B.Sc., CHEMISTRY (With Allied Mathematics)

SEM	COURSE CODE	PART	COURSE	COURSE TITLE	HRS / WEEK	CREDIT	CIA MARKS	SE MARKS	TOTAL MARKS
I	14U1 LT1/LA1/ LF1/ LH1 / LU1	I	Language - I		6	3	40	60	100
	14UCN1E1	II	English – I		6	3	40	60	100
	14UPH1A1	III	Allied-I	Properties of Matter and Sound	5	2	20	30	50
	14UPH1A1P	III	Allied-I	Properties of Matter – Practical	3	2	20	30	50
	14UCH1C1	III	Core-I	Inorganic, Organic and Physical Chemistry - I	4	4	40	60	100
	14UCH1M1P	III	Major Based Elective -I	Volumetric Analysis - Practical	3	3	40	60	100
	14UCN1VE	IV	Value Education	Value Education	3	3	40	60	100
TOTAL					**30**	**20**	**240**	**360**	**600**
II	14U2 LT2 / LA2/ LF2/ LH2/ LU2	I	Language – II		6	3	40	60	100
	14UCN2E2	II	English – II		6	3	40	60	100
	14UPH2A2	III	Allied-II	Modern Physics	4	2	20	30	50
	14UPH2A2P	III	Allied-II	Optical, Thermal and Electricity – Practical	3	2	20	30	50
	14UCH2C2	III	Core-II	Inorganic, Organic and Physical Chemistry - II	4	4	40	60	100
	14UCH2M2P	III	Major Based Elective –II	Industrial Chemistry - Practical	3	3	40	60	100
	14UCH2N1	IV	Non-Major Elective-I#		2	2	40	60	100
	14UCN2ES	IV	Environmental Studies	Environmental Studies	2	2	40	60	100
TOTAL					**30**	**21**	**280**	**420**	**700**
III	14U3 LT3 / LA3/ LF3/LH3/ LU3	I	Language – III		6	3	40	60	100
	14UCN3E3	II	English - III		6	3	40	60	100
	14UMA3A3:2	III	Allied-III	Classical Algebra	7	4	40	60	100
	14UCH3C3	III	Core-III	Inorganic, Organic and Physical Chemistry - III	4	4	40	60	100
	14UCH3M3P	III	Major Based Elective –III	Domestic Products Preparation – Practical	3	3	40	60	100
	14UCH3N2	IV	Non-Major Elective-II#		2	2	40	60	100
	14UCN3S1	IV	Skill Based Elective - I	Soft Skills	2	2	40	60	100
TOTAL					**30**	**21**	**280**	**420**	**700**
IV	14U4 LT4/ LA4/ LF4/LH4/ LU4	I	Language-IV		6	3	40	60	100
	14UCN4E4	II	English-IV		6	3	40	60	100
	14UMA4A4:2	III	Allied-IV	Calculus and Trigonometry	8	4	40	60	100
	14UCH4C4	III	Core-IV	Inorganic, Organic and Physical Chemistry – IV	4	4	40	60	100
	14UCH4C5P	III	Core-V	Inorganic Qualitative analysis-Practical	4	4	40	60	100
	14UCH4S2	IV	Skill Based Elective - II	Separation and Purification Techniques	2	2	40	60	100
	14UCN4EA	V	Extension Activities	NCC, NSS, etc	-	2	-	-	-
	14UCH4EC1		Extra Credit- I	Computer Applications in Chemistry	-	4*	-	100*	100*
	14UCH4EC2		Extra Credit- II	Photochemistry and Radiation Chemistry	-	4*	-	100*	100*
TOTAL					**30**	**22**	**240**	**360**	**600**
V	14UCH5C6P	III	Core-VI	Gravimetric Estimation and Physical Constants Determination - Practical	5	4	40	60	100
	14UCH5C7	III	Core-VII	Transition Elements and Nuclear Chemistry	4	4	40	60	100
	14UCH5C8	III	Core-VIII	Organic Reactions, Heterocyclic and Stereo Chemistry	4	4	40	60	100
	14UCH5C9	III	Core- IX	Thermodynamics and Solutions	4	4	40	60	100
	14UCH5C10	III	Core- X	Analytical Chemistry	4	4	40	60	100
	14UCH5C11	III	Core- XI	Applied Chemistry	4	4	40	60	100
	14UCH5M4P	III	Major Based Elective-IV	Physical Chemistry Electrical - Practical	3	3	40	60	100
	14UCH5S3	IV	Skill based elective-III	Medicinal Chemistry	2	2	40	60	100
	14UCH5EC3		Extra Credit- III	Chemistry for Competitive Examinations-I	-	4*	-	100*	100*
TOTAL					**30**	**29**	**320**	**480**	**800**
VI	14UCH6C12	III	Core-XII	Co-ordination Chemistry and Applications	5	4	40	60	100
	14UCH6C13	III	Core-XIII	Molecular Spectroscopy and Electrochemistry	5	4	40	60	100
	14UCH6C14P	III	Core-XIV	Organic Analysis and Preparation-Practical	5	4	40	60	100
	14UCH6C15P	III	Core- XV	Physical Chemistry Non - Electrical – Practical	4	4	40	60	100
	14UCH6C16	III	Core- XVI	Organic Compounds and Molecular Rearrangements	4	4	40	60	100
	14UCH6C17	III	Core- XVII	Soil, Dairy and Leather Chemistry	4	4	40	60	100
	14UCH6S4	IV	Skill Based Elective-IV	Chemistry of Biomolecules	2	2	40	60	100
	14UCN6GS	V	Gender Studies	Gender Studies	1	1	40	60	100
	14UCH6EC4		Extra Credit- IV	Chemistry for Competitive Examinations-II	-	4*	-	100*	100*
TOTAL					**30**	**27**	**320**	**480**	**800**
GRAND TOTAL					**180**	**140**	**1680**	**2520**	**4200**

Non Major Elective Courses offered to the other Departments:

SEM	COURSE TITLE
II	Food and Nutrition Chemistry
III	Chemistry in Everyday life

* Not considered for Grand Total and CGPA

B.Sc., CHEMISTRY (With Allied Botany)

SEM	COURSE CODE	PART	COURSE	COURSE TITLE	HRS / WEEK	CREDIT	CIA MARKS	SE MARKS	TOTAL MARKS
I	14U1LT1/LA1/ LF1/LH1/LU1	I	Language - I		6	3	40	60	100
	14UCN1E1	II	English – I		6	3	40	60	100
	14UPH1A1	III	Allied-I	Properties of Matter and Sound	5	2	20	30	50
	14UPH1A1P	III	Allied-I	Allied Physics I – Practical	3	2	20	30	50
	14UCH1C1	III	Core-I	Inorganic, Organic and Physical Chemistry–I	4	4	40	60	100
	14UCH1M1P	III	Major Based Elective –I	Volumetric Analysis - Practical	3	3	40	60	100
	14UCN1VE	IV	Value Education	Value Education	3	3	40	60	100
	TOTAL				**30**	**20**	**240**	**360**	**600**
II	14U2LT2/LA2/ LF2/LH2/ LU2	I	Language – II		6	3	40	60	100
	14UCN2E2	II	English – II		6	3	40	60	100
	14UPH2A2	III	Allied-II	Modern Physics	4	2	20	30	50
	14UPH2A2P	III	Allied-II	Allied Physics II – Practical	3	2	20	30	50
	14UCH2C2	III	Core-II	Inorganic, Organic and Physical Chemistry-II	4	4	40	60	100
	14UCH2M2P	III	Major Based Elective –II	Industrial Chemistry- Practical	3	3	40	60	100
	14UCH2N1	IV	Non-Major Elective-I#		2	2	40	60	100
	14UCN2ES	IV	Environmental Studies	Environmental Studies	2	2	40	60	100
			TOTAL		**30**	**21**	**280**	**420**	**700**
III	14U3LT3/LA3/ LF3/LH3/ LU3	I	Language – III		6	3	40	60	100
	14UCN3E3	II	English – III		6	3	40	60	100
	14UBO3A3	III	Allied-III	Morphology, Taxonomy, Anatomy and Embryology	4	2	20	30	50
	14UBO3A3P	III	Allied-III	Morphology, Taxonomy, Anatomy and Embryology - Practical	3	2	20	30	50
	14UCH3C3	III	Core-III	Inorganic, Organic and Physical Chemistry-III	4	4	40	60	100
	14UCH3M3P	III	Major Based Elective –III	Domestic Products Preparation - Practical	3	3	40	60	100
	14UCH3N2	IV	Non-Major Elective-II#		2	2	40	60	100
	14UCN3S1	IV	Skill Based Elective – I	Soft Skills	2	2	40	60	100
	TOTAL				**30**	**21**	**280**	**420**	**700**
IV	14U4LT4/LA4/ LF4/LH4/ LU4	I	Language – IV		6	3	40	60	100
	14UCN4E4	II	English – IV		6	3	40	60	100
	14UBO4A4	III	Allied-IV	Thallophytes, Bryophytes, Pteridophytes, Gymnosperms and Plant Physiology	5	2	20	30	50
	14UBO4A4P	III	Allied-IV	Thallophytes, Bryophytes, Pteridophytes, Gymnosperms and Plant Physiology-Practical	3	2	20	30	50
	14UCH4C4	III	Core-IV	Inorganic, Organic and Physical Chemistry-IV	4	4	40	60	100
	14UCH4C5P	III	Core-V	Inorganic Qualitative analysis- Practical	4	4	40	60	100
	14UCH4S2	IV	Skill Based Elective - II	Separation and Purification Techniques	2	2	40	60	100
	14UCN4EA	V	Extension Activities	NCC, NSS, etc	-	2	-	-	-
	14UCH4EC1		Extra Credit- I	Computer Applications in Chemistry	-	4*	-	100*	100*
	14UCH4EC2		Extra Credit- II	Photochemistry and Radiation Chemistry	-	4*	-	100*	100*
	TOTAL				**30**	**22**	**240**	**360**	**600**
V	14UCH5C6P	III	Core-VI	Gravimetric Estimation and Physical Constants Determination- Practical	5	4	40	60	100
	14UCH5C7	III	Core-VII	Transition Elements and Nuclear Chemistry	4	4	40	60	100
	14UCH5C8	III	Core-VIII	Organic Reactions, Heterocyclic and Stereo Chemistry	4	4	40	60	100
	14UCH5C9	III	Core- IX	Thermodynamics and Solutions	4	4	40	60	100
	14UCH5C10	III	Core- X	Analytical Chemistry	4	4	40	60	100
	14UCH5C11	III	Core- XI	Applied Chemistry	4	4	40	60	100
	14UCH5M4P	III	Major Based Elective-IV	Physical Chemistry Electrical- Practical	3	3	40	60	100
	14UCH5S3	IV	Skill based elective-III	Medicinal Chemistry	2	2	40	60	100
	14UCH5EC3		Extra Credit- III	Chemistry for Competitive Examinations-I	-	4*	-	100*	100*
	TOTAL				**30**	**29**	**320**	**480**	**800**
VI	14UCH6C12	III	Core-XII	Co-ordination Chemistry and Applications	5	4	40	60	100
	14UCH6C13	III	Core-XIII	Molecular Spectroscopy and Electrochemistry	5	4	40	60	100
	14UCH6C14P	III	Core-XIV	Organic Analysis and Preparation- Practical	5	4	40	60	100
	14UCH6C15P	III	Core- XV	Physical Chemistry Non Electrical - Practical	4	4	40	60	100
	14UCH6C16	III	Core- XVI	Organic Compounds and Molecular Rearrangements	4	4	40	60	100
	14UCH6C17	III	Core- XVII	Soil, Dairy and Leather Chemistry	4	4	40	60	100
	14UCH6S4	IV	Skill Based Elective-IV	Chemistry of Bio molecules	2	2	40	60	100
	14UCN6GS	V	Gender Studies	Gender Studies	1	1	40	60	100
	14UCH6EC4		Extra Credit- IV	Chemistry for Competitive Examinations-II	-	4*	-	100*	100*
	TOTAL				**30**	**27**	**320**	**480**	**800**
	GRAND TOTAL				**180**	**140**	**1680**	**2520**	**4200**

Non Major Elective Courses offered to the other Departments:

SEM	COURSE TITLE
II	Food and Nutrition Chemistry
III	Chemistry in Everyday life

* Not considered for Grand Total and CGPA

SEMESTER-I: CORE-I

INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY-I

Course Code	**: 14UCH1C1**	**Max. Marks**	**: 100**
Hours/Week	**: 4**	**Internal Marks**	**: 40**
Credit	**: 4**	**External Marks**	**: 60**

Objectives:

- *To understand the principles of quantum numbers and periodicity of elements*
- *To understand the theoretical aspects of inorganic qualitative and quantitative analysis*
- *To make the students acquire knowledge about nomenclature of simple aliphatic compounds, the nature and types of bonding.*
- *To learn the concept and behaviour of gases.*

UNIT – I **12 Hours**

1.1. **Quantum Numbers:** Principles of occupation of electrons in quantum levels – Pauli's exclusion principle, Hund's rule, Aufbau Principle – lowest energy rule, stability of half and fully filled orbitals – degeneracy of orbitals.

