about the characteristic reactions in photochemistry	K4
CO5	Capability to understand the pericyclic reactions.	K5

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	S
CO2	M	S	S	M	S
CO3	S	S	M	S	M
CO4	S	M	S	S	M
CO5	M	M	S	M	S

S-STRENGTH M-MEDIUM L-LOW

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CORE COURSE-VII

INORGANIC CHEMISTRY PRACTICAL-II

Semester-II **Marks:60**
Course code: 20PCH2C7P **Credits:4**
Total Periods: 90 **Exam Hours:6**

OBJECTIVES

- To carry out the titrimetric analyses
- To carry out gravimetric analyses
- To understand about the basis for preparation of organic compounds.

1.TITRIMETRIC AND GRAVIMETRIC

A mixture of solution(s) should be given for estimation
Cu (V) and Ni (G)
Cu (V) and Zn (G)
Fe (V) and Zn (G)
Fe (V) and Ni (G)
Zn (C) and Cu (G)

2. PREPARATION OF COMPLEXES

1. Tris(thiourea)copper(I) chloride

2. Tetraamminecopper(II) sulphate
3. Potassium trioxalatoferrate
4. Potassium trioxalatoaluminate(III)
5. Potassium trioxalatochromate(III)
6. Hexamminecobalt(III) chloride

REFERENCE:

1. A. I. Vogel, Text Book of Quantitative Inorganic Analysis; 6th Ed., Longman, New Delhi, 2000

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

COURSE OUTCOMES

CO number	CO statement	Knowledge level
CO1	Students get the ability to analyse the mixture in solution	K3
CO2	Students will be able to prepare the organic compounds	K4
CO3	Students can analyse gravimetry	K5

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	M	S	S	M	S
CO2	M	S	S	M	S
CO3	M	S	M	S	M

S-STRENGTH M-MEDIUM L-LOW

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CORE COURSE-VIII
ORGANIC CHEMISTRY PRACTICAL-II

Semester-II **Marks: 60**
Course code: 20PCH2C8P **Credits:4**
Total Periods:90 **Exam Hours:6**

OBJECTIVES

- To carry out the qualitative analysis of an organic mixture
- To perform the preparation of organic compounds.
- To carry out TLC techniques

1.QUANTITATIVE ANALYSIS OF ORGANIC COMPOUNDS

Estimation of following

(a) Phenol
(b) Aniline
(c) Ketone
(d) Glucose
(e) nitrobenzene,
(f) Saponifiction value of an oil
(g) iodine value of oil.

2. PREPARATION OF ORGANIC COMPOUNDS (DOUBLE STAGE)

(a.) *p*-Bromoacetanilide from aniline (acetylation and bromination)
(b). Acetylsalicylic acid from methyl salicylate (hydrolysis and acetylation)
(c.) 1,3,5-Tribromobenzene from aniline (bromination, diazotization and hydrolysis)
(d.)*p*-Nitroaniline from acetanilide (nitration and hydrolysis)
(e.) Benzilic acid from Benzoin (rearrangement)
(f.)*p*-Aminobenzoic acid from p-nitrotoluene (oxidation and reduction)
(g.) Benzanilide from benzophenone (rearrangement)
(h.)*p*-Bromoaniline from acetanilide (bromination and hydrolysis)
(i.)*m*-Nitroaniline from nitrobenzene (nitration and reduction)
(j.)1,2,4-Triacetoxy benzene from hydroquinone (oxidation and acylation)

3. CHROMATOGRAPHIC TECHNIQUE

Identify the given organic compounds using Thin Layer Chromatography

REFERENCES

1. J. Mohan, Organic Analytical Chemistry, Theory and Practice; Narosa, 2003.
2. V. K. Ahluwalia, P. Bhagat and R. Agarwal, Laboratory Techniques in Organic Chemistry; I. K. International, 2005.

3. N. S. Gnanaprakasam and G. Ramamurthy, Organic Chemistry Lab Manual; S. V. Printers, 1987.
4. A. I. Vogel, A. R. Tatchell, B. S. Furnis, A. J. Hannaford and P. W. G. Smith, Vogel's Textbook of Practical Organic Chemistry; 5th Ed., Prentice Hall, 1989.

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

COURSE OUTCOMES

CO number	CO statement	Knowledge level
CO1	Students get the ability to analyse the organic compounds	K4
CO2	Students will be able to prepare the organic compounds	K5
CO3	Capacity to carry out TLC techniques	K6

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	M	S	S	M	M
CO2	M	S	S	M	S
CO3	S	M	M	S	M

S-STRENGTH M-MEDIUM L-LOW

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ELECTIVE COURSE-IIA

SUPRAMOLECULAR CHEMISTRY

Semester-II **Marks:75**
Elective Course : 20PCH2E2A **Credits:4**
Total Periods: 75 **Exam Hours:3**

OBJECTIVES

- To know the fundamentals of supramolecules and catalysis by supramolecules
- To study the co-receptor molecules and multiple recognition
- To understand the Supramolecular devices

UNIT I: CONCEPTS OF SUPRAMOLECULAR CHEMISTRY (15 Periods)

Concepts and languages of Supramolecular chemistry – various types of noncovalent interactions – hydrogen bonds, C-H**…**X interactions, halogen bonds – π-π interactions, non–bonded interactions – various types of molecular recognition. Crystal engineering of organic solids – hydrogen bonded supramolecular patterns involving water / carboxyl / halide motifs – concepts of different types of synthons based on non-covalent interactions – principles of crystal engineering and non-covalent synthesis – polymorphism and pseudopolymorphism – supramolecular isomorphism / polymorphism – crystal engineering of pharmaceutical phases.

UNIT II: METALLO ORGANIC FRAMEWORKS (15 Periods

M.O.F (Metallo Organic Frameworks) – organometallic systems – combinations of different interactions to design molecular rods, triangles, ladders, networks, etc. – design of nanoporous solids – interligand hydrogen bonds in metal complexes – implications for drug design – crystal engineering of NLO materials, OLED.

UNIT III: CO-RECEPTOR MOLECULES AND MULTIPLE RECOGNITION (15 Periods)

Dinuclear and polynulclear metal ion cryptates – linear recognition of molecular length by ditopic co-receptors – heterotopic co-receptors – cyclophane receptors, amphiphilic receptors and large molecular cages – multiple recognition in metalloreceptors – supramolecular dynamics.

UNIT IV: SUPRAMOLECULAR REACTIVITY AND CATALYSIS (15 Periods)

Catalysis by reactive macrocyclic cation receptor molecules – catalysis by reactive anion receptor molecules – catalysis with cyclophane type receptors – supramolecular metallocatalysis – cocatalysis – catalysis of synthetic reactions – biomolecular and abiotic catalysis. Supramolecular chemistry in solution – cyclodextrin, micelles, dendrimers, gelators – classification and typical reactions – applications.

UNIT V: SUPRAMOLECULAR DEVICES (15 Periods)

Supramolecular devices and sensors – various types of supramolecular devices – an overview – supramolecular photochemistry – molecular and supramolecular photonic devices – light conversion and energy transfer devices – molecular and supramolecular electronic devices – electronic conducting devices – molecular wires, modified and switchable molecular wires – molecular and supramolecular ionic devices – tubular mesophases, molecular protonics – switching devices – electro-photo switch – ion and molecule sensors – role of supramolecular chemistry in the development of nanoscience and technology.

TEXT AND REFERENCE BOOKS:

1. J. M. Lehn, Supramolecular Chemistry; VCH, Weinheim, Germany, 1995.
2. G. R. Desiraju, Crystal Engineering: The Design of Organic Solids; Elsevier, United States, 1989.
3. G. R. Desiraju, and T. Steiner, The Weak Hydrogen Bond in Structural Chemistry and Biology; Oxford University Press, Oxford, 1999.
4. G. A Jeffrey, Introduction to Hydrogen Bonding; Oxford University Press: UK, 1997.
5. J. M. Lehn, Transition Metals in Supramolecular Chemistry; John Wiley and Sons: New York, 1999.
6. G. R. Desiraju, Current Science; 2001, 81, 1038.
7. Web source:
(i) Crystal Growth and Design,
http://www.pubs.acs.org/journals/cgdefu/index.html
(ii) Crystal Engineering
Communicationhttp://www.rsc.org/Publishing/Journals/ce/index.a

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

COURSE OUTCOMES

CO number	CO statement	Knowledge level
CO1	Students will be able to explain the concept of Supramolecular chemistry	K3
CO2	Capacity to know the catalysis of reactions	K3
CO3	Students can get the knowledge about the M.O.F	K4
CO4	Learners can understand ditopic and heterotopic receptors	K5
CO5	Students acquire knowledge about supramolecular devices	K5

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	S
CO2	M	S	M	M	S
CO3	M	S	M	S	M
CO4	S	M	S	S	M
CO5	M	M	S	M	S

S-STRENGTH M-MEDIUM L-LOW

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ELECTIVE COURSE-II B

INDUSTRIAL CHEMISTRY

Semester-II **Marks:75**
Elective Course : 20PCH2E2B **Credits:4**
Total Periods : 75 **Exam Hours:3**

OBJECTIVES

- To know the basic ideas of an industry and industrial wastes.
- To study the preparation and uses of petrochemicals.
- To understand the manufacture of cement, paper and soaps.

UNIT -I: BASIC IDEAS AND INDUSTRIAL WASTES (15 Periods)

Basics idea about unit operation – flow chart – chemical conversion – batch versus continuous processing – chemical process selection – design – chemical process control. Types of industrial wastes – treatment of wastes or effluent with organic impurities –treatment of wastes or effluent with inorganic impurities – treatment of some important chemical wastes.

UNIT- II: PETROLEUM AND PETROCHEMICALS (15 Periods)

Introduction – saturated hydrocarbons from natural gas – uses of saturated hydrocarbons – unsaturated hydrocarbons – acetylene, ethylene, propylene, butylene – aromatic hydrocarbons – toluene and xylene. Preparation of rectified spirit from beat – methylated spirit – preparation of absolute alcohol from rectified spirit – petrochemicals in India.

UNIT -III: MANUFACTURE OF CEMENT (15 Periods)

Introduction – types of cement – high alumina cement, water proof cement, slag cement, acid resisting cement, white cement, coloured cement, Pozzolana cement. Setting of cement – properties of cement – testing of cement – uses of cement – concrete – cement industries in India.

UNIT- IV: PULP AND PAPER AND MANUFACTURE OF PAPER (15 Periods)

Introduction – manufacture of pulp – types of pulp – sulphate or craft pulp, soda pulp, Rag pulp – beating, refining, filling, sizing and colouring. Calendaring – uses – paper industries in India.

UNIT- V: SOAPS, DETERGENTS AND PERFUMES (15 Periods)

Introduction – types of soaps – hard and soft soaps – manufacture of soap (hot and continuous process only) – cleansing action of soap – detergents – surface active agents – biodegradability of surfactants, amphoteric detergents. Introduction – production of natural perfumes – flower perfumes – jasmine, rose and lily – production of synthetic perfumes – muscone and nitro-musks.