#Periodic Table: Mendeleef's modern periodic law – modern periodic table#, Classification of elements on the basis of electronic configuration.

1.2 **Properties of Elements:** Atomic and ionic radii – Comparison – Types of atomic radii – Covalent, metallic and van der Waals; Ionic radii – Determination by Pauling's method – Factors influencing magnitude of ionic radii.

Electro valency: Periodic properties of ionization energy – Factors influencing ionization energy – Electron affinity – Electronegativity – Pauling's and Mullikan's scale of electronegativity.

UNIT – II **12 Hours**

2.1. **Qualitative Analysis:** Advantages of semi-micro analysis, General reactions of common anions – carbonate, sulphide, sulphate, nitrate, chloride, iodide, borate, phosphate, oxalate, fluoride.

General reactions of cations: Precipitants of Lead, bismuth, copper, cadmium, aluminium, iron, manganese, zinc, cobalt, #nickel, barium, calcium and magnesium.#

2.2. **Volumetric Analysis:** Concentrations of standard solution – Normality, Molarity and Molality - Primary and secondary standards, equivalence point. Acid - base titrations: Types – Strong acid Vs Strong base, Strong acid Vs Weak base. Theory of indicators- Phenolphthalein and Methyl Orange.

UNIT – III **12 Hours**

3.1 **Nomenclature of organic compounds** – IUPAC naming of simple aliphatic compounds containing different functional groups – naming of aromatic compounds and alicyclic compounds.

3.2 **Bond -** Types of bonds – homolytic and heterolytic fission of bonds, bond length, bond energy- orbital overlap – sigma and pi bonds – hybridization and geometry of molecules methane, ethane, ethylene, acetylene and benzene.

3.3 **Isomerism**- #Structural and geometrical isomerism#

UNIT – IV **12 Hours**

4.1 **Reactive intermediates:** Generation, structure, reactivity and stability of carbocation, carbanion, free radical and carbenes.

4.2 **Electron displacement effects:** Inductive, electromeric, mesomeric, resonance, hyperconjucation and steric effects.

UNIT – V **12 Hours**

Gaseous State

5.1 Gas Laws-Kinetic theory of gases, Kinetic equation of gases, Derivation of various gas laws from Kinetic gas equation – Different types of molecular velocities, Maxwell's law of distribution of molecular velocities.

5.2 Expansivity and compressibility, Boyle temperature, mean free path, Collision diameter, Collision number, Collision frequency, Heat capacity of gases, Determination of heat capacity ratio.

5.3 Real gases and ideal gases- Deviation of real gases from the ideal gases, derivation of van der Waals equation for real gases, significance of Van der Waals constants- #critical phenomenon, Calculation of critical constants#.

#_____**#** Self study

TEXT BOOKS:

1. B.R. Puri and L.R. Sharma – "Principles of Inorganic Chemistry" , Shoban Lal, Nagin Chand &Co., New Delhi (2000).
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. B.R. Puri, L.R. Sharma and M.S. Pathania, "Principles of Physical Chemistry", Vishal Publications, Jalandhar, 2002.

UNIT I : Text Book 1,2
UNIT II : Text Book 1
UNIT III : Text Book 3
UNIT IV : Text Book 3
UNIT V : Text Book 4

REFERENCES:

1. R.D Madan – "Modern Inorganic Chemistry" , S. Chand & Co Pvt Ltd (2009).
2. B.R. Puri, L.R.Sharma and K.C.Kalia- Principles of Inorganic chemistry, Milestone publishers and distributors, New Delhi. (2012)
3. M.K. Jain – "Organic Chemistry" – 12th Ed., (2003) Sulthan and Chand Company, New Delhi.
4. Bahl and Arun Bahl – "Advanced Organic Chemistry" – 19th Edition. (2005) Sulthan and Chand Company, New Delhi.
5. R.L. Madan, G.D. Tuli, "Simplified Course in Physical Chemistry", 5th revised and enlarged edition, S.Chand & Co., New Delhi, 2009.

SEMESTER-II: CORE-II

INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY-II

Course Code : 14UCH2C2 **Max. Marks : 100**
Hours/Week : 4 **Internal Marks : 40**
Credit : 4 **External Marks : 60**

Objectives:

- *To learn the concepts of bonding and molecular orbital theory.*
- *To know the shapes of molecules by VSEPR theory.*
- *To study the preparations and reactions of alkanes, cycloalkanes, alkenes, alkynes and dienes.*
- *To learn the concepts, properties and applications of liquid and liquid crystals*
- *To understand the basic idea of colloids*

UNIT – I **12 Hours**

1.1 **Ionic Bond:** Electronic theory of valency: Properties of ionic compounds – Variable Electrovalence, Inert Pair effect – Lattice energy – Born Haber cycle – application, factors determining lattice energy – solubility and solvation energy.

1.2 **Covalent Bond:** Lewis, Valence Bond concepts – #types of overlap of orbitals (ss, pp, sp)# – sigma, pi –bonds : Polarity of bonds – ion polarization – degree of ionic character; Significance of dipole moment of polar molecules – Fajan's Rules – Applications.

1.3 **Molecular Orbital Theory:** Bonding and anti – bonding (LCAO method) – Order of energy levels – Relationship between bond order, stability of bond length and molecular magnetic behaviour. Molecular Orbital diagrams of homonuclear (H_2, He_2, N_2 and O_2) heteronuclear (CO, NO and HF) diatomic molecules. Comparison of valence bond theory and molecular orbital theory.

UNIT – II **12 Hours**

2.1. **Shapes of Covalent Molecules:** Hybridization sp (BeF_2, CO_2), sp^2 (BF_3, NO^-_3 ion), sp^3 (NH_4^+, H_2O, SO_4^{2-}), sp^3d (PCl_5) – Salient features of hybridization – Rules – Bond Strength, energy and length. #Resonance -Canonical forms of CO_2, NO_2, CO_3^{2-} – Resonance energy, conditions.# VSEPR – Theory, Postulates, shapes and bond angles of molecules containing only bonded pairs of electrons.

2.2. **Metallic Bond**: Electron sea theory, valence bond theory, Band theory – Properties explained by these.

2.3 **Hydrogen Bond:** Nature, types, effects on physical – Chemical Properties. van der Waals attraction: Significance of Intermolecular electrostatic force.

UNIT – III **12 Hours**

3. 1 **Alkanes** – Preparation by Wurtz, Corey-House and Kolbe's synthesis– Mechanism of free radical substitution in alkanes – chlorination and pyrolysis(cracking).

3.2 **Cycloalkanes** – preparation using Wurtz reaction, Dieckmann's ring closure and reduction of aromatic hydrocarbons, substitution and ring opening reactions –Bayer strain theory.

3.3 **Grignard reagent:** #Preparation, synthesis of alcohols, aldehydes and ketones using Grignard reagent#.

UNIT – IV **12 Hours**

4.1 **Alkenes** – Preparation by Wittig reaction - properties of alkenes – electrophilic and free radical addition – Addition reactions with Hydrogen, Halogens, Hydrogen halides- #Markownikoff's Rule and Anti- Markownikoff's Rule#.

4.2 **Dienes**: Types of dienes – conjugated – Non conjugated and cumulated dienes – relative stabilities of dienes and chemical reactivity – 1,2 and 1,4- additions – Diels-Alder reaction.

4.3 **Alkynes** – preparation from dihalides- - Addition reactions - hydrogen, halogens, halogen acids, water, oxidation – by $KMnO_4$, ozonolysis - acidity of alkynes- formation of copper & silver acetylides and polymerisation.

UNIT-V **12 Hours**

Liquids and Colloids:

5.1 Liquids-Physical properties of liquids- Vapour pressure, measurement of vapour pressure by isoteniscopic method, heat of vaporization, Trouton's rule - Surface tension, measurement of surface tension by Capillary-Rise Method, variation of surface tension with temperature and pressure. #Viscosity – determination of viscosity by Hoppler viscometer**,** variation of viscosity with temperature and pressure#.

5.2 Liquid crystals – definition, classification, theory of liquid crystals, molecular viscosity – parachor, atomic parachor, structural parachor and application of parachor in deciding structures.

5.3. 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, Theories of protection – stabilities of Sols.

#_____# Self study

TEXT BOOKS:

1. P.L. Soni – "Text book of Inorganic Chemistry", S. Chand & Co., New Delhi (1999).
2. P.L. Soni and H.M. Chawla – "Text Book of Organic Chemistry" – 28th Ed., (1999) - Sulthan and Chand company, New Delhi.
3. B.R. Puri, L.R. Sharma and M.S. Pathania, "Principles of Physical Chemistry", Vishal Publications, Jalandhar, 2002.

UNIT I : Text Book 1
UNIT II : Text Book 1
UNIT III : Text Book 2
UNIT IV : Text Book 2
UNIT V : Text Book 3

REFERENCES:

1. R.D Madan – "Modern Inorganic Chemistry" , S. Chand & Co Pvt Ltd (2009).
2. B.R. Puri, L.R.Sharma and K.C.Kalia- Principles of Inorganic chemistry, Milestone publishers and distributors, New Delhi. (2012).
3. Bahl and Arun Bahl – "Advanced Organic Chemistry" – 19th Ed., (2005) – Sulthan and Chand company, New Delhi.
4. R.L. Madan, G.D. Tuli, "Simplified Course in Physical Chemistry", 5th revised and enlarged edition, S.Chand & Co., New Delhi, 2009.

SEMESTER-II: NON MAJOR ELECTIVE-I
FOOD AND NUTRITION CHEMISTRY

Course Code : 14UCH2N1 **Max. Marks : 100**
Hours/Week : 2 **Internal Marks : 40**
Credit : 2 **External Marks : 60**

Objectives:

- *To learn basic knowledge in Food Chemistry.*
- *To know the nutritional values of food.*
- *To get awareness on the food spoilage, adulteration and sanitation.*

UNIT – I **6 hours**

1.1 Food: Definition –classification based on nutritional values, nutritive values of cereals, nuts as oil seeds and milk as milk products.

1.2 Carbohydrates: sources, biological functions, deficiency disease and RDA.

1.3 Protein: sources, biological functions, deficiency diseases and RDA.

1.4 Fat : sources, biological functions, deficiency and RDA.

UNIT – II **6 hours**

2.1 Minerals: Dietary sources, functions, Effects of deficiency and requirements of calcium, phosphorous, iron, fluorine, iodine, #sodium and potassium#.

2.2 Vitamins: Classification, fat and water soluble vitamin, their food sources, effects of deficiency and RDA.

UNIT – III **6 hours**

3.1 Meal planning for various age groups: 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 **6 hours**

4.1 Food spoilage: – Food Spoilage – Causes of food spoilage – Fermentation, rancidity, autolysis and putrefaction – food poisoning.

4.2 **Food Preservation**: principle and importance-method of freezing, canning, pickling, salting, smoking, bottling, sterilization, refrigeration, dehydration, heating, #radiation and preservative agents#.

UNIT – V **6 hours**

5.1 Food adulteration: Definition, classification – Common adulteration in food and their ill effects – Packing hazards-food additives.

5.2 Practical rules for good sanitation of food: Food laws and standards – Bureau of Indian Standards –# AGMARK – Consumer Protection act#.

#_____# Self study

TEXT BOOKS:

1. Dr.M. Swaminathan –"Handbook of food and Nutrition" 5th Ed, Bangalore Printing and Publishing Co Ltd, Bangalore, 2007.

2. K. Bagavathi Sundari – "Applied Chemistry" ,1st Ed, MJP Publishers, Chennai, 2006.
3. M.Raheena Begum – "A Text Book of Foods, Nutrition and Dietetics" - Sterling Publishers, Delhi, 2010.

UNIT I : Text Book 1,3
UNIT II : Text Book 1,2,3
UNIT III : Text Book 1,3
UNIT IV : Text Book 1,3
UNIT V : Text Book 1,2,3

REFERENCES:

1. B. Srilaksmi – "Food Science" – 3rd Ed, New Age International (P) Ltd, New Delhi, 2005.
2. Jayashree Ghose – "Fundamental Concepts of Applied Chemistry" – 1st Ed, S. Chand and Company (P) Ltd, New Delhi, 2006.
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.

SEMESTER-III: CORE-III

INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY-III

Course Code : 14UCH3C3 | **Max. Marks : 100**
Hours/Week : 4 | **Internal Marks : 40**
Credit : 4 | **External Marks : 60**

Objectives:

- *To understand the chemistry of halogen, oxygen and nitrogen family*
- *To understand about the preparations and reactions of alcohols and alkyl halides*
- *To learn the basic concepts of solids and their structure*
- *To know the behavior of adsorption on solids*
- *To study the structure of molecules based on physical properties.*

UNIT – I **12 hours**

1.1. **Halogen Family:** Comparative study of halogens and their compounds – Oxides and Oxyacids of halogens; Basic Properties of Iodine; Chemistry of Astatine.Interhalogen compounds: Preparation, properties and structures (ClF_3, IF_5, IF_7) Polyhalides stoichiometry, properties, structures (ICl^-_2, IF^-_4).

2.1 **Oxygen Family:** Comparative study of elements – Oxides and their classification (based on oxygen content and based on their chemical behaviour) – Ozone – manufacture, properties, uses. Sulphur – Properties – Allotropic modifications – Compounds of sulphur – #Oxides and Oxyacids of sulphur – Properties – Structures#

UNIT – II **12 hours**

2.1 Peracids of Sulphur and Thionic acids: Preparation and properties – Sodium thiosulphate – properties and uses.

2.2 **Nitrogen family:** Comparative study of nitrogen family elements, their compounds, #oxides and oxyacids of Nitrogen – preparation, properties.#

2.3 Preparation, properties and uses of hydrazine, hydrazoic acid, hydroxyl amine and liquid ammonia. Oxyacids of phosphorous- ortho and pyro phosphoric acids, P_2O_5 and Graham salt. Phosphine.

UNIT – III **12 hours**

3.1 **Alcohols**: Classification – isomerism, preparation using alkyl halides - properties –reaction with active metals, PCl_5 and Hydrogen halide. #Distinction between primary, secondary and tertiary alcohols by Lucas and Victor Meyer methods. Glycol - preparation by oxidation method. Glycerol – preparation from fats and oils and uses#.

3.2 **Alkyl halides:** Alkyl halide, vicinal dihalides - Preparation from alkenes, gem dihalides - Preparation from alkyne, properties – hydrolysis and dehalogenation. Aliphatic Nucleophilic substitution reactions - mechanism of SN_1, SN_2 and SN_i reactions. Elimination reactions - mechanisms of E1 and E2 reactions – Saytzeff's and Hofmann rules.

UNIT – IV **12 hours**

Solid state and Adsorption

4.1 Solid state –Classification- crystalline and amorphous solids, isotropic and anisotropic solids. Space lattice, unit cell, seven crystal systems, crystal structure of NaCl and CsCl. #Packing in crystals – hcp, ccp and bcc. Bravais lattice - law of rational indices, Weiss indices and Miller indices#.

4.2 X- ray diffraction - Derivation of Bragg's equation – Determination of crystal structure by Laue's powder method.

4.3 Adsorption on solids – Chemisorption and physisorption, Postulates and mathematical form of Freundlich, Langmuir and BET adsorption isotherms.

UNIT –V **12 hours**

5.1 **Electrical Properties of Matter:** Polar and non – polar molecules, dipole moment, Stark effect, polarization of molecules in an electric field - electronic polarization, atomic polarization and orientation polarization- Clausius-Mosotti equation (no derivation)and Debye equation (no derivation)- Methods to determine dipole moment - Temperature method and dilute solution method- applications of dipole moment- determining the percentage of ionic character of bonds- shapes of simple molecules (H_2O, CO_2 and NH_3).

5.2 **Magnetic Properties of Matter:** #Magnetic flux, Magnetic susceptibility, Types of magnetism- dia, para, ferro and antiferro magnetism#. Determination of magnetic susceptibility by Guoy balance method. Application to solving of simple structural problems.

#_____**#** Self study

TEXT BOOKS:

1. P.L. Soni – "Text book of Inorganic Chemistry. S. Chand & Co., New Delhi (1999).
2. Bahl and Arun Bahl – "Advanced Organic Chemistry" – 19th Ed., (2005) – Sulthan and Chand Company, New Delhi.
3. R. Puri, L.R. Sharma and M.S. Pathania – Principles of Physical Chemistry, Vishal Publications, Jalandhar, 2002.
4. B.S. Bahl, G.D. Tuli and Arun Bahl, "Essentials of Physical Chemistry", S.Chand & Co., New Delhi, 1999.

UNIT I : Text Book 1
UNIT II : Text Book 1
UNIT III : Text Book 2
UNIT IV : Text Book 3,4
UNIT V : Text Book 3,4

REFERENCES:

1. R.D Madan – "Modern Inorganic Chemistry" , S. Chand & Co Pvt Ltd, 2009.
2. B.R. Puri, L.R.Sharma and K.C.Kalia- Principles of Inorganic chemistry, Milestone publishers and distributors, New Delhi. 2012.
3. Dr. Jagadamba Singh – "Undergraduate Organic Chemistry" UGC Curriculum Vol. I & Vol. II, Pragati Ed.,– Pragati Prakashan, Meerut. 2007.
4. N.Gurtu and Snehi - Advanced Physical Chemistry, Pragathi Prakashan, Meerut, 1998.

SEMESTER-III: NON MAJOR ELECTIVE-II
CHEMISTRY IN EVERY DAY LIFE

Course Code : 14UCH3N2 **Max. Marks : 100**
Hours/Week : 2 **Internal Marks : 40**
Credit : 2 **External Marks : 60**

Objectives:

- *To acquire knowledge on chemistry applied in day to day activities*
- *To get knowledge about the preparation and uses of several commodities in daily life*
- *To understand the importance of fuels*

UNIT-I **6 hours**

Essential oils, Perfumes and Flavours:

1.1 Essential oils – definition – occurances – methods of production plants – steam distillation and expression method.

1.2 **Perfumes:** Formulations, Requirements of a good perfume, composition of perfumes, classification of perfumery materials – animals - synthetic - formulations #Manufacturing and Packaging processes of Perfumes#.

1.3 **Flavours:** Definition of flavours – classification, chemical composition, common characteristics, formulation, #uses and hazards #.

UNIT-II **6 hours**

Cosmetics:

2.1 Face cream, sun screen lotion, shaving cream-composition-formulation - uses and their hazard.

2.2 Sprayer, hand lotion, nail lacquers, nail bleaches, hair oil, hair dyes - Composition-formulation-uses and their hazards.

UNIT-III **6 hours**

Dyes:

3.1 Definition, classification of dyes based on applications – preparation and uses of alizarin, indigo, methyl orange, phenolphthalein and malachite green.

UNIT-IV **6 hours**

Polymers:

4.1 Definition-classification of polymer–addition and condensation – Preparation and uses of PVC, PTFE, polystyrene, #terylene and nylon 6,6 #.

4.2 Plastics - thermo plastic, thermosetting plastics examples- differences –properties-uses.

UNIT-V **6 hours**

Fuels for Home and Fire Protection:

5.1 **Fuels**: Definition, classification-solid, liquid and gaseous fuels, requirements of a good fuel-Composition and uses of LPG, gobar gas and water gas.

5.2 **Fire Protection**: Causes of fire accidents in homes, firefighting in homes – methods of extinguishing fire, chemical fire extinguishers - merits and demerits. #Automatic fire detection cum control, causes and fire fighting #.

#_____# Self Study

TEXT BOOKS:

1. Thangammal Jacob, A textbook of applied chemistry, Mcmillan Company Ind. Ltd, 1979.
2. K.Bagavathi Sundari, Applied Chemistry, MJP publishers Chennai, First Edition, 2006.

UNIT I : Text Book 1,2
UNIT II : Text Book 1,2
UNIT III : Text Book 1,2
UNIT IV : Text Book 1,2
UNIT V : Text Book 1,2,3

REFERENCES:

1. B.K.Sharma, Industrial Chemistry, Goel Publishing House, 1995.
2. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, First Edition S.Chand Company Ltd – New Delhi, 2006.

SEMESTER- IV: CORE-IV

INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY-IV

Course Code : 14UCH4C4 **Max. Marks : 100**
Hours/Week : 4 **Internal Marks : 40**
Credit : 4 **External Marks : 60**
Objectives:

- *To understand the chemistry of carbon and boron family.*
- *To study about the preparations and reactions of carbonyls and ethers.*
- *To understand the aromaticity and mechanism of electrophilic substitution reactions.*
- *To know the importance of acids, bases and their salts*
- *To study the kinetics and catalysis of chemical reactions*

UNIT – I **12 hours**

1.1. **Carbon family:** Comparative study of carbon family and their compounds – hydrides, halides and oxides. Preparation and properties of carbonic acid, phosgene, carbon disulphide, cyanogens, HCN, HCNS and pseudo halogens.

1.2. **Boron Family:** Comparative study of boron family. Preparation, properties, structure and uses of H_3BO_3, Borax, diborane and borazole.

1.3. #Compounds of Aluminium: Alumina, precious gems and alums.#

UNIT – II **12 hours**

2.1 **Carbonyl Compounds:** General methods of preparation of aliphatic carbonyl compounds (acetone, acetaldehyde) – by oxidation of alcohols, properties – nucleophilic addition reactions, acidity of alpha hydrogen and addition of Grignard reagents. Aromatic carbonyl compounds (Benzaldehyde) - preparation by Rosenmund reduction and Gattermann Koch synthesis, benzophenone and acetophenone – preparation by Fridel-Crafts Acylation, properties – reduction reactions.

2.2 **Ethers**: # Simple and mixed ethers – isomerism – preparation by Williamson's ether synthesis, properties - reactions involving alkyl, ethereal oxygen and C-O bonds#. Anisole – Preparation from benzene diazonium chloride – Thio ether preparation by Williamson's ether synthesis and mustard gas preparation from ethylene and uses.

UNIT – III **12 hours**

3.1 **Aromaticity:** Huckel's rule and its application to aromaticity of benzenoid compounds.

3.2 **Aromatic Electrophilic substitution reactions:** General mechanism of electrophilic reactions – Halogenation, nitration and sulphonation. Fridel-Craft's alkylation and acylation reactions. Orientation effects of various substituents – ortho / para ratio.

UNIT –IV **12 hours**

4.1 **Acids and bases** – Arrhenius, Bronsted- Lowry, and Lewis concepts of acids and bases – Ionic Equilibria -Buffer solution – Definition, buffer action, buffer capacity, mechanism of buffer action and its uses- various measurement scale for the strength of acids and bases- pH, pOH, and pK_a - calculation of pH of buffer mixtures by Henderson's equations.