TEXT AND REFERENCE BOOKS:

1. B. K. Sharma, Industrial Chemistry; 8th Ed., Goel Publishing House, New Delhi, 1997. (Unit–I, II, III, IV and V)
2. R. N. Shreve, and J. A. Brink Jr. Chemical Process Industries; 4th Ed., McGraw Hill, Toronto, 1977. (Unit–I, II, III, IV and V)
3. A. C. S. Brain, Production and Properties of Industrial Chemicals; Reinhold, New York, 1989. (Unit–I)

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

COURSE OUTCOMES

CO number	CO statement	Knowledge level
CO1	Students can get the basic ideas about the industrial wastes	K2
CO2	Learners to get the knowledge about petro chemicals	K3
CO3	Learners will be able to know the manufacturing techniques of	K4

	cement and paper	
CO4	Capacity to know about the types and methods of pulps	K4
CO5	Students acquire production natural perfumes,soaps and detergents	K5

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	S	S
CO2	M	S	S	M	S
CO3	S	S	M	S	M
CO4	S	M	M	S	M
CO5	M	M	S	M	S

S-STRENGTH M-MEDIUM L-LOW

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APPLICATION ORIENTED COURSE-II

FOOD AND DRUGS

Semester-II **Marks:75**
Course code: 20PCH2A2 **Credits:3**
Total Periods: 45 **Exam Hours:3**

Objectives:

- To learn basic knowledge in food and
- To study basic idea about in drugs.

UNIT-I :FOOD SCIENCE(9 Periods)

Food science: Balanced diet – proteins – carbohydrates, fats, vitamins – sources – daily needs (quality) – deficiency and excess effects- Food adulteration and detection.

UNIT-II : MACROELEMENTS (9 Periods)

Macro elements – Calcium, factors regulating serum calcium level, dietary sources of calcium, effects of calcium deficiency and excess of calcium in human- Phosphorus – Important functions, Dietary sources. Micro elements – Iodine – dietary sources, effect of iodine deficiency and excess effect of iodine.

UNIT-III (9 Periods)

Toxins naturally present in foods: Toxic minerals and metals – fluoride, nitrate, lead and polycyclic aromatic hydrocarbons- Food additives-definition, compositions, general characteristics and their health hazards.

UNIT-IV (9 Periods)

Quality Assurance-Nutritive values of Rice (Raw, Boiled), Pulses (Bengal gram, peas (green), vegetables-cabbage, carrot, brinjal, tomato) – Food standards – ISI and Agmark. Saponification values of oils and fats -Water quality standards – ICMR, WHO, USPHS.

UNIT-V (9Periods)

Common drugs and medicines used in home- Preparation and uses of aspirin, paracetamol, gentan and tincture of iodine- Antiseptics-Preparation and uses of Boric acid and Dettol- Household disinfectants- laxatives- prevention and control of adverse reactions from drugs.

TEXT AND REFERENCE BOOKS:

1. Dr.M. Swaminathan –"Handbook of food and Nutrition" 5th Ed, Bangalore Printing and Publishing Co Ltd, Bangalore, 2007.
2. M.Raheena Begum – "A Text Book of Foods, Nutrition and Dietetics" - Sterling Publishers, Delhi, 2010.
3. Morris B. Jacobs – "The Chemical Analysis of Foods and Food Products" – 3rd Ed, CBS Publishers and Distributors, New Delhi, 1993.
4. H.K.Chopra and P.S.Panesar – "Food Chemistry", Narosa Publisher, 2010

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

COURSE OUTCOMES

CO number	CO statement	Knowledge level
CO1	Students can get the knowledge about the food science	K2
CO2	Learners will be able understand the macro elements	K2

CO3	Students acquire knowledge about toxic minerals and food additives	K3
CO4	Capacity to understand Quality assurance of foods	K3
CO5	Learners know about the common drugs	K4

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	S
CO2	M	M	S	M	S
CO3	M	S	M	S	M
CO4	S	M	S	S	M
CO5	M	M	S	M	S

S-STRENGTH M-MEDIUM L-LOW

CORE COURSE-IX
PHYSICAL METHODS IN CHEMISTRY

Semester-III **Marks: 75**
Course code: 20PCH3C9 **Credits: 5**
Total Periods : 90 **Exam Hours: 3**

OBJECTIVES

- To impart the principles and applications of molecular spectroscopy.
- To understand about concepts of NMR spectroscopy
- To learn about UV-VISIBLE spectroscopy
- To know about IR, and Raman spectroscopic techniques

UNIT I: PRINCIPLES OF MOLECULAR SPECTROSCOPY (18 Periods)

Interaction of electromagnetic radiation with molecular systems – time evolution of the systems under radiation – Einstein transition probability for induced absorption and spontaneous and stimulated emission – transition moment and oscillator strength.

Microwave spectroscopy – rotational spectra of diatomic molecules, rigid and non-rigid rotors – intensity of spectral lines – effects of isotopic substitution –microwave spectra of polyatomic molecules – linear and symmetric top molecules

UNIT II: INFRARED SPECTRA&RAMAN SPECTROSCOPY(18Periods)

A. **Infrared spectra** – diatomic molecules, simple harmonic and anharmonic oscillators – diatomic vibrating rotator rotation – vibration spectrum of carbon monoxide – interaction of rotation and vibration (breakdown of Born-Oppenheimer approximation) – influence of the rotation on the spectrum of polyatomic molecules, linear and symmetric top molecules, parallel and perpendicular vibrations – influence of nuclear spin.. Effect of isotopic substitution. Non-rigid rotator. Vibrational-rotation spectroscopy, P, Q and R branches. Breakdown of Born-Oppenheimer approximation;

B. **Raman Spectroscopy** Classical and quantum theories of Raman effect. Stokes and anti-Stokes lines. Polarizability ellipsoids. Pure rotational, vibrational and vibrational-rotational Raman spectra, selection rules,

UNIT III: UV-VISIBLE SPECTROSCOPY (18Periods)

UV-Visible spectroscopy – introduction – instrumentation, sampling techniques – Woodward-Fieser and Scott's rules for conjugated dienes and polymers, ketones, aldehydes, α,β-unsaturated acids, esters, nitriles, and amides – differentiation of geometrical isomers and positional isomers – disubsitituted benzene derivatives – study of steric effect in aromaticity.
Infrared spectroscopy – Introduction – instrumentation, sampling techniques – factors influencing group frequencies – quantitative studies – hydrogen bonding (intermolecular and intramolecular).

UNIT IV: NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY(18Periods)

1H NMR Spectroscopy – multiplicity – coupling constant – spin-spin splitting ,vicinal and geminal coupling constants . Nuclear spin, resonance, saturation, shielding of magnetic nuclei, chemical shift and its measurements, factors influencing chemical shift, deshielding, spin-spin interactions, factors influencing coupling constant 'J', spin decoupling; – double resonance techniques,

shifts reagents – chemical spin decoupling of rapidly exchangeable protons (OH, SH, COOH, NH, NH2) – an elementary treatment of NOE phenomenon.

NMR studies of nuclei other than proton - 13C, 19F and 31P. FTNMR, advantages of FTNMR. DEPT spectra – identification of small compounds based on NMR data

UNIT V :**MASS SPECTROMETRY(18Periods)**

Mass Spectrometry – instrumentation – resolution – ESI, EI, CI and FAB methods – base peak, isotopic peaks, metastable peaks – importance of metastable peaks, parent peak, recognition of molecular ion peak – fragmentation – general rules – pattern of fragmentation for various classes of compounds, McLafferty rearrangement – nitrogen rule. Application of UV, IR, NMR and mass spectroscopy – structural elucidation of organic compounds – (minimum 15 problems should be worked out).

TEXT AND REFERENCE BOOKS

1. C. N. Banwell, Fundamentals of Molecular Spectroscopy; 4th Ed., McGraw Hill Education, Noida, 1994.
2. B. P. Straughan and S. Walker, Spectroscopy; Vol.3, Halstead Press, Sydney, 1978.
3. G. M. Barrow, Introduction to Molecular Spectroscopy; McGraw Hill, New York, 1964.
4. P. K. Ghosh, Introduction to Photoelectron Spectroscopy; John Wiley, New York,1989.
5. P. M. Silverstein and amd F. X. Western, Spectroscopic Identification of OrganicCompounds; 8th Ed., John Wiley, New York, 2014.
6. W. Kemp, Organic Spectroscopy; 3rd Ed., Palgrave, New York, 1991.
7. J. R. Dyer, Applications of Absorption Spectroscopy of Organic Compounds, PHI Learning, New Delhi, 2009.
8. Y. R. Sharma, Elementary Organic Spectroscopy – Principles and Chemical applications; S. Chand, New Delhi, 1992.
9. P. S. Kalsi, Spectroscopy of Organic Compounds; 6th Ed., New Age International Publishers, New Delhi, 2004.
10. W. Clegg, Crystal Structure Determination; Oxford University press, UK, 1998.
11. G. H Stout and L. H. Jensen, X-ray Structure Determination: A Practical Guide; John Wiley and Sons, New York, 1992.
12. J. P. Glusker and K. N. Trueblood, Crystal Structure Analysis: A Primer; 3rd Ed., Oxford University Press, UK, 2010.
13. D. N. Sathyanarayana, Electronic Absorption Spectroscopy and Related Techniques; University Press, Hyderabad, 2001.
14.Web Pages: Cambridge Structural Database (CSD)-
http://www.ccdc.cam.ac.uk/products/csd/ProteinDataBank(PDB) http://www.rcsb.org/p

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

COURSE OUTCOMES

CO number	CO statement	Knowledge level
CO1	Acquire knowledge about interaction of electromagnetic radiation with matter.	K2
CO2	Capability to explain the conditions required for a molecule to be IR, MICROWAVE, and RAMAN active	K2
CO3	Students able to identify organic compounds by using uv-spectra	K3
CO4	Ability to define principles of NMR spectroscopy	K4
CO5	Leaner's can explain principles of ESR Spectrometry	K5

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	S
CO2	M	S	S	M	S
CO3	S	S	M	S	M
CO4	S	M	S	S	M
CO5	M	M	S	M	S

S-STRENGTH M-MEDIUM L-LOW

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CORE COURSE-X
BIO-ORGANIC CHEMISTRY

Semester-III **Marks: 75**
Course code: 20PCH3C10 **Credits: 5**
Total Periods : 90 **Exam Hours: 3**

OBJECTIVES:

- To explain the basic concepts of Metabolism of Carbohydrates, Amino acids, Proteins and Lipids,
- To know the types of Nucleic acids
- To understand the importance of Vitamins and Enzyme.

UNIT - I :CARBOHYDRATES (18 Periods)

Definition, classification and biological role of carbohydrates. Monosaccharides Linear and ring structures (Haworth formula) of ribose, glucose, fructose and mannose (structural determination not required) physical and chemical properties of glucose and fructose. Disaccharides: - occurrence, physical and chemical properties of maltose, lactose and sucrose. Polysaccharides: Starch, glycogen and cellulose - structure and properties. Glycolysis of carbohydrates.

UNIT -II :AMINO ACIDS AND PROTEINS

(18 Periods)

Amino acids : Various classifications, essential amino acids, physical properties (amphoteric nature and isoelectric point) and reactions. Proteins : Classifications (based on shape, composition and solubility), physical properties. Primary structure - End group analysis (N- terminal analysis- Edman's method, dansyl chloride method ; C - terminal analysis- hydrazinolysis and bio -chemical methods) Biological functions of proteins, Deamination, transamination reactions,Urea cycle.

UNIT - III :CHEMISTRY OF LIPIDS(18 Periods)

Definition, classification- simple lipids (fatty acids), compound lipids and derived lipids. Properties : saponification number, Acetyl number. Steroids: Classification – Structural elucidation and medicinal values of cholesterol, oestrone, progesterone, ergosterol biological importance and chemical properties. Bile acids- functions. Biological functions of lipids. Carotenoids: Introduction – Classification, structural elucidation of α-carotene, β- carotene

UNIT - IV : NUCLEIC ACIDS , ENZYMES (18 Periods)

Chemical nature of enzymes – characteristics of enzymes – colloidal nature - catalytic nature. Mechanism of enzymes – Michaelis-Menten hypothesis – Fischer's lock and key model – regulation of enzyme activity **.** Purine and pyrimidine bases, nucleosides, nucleotides, polynucleotides, DNA structure - various types, RNAstructure - various types. Biological functions of DNA and RNA, Genetic code.