4.2 **Hydrolysis of salts** – Definition, salts of strong acids-strong base - salt of weak acids-strong bases, salt of weak base - strong acid, salt of weak acid - weak base, hydrolysis constant(K_h), relation between K_h, K_a and K_w, #Degree of hydrolysis - salt of weak acid-strong base, salt of weak base - strong acid, salt of weak acid - weak base#.

UNIT – V **12 hours**

Chemical Kinetics and Catalysis

5.1 Chemical Kinetics-Energy of activation and its significance, influence of temperature, Arrhenius Rate Equation and its significance. Theories of reaction rates – simple collision theory, Absolute Reaction Rate Theory (ARRT) to simple uni-molecular and bimolecular processes - Comparison of collision & ARRT.

5.2 Catalysis- basic idea of catalyst- types- homogeneous and heterogeneous catalysis – theories of acid-base catalysis, enzyme catalysis- mechanism and kinetics (Michaelis-Menten equation). #synthetic and industrial importance of catalyst#.

#_____# Self study

TEXT BOOKS:

1. B.R. Puri, L.R.Sharma and K.C.Kalia- Principles of Inorganic chemistry, Milestone Publishers and distributors, New Delhi. 2012.
2. P.L. Soni – "Text book of Inorganic Chemistry. S. Chand & Co., New Delhi, 1999 .
3. Bahl and Arun Bahl – "Advanced Organic Chemistry" – 19th Ed., – Sulthan and Chand company, New Delhi. 2005
4. B.R. Puri, L.R. Sharma and M.S. Pathania – Principles of Physical Chemistry, Vishal Publications, Jalandhar, 2002.
5. R.L. Madan and G.D. Tuli – "Simplified Course in Physical Chemistry", 5th revised and enlarged edition S.Chand & Co., New Delhi, 2009.

UNIT I : Text Book 1,2
UNIT II : Text Book 2,3
UNIT III : Text Book 2,3
UNIT IV : Text Book 4,5
UNIT V : Text Book 4,5

REFERENCES:

1. R.D Madan – "Modern Inorganic Chemistry" , S. Chand & Co Pvt Ltd (2009).
2. V.K. Ahluwalia "Text book of organic chemistry" Vol-I & Vol-II (2010) Ane's Student edition. New Delhi.
3. Bahl and Arun Bahl – "Advanced Organic Chemistry" – 19th Ed., (2005) – Sulthan and Chand company, New Delhi.
4. Dr. Jagadamba Singh – "Undergraduate Organic Chemistry" UGC Curriculum Vol. I & Vol. II, Pragati Ed., (2007) – Pragati Prakashan, Meerut.

SEMESTER- IV: SKILLBASED ELECTIVE-II

SEPARATION AND PURIFICATION TECHNIQUES

Course Code : 14UCH4S2 **Max. Marks : 100**
Hours/Week : 2 **Internal Marks : 40**
Credit : 2 **External Marks : 60**

Objectives:

- *To help students to develop knowledge of safety in laboratory.*
- *To learn the basic separation and purification methods.*

UNIT – I **6 hours**

Distillation: Desiccant – types – drying power and choice of desiccants – Distillation - Principles and techniques of fractional distillation, steam distillation and azeotropic distillation.

UNIT–II **6 hours**

Purification Techniques: Hot filtration, removal of colouring matter during recrystallization, precautions. Sublimation - techniques – advantages. Criteria and tests for purity – definition and #determination of melting point and boiling point#.

UNIT – III **6 hours**

Chromatography: Introduction–classification–partition, adsorption, ion exchange and exclusion.

Paper Chromatography: Principle, types, techniques and #applications#.

UNIT – IV **6 hours**

Thin layer Chromatography: Principle, types, techniques and applications.

HPLC: Principle, types, techniques and #applications#.

UNIT – IV **6 hours**

Column Chromatography: Principle, types, techniques and applications.

Ion exchange Chromatography: Principle, types, techniques and #applications#.

#_____# Self study

TEXT BOOKS:

1. R. Gopalan, P.S. Subramanian, K. Rangarajan – "Elements of Analytical Chemistry", Sultan Chand and Sons, 1995.
2. S.M. Khopkar, "Basic concept of Analytical Chemistry", Wiley Eastern Ltd., 1998.

UNIT I : Text Book 1,2
UNIT II : Text Book 1,2
UNIT III : Text Book 1,2
UNIT IV : Text Book 1,2
UNIT V : Text Book 1,2

REFERENCES:

1. B.K. Sharma - "Instrumental methods of Analysis", Geol Publications,2000.
2. H. Kaur – "Instrumental methods of Chemical Analysis", Pragathi prakasan Publications,Meerut, 1987.

SEMESTER-IV: EXTRA CREDIT-I
COMPUTER APPLICATIONS IN CHEMISTRY

Course Code : 14UCH4EC1 **Max. Marks : 100***

Hours/Week : -- **Internal Marks : --**

Credit : 4* **External Marks : 100***

Objectives:

- *To enable the students to learn computer basics and operating system*
- *To know the fundamentals of networks and C programming*
- *At the end of this course the students will be in a position to get an idea of solve chemistry formulae in C programming.*

UNIT-I

Introduction to computer – Characteristics of computers – organization of a computer – secondary storage devices – computer languages – low level, assembly and high level languages – software – system and application software – application of computer – algorithms and flow charts.

UNIT-II

Operating system – MS-DOS, simple DOS commands – MS-Windows - Components of Windows – desktop, My Computer, Recycle Bin, Taskbar, My briefcase and Network Neighborhood – Windows Accessories – Calculator, games, Windows media player, Notepad and Imaging – Windows Explorer. Power point – creating a presentation – slide preparation – popular websites for data collection in chemistry.

UNIT-III

Fundamentals of Computer Networks – Importance – Mode of Connections – Protocol – Network Topologies – Bus, Ring and Star topologies – Network Architecture - Network components – Hubs , cables, repeaters, routers and bridges,

Internet and its application: Internet – meaning – importance –WWW– Browsing the internet – Browsing software – URL addresses, search engines, exploring websites and downloading materials from websites, E-mail – sending, receiving and storing mail and chatting.

UNIT-IV

Fundamentals of C – Character set – identifiers – keywords – data types – Constants – Variables – symbolic constants – operators – expressions – evaluation of expressions. Input and Output functions - get char – put char – scanf – Printf – gets and puts functions.

UNIT – V

Applications of C-Programming:

- Basic Structure of C-Programming
- Conversion of temperature from Kelvin to Celsius
- Determination of molecular weight by Rast - Macro method
- Calculation of rate constant using first order rate equation
- Calculation of root mean square, average and most probable velocities of molecules
- Calculation of Bohr radius
- pH determination using Henderson equation
- Determination of half life and average life of a radioactive nucleus
- Determination of van der Waals constants
- Determination of lattice energy of a Crystal using Born-Lande equation

TEXT BOOKS:

1. E. Balagurusamy – "Programming in ANSI C" 3rd Edition – Tata McGraw-Hill- New Delhi.
2. Pundir Ansu Bansal –"Computers for Chemists" -9st Edition –Pragati Prakashan Publication, 2011.

UNIT I : Text Book 1
UNIT II : Text Book 1
UNIT III : Text Book 1,
UNIT IV : Text Book 1,2
UNIT V : Text Book 2

REFERENCES:

1. Kishor Arora –"Computer Application in Chemistry" -1st Edition – Anmol Publications Pvt. Ltd.
2. Andrews Tenenbaum – "Computer Networks" – 4th Edition – Prentice-Hall of India Pvt.Ltd. – New Delhi -110 001.
3. Ramesh Kumari, "Computer and their Applications to Chemsirty"-Narosa Publishing House, New Delhi.

SEMESTER-IV: EXTRA CREDIT-II
PHOTOCHEMISTRY AND RADIATION CHEMISTRY

Course Code : 14UCH4EC2 **Max. Marks : 100***

Hours/Week : -- **Internal Marks : --**

Credit : 4* **External Marks : 100***

Objective:

- *To understand the fundamentals of photochemistry and radiation chemistry*

UNIT – I

Introduction – Photochemical reaction, thermal reactions –Differences between thermal and photochemical reactions, Laws of photochemistry – Lambert law, Beer's law, Lambert – Beer's law, Grothus - Draper's law, Einstein's law of photochemical equivalence.

Quantum yield – Experimental determination of quantum yield – High quantum yield reactions, low quantum yield reactions. Primary and secondary process, reasons for high and low quantum yield. Factors affecting the quantum yield.

UNIT – II

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

UNIT – III

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 of transition metals – Substitution reaction, redox reactions.

Photo sensitisation – Photosynthesis in plants, Excimers, Exciplexes, Atmospheric photochemistry, photochemistry formation of smog.

UNIT – V

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

TEXT BOOKS:

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.

UNIT I : Text Book 1
UNIT II : Text Book 1,2
UNIT III : Text Book 1,2
UNIT IV : Text Book 1,2
UNIT V : Text Book 1,2

REFERENCES:

1. Gurdeep Raj “Photochemistry”, Goel Publishing House, Meerut,2009.
2. B.S. Bahl, G.D. Tuli and Arun Bahl, “Essentials of Physical Chemistry”, S.Chand & Co., New Delhi, 1999.

SEMESTER-V: CORE-VII

TRANSITION ELEMENTS AND NUCLEAR CHEMISTRY

Course Code : 14UCH5C7 **Max. Marks : 100**

Hours/Week :4 **Internal Marks : 40**

Credit : 4 **External Marks : 60**

Objectives:

- *To understand chemistry of zero group elements, alkali and alkaline earth metals*
- *To study the chemistry of transition and inner transition metals*
- *To know about the fundamental concepts and applications of nuclear chemistry*

UNIT – I **12 hours**

1.1. **Zero group elements:** Position in the periodic table. Separation of Noble gases (Dewar's method) and from liquid air. General properties, uses. Compounds of Xenon – Fluorides – Preparation, properties. Structures of XeF_2, XeF_4, XeF_6 $XeOF_4$, Clathrates, Structures.

1.2. **Alkali and alkaline earth metals:** Comparative study of metals and their compounds(oxides, hydroxides, carbonates, sulphates). Glauber's salt, Chile saltpeter, Sodamide, Sodium azide. #Analytical tests for sodium and potassium.#

UNIT – II **12 hours**

2.1. **Transition Metals:** General characteristics of I B, II B – VII B group metals – electronic configuration – variable oxidation states – tendency to form complexes – standard electrode potential – colour – magnetic properties and catalytic properties.

2.2. Preparation, properties and uses of TiO_2, V_2O_5, Cr_2O_3, WO_3, FeO, Fe_2O_3 and Cu_2O.

2.3. #Preparation, properties and uses of $ZnCl_2$, CdS and $HgCl_2$.#

UNIT – III **12 hours**

3.1. **Lanthanides and Actinides:** Position in periodic table, Electronic configuration, oxidation states. Size of the atoms. Ionic radii, lanthanide and actinide contractions and their effects. Methods of separation of Lanthanides.

3.2. **Metallurgy:** Occurrence of metals in India – Extraction of V and Ti from their ores. Concentration of Ores – Froth floatation, Magnetic separation, roasting, smelting. Purification of metals - Reduction, Electrolysis, Van Arkel process, #Zone refining, Aluminothermic process.#

UNIT – IV **12 hours**

Nuclear Chemistry:

4. 1 Composition of nucleus – nuclear stability-n/p ratio, half life period and average life period. Mass defect, binding energy and magic numbers.

4.2 Nuclear Models – Nuclear shell model, liquid drop models. Nuclear Forces - Meson theory.

4.3 #Definition of isotopes, isobars, isotones and isomers# - Whole number rule and packing fraction. Applications of radio isotopes- rock dating and carbon dating.