UNIT -V : VITAMINS(18 Periods)

Vitamins: Definition, classification- water-soluble vitamins (B2, B3, B6, B12 and vitamin-C) and fat-soluble vitamins (A, D, E and K) - occurrence, structure, deficiency diseases, biochemical rules and daily requirements

REFERENCE AND TEXT BOOKS

1. J. L. Jain, Fundamentals of Biochemistry; S. Chand and Co., New Delhi, 2007

2. N. C. Price and L. Stevens, Fundamental of Enzymology; Oxford University Press, UK, 1999 [Unit-II].
3. F. A. Carey and R. J. Sundberg, Advanced Organic Chemistry: Part-A and Part-B; 5th Ed., Springer, Germany, 2008 [Unit-I, II, III].
4. Principles of Biochemistry - A.L. Lehninger, 4th edition, 2005, W.H. Freeman.
5. Biochemistry – Sathyanarayana U, 2002, Arunabha Sen Books & Allied (P) Ltd, Kolkata.
6. Voet, D, Voet, JG, Pratt, C.W. (2005) **"**Fundamentals of Biochemistry" 2nd edition John Wiley & Sons, USA.

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

COURSE OUTCOMES

CO number	CO statement	Knowledge level
CO1	Students will be able get the knowledge of carbohydrates	K2
CO2	Learners can understand the metabolism of amino acid and proteins	K2
CO3	Acquire knowledge about the biological functions of lipids and steroids	K3
CO4	Students gain the knowledge about characteristics of nucleic acids and enzyme activity	K4
CO5	Students will be able to classify the vitamins and their structure	K5

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	S
CO2	M	S	M	M	S
CO3	S	S	M	S	M
CO4	S	M	S	M	M
CO5	M	M	S	M	S

S-STRENGTH M-MEDIUM L-LOW

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CORE COURSE-XI

PHYSICAL CHEMISTRY-I

Semester-III **Marks: 75**
Course code: 20PCH3C11 **Credits: 5**
Total Periods : 90 **Exam Hours: 3**

OBJECTIVES:

- To learn the basic concepts in chemical kinetics and group theory
- To understand the need for quantum mechanics and appreciate their significance.
- To know the concepts of thermodynamics.

UNIT I: QUANTUM MECHANICS –AN INTRODUCTION (18 Periods)

Inadequacy of classical mechanics – Planck's explanation about black-body radiation - de-Broglie's concept of matter waves – photoelectric effect , Planck's radiation law – Compton effect – Heisenberg's uncertainty principle – Bohr's complementarily principle - Postulates of quantum mechanics

Atomic hydrogen spectra– Operator algebra: Expressions – addition - subtraction and multiplication – linear operators – Laplacian operator , vector operator , ladder operator . quantum mechanical operator for the following observables: position , momentum, kinetic energy, potential energy,total energy and angular momentum . commutation rule for angular momentum– Hermitian operator – properties . properties of wave functions – Eigen function – Eigen value – Concept of orthoganality and normalization – significance of ψ and $\psi 2$.

UNIT - II: APPLICATION OF QUANTUM MECHANICS TO SIMPLE SYSTEMS (18 Periods)

Rigid rotor- harmonic oscillators , shapes of orbitals, shape of quantization. Solution of the Schrödinger equation for exactly solvable problems for bound states such as particles - in a box, one ,two and three dimensional box. Jahn -Teller effect, quantum numbers , zero point energy, tunnelling , perturbation theory.

UNIT - III: CONCEPTS OF GROUP THEORY (18 Periods)

Symmetry elements and operations – point groups – assignment of point groups to molecules – group postulates and types of groups – group multiplication tables, sub groups, similarity transformations – conjugate elements and classes. Matrix representation of symmetry operations and point groups . The great orthogonality theorem . Construction of C2V and C3V Character tables . Representation reducible and irreducible, analysis of reducible representation. SALC. Selection rule for fundamental vibrational transition.(IR ,Raman activity).

UNIT-IV : CHEMICAL KINETICS(18 Periods)

Theories of reaction rate – Absolute reaction rate theory (ARRT) - Significance of reaction co-ordinate – Potential energy surfaces – Kinetic isotope effect – Molecular dynamics – Principle of microscopic reversibility - Explosions and hydrogen – oxygen reactions. Application of ARRT to solution kinetics - Effect of solvent and ionic strength, influence of pressure on rates in solution - Enzyme catalysis- Mechanism of single substrate reactions – Michaelis Menton law – Kinetics of processes in micellar and reverse micellar systems.

UNIT V: CLASSICAL AND STATISTICAL THERMODYNAMICS(18 Periods)

Classical thermodynamics: partial molar quantities and chemical potential , Gibbs-Duhem equation, Real gases and Fugacity. Thermodynamics of ideal and non-ideal solutions: Liquid- liquid solutions, Liquid- solid solutions , mean ionic activity coefficients , Debye- Hucel Limiting law.

Statistical Thermodynamics:Thermodynamic probability – relation between entropy and probability – ensembles - Ergodic hypothesis - microstates and macrostates, Maxwell-Boltzmann distribution law – Thermodynamic quantities in terms of partition functions, quantum statistics-Bose-Einstein and Fermi-Dirac.

REFERENCES

1. F. A. Cotton, Chemical Applications of Group Theory; 3rd Ed., John Wiley and Sons, Singapore, 2003.
2. R. L. Flurry, Jr, Symmetry Groups: Theory and Chemical Applications; Prentice Hall, New Jersy, 1980.
3. S. F. A. Kettle, Symmetry and Structure; 2nd Ed., John Wiley and Sons, Chichester, 1995.10
4. A. K. Chandra, Introductory Quantum Chemistry; 4th Ed., Tata McGraw Hill, Noida, 1994.
5. D. A. Mcquarrie, Quantum Chemistry; University Science Books, Sausalito, 2008.
6. I. N. Levine, Quantum Chemistry; 5th Ed., Prentice Hall, New Jersey, 2000.
7. R. K. Prasad, Quantum Chemistry; 4th Ed., New Age International Publishers, New Delhi, 2014.
8. K. J. Laidler, Chemical Kinetics; 3rd Ed., Tata McGraw Hill, Noida, 1987.
9. J. W. Moore and R. G. Pearson, Kinetics and Mechanism; 3rd Ed., John Wiley and Sons, New York, 1981.
10. M. Mortimer and P. G. Taylor, Chemical Kinetics and Mechanism; 1st Ed., Royal Society of Chemistry, UK, 2002.
11. J. N. Gurtu and A. Gurtu, Advanced Physical Chemistry; 5th Ed., Pragathi Prakashan, Meerut, 2006.
12. J. I. Steinfeld, J. S. Francisco and W. L. Hase, Chemical Kinetics and Dynamics; 2nd Ed., Prentice Hall, New Jersey, 1999.

13. K. S. Gupta, Chemical Kinetics and Reaction Mechanism; RBSA Publishers, Jaipur, India, 1992.
14. P. W. Atkins, Physical Chemistry; 7th Ed., Oxford University Press, Oxford, 2001.
15. J. Rajaram and J. C. Kuriacose, Thermodynamics for Students of Chemistry - Classical, Statistical and Irreversible; Pearson Education, New Delhi, 2013.

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

COURSEOUTCOMES

CO number	CO statement	Knowledge level
CO1	Capacity toget the knowledge of quantum mechanics	K1
CO2	Acquire knowledge about the harmonic and anharmonic oscillator systems	K2
CO3	Students get the idea about group theory and orthogonality theorem	K2
CO4	Learners will be able to understand the rate of the reactions and rate law	K1
CO5	Students can understand the stastical thermodynamics	K2

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	S
CO2	M	S	S	M	S
CO3	S	S	M	S	M
CO4	S	M	M	S	M
CO5	M	M	S	M	S

S-STRENGTH M-MEDIUM L-LOW

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CORE COURSE-XII
PHYSICAL CHEMISTRY PRACTICALS

Semester-III **Marks:60**
Course code: 20PCH3C12P **Credits: 5**
Total Periods:105 **Exam Hours: 6**

OBJECTIVES

- To perform the various physical experiments using different techniques.

1. Kinetics-acid hydrolysis of ester.
2. Kinetics-acid hydrolysis of ester– comparison of strengths of acids / determination of energy of activation (Ea).
3. Determination of molecular weight of substance by transition temperaturemethod.
4. Determination of molecular weight/ depression in freezing point of substances by Rast method .
5. Determination of Critical Solution Temperature (CST) of phenol-water system and effect of impurity on CST.
6.Study of phase diagram of two components forming a simple eutectic/ forming a compound.
7.Distribution law – study of association of benzoic acid in benzene.
8. Adsorption – oxalic acid/acetic acid on charcoal using Freundlich isotherm.
9. Conductometry – precipitation titrations.
10. Conductometry – solubility product of sparingly soluble silver salts.
11. Verification of Onsager equation - conductivity method.
12. Potentiometric titrations – precipitation titrations.
13. Potentiometric titrations – redox titrations.
14. Potentiometry – determination of dissociation constant of weak acids.
15. To determine the relative strength of two acids by conductance measurements.
16. To determine the pH of a buffer solution using a quinhydrone electrode.

TEXT AND REFERENCES BOOKS:

1. B. P. Levitt, Findlay's Practical Physical Chemistry; 9th Ed., Longman, 1985.
2. J. N. Gurtu and R. Kapoor, Advanced Experimental Chemistry; Vol. 1-Physical, S. Chand and Co., New Delhi, 1987.
3. J. B. Yadav, Advanced Practical Physical Chemistry; 20th Ed., GOEL Publishing House, Krishna Prakashan Media Ltd., Chennai, 2001.
4. B. P. Levitt, Findlay's Practical Physical Chemistry; 9th Ed., Longman, London, 1985.
5. J. N. Gurtur and R. Kapoor, Advanced Experimental Chemistry; Vol. 1-Physical, S. Chand and Co. Ltd, New Delhi, 1997.

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

COURSE OUTCOMES

CO number	CO statement	Knowledge level
CO1	Students will be able to perform the physical experiments using different techniques	K5
CO2	Learners can easily determine the conductivity by using	K5

	conductometric titration	
CO3	Students can easily determine the emf by using potentiometric titration	K5

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	S
CO2	M	M	S	M	S
CO3	S	S	M	S	M
CO4	S	M	S	M	M
CO5	M	M	S	M	S

S-STRENGTH M-MEDIUM L-LOW

ELECTIVE COURSE-III
POLYMER CHEMISTRY

Semester-III **Marks:75**
Course code: 20PCH3E3A **Credits: 4**
Total Periods:75 **Exam Hours: 3**

Objectives:

- To understand the basic concepts of polymers
- To know the different types of polymerization techniques
- To learn the various techniques of polymer processing
- To know the applications of synthetic polymers

UNIT-I BASIC CONCEPTS OF POLYMERS(15 Periods)

Monomer, polymer, characteristics of polymer, degree of polymerization, Classification – based on sources, reactions, structure and functionality. Stereo regular polymers. 1.2 Kinetics and mechanism: Free radical, Cationic, Anionic, Coordination and co-polymerization.Poly condensation-Ring opening polymerization.

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UNIT-II : POLYMERIZATION TECHNIQUES AND CHARACTERIZATION(15 Periods)

Polymerization Techniques - Bulk, Solution, Suspension and Emulsion polymerizations. Characterization - number, weight and viscosity average molecular weight concepts - Polydispersity and molecular weight distribution - Practical significance of molecular weight - Determination of molecular weight of polymers by light scattering, osmometry and ultracentrifugation methods. Characterization of polymer by IR, SEM and XRD

UNIT-III PROPERTIES OF POLYMERS (15 Periods)

Physical properties - Hardness, tensile strength, fatigue, impact, tear resistance and abrasion resistance. Polymer structure and property relationship - melting point (Tm), effect of chain flexibility and other steric factors. Glass transition temperature (Tg), factors influencing Tg, relationship between Tg and Tm. Degradation of polymers - thermal, photo, mechanical and oxidative degradations. # Preventing methods of polymer degradation#

UNIT-IV POLYMER PROCESSING(15 Periods)

Elastomers, plastics and fibres - thermosetting and thermoplastics - Compounding and vulcanization of elastomers. Processing techniques: Calendering, die casting, rotational casting, film casting, injection moulding, blow moulding, extrusion moulding, thermoforming, foaming, # reinforcing and fibre spinning .

UNIT-V COMMERCIAL POLYMERS AND THEIR APPLICATIONS(15 Periods)

Preparation, properties and applications of Teflon, Polyamides - Nylon-6,6, nylon-6,10, polymethylmethacrylate (PMMA), phenolic resins, epoxy resins, Buna-S, Buna-N, and butyl rubber. Speciality polymers - Fire retarding polymers and conducting polymers, Types - electron, proton and ion conducting polymers. Biomedical polymers - contact lens, dental, artificial heart, artificial kidney, artificial skin and artificial blood cells Self study

REFERENCES:

1. V. R. Gowariker N. V. Viswanathan and J. Sreedhar, “Polymer Science”, New Age International, New Delhi, 2003.
2. F. W. Billmeyer, “Text Book of Polymer Science”, 3rd Edition, John Wiley & Sons, New York, 2003.

3. Alka L. Gupta, “Polymer Chemistry”, 4th Edition, A Pragati Edition, Meerut, 2015. 4. M.S. Bhatnagar, “A Text book of Polymers (Basic Concepts)”, Vol.-I, S.Chand & Company Ltd. New Delhi.
4. Charles E. Carraher Jr. “Introduction to Polymer Chemistry”, 2006 Third Edition, CRC Press, Taylor & Francis group.
5. Robert J. Young, Peter A. Lovell “Introduction to Polymers”, Third Edition, CRC Press, Taylor & Francis group, 2009

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

COURSE OUTCOMES

CO number	CO statement	Knowledge level
CO1	Students will be able to understand basic concept of polymerisation	K3
CO2	Learners can able to perform the various polymerisation techniques	K4
CO3	Acquire to know about the characteristic of glass materials	K4
CO4	Students can understand thermosetting and thermoplastic polymers	K5
CO5	Learners get the idea about the usage of commercialisation of polymers	K5

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	M	S
CO2	M	S	M	M	S
CO3	S	S	M	S	M
CO4	S	M	S	M	M
CO5	M	M	S	M	S

S-STRENGTH M-MEDIUM L-LOW

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ELECTIVE COURSE-III
CHEMISTRY OF NANOSCIENCE AND NANOTECHNOLOGY

Semester-III **Marks:75**
Course code: 20PCH3E3B **Credits: 4**
Total Periods:75 **Exam Hours: 3**

OBJECTIVES

- To know the synthetic methods of nanomaterials and
- To understand the characterization of nanomaterials, carbon clusters.
- To learn the nanostructures using nanotechnology and nanodevices.

UNIT I: SYNTHETIC METHODS (15 Periods)

Definition of nano dimensional materials – historical milestones – unique properties due to nanosize, quantum dots, classification of nanomaterials. General methods of synthesis of nano materials – hydrothermal synthesis, solvothermal synthesis – microwave irradiation– sol-gel and precipitation technologies – combustion flame – chemical vapour condensation process – gas-phase condensation synthesis – reverse micelle synthesis – polymer-mediated synthesis – protein microtubule-mediated synthesis – synthesis of nanomaterials using microorganisms and other biological agents – sonochemical synthesis – hydrodynamic cavitation. Inorganic nanomaterials – typical examples – nano TiO_2/ZnO/CdO/CdS, organic nanomaterials – examples – rotaxanes and catenanes.

UNIT II: CHARACTERISATION OF NANOSCALE MATERIALS(15 Periods)

Principles of Atomic Force Microscopy (AFM) – Transmission Electron Microscopy(TEM) Resolution and Scanning Transmission Electron Microscopy (STEM) – Scanning Tunneling Microscopy (STM) – Scanning Nearfield Optical Microscopy (SNOM).XPS. Scanning ionconductance microscope, scanning thermal microscope, scanning probe microscopes and surface plasmon spectroscopy.

UNIT III: REACTIONS IN NANOPARTICLES (15 Periods)

Reactions in nanospace – nanoconfinement – nanocapsules Cavitands, cucurbiturils, zeolites, M.O.Fs, porous silicon, nanocatalysis.

UNIT IV: CARBON CLUSTERS AND NANOSTRUCTURES (15 Periods)

Nature of carbon bond − new carbon structures − carbon clusters - Graphene– discovery of C60−alkali doped C60−superconductivity in C60−larger and smaller fullerenes. Carbon nanotubes – synthesis − single walled carbon nanotubes − structure and characterization − mechanism of formation − chemically modified carbon nanotubes − doping − functionalizing nanotubes − applications of carbon nanotubes. Nanowires −synthetic strategies − gas phase and solution phase growth − growth control − properties.

UNIT V: NANOTECHNOLOGY AND NANODEVICES (15 Periods)

DNA as a nanomaterial – DNA – knots and junctions, DNA – nanomechanical device designed by Seeman.Nano device Point on chip. Force measurements in simple protein molecules and polymerase – DNA complexes– molecular recognition and DNA based sensor. Protein nanoarray, nanopipettes, molecular diodes, self-assembled nanotransistors, nanoparticle mediated transfection. Micro fluidics - MEMS - Introduction and applications.

TEXT AND REFERENCE BOOKS

1. C. N. R. Rao, A. Muller and A. K. Cheetham (Eds), The Chemistry of Nanomaterials: Vol. 1 and 2; Wiley-VCH;Germany, Weinheim, 2004.
2. C. P. Poole, Jr: and F. J. Owens, Introduction to Nanotechnology; Wiley Interscience, New Jersey, 2003.
3. K. J. Klabunde (Ed), Nanoscale Materials in Chemistry; 2nd Ed., Wiley- Interscience, New York, 2009.
4. T. Pradeep, Nano: The Essentials in Understanding Nanoscience andNanotechnology; 1st Ed., Tata McGraw Hill, New York, 2007.
5. H. Fujita (Ed.), Micromachines as Tools in Nanotechnology; Springer-Verlag, Berlin, 2003.
6. Bengt Nolting, Methods in Modern Biophysics; 3rd Ed., Springer-Verlarg, Berlin, 2009.
7. H. Gleiter, Nanostructured Materials: Basic Concepts, Microstructure and Properties, Elsevier, Chennai, 2000.
8. W. Kain and B. Schwederski, Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life; 2nd Ed., John-Wiley R Sons, New York, 2013.
9. T. Tang and P. Sheng (Eds), Nanoscience and Technology, Novel Structures and Phenomena; Taylor andFrancis, New York, 2003.
10. A. Nabok, Organic and Inorganic Nanostructures; Artech House, Boston, 2005.

11. E. A. Rietman, Molecular Engineering of Nanosystems; Springer-Verlag, New York, 2001.
12. Home page of Prof. Ned Seeman - http://seemanlab4.chem.nyu.edu/
13. Nanoletters - http://pubs.acs.org/journals/nalefd/index.html
14. Nanotation - http://www.acsnanotation.

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

COURSE OUTCOMES

CO number	CO statement	Knowledge level
CO1	Students get the capacity to understand the synthetic methods of nanomaterials.	K3
CO2	Learners can understand the characterization of nanomaterials, carbon clusters	K4
CO3	Students will be able to write the reactions in nanoparticles	K4
CO4	Students can get the ideas about the nano carbon structure and mechanisms	K5
CO5	Acquire knowledge about advance technology using nanodevices	K5

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	M	S
CO2	M	S	M	M	S
CO3	S	S	M	S	M
CO4	S	M	S	S	M
CO5	M	M	S	M	S

S-STRENGTH M-MEDIUM L-LOW

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CORE COURSE-XIII
PHYSICAL CHEMISTRY-II

Semester-IV **Marks: 75**
Course code: 20PCH4C13 **Credits: 5**
Total Periods : 90 **Exam Hours: 3**

OBJECTIVES:

- To learn the concepts in enzyme kinetics, surface reactions and fast reactions and
- To understand the applications of quantum mechanics in atomic and molecular structure.

UNIT - I: ADVANCED QUANTUMCHEMISTRY (18 Periods)

Structure and spectra of hydrogenic atoms: separation of internal motion and radial solutions. Structure of many - electron atoms: Helium and Hydrogen atoms, hydrogen molecule, pauli principles , electron affinities, self- consistent field, atomic orbitals , slater type orbitals , slater exponents and the periodic properties of elements, LACO-MO ,Huckel orbitals , Born-oppenheimer approximation, potential energy surface, Hellman - Feynman theroem. Spectra of complex atoms: quantum defects and inoization limits , spin - orbit couplings and term symbols and selection rule.

UNIT - II: ELECTROCHEMISTRY (18 Periods)

Ion transport in solution – migration, convection and diffusion – Fick's laws of diffusion conduction – Debye-Huckel theory – ionic atmosphere – Debye- Huckel-Onsager equation – verification and extension – Debye-Falkenhagen effect and Wien effect, Debye-Huckel limiting law – activity coefficients and ionic strength – Bjerrum model. The electrode – electrolyte interface – electrical double layer and multi layers – theories – electrocapillary curves – Lipmann equation and Lipmann potential. Electrokinetic phenomena – classification – Tiselius method of separation of proteins – membrane potential – electrocatalysis - Butler-Volmer equation – Taft equation– Pourbaix and Evans diagrams.

UNIT - III: FAST REACTION KINETICS AND CATALYSIS(18 Periods)

Fast reaction techniques – Chemical relaxation methods, temperature and pressure jump methods, ultrasonic absorption techniques, reaction in flow system, continuous and stopped flow. Homogeneous catalysis – acid base catalysis – enzyme catalysis –Michaelis–Menten kinetics –

influence of pH on the enzyme catalysis. Heterogeneous catalysis – kinetics and mechanism of unimolecular and bimolecular reactions – Langmuir-Hinshelwood and Langmuir-Rideal mechanism – ARRT of surface reactions – synthesis of ammonia, hydrogenation of ethylene and cracking of hydrocarbons.RRKM Theory.

UNIT - IV: APPLICATION OF CHEMICAL THERMODYNAMICS(18 Periods)

Combining first and second law of thermodynamics – Maxwell relations – properties of Gibbs function – temperature dependence of the Gibbs function – Gibbs-Helmholtz equation – the pressure dependence of the Gibbs function – Clausius-Clapeyron equation – derivation and applications – thermodynamics of ideal solutions – free energy change of mixing – relation between the depression of freezing point and concentration – elevation of boiling point and concentration.