UNIT – V **12 hours**

5.1 Radioactivity: Definition, Properties of α, β and γ rays: Detection and measurement – Wilson cloud chamber and G.M.Counter. decay constant,

5.2 Modes of decay – Group displacement law. Radioactive series.

5.3 Nuclear Fission – Atom bomb and nuclear reactor. Nuclear Fusion – Hydrogen bomb and stellar energy.

#_____**#** Self Study

TEXT BOOKS:

1. R.D Madan – "Modern Inorganic Chemistry" S. Chand & Co Pvt Ltd. 1987.
2. H.J. Arnikar – "Essential of Nuclear Chemistry", 4th Ed., Wiley Eastern Limited, 1986.
3. P.L. Soni – "Text book of Inorganic Chemistry. S. Chand & Co., New Delhi,1999.

UNIT I : Text Book 1,3
UNIT II : Text Book 1,3
UNIT III : Text Book 1,3
UNIT IV : Text Book 2,3
UNIT V : Text Book 2,3

REFERENCES:

1. B.R. Puri and L.R. Sharma – "Principles of Inorganic Chemistry" , Shoban Lal, Nagin Chand and Co., New Delhi ,2000.
2. H.J. Arnikar – "Essential of Nuclear Chemistry", 4th Ed., Wiley Eastern Limited, 1986.
3. Maheshwar Sharon and Madhuri Sharon, "Nuclear Chemistry", Ane Books (p) Ltd, 2009.

SEMESTER –V: CORE-VIII

ORGANIC REACTIONS, HETEROCYCLIC AND STEREOCHEMISTRY

Course Code : 14UCH5C8 **Max. Marks : 100**

Hours/Week :4 **Internal Marks : 40**

Credit : 4 **External Marks : 60**

Objectives:

- *To understand the concepts of stereochemistry, conformational analysis and their applications in the determination of reaction mechanism.*
- *To know modern synthetic methods and synthetic strategies. This helps in planning the synthesis of any types of organic compounds.*
- *To study about the reactions of heterocyclic compounds and polynuclear hydrocarbons*.

UNIT – I **12 hours**

Stereochemistry – I

1.1 Stereoisomerism – Definition – classification - Optical isomerism -Optical activity – conditions for optical activity, asymmetric centre – Definition of Chirality and prochirality.

1.2 #Optical isomerism activity of lactic acid and tartaric acid# - enantiomers and diasteriomers, racemic mixture – resolution – chemical and biochemical resolutions. Racemization, Asymmetric synthesis and Walden inversion.

1.3 Optical activity of compounds containing no asymmetric carbons – Biphenyls, allenes and spiranes.

UNIT – II **12 hours**

Stereochemistry - II

2.1 R & S Notations – Cahn, Ingold and Prelog rule – Erythro and Threo representations. Fischer, Sawhorse and Newmann projection formulae of compounds containing two asymmetric carbon atoms.

2.2 Geometrical Isomerism:- Cis-trans, syn–anti and E–Z notations – #Geometrical isomerisms of Maleic and Fumaric acids# and unsymmetrical ketoximes – Methods of determination of the configuration of geometrical isomers.

2.3 Conformation Analysis **-** Definition – conformation and configuration – conformation of ethane and n-butane molecules and their stability. Conformations of cyclohexanes – energy profile diagrams.

UNIT – III **12 hours**

Reagents and Naming Reactions:

3.1 **Reagents:** #Lithium aluminium hydride, Sodium boro hydride, Raney nickel#, Sodium cyano borohydride, chromyl chloride, HIO_4, SeO_2, Wilkinson's catalyst, Zeigler – Natta catalyst, Fenton's reagent and $Pb(OAc)_4$.

3.2 **Naming reactions**: Aldol, Benzoin, Cannizaro, Crossed Cannizaro, Mannich, Michael addition, Oppenauer oxidation, MPV, Perkin, Rosenmund and Wolf Kishner reactions with mechanisms.

UNIT – IV **12 hours**

Heterocyclic Compounds:

4.1 Nomenclature for mono cyclic compounds - Preparation of Furan from furfural, pyrrole from furan and thiophene from butene. Properties -electrophilic substitution reactions - Halogenation, nitration and sulphonation. Comparative basic characters of pyrrole and piperidine with alkyl amines.

4.2 Synthesis of Quinoline, Isoquinoline and Indole with special reference to Skraup, Fischer indole synthesis and Fischer Napieralski synthesis. Structural elucidation of Quinoline and Isoquinoline.

UNIT – V **12 hours**

5.1 **Polynuclear hydrocarbons:** Naphthalene, anthracene and phenanthrene – preparation by Haworth synthesis, properties - oxidation, reduction, sulphonation, nitration, halogenation and uses.

5.2 **Petroleum**: Thermal and catalytic process of cracking, Synthetic petrol-Fischer Tropsch's Process - Bergius process – flash point, fire point, smoke point – knocking - octane number and cetane number - antiknocking reagents – Power alcohol.

#_____# Self Study

TEXT BOOKS:

1. Dr. Jagadamba Singh – "Undergraduate Organic Chemistry" UGC Curriculum Vol-I & Vol-II, Pragati Ed., (2007) – Pragati Prakashan, Meerut
2. M.K.Jain and S.C.Sharma, "Organic Chemistry for B.Sc students of Indian universities" – Vishal Publications.
3. V.K. Ahluwalia "Text book of organic chemistry" Vol.-I & Vol.-II (2010) Ane's Student edition, New Delhi.
4. Bahl and Arun Bahl – "Advanced Organic Chemistry" – 19th Ed., (2005) – Sulthan and Chand company, New Delhi.

UNIT I : Text Book 1
UNIT II : Text Book 1
UNIT III : Text Book 2
UNIT IV : Text Book 3
UNIT V : Text Book 4

REFERENCES:

1. P.S. Kalsi – "Stereochemistry conformation and mechanism" – 6th Ed., (2005), New Age International (P) Ltd., New Delhi.
2. Raj K. Bansal – "A Text Book of Organic Chemistry" – Revised 4th Ed., (2005) - New Age International Publishers, New Delhi.
3. I.L. Finar – "Stereochemistry and the Chemistry of Natural Products" – Vol. II, 5th Ed., (2006), Dorling Kindersley (India) Pvt. Ltd.

SEMESTER-V: CORE–IX

THERMODYNAMICS AND SOLUTIONS

Course Code : 14UCH5C9 **Max. Marks : 100**
Hours/Week : 4 **Internal Marks : 40**
Credit : 4 **External Marks : 60**

Objectives:

- *To understand the concepts of thermodynamics and thermo chemistry.*
- *To make the student to understand the phase rule and its applications to one and two component systems*
- *To study the concepts and uses of colligative properties.*

UNIT – I **12 hours**

First Law of Thermodynamics and Thermo Chemistry

1.1. Terms used in thermodynamics – #Various systems and process#. Intensive and extensive properties, internal energy, work and heat, state function, path function, exact and inexact differentials, first law of thermodynamics- definition, heat capacity – C_p and C_v. Joule-Thomson effect, Joule Thomson co-efficient and inversion temperature, zeroth law of thermodynamics.

1.2. Application of First law – Calculation of q, W, ΔU and ΔH for isothermal and adiabatic reversible & irreversible expansion of an ideal gas.

1.3. **Thermo chemistry:** Change of internal energy and enthalpy in a chemical reaction, Enthalpy of reaction at constant volume and at constant pressure, #Enthalpy of combustion, formation, neutralization, dissociation, solution, hydration, dilution, precipitation#. Kirchoff equation and Hess's law and their applications.

UNIT – II **12 hours**

Second Law of Thermodynamics

2.1. Need for the law, spontaneous process, Carnot's cycle, efficiency of Carnot's engine, thermodynamic scale of temperature, entropy - Concept of entropy, entropy as a state function, entropy change in isothermal expansion of ideal gas, entropy change in reversible and irreversible processes.

2.2. Entropy change accompanying change of phase, entropy of mixture of ideal gases, Physical significance of entropy. Other state functions – Free energy, work functions, variation of G with T and P, #Maxwell's relations, Gibb's– Helmholtz equation#.

UNIT – III **12 hours**

Third Law of Thermodynamics and Phase Rule

3.1. Need for Third law of thermodynamics - Nernst heat theorem, Third law of thermodynamics, Determination of absolute entropies.

3.2. Phase Rule - Definition of the terms – Phase, components, degrees of freedom, derivation of Gibbs`s phase rule, one component system – H_2O, CO_2, and Sulphur systems, two component system – Simple eutectic system - Pb-Ag, freezing mixture, #compound formation with congruent melting points - $FeCl_3$-H_2O system, compound formation with incongruent melting points - Na_2SO_4-H_2O system#.

UNIT – IV **12 hours**

Solutions of Non-Electrolytes

4.1. Solution of liquids in liquids – Ideal and non-ideal solutions, Raoult's Law and Henry's Law, vapour pressure of ideal solution, activity and activity co-efficients component in ideal and non-ideal solutions, chemical potential of ideal and non-ideal solution – Gibbs – Duhem - Margules equation.

4.2. Vapour pressure of non-ideal solution - deviations from Raoult's law, vapour pressure composition and boiling point - composition curves, azeotropic mixtures ($HCl–H_2O$ and ethanol–water system).

4.3. Solubility of partially miscible liquids pairs – system with upper CST - Phenol–Water, aniline–hexane, system with lower CST – Triethylamine-water and system with upper and lower CSTs - Nicotine-water, effects of impurities on CST, #completely immiscible liquid pairs –Nernst distribution law and its application to solvent extraction#.

UNIT – V **12 hours**

Properties of Dilute Solutions

5.1. Colligative properties – Definition, lowering of vapour pressure, relative lowering of vapour pressure, determination of molecular weight from lowering of vapour pressure, measurement of lowering of vapour pressure, osmosis and osmotic pressure – definitions, expression for calculating osmotic pressure, determination of molecular weight from osmotic pressure, relation between osmotic pressure and lowering of vapour pressure, experimental determination of osmotic pressure.

5.2. Elevation of boiling point – Definition, derivation of ebullioscopic constant, determination of molecular weight from elevation of boiling point, elevation of boiling point determination, depression of freezing point – definition, derivation of cryoscopic constant, determination of molecular weight from depression of freezing point, #experimental determination, abnormal colligative property – Association, dissociation and Van't Hoff factor, degree of dissociation#.

#_____# Self Study

TEXT BOOKS:

1. B.R. Puri, L.R. Sharma and M.S. Pathania, "Principles of Physical Chemistry", Vishal Publications, Jalandhar, 2002.
2. K. Kuriacose and J. C. Rajaram, "Thermodynamics for Students of Chemistry", Shoban Lalnagin Chand & Co, Delhi, 2002.
3. R.L. Madan and G.D. Tuli, "Simplified Course in Physical Chemistry", 5th revised and enlarged edition, S.Chand & Co., New Delhi, 2009.

UNIT I : Text Book 1,2
UNIT II : Text Book 1,2
UNIT III : Text Book 1,2
UNIT IV : Text Book 1,3
UNIT V : Text Book 1,3

REFERENCES:

1.N. Kundu and S .K .Jain, Physical Chemistry, S.Chand & Co. Ltd.1998, New Delhi.

2.B.S. Bahl, G.D. Tuli and Arun Bahl, "Essentials of Physical Chemistry", S.Chand & Co.,New Delhi, 1999.

3.Samuel Glasstone, "Textbook of Physical Chemistry", 2nd Edition, MacMillan India, 1981.

4. Gurtu and Snehi "Advanced Physical Chemistry", Pragathi Prakashan, Meerut, 2002.

SEMESTER-V: CORE-X
ANALYTICAL CHEMISTRY

Course Code : 14UCH5C10 **Max. Marks : 100**

Hours/Week : 4 **Internal Marks : 40**

Credit : 4 **External Marks : 60**

Objectives:

- *To develop the habit of accurate manipulation and an attitude of critical thinking.*
- *To learn the basic analytical methods and have a sound knowledge of chemistry involved in an analysis.*

UNIT – I **12 hours**

Laboratory Hygiene and Safety: Storage and handling of chemicals, handling of ethers, Toxic and poisonous chemicals, general precautions for avoiding accidents, first aid techniques – acid and alkali on eye, acid and alkali burn – Bromine burns - cut by glasses – Heat burns – Inhalation of toxic vapours– Poisoning – #Treatment for specific poisons – acids, alkalis, acetone, arsenic and copper compounds, cyanides - universal antidote#.