UNIT - V: SOLID STATE CHEMISTRY(18 Periods)

Basic diffraction theroy, Braggs law , Miller Iindices, Laue equation, X-ray major sources and production, X-ray detectors, crystallization techniques and principles, symmetry and space groups , reciprocal space, fourier transform , structure factor equation , phase problem , data collection and processing, methods of structure determination , heavy atoms solutions like direct methods , pattern methods, multiple anamalous diffraction , sulphur phasing.Biological crystallography(eg.Proteins)

TEXT AND REFERENCE BOOKS

1. A. K. Chandra, Introductory Quantum Chemistry; 4th Ed., Tata McGraw Hill,Noida, 1994.
2. D. A. Mcquarrie, Quantum Chemistry; University Science Books, Herndon, 2008.
3. J. P. Lowe, and K. A. Peterson, Quantum Chemistry; 3rd Ed., Academic Press, Cambridge, 2005.
4. I. N. Levine, Quantum Chemistry; 7th Ed., Prentice Hall, New Jersey, 2013.
5. R. K. Prasad, Quantum Chemistry; 4th Ed., New Age International Publishers, New Delhi, 2014.
6. F. A. Cotton, Chemical Applications of Group Theory; 3rd Ed., Wiley Eastern, New Delhi, 1990.
7. P. Atkins and J. de Paula, Physical Chemistry; 9th Ed., W. H. Freeman Publications, New York, 2009.
8. S. Glasstone, Introduction to Electrochemistry; Maurice Press, Philadelphia, 2008.
9. L. Antropov, Theoretical Electrochemistry; University Press of the Pacific, USA, 2001.
10. S. Glasstone, An Introduction to Electrochemistry; Read Books, New Delhi, 2007.

11. J. O'M Bockris and A. K. N. Reddy, Modern Electrochemistry; Vol. 1 and 2, 2nd Ed., Plenum Press, New York, 1998.
12. R. G. Compton, Electrode Kinetics: Reactions; Elsevier Science Press, Chennai, 1987.
13. G. W. Castellan, Physical Chemistry; Narosa, New Delhi, 1986.
14. K. J. Laidler, Chemical Kinetics; 3rd Ed., Prentice Hall, New Jersey, 1987.
15. J. W. Moore and R. G. Pearson, Kinetics and Mechanism; 3rd Ed., John Wiley and Sons, New York, 1981.
.16. J. Rajaram and J. C. Kuriacose, Thermodynamics for Students of Chemistry - Classical, Statistical and Irreversible; Pearson Education, New Delhi, 2013.
17. R. K. Dave, Chemical Kinetics; Campus Books, 2000.
18. S. Glasstone, Thermodynamics for Chemists; 3rd Ed., Narahari Press, Bangalore, 2007.

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

COURSE `OUTCOMES

CO number	CO statement	Knowledge level
CO1	Students will understand the concept of quantum chemistry	K3
CO2	Students can know the determination of ionic movement and electrical properties	K4
CO3	Learners can analyse the reaction kinetics and catalysts	K4
CO4	Students will know the application of chemical thermodynamics	K5
CO5	Learners will easily understand the basic concepts of crystallization techniques	K6

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	M	S	S	M	S
CO3	S	S	M	S	M
CO4	S	M	M	S	M
CO5	M	M	S	M	S

S-STRENGTH M-MEDIUM L-LOW

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ALLIED COURSE-I

GENERAL CHEMISTRY-I

(ForPhysics studentsadmitted from 2020-2021 onwards)

Semester-I **Marks: 75**
Course Code: 21UPH1A1 **Credits: 3**
Hours: 45 **Exam Hours: 3**

OBJECTIVES

- To Know about coordination chemistry
- To understand electron displacement effects and halogen compounds
- To know about aromatic compounds and organic reactions
- To know about basic concepts of chemical kinetics
-

UNIT-I:COORDINATION CHEMISTRY
(9Periods)

Coordination Chemistry: Double salts- coordination compounds-types of ligands- chelation-Nomenclature – isomerism- Werner's theory - Sedgwick theory -VBT, CFT- Applications of crystal filed theory. Industrial importance of EDTA, Biological role of hemoglobin and Chlorophyll.

UNIT-II:ELECTRON DISPLACEMENT AND HALOGEN COMPOUNDS (9Periods)

Inductive effect, Mesomeric, Resonance, Hyper Conjugations and Steric Effect. Polar effects: Inductive effect – Relative Strength of Aliphatic monocarbocylic acid and aliphatic amines.
Resonance – Condition for resonance. Consequences of resonance – resonance of energy. Basic property of aniline and acidic property of phenol.
Halogen Containing Compounds: Dichloromethane, chloroform, carbon tetrachloride, DDT and BHC. Types of solvents: - Polar, Non polar solvents. Important of chlorohydrocarbons used as solvents.

UNIT- III:AROMATIC COMPOUNDS AND ORGANIC REACTIONS
(9Periods)

Aromatic compounds: Structure and Conditions for Aromacityand Aromaticity of benzene-Huckels rule. Substitution reaction: Nitration, Halogenations, Alkylation. Naphthalene Isolation, Structure, properties and uses.

Organic reaction: Biuret, Decarboxylation, Benzoin, Perkin, Cannizaro, Claisen and Haloform reactions

UNIT- IV : ENERGETICS AND PHASE RULE (9Periods)

Energetic: First law of thermodynamics – state and path function – need for the second law – carnots cycle and thermo- dynamic scale of temperature, spontaneous and Non – spontaneous processes – entropy – Gibbs free energy

Phase rule: Phase, component, degree of Freedom, and phase rule definitions - one component system– water system.

UNIT -V: CHEMICAL EQUILIBRIUM AND CHEMICAL KINETICS (9Periods)

Chemical equilibrium: Criteria of homogeneous and heterogeneous equilibrium, Decomposition of HI, N_2O_4, $CaCO_3$ and PCl_5. Chemical Kinetics: Order and Molecularity of reaction and their methods of determinations , activation energy, effects of temperature on reaction rate.

Catalysis: Catalysis – Types-Importance of catalysts, Homogeneous and heterogeneous catalysis Industrial catalyst, catalyst carrier, catalyst promoter, catalyst inhibitor, catalytic poison, activity of catalyst.

TEXT BOOKS AND REFERENCES BOOKS:

1. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000.
2. P.L. Soni – "Text book of Inorganic Chemistry. S. Chand & Co., New Delhi (1999)
3. B.S. Bahl and Amn Bahl, Advanced Organic Chemistry, S. Chand & Co. Ltd, New Delhi (1996).
4. Glasstone S. and Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co Ltd.
5. Puri B.R., Sharma L.R. and Pathania M.S. (2013), Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin Chand and Co.
6. J. D. Lee, Concise Inorganic Chemistry, Blackwell Science Ltd., London (2006).
7. Gopalan R, Text Book of Inorganic Chemistry, 2nd Edition, Hyderabad, Universities Press, (India), 2012.
8. Morrison R.T. and Boyd R.N., Bhattacharjee S. K. Organic Chemistry (7th edition), Pearson India, (2011)
9. M.K. Jain – "Organic Chemistry" – 12th Ed., (2003) Sulthan and Chand Company, New Delhi.

10. R.D. Madan, J.S. Tiwari and G.L. Mudhara – A Textbook of First Year B.Sc. Chemistry: S.Chand and Co, 2002
11. Laidlier, Chemical Kinetics, Tata Mc.Graw Hill (1973)

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Capacity to explain structure and naming of coordination compounds.	K1
CO2	Ability to define electron displacement effects.	K2
CO3	**Capacity to explain aromaticity.**	K2
CO4	**Learners can able to explain phase rule**	K2
CO5	Leaner's can able to explain basic concepts of chemical kinetics .	K3

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	M
CO3	M	S	M	S	S
CO4	S	S	S	S	S
CO5	S	S	M	S	S

ALLIED COURSE: II

VOLUMETRIC AND ORGANIC QUALITATIVE ANALYSIS

(For Physics admitted from 2018-2019 onwards)

Semester-I &IIMarks: 60
Course code: 21UPH1A2P **Credits: 3**
Hours: 45 **Exam Hours: 3**

OBJECTIVES

- To enable the students to understand the concepts of volumetric analysis
- To learn theOrganic qualitative analysis

I.VOLUMETRIC ANALYSIS

1. Acidimetry and Alkalimetry

(a) Strong acid VS strong base

(b) Weak acid VS strong base

2. Permanganometry

(a) Estimation of ferrous sulphate

(b) Estimation of oxalic acid

3. Iodometry

(a) Estimation of potassium dichromate

(b) Estimation of potassium permanganate

4. Complexometry

(a) Determination of Hardness of water

II. ORGANIC ANALYSIS

Analyze the following organic Compounds.

1. Carbohydrate, 2. Amide, 3. Aldehyde, 4. Ketone, 5. Acid & 6. Amine

The students may be trained to perform the specific reactions like tests for elements (nitrogen only), Aliphatic/ Aromatic, Saturated /Unsaturated and Functional group present and record their observations.

REFERENCES

1. R. Gopalan, Elements of analytical chemistry, S. Chand, New Delhi, 2000.

2. N. S. Gnanapragasam and G. Ramamurthy, Organic Chemistry lab manual,S.Viswanathan and Co. Pvt. Ltd. Chennai-1998

Note:Scheme for Practical Evaluation.

Organic Qualitative Analysis - 20

Volumetric Estimation -35

Record - 5

Internal Assessment - 40 **Totals: 100 Marks**

Organic Qualitative Analysis: 20

Identification of Nitrogen - 4 marks

Saturated and unsaturated - 3 marks

Aliphatic or Aromatic - 3 marks

Preliminary reactions with

Procedure - 5 marks

Functional group identified

Correctly - 5 marks

Volumetric Analysis: 35

Procedure 5 marks

Results

< 2 % - 30 marks

>2-3 % -20 marks

>3-4 % - 10 marks

> 4 % - 5 marks

- **COURSE OUT COMES**

CO	**CO Statement**	**Knowledge level**
CO1	• Capacity to carry out volumetric analysis.	K1
CO2	• Capacity to carry out organic qualitative analysis.	K2
CO3	• Capacity to carry out hardness of water.	K3

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	M
CO3	M	S	M	S	S

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ALLIED COURSE-III

GENERAL CHEMISTRY-II

(For Physics Studentsadmitted from 2018-2019 onwards)

Semester-IIMarks: 75

Course code:21UPH2A3 **Credits: 3**

Total periods: 45 **Exam Hours: 3**

OBJECTIVES

- To know about types of bonding
- To learnt about carbohydrates, aminoacids and proteins
- To know about heterocyclic compounds colloids

UNIT- I :CHEMICAL AND METALLIC BONDING (9Periods)

Types of bonding: Ionic bond, covalent bond and coordinate bond. MO theory- Bonding , Anti bonding, non-bonding orbitals. Bond order applications of MO theory to H_2, He_2, O_2 and molecules.

Metallic bond: Electron gas, Pauling and band theories, semi conductors – intrinsic, extrinsic N-type andP-type semi conductors.

UNIT- II: CARBOHYDRATES, AMINOACIDS AND PROTEINS (9Periods)

Carbohydrates: classification – glucose and fructose – preparation and properties .Structure of glucose and Fructose -Fischer and Haworth CyclicStructures. Amino acids and proteins:

Amino acids – Classification based on structure Essential and non – essentials amino acids – preparation, properties and uses – peptides (elementary treatment only)

Proteins – Classification based on physical properties and biological functions. Structure of proteins – primary and secondary (elementary treatment).

UNIT- III: HETEROCYCLIC STEREOISOMERISMAND COMPOUND(9Periods)

Stereoisomerism: Structural isomerism , Optical isomerism – Lactic and Tartaric acid - conditionfor optical isomerism- enantiomers- diastereomers-– racemic mixture and resolution. Geometrical Isomerism – maleic and fumaric acids.

Heterocyclic compounds: Furan, Pyrrole and Pyridine – preparation, properties and uses – basic properties of Pyridine and Pyrrole.

UNIT -IV: SURFACE CHEMISTRYAND COLLOIDS(9Periods)

Surface Chemistry:Adsorption, Chemisorptions, Application of Adsorption, Surface tension,- chemical and physical adsorption,Frendulich- Langmuir adsorption isotherms.

Colloids:Types and Classification of colloidal systems, Lyophilic and Lyophobic Sol Electro-dialysis, Ultra filtration. Emulsion –types- preparation- emulsifier- Deemulsification. Gels-types.

UNIT -V: ELECTROCHEMISTRY(9Periods)

Electrochemistry: Specific and equivalent conductivity – their determination –effect of dilution on conductivity. Ostwald's Dilution law, Kohlrausch law, conductivity measurements, and conductometric titrations.
pH: Introduction – pH-Types of buffers – pH determination byelectrometric methods.

TEXT BOOKS AND REFERENCES BOOKS

1. R.D Madan – "Modern Inorganic Chemistry" (1987), S. Chand & Co Pvt Ltd.
2. P.L. Soni – "Text book of Inorganic Chemistry. S. Chand & Co., New Delhi (1999).
3. P.L. Soni and H.M. Chawla - "Text Book of Organic Chemistry" - 28th Edition. (1999) - Sulthan and Chand company, New Delhi.
4. Bahl, B.S. and Bahl, A., Organic Chemistry, (12th edition), New Delhi, Sultan Chand &Co., (2010)
5. B.R. Puri, L.R. Sharma, K.C. Kalia, 'Principles of Physical Chemistry', 21st edition, Vallabh Publications, 2004-2005.
6. Puri B.R., Sharma L.R. and Pathania M.S. (2013), Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin Chand and Co.
7. J. D. Lee, Concise Inorganic Chemistry, Blackwell Science Ltd., London (2006).
8. Sathya prakash., G.D.Tuli., S.K.Basu and R.D.Madan "Advanced Inorganic chemistry' Volume-1s.chand &company .
9. A.K. Srivastava – "Organic Chemistry" – 1st Edition.,(2002) – New Age International Publishers, New Delhi.
10. O.P.Agarwal Advanced orgcanic chemistry Sultan Chand & Co.,
11. Puri B.R., Sharma L.R. and Pathania M.S. (2013), Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin Chand and Co
12. Glasstone S. and Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co Ltd.

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	Capacity to explain chemistry of carbohydrates, amino acids and proteins	K1

CO2	Able to explain types of bonding .	K2
CO3	Students will be able to draw structure of heterocyclic compounds.	K2
CO4	Ability to define surface chemistry.	K2
CO5	Students can able to explain p^H value.	K3

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	M
CO3	M	S	M	S	S
CO4	S	S	S	S	S
CO5	S	S	M	S	S

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ALLIED COURSE-I

GENERALCHEMISTRY-I

(For Bio-Chemistry studentsadmitted from 2020-2021onwards)

Semester-I **Marks: 75**
Course Code: 21UBC1A1Credits: 3
Total periods: 45Exam Hours: 3

OBJECTIVES

- To know about coordination chemistry
- To understand electron displacement effects and halogen compounds
- To learn about aromatic compounds and organic reactions
- To know about basic concepts of acids, bases and catalysis

UNIT-I: COORDINATION CHEMISTRY **(9Periods)**

Coordination Chemistry: Simple salts- Double salts- Coordination compound types of ligands- Chelation-Nomenclature – isomerism- Werner's theory -Pauling's and Sedgwick theory -VBT. Industrial importance of EDTA.

Biologically important co-ordination compounds: Hemoglobin and Chlorophyll- structure and biological role.

UNIT-II:ELECTRON DISPLACEMENT AND HALOGEN COMPOUNDS (9Periods)

Inductive effect, Mesomeric, Resonance, Hyper Conjugations and Steric Effect. Polar effects.Inductive effect – Relative Strength of Aliphatic monocarbocylic acid and aliphatic amines.

Resonance – Condition for resonance. Consequences of resonance – resonance of energy. Basic Property of aniline and acidic property of phenol.

Halogen Containing Compounds: Dichloromethane, chloroform, carbon tetrachloride, DDT and BHC. Types of solvents: - Polar, Non polar solvents. Important of chlorohydrocarbons used as solvents.

UNIT- III :AROMATIC COMPOUNDS AND ORGANIC REACTIONS (9Periods)

Aromatic compounds: Structure and Conditions for Aromacityand Aromaticity of benzene-Huckels rule. Substitution reaction: Nitration, Halogenations, Alkylation. Naphthalene – Isolation, Structure, properties and uses.

Organic reaction: Biuret, Decarboxylation, Benzoin, Perkin, Cannizaro, Claisen and Haloforms reactions

UNIT-IV: SEPARATION AND PURIFICATION TECHNIQUES(9Periods)

Separation Techniques: Distillation-steam, fractional and azeotropic distillation, crystallization-principles, working techniques and applications .Chromatography – principles, experimental techniques and applications of paper, thin layer and column chromatography.

UNIT- V: ACIDS, BASES AND CATALYSIS (9Periods)

Acids-Bases: Arrhenius, Lowry-Bronsted and Lewis concepts of acids and bases-pH, buffersolution, Henderson-Hasselbalch equation and its importance (no derivation) -Biological importance of pH and buffer solutions in living system- Determination of pH by colorimetricmethod.

Catalysis: Catalysis – Importance of catalysis. Types of catalysis - Homogeneous and heterogeneous catalysis, factors affecting catalysis. Definitions of catalytic promoter, catalytic inhibitor, catalytic poison. Theory of catalysis.

TEXT BOOKS AND REFERENCES BOOKS

6. .R.D. Madan, “Modern Inorganic Chemistry”, 2nd edition, S. Chand & Company Ltd., 2000.
7. P.L. Soni – “Text book of Inorganic Chemistry. S. Chand & Co., New Delhi (1999)
8. B.S. Bahl and Amn Bahl, Advanced Organic Chemistry, S. Chand & Co. Ltd, New Delhi (1996).

9. Glasstone S. and Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co Ltd.
5 Puri B.R., Sharma L.R. and Pathania M.S. (2013), Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin Chand and Co.
6 A .K. Srivastava – "Organic Chemistry" – 1st Ed.,(2002) – New Age International Publishers,New Delhi.
7 Gopalan R, Subramanian PS and Rengarajan K (1993) ``Elements of analytical chemistry" second revised edition, Sultan Chand.
8 J. D. Lee, Concise Inorganic Chemistry, Blackwell Science Ltd., London (2006).
9.Gopalan R, Text Book of Inorganic Chemistry, 2nd Edition, Hyderabad, Universities Press, (India), 2012.
10 . Morrison R.T. and Boyd R.N., Bhattacharjee S. K. Organic Chemistry (7th edition), Pearson India, (2011)
11 .M.K. Jain – "Organic Chemistry" – 12th Ed., (2003) Sulthan and Chand Company, New Delhi.
12. R.D. Madan, J.S. Tiwari and G.L. Mudhara – A Textbook of First Year B.Sc. Chemistry: S.Chand and Co, 2002
13.Gurdeep R Chatwal, Sham K. Anand (2005) ``Instrumental methods of chemical analysis", Himalaya publishing house.
14. Sharma, B. K., Instrumental methods of chemical analysis, Goel Publishing House, Merrut (1997).

COURSE OUT COMES

CO	**CO Statement**	**Knowledge level**
CO1	Capacity to explain structure and naming of coordination compounds	K1
CO2	Ability to define electron displacement effects	K2
CO3	Capacity to explain organic reactions	K2
CO4	Leaner's can able to explain basic concepts of separation and purification techniques	K2
CO5	Students will be able to explain about acids, bases and catalysis	K3

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	M
CO3	S	S	M	S	S
CO4	S	S	S	S	S
CO5	S	S	M	S	S

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ALLIED COURSE: II

LAB IN VOLUMETRIC AND ORGANIC QUALITATIVE ANALYSIS

(For Bio-Chemistry students admitted from 2018-2019 onwards)

Semester-I **Marks: 60**
Course code: 21 UBC1A2P **Credits: 3**
Total periods : 45 **Exam Hours: 3**

OBJECTIVES

- To enable the students to understand the concepts of volumetric analysis
- To learn the Organic qualitative analysis

I. VOLUMETRIC ANALYSIS

1. Acidimetric and Alkalimeter

(a) Strong acid VS strong base

(b) Weak acid VS strong base

2. Permanganometry

(a) Estimation of ferrous sulphate

(b) Estimation of oxalic acid

3. Iodometry

(a) Estimation of potassium dichromate

(b) Estimation of potassium permanganate

4. Complexometry

(a) Determination of Hardness of water

II. ORGANIC ANALYSIS

Analyze the following organic Compounds.

1. Carbohydrate, 2. Amide, 3. Aldehydes, 4. Ketone, 5. Acid & 6. Amine

The students may be trained to perform the specific reactions like tests for Element (nitrogen only), Aliphatic/ Aromatic, Saturated /Unsaturated and Functional group present and record their observations.

REFERENCES

1. R. Gopalan, Elements of analytical chemistry, S. Chand, New Delhi, 2000.

2. N. S. Gnanapragasam and G. Ramamurthy, Organic Chemistry lab manual,S.Viswanathan and Co. Pvt. Ltd. Chennai-1998

Note:Scheme for Practical Evaluation.

Organic Qualitative Analysis - 20

Volumetric Estimation -35

Record - 5

Internal Assessment - 40

Total: 100 Mark

Organic Qualitative Analysis: 20

Identification of Nitrogen - 4 marks

Saturated and unsaturated - 3 marks

Aliphatic or Aromatic - 3 marks

Preliminary reactions with

Procedure - 5 marks

Functional group identified

Correctly - 5 marks

Volumetric Analysis: 35

Procedure 5 marks

Results

< 2 % - 30 marks

2-3 % -20 marks

3-4 % - 10 marks

> 4 % - 5 marks

COURSE OUT COMES

CO	CO Statement	Knowledge level
CO1	• Capacity to carry out volumetric analysis	K1
CO2	• Capacity to carry out organic qualitative analysis	K2
CO3	• Capacity to carry out hardness of water	K3

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	M
CO3	S	S	M	S	S

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ALLIED COURSE-III

INORGANIC, ORGANIC AND PHYSICALCHEMISTRY-II

(For Bio-Chemistrystudents admitted from 2018-2019 onwards)

Semester-IIMarks: 75
Course code:21UBC2A3 **Credits: 3**
Total periods: 45 **Exam Hours: 3**

OBJECTIVES

- To know about types of bonding
- To learnt about carbohydrates, aminoacids and proteins
- To know about heterocyclic compounds colloids
- To understand chemistry of colloids, emulsion and gels
- To learn about Chemical Kinetics and Chemical equilibrium

UNIT- I : CHEMICAL AND METALLIC BONDING (9 Periods)

Types of bonding: Ionic bond, covalent bond and coordinate bond. MO theory- bonding , Anti bonding, non-bonding orbitals. Bond order applications of MO theory to H2, He2, O2 and molecules.

Metallic bond: Electron gas, Pauling and band theories, semi conductors – intrinsic, extrinsic N-type andP-type semi conductors.

UNIT- II: CARBOHYDRATES, AMINOACIDS AND PROTEINS
(9Periods)

Carbohydrates: classification – glucose and fructose – preparation and properties .Structure of glucose and Fructose -Fischer and Haworth CyclicStructure.
Amino acids and proteins: Amino acids – Classification based on structure Essential and non essentials amino acids – preparation, properties and uses – peptides (elementary treatment only)
Proteins – Classification based on physical properties and biological functions. Structure of proteins – primary and secondary (elementary treatment).

UNIT - III: HETEROCYCLIC STEREOISOMERISMAND COMPOUND (9Periods)

Stereoisomerism: Structural isomerism , Optical isomerism – Lactic and Tartaric acid - conditionfor optical isomerism- enantiomers- diastereomers-– racemic mixture and resolution. Geometrical Isomerism – maleic and fumaric acids.
Heterocyclic compounds: Furan, Pyrrole and Pyridine – preparation, properties and uses – basic properties of Pyridine and Pyrrole.