UNIT – II **12 hours**

Gravimetric Analysis: Precipitation – mechanism of precipitation, desirable properties of gravimetric precipitates – large particle size – factors affecting the particle size. Low solubility – factors affecting the solubility of precipitates – co-precipitation – post precipitation – precipitants – selective and specific precipitants - precipitation from homogeneous solution, masking and demasking agents – #Digestion of the precipitate, filtration, washing and drying#.

UNIT – III **12 hours**

Thermal Analysis

Thermo gravimetric Analysis (TGA): Principle – Instrumentation – Techniques - Factors affecting TGA – applications ($CuSO_4.5H_2O$ and $Ca(C_2O_4)_2.H_2O$).

Differential Thermal Analysis (DTA): Principle – Instrumentation – Techniques – Simultaneous TGA – DTA curves – applications.

Thermometric Titration: Introduction – Technique and Apparatus for Thermometric titrations – #applications#.

UNIT – IV **12 hours**

Analytical Electrochemistry: Redox potential measurement and applications – Interpretation of chemical behavior – Electrolytic separation.

Polarography: Principle – Dropping mercury electrode – Experimental assembly – Polarographic curves – Application of quantitative and qualitative analysis – Concept of pulse polarography – #Amperometric titration – Principle and applications#.

UNIT – V **12 hours**

Colorimetric Analysis: Laws of colorimetry – Estimation of Ni, Cu, and Fe.

Electrogravimetry: Theory – Instrumentation - applications - Spontaneous (Internal) electrolysis – Coulometric analysis, coulometric titration – Applications –Potentiostatic coulometry.

#_____**#** Self Study

TEXT BOOKS:

1. R. Gopalan, P.S. Subramanian, K. Rangarajan – "Elements of Analytical Chemistry", Sultan Chand & Sons, 1995.
2. S.M. Khopkar, "Basic concept of Analytical Chemistry", Wiley Eastern Ltd., 1998.
   UNIT I : Text Book 2
   UNIT II : Text Book 2
   UNIT III : Text Book 2
   UNIT IV : Text Book 2
   UNIT V : Text Book 1,2

REFERENCES:

1. B.K. Sharma - "Instrumental methods of Analysis", Geol Publications,2000.
2. H. Kaur – "Instrumental methods of Chemical Analysis", Pragathi prakasan Publications, Meerut, 1987.
3. A.K. Srivastava and P.C. Jain – "Instrumental approach to Chemical Analysis'', S.Chand

SEMESTER-V: CORE-XI
APPLIED CHEMISTRY

Course Code : 14UCH5C11	**Max. Marks :100**
Hours/Week : 4	**Internal Marks : 40**
Credit : 4	**External Marks : 60**

Objectives:

- *To impart knowledge on Glass, Refractories, Paints and Varnishes and Pigments.*
- *To have knowledge on applied the chemistry in daily life.*

UNIT – I **12 hours**

1.1. **Glass and Ceramics:** Glass – General properties of glass – types of glasses – manufacture of glass – Ceramics – classification – clay products – white wares – chemical store wares – plasticity of clay – #manufacture of white pottery, glazing, Earthen wares#.

1.2. **Refractories :** Definition – classification, properties of refractories – manufacture of refractories, fire clay bricks manufacture, uses of fire clay refractories – High alumina refractories – uses – silicon carbide refractories – properties and uses.

UNIT – II **12 hours**

2.1 **Paints and varnishes** : Paint – definition – classification of paints based on their applications – constituents – Requisites of a good paint – emulsion paints. Varnishes - Definition – constituents of varnish – characteristics of a good varnish – uses – Japans varnish. #Enamel – definition – Types – Ingredients and uses#.

2.2 **Pigments:** Definition – composition, characteristics and uses of white lead, Zinc oxide, Lithopone and TiO_2 – Blue pigments – Ultra marine blue – characteristics – uses. Red pigments – red lead –characteristics and uses. Green pigments – chrome green, Guigwet's green and chromium oxide – characteristics and their uses.

UNIT – III **12 hours**

3.1. **Soap and Detergents** : Soap - Definition – General consideration in soap making – manufacture of soap – Hot and Cold process - transparent soaps – properties. Detergents - Definition – classification of face active agents – anionic detergents - cationic detergents – #properties of detergents – Health hazards#.

3.2 **Dyes :** Dyes - colour and constitution – classification of dyes - based on application and chemical structure – nitro and nitroso dyes - triphenyl methylene dyes - malachite green, crystal violet, Azo dyes - Aniline yellow, methyl orange – phthaleins – Phenolphthalein, fluorescein – preparation properties and uses.

UNIT – IV **12 hours**

4.1 **Portland Cement:** Introduction – types of cements – High alumina cement, Pozzolona cement Portland cement- manufacture and quantitative requirements, #Setting of Cement and uses#.

4.2 **Pulp and Paper:** Introduction – manufacture of pulp – mechanical process – chemical process – sulphate, sulphite,soda, rag pulp. Beating, Refining, filling, sizing and colouring, #manufacture of paper, types of paper and uses#.

UNIT – V **12 hours**

5.1 **Corrosion:** Introduction – Dry and Wet Corrosion – Electrochemical theory of Corrosion- Mechanism – Galvanic corrosion, Concentration cell, corrosion Waterline Attack – Pitting – passivity – stress corrosion - Corrosion control methods.

5.2 **Batteries:** Fundamentals of Batteries – Classification of Batteries – Sizes of Batteries – Primary Batteries – Le'clanche dry cell – Magnesium dry cell – Secondary batteries – Lead-acid battery – Alkaline Storage Batteries. # Fuel cells (hydrogen – oxygen) #.

#_____# Self study

TEXT BOOKS:

1. B.K. Sharma – "Industrial Chemistry", 1st Ed., Goel Publishing House– Meerut.,1984.
2. P.L. Soni, H.M. Chawla – "Text Book of Organic Chemistry", Sultan Chand and Sons, New Delhi, 1994.
3. Arun Bahl and B.S. Bahl – "Text Book of Organic Chemistry", 11th and 18th Ed., S. Chand, New Delhi, 2006.

UNIT I : Text Book 1
UNIT II : Text Book 1
UNIT III : Text Book 1,2,3
UNIT IV : Text Book 1
UNIT V : Text Book 1

REFERENCES:

1. J.C. Kuriacose, J.Rajaram – "Chemistry in Engineering and Technology –Vol – 2. Tata McGraw- Hill Publishing Company Limited – New Delhi – 1994.
2. P.C.Jain & Monika Jain – "Engineering Chemistry", 15th Ed., Dhanpath Rai Publishing Company, New Delhi, 2005.
3. Krishnamoorthy, P. Vallinayagan & K. Jaya Subramanian – "Applied Chemistry", 2nd Ed., Tata MaGraw –Hill Publishing Co. Ltd., New Delhi, 2001.

SEMESTER- V SKILL BASED ELECTIVE - III
MEDICINAL CHEMISTRY

Course Code : 14UCH5S3 **Max. Marks : 100**

Hours/Week : 2 **Internal Marks : 40**

Credit : 2 **External Marks : 60**

Objectives:

- *To impart the knowledge in the basic concept of drugs.*
- *To create the awareness about the diseases and their causes.*

UNIT –I **6 hours**

1.1**. Drugs:** source of drugs - important terminologies - molecular pharmacology, pharmacodynamics, pharmacophore, metabolites, virus, antimetabolites, bacteria, fungi - actinomycetes.

1.2. **#Indian medicinal plants and trees** –Adathoda, tulsi, thoothuvalai, neem, mango, and kizhanelli**#**.

1.3. **Causes and symptoms of common diseases**: Tuberculosis, asthma, jaundice, leprosy, typhoid, malaria, cholera and filaria.

UNIT – II **6 hours**

2.1. **Antibiotics:** Definition, structure - uses of chloramphenicol, ampicillin, streptomycin, tetracycline, rifamycin – Erythromycin – Properties, uses.

2.2 Sulpha drugs: Definition and drug action of sulpha drugs.Preparation and uses of sulphadiazine, sulphapyridine, sulpha thiazole and sulpha furazole.

2.3. **Antineoplastic drugs:** Causes of cancer - antineoplastic agents – cytotoxic - **#**anti-metabolites - plant products - harmones**#**.

UNIT – III **6 hours**

3.1. **Antiseptics and Disinfectants:** Definition - standardization – use of phenols – dyes – chloramines – organo mercurials – formaldehyde - cationic surface active agents - uses.

3.2. **Anasthetics:** Definition – classification – general volatile anaesthetics – ethers, nitrous oxide, chloroform, trichloro ethane, storage – advantages – disadvantages – intravenous anaesthetics – thiopental sodium, methohexitone – local anaesthetics – cocaine, procaine, benzocaine – uses – advantage – disadvantages.

3.3**. Antipyretic Analgesics:** Salicylic acid derivatives, aminophenol derivatives, mechanism of action – uses. Anti-Inflammatory Drugs: Indolyl derivatives – indomethacin – ibubrufen – properties and uses

UNIT – IV **6 hours**

4.1. **Blood:** Composition of blood, blood graphics – Rh factor, Blood clotting, Mechanism.

4.2. **Haematological agents :** Coagulants and anticoagulants, definition-examples.

4.3 #Qualitative test for urea, bile, ketone, Protein in urine sample and urea, glucose in blood sample#.

UNIT-V **6 hours**

5.1. Psychopharmacology, antipsychotic drugs, anti anxiety drugs, anti depressant drugs, sedatives and hypnotics – definition – examples.

5.2. **Diabetes and Hypoglycemic Drugs:** Types-causes- symptoms – control methods insulin - oral hypoglycemic agents - sulphonyl urea – adverse effects.

5.3. **Anticonvulsant agents:** Definition, types, barbiturates, hydantoins, succinimides – acetyl urea derivatives -uses.

#_____# Self study

TEXT BOOKS:

1. Mathew George and Lincy joseph , Text book of pharmaceutical chemistry, 2009.
2. Jayashree Ghose – Text book of Pharmaceutical chemistry, 2nd Edn., 2003.
3. Lakshmi.S., Pharmaceutical Chemistry, III Edn., Sulthan Chand and Sons, New Delhi,2004.

UNIT I : Text Book 1,2,3
UNIT II : Text Book 1,2,3
UNIT III : Text Book 1,2,3
UNIT IV : Text Book 1,2,3
UNIT V : Text Book 1,2,3

REFERENCES:

1. Aleg gringaur, Introduction to Medicinal Chemistry, Sharma Printers Delhi, 2011.
2. D.Sriram and P.Yogeshwari, Medicinal Chemistry, 2nd edition-2008.
3. Ashutoshkar , Medicinal chemistry, revised and expanded edition, International Publishers, 2010.
4. V.N. Rajasekaran, Vol. I and Vol.II, Pharmaceutical Chemistry, Sun publications Chennai. 4th Edn., 2003.
5. V.K.Ahluwalia and Madhu Chopra, Medicinal chemistry, Ane books private Ltd., New Delhi, 1st Edition, 2008.
6. Marlin Herbert, Pharmacology, Ashton Nany Darkson, Jones and Bartlett India Pvt.Ltd. 11th Edition, 2010.

SEMESTER-V : EXTRA CREDIT-III
CHEMISTRY FOR COMPETITIVE EXAMINATIONS – I

Course Code : 14UCH5EC3	**Max. Marks : 100***
Hours/Week : --	**Internal Marks : --**
Credit : 4*	**External Marks:100***

Objectives:

- *To impart the knowledge for the preparation of competitive examinations*
- *To understand reasoning skills in the concept of chemistry for competitive examination*

UNIT – I

Periodic classifications of elements, atomic and ionic radii - ionization potential – electron affinity – electro negativity –Oxidation states and oxidation number – common oxidizing and reducing agents –ionic equations- inert gases- isolation and chemistry – principles of inorganic chemical analysis.

UNIT – II

Modern concepts of covalent bonding – electron displacements – inductive- mesomeric – hyperconjugative effects – effect of structure on dissociation constants of acids and bases – resonance and its applications to organic chemistry – principles of organic reaction mechanism – addition nucleophilic substitution.

UNIT – III

Alkanes- alkenes- alkynes – petroleum as a source of organic compounds – simple derivatives of aliphatic compounds – alcohols- aldehydes- ketones – acids – halides – esters – ethers – amines – acid anhydrides – chlorides and amides – Mono basic hydroxyl – ketonic and amino acids- Malonic and acetoacetic esters- unsaturated and dibasic acids – lactic- tartaric – citric – maleic and fumaric acids- carbohydrates – classification and general reactions – glucose – fructose and sucrose – organometallic compounds- Grignard reagents.

UNIT – IV

Benzenes and its simple derivatives – toluene –xylenes – phenols – halides- nitro and amino compounds – benzoic – salicylic – cinnamic - mandellic and sulphonic acids- aromatic aldehydes and ketone –diazo – azo and sulphonic acid-- aromatic aldehydes and ketone –diazo – azo and hydrazo compounds- aromatic substitution- naphthalene – pyridine – quinoline – synthesis – structure and simple reactions – simple chemistry of economically important materials – coal – tar - cellulose – starch - oils – fats - proteins –vitamins.

UNIT – V

Thermodynamics – the first law of the thermodynamics – isothermal – adiabatic expansions – enthalpy- heat capacities – thermochemistry – heat of reaction – formation – solution and combustion – calculation of bond energies – Kirchoff's equation. Criteria for spontaneous change – second law of thermodynamics – entropy – free energy – criteria of chemical equilibrium.

TEXT BOOKS:

1. B.R. Puri, L.R.Sharma and K.C.Kalia- Principles of Inorganic chemistry, Milestone publishers and distributors, New Delhi. (2012)
2. Bahl and Arun Bahl – "Advanced Organic Chemistry" – 19th Edition. (2005) Sulthan and Chand Company, New Delhi.
3 Raj. K. Bansal – A text book of Organic Chemistry "., 4 th ed., New York.
4 Samuel Glasstone " Thermodynamics for Chemists" affiliated east west press (p) Ltd. Madras.

UNIT I : Text Book 1,
UNIT II : Text Book 2
UNIT III : Text Book 3
UNIT IV : Text Book 2,3
UNIT V : Text Book 4

REFERENCES:

1. James E. Huheey, Ellen A. Keiter and Richard L., Keiter – Inorganic chemistry Principles of Structure and reactivity" 4 th Ed., Wessley, New York.
2. Cotton and Wilkinson – Advanced Inorganic Chemistry", 5 th ed., John wiley Sons, New York.
3. W. Kain and B. Schwederaki – " Bioinrganic Chemistry", John Wiley & sons New York.
4. W. J. Moore –"Physical Chemistry", 5 th Ed., Orient Longman,1972.

SEMESTER-VI: CORE-XII

CO-ORDINATION CHEMISTRY AND APPLICATIONS

Course Code : 14UCH6C12 **Max. Marks : 100**

Hours/Week : 5 **Internal Marks : 40**

Credit : 4 **External Marks : 60**

Objectives:

- *To study nomenclature, properties and applications of coordination compounds*
- *To understand the nature of coordinate bonds.*
- *To know the concepts of acids and bases.*
- *To study the chemistry of inorganic polymers, polyacids and carbonyl compounds.*

UNIT – I **15 hours**

1.1. **Coordination Chemistry:** # Coordinate valence (electron pair donation) – characteristics of coordination compounds#. Ligands: Classification – uni dentate to hexadentate. Symmetrical, unsymmetrical ligands, ambidentate ligands.

1.2. **IUPAC Nomenclature:** Naming of ligands (all types) – bridging and ambidentate ligands. Naming of mono-nuclear and bi-nuclear complexes.

1.3. **Isomerism:** Structural (all types), Stereoisomerism – geometrical and optical isomerism in 4 and 6 coordination compounds.

UNIT – II **15 hours**

2.1. Detection and structure determination of complexes in solution.

2.2. **Theories of coordination:** # Werner's, Sidgwick (EAN concept)# and Valence bond theory for the octahedral, tetrahedral and square planar complexes. Application of VBT for properties of complexes – Limitations of VBT. Crystal field theory – Important features, splitting of d-orbitals in O_h, T_d and square planar complexes. CFSE – factors influencing 10 Dq values. Application of CFT – magnetic properties – Limitations of CFT.

UNIT – III **15 hours**

3.1. **Chelation:** Characteristics, classification – Factors influencing the stability of metal chelates. Polynuclear complexes (di and tri) – Bridging of hydroxo, oxo, amido, chloro, carbonyl and nitrosyls - bonding, structures.

3.2. **Stability of complexes:** Stability and instability constants, labile and inert complexes. thermodynamic and kinetic stability.

3.3. **Application of complexes in analysis:** Detection of K^+ ions, separation of Copper and Cadmium ions. Estimation of Ni^{2+} and Al^{3+} ions through chelation. Structure of EDTA and its complexes.

3.4. **Application in Bio-fields:** # Structure and functions of Haemoglobin and Chlorophyll#

UNIT – IV **15 hours**

4.1. **Acids and Bases:** Arrhenius, Bronsted-Lowry and Lewis theory – Protonic acids – Relative strength of acids and bases – Periodic variation of acidic and basic properties – Differentiating and leveling solvents – Hydracids, Oxyacids. Amphiprotonic compounds.

4.2. **Organic acids:** # Acetic acid, Oxalic acids – inductive effect#. Aromatic acid – resonance effect – General theory of solvent – Cady and Elsey concept

4.3. Preparation, properties and structure of metal carbonyls (mono, bi) Ni, Fe, Co.

UNIT – V **15 hours**

5.1. **Silicates:** Definition – Classification – Ortho, Pyro, Chain structures, sheet silicates, three – dimensional silicates – Composition, structure and uses.

5.2. **Silicones:** Preparation – Silicone Oils – # Silicone rubbers - important uses#.

5.3. **Polyacids:** Isopolyacids – Preparation, Structure of Cr, W and V poly acids.

5.4. **Boron-Nitrogen Polymers:** Boron nitride - Layer structure, preparation, hardness.

#_____# Self study

TEXT BOOKS:

1. P.L. Soni - "Text book of Inorganic Chemistry. S. Chand & Co., New Delhi ,1999.
2. Wahid Malik, G.D.Tuli and R.D.Madan, "Selected Topics in Inorganic Chemistry", S.Chand & Co. Pvt Ltd ,2011.

UNIT I : Text Book 1,2
UNIT II : Text Book 2
UNIT III : Text Book 2
UNIT IV : Text Book 2
UNIT V : Text Book 1

REFERENCES:

1. R.D Madan - "Modern Inorganic Chemistry", S. Chand & Co Pvt Ltd , 2009.
2. B.R. Puri, L.R.Sharma and K.C.Kalia- Principles of Inorganic chemistry, Milestone publishers and distributors, New Delhi.,2012.

SEMESTER–VI: CORE– XIII

MOLECULAR SPECTROSCOPY AND ELECTROCHEMISTRY

Course Code : 14UCH6C13 **Max. Marks : 100**
Hours/Week : 5 **Internal Marks : 40**
Credit : 4 **External Marks : 60**

Objectives:

- *To study the fundamentals of various spectroscopy*
- *To understand the concept and applications of electrolytic conductance and electrochemical cells.*

UNIT – I **15 hours**

Atomic structure, Quantum theory and Spectroscopy

1.1. de-Broglie theory of matter, experimental proof, Heisenberg`s uncertainty principle, derivation of Schrodinger wave Equation, significance of Ψ and Ψ^2.

1.2. Electromagnetic radiations – Definition, regions of electromagnetic radiations, quantization of energies in molecules - Translational, rotational, vibration, and electronic energies, molecular spectra - origin of molecular spectra - Interaction of electro-magnetic radiations with molecules.

1.3 UV visible spectroscopy – Theory of electronic spectroscopy, Frank – Condon Principle, types of electronic transitions – # Dissociation and Predissociation spectra#.

UNIT – II **15 hours**

Absorption Molecular Spectroscopy

2.1. Microwave spectroscopy - Molecular rotation, theory of microwave spectroscopy, selection rule, effect of isotopic substitution and calculation of moment of inertia and bond length of diatomic molecules.

2.2. Infrared spectroscopy - Molecular vibration – Modes of vibration of diatomic, tri-atomic linear(CO_2) and non linear (H_2O) molecules - Stretching and bending vibrations, selection rules, expression for vibration frequency, Hook's law - calculation of force constant.

2.3. Raman spectroscopy – Raman Effect, Rayleigh and Raman scattering – Stokes and anti-stokes lines - # Modes of vibrations and change in polarisability of H_2O and CO_2, mutual exclusion principle#, comparison between Raman and IR spectroscopy.

UNIT – III **15 hours**

Resonance and Mass Spectra

3.1. NMR spectroscopy - Magnetic and non–magnetic nuclei, principle of nuclear magnetic resonance - shielding mechanism, chemical shift, factors affecting chemical shifts (electro negativity and anisotropic effect) - number of signals – proton counting - Spin-spin coupling, coupling constant, NMR spectrum of ethyl alcohol.

3.2. ESR spectroscopy - theory of ESR spectra, hyperfine splitting, ESR spectra of hydrogen and methyl radicals – comparison of NMR and ESR.

3.3. Mass spectroscopy- Basic principle, molecular ion peak, base peak, isotopic and meta stable peaks, and nitrogen rule and # mass spectra of toluene and branched alkanes#.

UNIT – IV **15 hours**

Electrolytic Conductance and Transference

4.1. Ionic mobility – Definition, experimental proof for migration of ions, transport number – definition, Hittorf`s rule, experimental determination - Hittorf's method, moving boundary method, effect of concentration on transport number.

4.2. Transport of ions in solution – Debye-Huckel-Onsager (DHO) theory – assumption and mathematical form - validity of DHO equation, drawbacks of DHO equation, and Extension of Debye-Huckel-Onsager theory to strong electrolytes- Conductometric titrations- Acids and Bases.

4.3. Activity of ions in solutions – Mean ionic activity and activity coefficient, ionic strength, Debye-Huckel limiting law of activity coefficient. (No Derivation)

UNIT – V **15 hours**

Electromotive Force of Galvanic Cells

5.1. Galvanic cell – Definition, chemical cell, concentration cell, reversible cell and irreversible cell, types of reversible electrodes – Metal-metal ion electrodes, amalgam electrodes, gas electrodes, metal-insoluble metal salt electrode and oxidation - reduction electrode, single electrode potential.

5.2. E.M.F. of galvanic cell and cell reaction – Cell e.m.f., sign conventions of cell e.m.f. and cell reaction, Nernst equation for cell e.m.f., reference electrode – primary and secondary reference electrode, standard electrode potential and its determination, electro chemical series, standard cell,

5.3. Thermodynamics of galvanic cells – Relation between E.M.F. and ΔG, ΔH, ΔS and equilibrium constant(K), concentration cells – Electrode concentration cells – Amalgam and gas concentration cells, electrolyte concentration cells -# Concentration cells without transference and its e.m.f., concentration cells with transference and its e.m.f., liquid junction potential#.

#_____# Self study

TEXT BOOKS:

1. C. N. Banwell and E. M. Mccash, "Fundamentals of Molecular Spectroscopy", Tata McGraw-Hill Publishing Company Limited, New Delhi, 2009.

2. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Vishal Publications, Jalandhar. 2005,

UNIT I : Text Book 1,2
UNIT II : Text Book 1,2
UNIT III : Text Book 1,2
UNIT IV : Text Book 2
UNIT V : Text Book 2

REFERENCES:

1. Manas Chanda," Structure and Chemical Bonding including Molecular spectra", Tata --McGraw-Hill Publishing Company Ltd., New Delhi, 2000.