UNIT- IV: COLLOIDS,EMULSION AND GELS(9Periods)

Colloids: Definition, differences between true solution, colloidal solution and suspension, phases of colloidal solution-Electrical properties – Electrophoresis and Electro osmosis (definition and uses only) - protection of colloids – Gold number- medicinal applications ofcolloids.
Emulsion: definition, types, preparation, and applications-Emulsifying agents and theirimportance.Gels: definition, types, preparation, properties and applications.

UNIT -V: CHEMICAL KINETICS AND CHEMICAL EQUILIBRIUM (9Periods)

Chemical kinetics: rate of reaction, order, molecularity, first order rate law, half life period and derivation of the first order equation.
Chemical equilibrium: Criteria of homogeneous and heterogeneous equilibrium, Decomposition of HI, N_2O_4, $CaCO_3$ and PCl_5

TEXT BOOKS AND REFERENCES BOOKS

1. R.D Madan – "Modern Inorganic Chemistry" (1987), S. Chand & Co Pvt Ltd.
2. P.L. Soni – "Text book of Inorganic Chemistry. S. Chand & Co., New Delhi (1999).
3. P.L. Soni and H.M. Chawla - "Text Book of Organic Chemistry" - 28th Edition. (1999) - Sulthan and Chand company, New Delhi.
4. . Bahl, B.S. and Bahl, A., Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (2010)
5. B.R. Puri, L.R. Sharma, K.C. Kalia, 'Principles of Physical Chemistry', 21st edition, Vallabh Publications, 2004-2005.
6. Puri B.R., Sharma L.R. and Pathania M.S. (2013), Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin Chand and Co. **:**
7. J. D. Lee, Concise Inorganic Chemistry, Blackwell Science Ltd., London (2006).
8. Sathya prakash., G.D.Tuli., S.K.Basu and R.D.Madan "Advanced Inorganic chemistry' Volume 1s.chand &company .
9. A.K. Srivastava – "Organic Chemistry" – 1st Edition.,(2002) – New Age International Publishers, New Delhi.
10 O.P.Agarwal Advanced orgcanic chemistry Sultan Chand & Co.,
11. Glasstone S. and Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co Ltd.

COURSE OUT COMES

CO	**CO Statement**	**Knowledge level**
CO1	Capacity to explain chemistry of carbohydrates, amino acids and proteins	K1
CO2	Able to explain types of bonding	K2
CO3	Students will be able to draw structure of heterocyclic compounds	K2
CO4	Capacity to explain chemistry of colloids, emulsion and gels	K3
CO5	Ability to explain chemical kinetics.	K3

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	M
CO3	S	S	M	S	S
CO4	S	S	S	S	S
CO5	S	S	M	S	S

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DHANALAKSHMI SRINIVASAN
COLLEGE OF ARTS AND SCIENCE FOR WOMEN,
PERAMBALUR – 621 212
(AUTONOMOUS)
(Affiliated to Bharathidasan University)
(Nationally Reaccredited with "A" Grade by NAAC)
DEPARTMENT OF CHEMISTRY
(M.Phil., Chemistry Course Structure)
(For the candidate admitted from the academic year 2020-2021 onwards)

SEM	COURSE	TITLE	COURES CODE	INS.PERIODDS/ WEEK	CREDIT	MARKS		TOTAL
						IA	UE	
I & II	Core Course –I	Research Methodology	20MPCH1C1	5	5	25	75	100
	Core Course –II	Advanced Topics in Chemistry	20MPCH1C2	5	5	25	75	100
	Core Course –III	Based on Project Work to be framed by the Guide	20MPCH1C3	5	5	25	75	100
	Core Course –IV	Teaching Learning Skills	20MPCH1C4	5	5	25	75	100
		Total		**20**	**20**	**400**		

	Project Work	Dissertation and Viva - Voce	20PDCH2PW	20	20	200
Total				**20**	**20**	**200**
Grand Total				**40**	**40**	**600**

M. Phil Chemistry

CORE COURSE-I

RESEARCH METHODOLOGY

Semester-I **Marks: 75**
Course code: 20MPCH1C1 **Credit: 5**
Total Periods : 75 **Exam Hours: 3**

OBJECTIVES
To introduce the purpose and importance of research for future development.

UNIT-I :PRINCIPLES OF RESEARCH (15 Periods)

Definition - Need for research. Objectives – Motivation – Types of research – Significance - Formulation of Research Problem – Developing Hypothesis - Preparing Research Design - Selection of Research Problem – Determining Sample Design Characteristics of a Good Sample Design - Collection of Data – Methods of Data Collection - Execution of Work. Analysis of Data – Hypothesis, Testing - Generalization and Interpretation - Preparation of Report - Submission of Report in the form of Thesis .

UNIT–II:LITERATURE SURVEY (15 Periods)

Print: Sources of information – Primary, Secondary, Tertiary sources – Journals – Journal abbreviations – Abstracts – Current titles – Reviews – Monographs – Dictionaries – Textbooks – Current contents – Introduction to Chemical Abstracts –Types (Chemical, Physical, Analytical), Survey of abstract indexes (substance index, author index, general technique index, collective and comprehensive indices), and Beilstein – Subject Index, Substance Index, Author Index, Formula Index and other Indices with examples, Beiestein compounds and tables of information. Chemical abstract search through loaded CDS. Aids of Computer devices in literature survey.

Digital: Web resources – E-Journal – Journal access – TOC alerts – Hot articles – Citation index – Impact factor – H-Index – E-Consortium – UGC infonet – E-Books – Internet discussion groups and communities – Blogs – Preprint server – Search engines, Scirus, Google Scholar, Chem Industry, Wiki – Databases, Chem Spider, Science Direct, Scientific Finder, Scopus.

Selection of topic and facilities - Selection of specific topics of research laboratory and instrumental facilities –location of journals, e-mail address, specific articles of science citation cards and indices, summarisations of works already done and published in the chosen field.

UNIT –III : METHODS OF SCIENTIFIC RESEARCH AND WRITING SCIENTIFIC PAPERS (15 Periods)

a) Proposal, Paper and Thesis Writing

Assignments and test papers, Thesis and dissertations, style andconventions in writing, selection of topic. Rough drafting of the article – Tile, Abstract, Introduction, Literature review problem and time limitation, Experimental methods, Results and discussions ,Foot notes, Figures, Data presentations, Tables, Sign convention followed –Conclusions and recommendations. The general format – page and chapter format – use of quotations – footnote – tables and figures. Results and discussions – applicability of the findings to common usage – referencing – abbreviations used etc.

B) General principles of research, inculcation of scientific temper, avoidance of prejudices and lax judgments, undue admiration of authority (i.e. excessive admiration of the work of great minds), false distinction between theoretical and applied research, impulses of a strong will to do research, persistent hard work and concentration, developing high-minded independence of judgment and taste for scientific originality, various stages of scientific research, observation, experimentation, working hypotheses, proof etc.,

C) On writing scientific papers – justification for scientific contributions, bibliography, justice and courtesy in decisions, description of methods, conclusions, the need for illustration, style, publications of scientific works, c) Writing methods - Writing the first draft, revising the

first draft on content and structure, revising the second draft on style, writing a thesis, writing review article and book reviews, preparing research proposals for grants.

UNIT IV - CHEMICAL SAFETY AND ETHICAL HANDLING OF CHEMICALS (15 Periods)

Safe working procedure and protective environment, protective apparel, emergency procedure and first aid, laboratory ventilation, Safe storage and use of hazardous chemicals, procedure for working with substances that pose hazards, flammable or explosive hazards, procedures for working with gases at pressures above or below atmospheric safe storage and disposal of waste chemicals , recovery , recycling and reuse of laboratory chemicals, procedure for laboratory disposal of explosives , identification , verification and segregation of laboratory waste , disposal of chemicals in the sanitary sewer system , in incineration and transportation of hazardous chemicals .

UNIT -V : DATA ANALYSIS AND PACKAGES (15 Periods)

Data:Types of Error - Accuracy, precision, significant figures, use of calculus in the estimation of errors - Frequency distributions, the binomial distribution, the Poisson distribution and normal distribution - describing Data, population and sample, mean, variance, standard deviation, way of quoting uncertainty, robust estimators, repeatability and reproducibility of measurements -Hypothesis testing, levels of confidence and significance, test for an outlier, testing variances, means t-Test, paired t-Test Analysis of variance (ANOVA) - Correlation and Regression - Curve fitting, Fitting of linear equations, simple linear cases, weighted linear case, analysis of residuals - General polynomial fitting, liberalizing transformations, exponential function fit - r and its abuse - Basic aspects of multiple linear regression analysis.

Electronics and Computer Packages

Basic fundamentals of electronic circuits and their components used in circuits common instruments like spectrophotometers, typical circuits involving operational amplifiers for electrochemical instruments. Elementary aspects of digital electronics.

Applications of some computer packages like MS-Excel, Origin, Chem draw, Sciplot, ISIS draw, Chemsketch.

TEXT AND REFERENCES BOOKS

1.J. March, „Advanced Organic Chemistry; Reactions, Mechanisms and Structure“, 6th Ed., Wiley- Interscience, 2007.

2. Santiago Ramon y Cajol, (translated by Neely S Wanson and Larry W Swanson) „Advice for a young Investigator“ A Bradford Book, The MIY Press, Massachusetts, London,England 1999.

3. Maeve O“Connor, „Writing successfully in science“ Chapman and Hall, London, 1991.

4.D. B. Hibbert and J. J. Gooding, „Data Analysis for Chemistry", Oxford University press, 2006.
5. J. Topping, „Errors of Observation and Their Treatment", Fourth Edn., Chapman Hall, London, 1984
6. S. C. Gupta, „Fundamentals of Statistics", Sixth Edn., Himalaya publ. House", Delhi, 2006
7. H. E. Solbers, „Inaccuracies in Computer Calculation in Standard Deviation", Anal. Chem. 55, 1611 (1983)
8. P. M. Wanek et al., „Inaccuracies in the Calculation of Standard Deviation with Electronic Calculators", Anal. Chem. 54, 1877 (1982)
9. R. L. Tokheim, „Digital Electronics-Principles and Applications", 5th Edn., Tata Mc Graw-Hill, New Delhi, 1999.
10. Alan Jhonson, „Electronics, A Systems Approach" Hodder and Stoughton, London, 1987.
11. Robert Boylested, Louis Nashelsky, „Electronic Devices and Circuit Theory", Prentice Hall, 9th Edn., May 2005.
12. Thomas L Floyd, „Principles of Electric Circuits: Conventional Current Version", Prentice Hall, 7th Edn., Jan 2006.
13. For computer applications any commonly available books as well as common materials available in the web. 5.

COURSE OUT COMES

CO	**CO Statement**	**Knowledge level**
CO1	Understand the basic concepts of database analysis and solving the problems	K1
CO2	Undestand the good laborator;y practices and chemical safety methods.	K2
CO3	Learners will easily understand the literatre survey and web resources	K2
CO4	Students will able to write the research aarticles.	K2
CO5	Learn the basic fundamentals of electrochemical instruments.	K3

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	S	S	S	S	M
CO3	M	S	M	S	S
CO4	S	S	S	S	S
CO5	S	S	M	S	S

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CORE COURSE-II

ADVANCED TOPICS IN CHEMISTRY

Semester-I **Marks: 75**
Course code: 20MPCH1C2 **Credits: 5**
Total Periods: 75 **Exam Hours: 3**

OBJECTIVES

- To understand advanced spectroscopic techniques

UNIT I - MICROSCOPY TECHNIQUES (15 Periods)

Electron Microscopy, Transmission electron microscope (TEM), general design, resolution, electron source, TEM grids, electron lenses , electron – sample interactions- Scanning transmission electron microscope (STEM) Scanning probe microscopy - Atomic and molecular force microscopes (AFM and MFM), Scanning tunnelling Microscope (STM); Scanning near-field and far-field optical microscope (SNOM and SFOM) - Fluorescence microscopy, single-molecule fluorescence imaging, single molecule FRET (Fluorescence energy transfer) techniques, Confocal microscopy.

Unit-II - RESONANCE SPECTROSCOPY (15 Periods)

1H NMR: Long-range coupling – Homotopic, enantiotopic and diastereotopic systems - Conformationally mobile, open-chain systems, Virtual coupling – Coupling of proton to fluorine, phosphorus - Nuclear Overhauser effect. 13C NMR: Off resonance decoupling – Coupling of carbon to deuterium, fluorine, phosphorus – DEPT – Application of proton

and carbon data in identifying small organic compounds. 2D NMR: Principles of 2D NMR spectroscopy - 1H-1H COSY, 1H-13C COSY, HMBC and HSQC.

Basic concepts of ESR spectroscopy – g tensor- Factors affecting the magnitude of g and A tensors in metal complexes – Anisotropy in g and A values -Zero-field splitting and Kramer's degeneracy - Applications of EPR to some simple systems like methyl radical, p-benzosemiquinone and naphthalene anion, Cu(II),Fe(II), Mn(II) and Ni(II) complexes – Spin-trapping.
Basic principles of ENDOR spectroscopy and its applications in inorganic chemistry

UNIT III - ELECTRO ANALYTICAL TECHNIQUES (15 Periods)

Potentiometric sensors- criteria for choosing these sensors, selective electrodes- primary ion-selective electrodes encompassing crystalline and non-crystalline electrodes-membrane ion-selective electrodes including gas-sensing and enzyme substrate electrodes- all solid state ion-

selective electrodes – Voltammetric sensors, chronoamperometry- potential sweep techniques (cyclic voltammetry including study of reaction mechanisms)- step and pulse techniques- Normal pulse and differential pulse voltammetry- square wave voltammetry- AC techniques- stripping voltammetry (anodic and cathodic)- stripping analysis.

UNIT IV :APPLICATIONS OF MASS SPECTROMETRY TO BIO MOLECULES AND FLUORESCENCE SPECTROSCOPY

(15 Periods)

Basic Instrumentation - Resolution, EI, CI and APCI methods - base peak, isotopic peaks, metastable peak, parent peak - determination of molecular formula Techniques in Instrumentation - Soft Ionization Methods - Fast Atom-Ion Bombardment-Electron spray Ionization - Matrix-Assisted Laser Desorption/Ionization - Mass Analyzers – Detectors- Hyphenated techniques, GC-MS, LC-MS and tandem Mass spectrometry- Applications to Biomolecules - Molecular weight Determination - Protein Identification - Protein- Peptide Sequencing - Nucleic Acid Applications.

Emission spectra and excitation spectra, 2D – emission spectra, frequency-domain spectra and time-domain spectra- definition of lifetime of an excited state-multiexponential decays- time-correlated single-photon counting technique to obtain time-domain spectra- micro-nano- pico and femto second transient recordings using laser flash photolysis techniques- various laser sources and light-emitting diodes- Fluorescence quenching and its applications in some biological systems like proteins. membranes, DNA etc.

UNIT V - BIOLOGICAL CHEMISTRY (15 Periods)

Chemistry in biosystems (distinct from non-living systems) – Weak non - covalent interactions - Molecular recognition – Enzyme chemistry – Mechanism of enzyme action – Chymotrypsin – Antibodies as enzymes-Enzymes in synthetic organic chemistry – Coenzyme chemistry - NADH – NADPH and FADH(2) as electron carriers – Pyridoxal phosphate - Thiamine pyrophosphate – suicide enzyme inactivators and affinity labels – Bioenergetics & metabolism – Biological energy – ATP – Carbohydrate metabolism – Lipid metabolism – Citric acid cycle – Enzyme models – utility of cyclodextrins, Crown ethers and calixarenes as enzyme models – Molecular recognition and drug design – Supramolecular chemistry – Supramolecular reactivity and catalysis

TEXT AND REFERENCES BOOKS

Unit I

1. Acc. Chem. Res. July 2005
2. Bengt Nolfing, „Methods in Modern Biophysics", Springer, 2004.
3. T. Pradeep, Nano: The Essentials, Mc Graw-Hill Edn, New Delhi, 2007.

Unit II

1. P.M. Silverstein, F.X. Wester, Spectroscopic Identification of Organic Compounds, 6th Ed., Wiley 1998.
2. J. Mohan, Organic Spectroscopy Principles and Applications, CRC; 2nd Ed., 2004.
3. W. Kemp, Organic Spectroscopy, 3rd Ed., MacMillon, 1994.
4. D.L. Pavia, G.M. Lampman and G.S. Kriz, Introduction to Spectroscopy, Brooks Cole, 3rd Ed., 2000.
5. H. Gunther, NMR spectroscopy, basic principles, concepts and application in chemistry, John Wiley & Sons, 2nd Ed., 1995.
6. R. S. Drago, Physical Methods in Chemistry, Saunders, 1977.
7. J. A. Weil, J. R. Boldton and J. E. Wertz, Electron Paramagnetic Resonance: Elementary\ Theory and Practical Applications, John Wiley and sons, 1994.

Unit III

1. Christopher M.A Brett and Ana Maria Oliveira Brett, "Electroanyalysis" Oxford University Press, Oxford, 1998.
2. Daniel C. Harris, "Quantitative Chemical Analysis", Third Edn., W.H. Freeman and Company New york, 1996.
3. A.J. Bard L.F. Faulkner, Electrochemical methods – Fundamentals and Applications, Second Edn., Wiley-VCH, 1998.
4. Journal of Chemical Education, "State of Art Sympoisum:Electrochemistry" Vol.60, issue No.4, 1983.
5. J. Janata, "Principles of Chemical Sensor", Plenum Press, New York, 1989.
6. Joseph Wang, "Analytical Electrochemistry", Second Edn., Wiley-VCH, 2001

Unit IV

1. Spectrometric Identification of Organic Compounds, 6th Edition, Robert M. Silverstein and Francis X. Webster, Publisher: John Wiley & Sons, Inc, 1998
2. Theme issue on "Frontiers in Mass Spectrometry", Chemical Reviews 2001, Vol. 101, Issue 2.
3. Bioanalytical Chemistry, S. K. Mikkelsen and Eduardo Corton, Publisher: Wiley- Interscience - John Wiley & Sons, Inc., 2004
4. Joseph R.Lakowicz "Principle of Fluorescence Spectroscopy" Third Edn. Springer,USA,2006

Unit V

1. Biochemistry, 3rd edition, C. K. Mathews, K. E. van Holde, K. G. Ahern, Publisher: Pearson Education 2000
2. Principles of Biochemistry, 2nd edition, A. L. Lehninger, D. L. Nelson, M. M. Cox, Publisher: CBS Publishers & Distributors (India) 1993
3. Bioorganic Chemistry: A Chemical Approach to Enzyme Action, 3rd edition, Hermann Dugas, Springer International Edition 2003

COURSE OUT COMES

CO	CO Statement	Knowledge level

CO1	Understand the instrumentation methods of TEM, SEMand AFM	K1
CO2	Acquire knowledge about the C13 , H1 NMR, COSY and EPR spectroscopy	K2
CO3	Learner will understand the elcectroanalytical techniques	K2
CO4	Students will able to the instrumentations techniques of fluorescence and mass spectroscopy and its applications	K1
CO5	Understand the enzyme activities, drug design and its biological applications	K2

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	M	M
CO4	S	S	S	S	S
CO5	S	S	S	M	S

S- STRONG M-MEDIUM

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COURSE –IV
TEACHING AND LEARNING SKILLS

Semester-I **Marks: 75**
Course code: 20MPCH1C4Credit: 5
Total Periods: 75 **Exam Hours:3**

OBJECTIVES

- understand the operations and use of computers and common Accessories and to develop skills of ICT and apply them in teaching learning context and Research

UNIT -I :COMPUTER APPLICATION SKILLS (15 Periods)

Computer system: Characteristics, Parts and their functions – Different generations of Computer – Operation of Computer: switching on / off / restart, Mouse control, Use of key board and some functions of key – Information and Communication Technology (ICT): Definition, Meaning, Features, Trends – Integration of ICT in teaching and learning – ICT applications: Using word processors, spread sheets, Power point slides in the classroom – ICT for Research: On-line journals, e-books, Courseware, Tutorials, Technical reports, Theses and Dissertations

UNIT- II : COMMUNICATION SKILLS (15 Periods)

Communication: Definitions – Elements of Communication: Sender, Message, Channel, Receiver, Feedback and Noise – Types of Communication: Spoken and written; Non-verbal communication – Intrapersonal, Interpersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and writing – Methods of developing fluency in oral and written communication – style, Diction and Vocabulary – Classroom communication and dynamics

UNIT- III : COMMUNICATION TECHNOLOGY (15 Periods)

Communication Technology: Bases, Trends and Developments – Skills of using Communication Technology – Computer Mediated Teaching: Multimedia, E-content – Satellite-based communication: EDUSAT and ETV channels, Communication through web: Audio and Video applications on the Internet, interpersonal communication through the web.

UNIT- IV: PEDAGOGY (15 Periods)

Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, Delivery of a lecture – Narration in tune with the nature of different disciplines – Lecture with power point presentation – Versatility of lecture technique – Demonstration, Characteristics, Principles, Planning Implementation and Evaluation – Teaching – Learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion – Models of teaching: CAI, CMI and WBI

UNIT –V: TEACHING SKILLS (15 Periods)

Teaching skill: Definition, Meaning and Nature – Types of Teaching skills: Skill of Set Induction, Skill of Stimulus Variation, Skill of Explaining, Skill of Probing Questions, Skill of Black Board writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills

Text and References Books:

1. Bela Rani Sharma (2007), Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi
2. Don Skinner (2005), Teacher Training, Edinburgh University Press Ltd., Edinburgh
3. Information and Communication Technology in Education: A Curriculum for Schools and programme of Teacher development, Jonathan Anderson and Tom Van Weart, UNESCO, 2002
4. Kumar K.I (2008) Educational Technology, New Age International Publishers, New Delhi
5. Mangal, S.K. (2002) Essential of Teaching – Learning and Information Technology, Tandon Publications, Ludhiana
6. Michael D. and William (2000), Integrating Technology into Teaching and Learning: Concepts and Applications, Prentice Hall, New York

7. Pandey S.K. (2005) Teaching Communication, Commonwealth Publishers, New Delhi
8. Ram Babu A. and Dandapani S (2006) Microteaching (Vol.1&2) NeelakamalPublications,Hyderabad
9. Singh V.K. and Sudarshan K.N. (1996) Computer Education, Discovery .Publishing Company, New York
10.Sharma R. A. (2006) Fundamentals of Educational Technology, Surya Publications, Meerut
11.Vanaja. M. and Rajasekar S. (2006) Computer Education, Neelkamal Publications, Hyderabad.

COURSE OUT COMES

CO	**CO Statement**	**Knowledge level**
CO1	Understand the computer operation and information technology	K1
CO2	Acquire knowledge about the skills of communications and different types	K2
CO3	Students will able to the basic concepts of Internet , interpersonal communication through the web	K2
CO4	Learners will able to Instructional Technology and teaching methods	K1
CO5	Students Know the foundation of Teaching skill:	K2

Mapping with Programme Outcomes

COS/POS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	M	M
CO4	S	S	S	S	S
CO5	S	S	S	M	S

S- STRONG M-MEDIUM