2.G.M.Barrow,"Introduction to Molecular Spectroscopy", Tata-McGraw- Hill Edition,1993.

3. N. Kundu and S. K. Jain, "Physical Chemistry", S.Chand and Co. Ltd., New Delhi, 1998.

4. Gurtu and Snehi, Advanced Physical Chemistry, Pragathi Prakashan, Meerut, 2002.

5. R.L. Madan and G.D. Tuli, "Simplified Course in Physical Chemistry", 5th revised and enlarged edition, S.Chand & Co., New Delhi, 2009.

SEMESTER–VI: CORE– XVI

ORGANIC COMPOUNDS AND MOLECULAR REARRANGEMENTS

Course Code : 14UCH6C16 **Max. Marks : 100**

Hours/Week : 4 **Internal Marks : 40**

Credit : 4 **External Marks : 60**

Objectives

- *To learn the various types of reactions, rearrangements and their mechanisms.*
- *To study about the reactions of carboxylic acids.*
- *To learn the characteristics and reactions of natural products*

UNIT – I **12 hours**

1.1 **Phenols**: Nomenclature-preparation from Dow process, acidic character-comparative acidic strengths of alcohol-phenol and phenol-substituted phenols – resonance stabilization of phenoxide ion.

Dihydric phenols: Preparations – Catechol and resorcinol using sodium hydroxide reagent and quinol from aniline.

1.2 **Reactions of phenols** – Esterification, nitration, sulphonation, halogenation, acylation and coupling reactions.

1.3 **Naphthols:** Preparation of α and β-naphthols from sodium naphthalene sulphonate, properties - electrophilic substitution reactions and uses of naphthols.

UNIT – II **12 hours**

Nitro Compounds and Amines:

2.1 Preparation of nitrobenzene from benzene – reduction of nitrobenzene in neutral, acidic and alkaline media - TNT.

2.2 **Amines:** Relative basic characters of aliphatic and aromatic amines – ring substitution in aromatic amines – separation of amines by Hinsburg and Hofmann methods, diazotization reaction.

2.3 Phenylene diamines (*o, p & m*) – **#** Preparation - sulphanilic acid, sulphanilamide, saccharin, chloramine -T and uses**#**.

UNIT –III **12 hours**

Mono, Dicarboxylic acids and Esters:

3.1 **Acetic acid** – preparation from quick vinegar process, properties - chlorination and uses. Acidity of carboxylic acids, acidity constants and comparison of acid strengths of substituted benzoic acids.

3.2 **Dicarboxylic acids** – preparations - oxalic acid from sucrose, malonic acid from chloro acetic acid and succinic acid from maleic acid, properties - oxalic acid (action with glycerol, H_2SO_4, $KMnO_4$ and action of heating), malonic acid (action with P_2O_5 and aldehyde), succinic acid (action with NH_3 and action of heating).

3.3 **Esters** – Preparations – malonic ester from potassium cyano acetate, aceto acetic ester from ethyl acetate. Properties - malonic ester and aceto acetic ester (formation of salts, hydrolysis and alkylation). Keto-enol tautomerism of aceto acetic esters, # synthetic applications of malonic and aceto acetic esters #.

UNIT – IV **12 hours**

Molecular rearrangements

4.1 Pinacole-Pinacolone, Beckmann, Benzidine, Hofmann and Benzilic acid rearrangements with mechanisms.

4.2 Claisen, Dienone-phenol, Fries, Favorskii and Wolff rearrangements with mechanisms.

UNIT – V **12 hours**

5.1 **Terpenoids:** Classification, Isoprene rule, special isoprene rule, gem - dialkyl rule, Structural elucidation and uses of citral, α-terpineol and menthol.

5.2 **Alkaloids:** Classification – General methods of isolation, Hofmann exhaustive methylation, Structural elucidation of coniine, nicotine and piperine.

#_____# Self study

TEXT BOOKS:

1. A.K. Srivastava – "Organic Chemistry" – 1st Ed.,– New Age International Publishers, New Delhi. 2002.
2. Bahl and Arun Bahl – "Advanced Organic Chemistry" – 19th Ed., – Sulthan and Chand company, New Delhi. 2005.
3. Gurdeep Chatwal – "Organic Chemistry of Natural Products" – Vol. – I & Vol. II, Revised fifth ed.,– Himalaya Publishing House. 2005.
4. Morrison and Boyd – "Organic Chemistry" – 6th Ed., (1998) – Prentice Hall of India Pvt. Ltd., New Delhi.

UNIT I : Text Book 1,2
UNIT II : Text Book 2
UNIT III : Text Book 4
UNIT IV : Text Book 4
UNIT V : Text Book 3

REFERENCES:

1. O.P. Agarwal – "Reactions and Reagents in Organic Chemistry" – 5th Ed., (2005) – Goel Publishing House, Meerut.
2. Raj K. Bansal – "A Text Book of Organic Chemistry" – Revised 4th Ed., (2005) - New Age International Publishers, New Delhi.
3. V.K. Ahluwalia "Text book of organic chemistry" Vol.-I & Vol.-II (2010) Ane's Student edition, New Delhi.

SEMESTER-VI: CORE-XVII
SOIL, DAIRY AND LEATHER CHEMISTRY

Course Code : 14UCH6C17	**Max. Marks :100**
Hours/Week : 4	**Internal Marks : 40**
Credit : 4	**External Marks : 60**

Objective:

- *To impart knowledge on dairy, leather, soil, fertilizers and water.*
- *To understand the applications of chemistry in industrial processes.*

UNIT – I **12 hours**

Soil Chemistry: Introduction - soil classification, physical and chemical properties of soil, soil water, soil air, soil temperature, soil minerals, soil colloids, soil reaction and buffering - soil pH, soil acidity, soil salinity and alkalinity, **#** soil fertility and soil formation**#**.

UNIT – II **12 hours**

Fertilizers: Organic Manures - Farmyard Manure - compost - oil cakes - bone meal - meat meal - fish meal - blood meal and green manures - Fertilizers - classification of fertilizers - requisites of a good fertilizers – preparation properties and uses of nitrogenous fertilizers , urea, CAN - phosphatic fertilizers - super phosphate of lime - triple super phosphate - NPK fertilizers - ill effects of fertilizers - **#** Micronutrients – definition - role of micronutrients in plants**#**.

UNIT – III **12 hours**

Water Chemistry: Water – types of water – soft and hard water – hardness, degree of hardness, **#** temporary and permanent hardness, removal of hardness**#** - Reverse osmosis and ion exchange methods – principle and techniques. Water Analysis - Determination of TDS, Total hardness by EDTA, BOD and COD.

UNIT – IV **12 hours**

Leather Chemistry: Introduction, chief process used in leather manufacture, structure of hide and skin, leather processing-process before tannage - tanning process- vegetable tanning and chrome tanning, **#** Tannery effluent and by product problems and treatment**#**.

UNIT – V **12 hours**

Dairy Chemistry: Milk - Definition, physicochemical properties of milk, constituents of milk, chemical change taking place in milk - boiling, pasteurization, sterilization and homogenization. Definition and composition of creams, butter, ghee and ice creams. Milk powder- definition, need for making powder. Principles involved in drying process- **#** spray drying and drum drying**#**.

#_____**#** Self study

TEXT BOOKS:

1B.K.Sharma, Industrial Chemistry, 13th Edition, Goel Publishing House, Reprint 2008.
2. Dilip Kumar Das, Introductory Soil Science, 1st Edition, Kalyani Publishers, Reprint 2002.

3. Gurdeep Chatwal, Organic Chemistry of Natural Products, Vol. 2, Himalaya Publishing House, Reprint, 2000
5. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, 1st Edition, S.Chand & Co. Ltd, New Delhi, 2006.

UNIT I : Text Book 2
UNIT II : Text Book 2
UNIT III : Text Book 1
UNIT IV : Text Book 1
UNIT V : Text Book 3

REFERENCES:

1. Clarence Henry Eckles, Willes Barnes Combs, Harold Macy, Milk and Milk Products, 4th Edition, Tata McGraw Hill Publishing Company Ltd, Reprint 2002.
2. G.R. Agarwal, Kiran Agarwal and O.P. Agarwal, Agarwal's Text Book of Biochemistry, 11th Edition, Goel Publishing House, 2000.
. 3 . M. Satake, Y. Mido, Chemistry of colour, 1st Edition, Discovery Publishing House, Reprint 2003.

SEMESTER- VI : SKILL BASED ELECTIVE-IV
CHEMISTRY OF BIOMOLECULES

Course Code : 14UCH6S4 **Max. Marks : 100**

Hours/Week : 2 **Internal Marks : 40**

Credit : 2 **External Marks : 60**

Objective:

- *To enable the student to develop a sound knowledge of fundamental concepts in biochemistry.*

UNIT-I **6 hours**

Amino Acids and Proteins:

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 **6 hours**

Nuclei acids: Types of nucleic acid - DNA and RNA - bases– nucleosides and nucleotides –polynucleosides – - Waston and crick model of DNA - biological functions nucleic acids.

UNIT-III **6 hours**

Carbohydrates: Classification, structural elucidation of glucose and fructose, Reactions of glucose and fructose - osazone formation - mutarotaion and its mechanism -Inter conversion of aldoses and ketoses .

Disaccharides – structure, properties and uses of maltose and sucrose. # Polysaccharides – structure, properties and uses of starch and cellulose#.

UNIT-IV **6 hours**

Vitamins: Classification- water soluble – fat soluble vitamins – Deficiency diseases- RDA – Estimation of vitamin B_1 and vitamin C.

UNIT-V **6 hours**

Enzymes: 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 – structure and physiological functions of some hormones – adrenaline – thyroxin – oxytocin – Insulin – # the sex hormones#

#_____# Self study

TEXT BOOKS:

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. Lubert Stryer, Biochemistry, W. H. Freeman and company, New York, 1975.

UNIT I : Text Book 1
UNIT II : Text Book 1,2,3
UNIT III : Text Book 1,2,3
UNIT IV : Text Book 1,2,3
UNIT V : Text Book 1,2,3

REFERENCES:

1. Robert L.Caret, Katherine J. Denniston, Joseph J. Topping, Principles and Applications of organic and biological chemistry, WBB publishers, USA, 1993.
2. J. L. Jain, Biochemistry, Sultan Chand and Co.1999
3. A. Mazur and B. Harrow, Text book of biochemistry, 10th Edition, W.B. Saunders Co.,Philadelphia, 1971.

SEMESTER-VI: EXTRA CREDIT-IV
CHEMISTRY FOR COMPETITIVE EXAMINATIONS – II

Course Code : 14UCH6EC4 **Max. Marks : 100***
Hours/Week : -- **Internal Marks : --**
Credit : 4* **External Marks : 100***

Objectives:

- *To impart the knowledge for the preparation of competitive examination*
- *To understand the analytical skills concept in chemistry for competitive examination*

UNIT-I

Analytical Chemistry: Classification of analytical Methods – classical and instrumental errors and evaluation: Definition of terms in mean and median – Types of errors, propagation of errors, accuracy and precision, least squares analysis, average standard deviation.

UNIT-II

Nuclear Chemistry: Radioactive decay and equilibrium, Nuclear reactions: Q valve, cross sections, types of reactions, Nuclear transmutations, fission and fusion- Radioactive techniques-tracer technique, neutron activation analysis. G.M, Ionization and proportional counters. Radiolysis of water – G value, dosimeters and Hydrated electron.

UNIT-III

Spectroscopy:- Rotational spectra of diatomic molecules - Isotopic substitution and retational constants - vibrations spectra of linear symmetric, linear asymmetric and bent tri atomic molecules - electronic spectra - selection rules - nuclear magnetic resonance - chemical shifts - spin - spin coupling - election spin resonance and hyperfine splitting theoretical principles of mass spectroscopy. Applications of UV, IR, NMR, ESR and mass spectroscopy for structural elucidation of organic compounds, inorganic complexes and free radicals.

UNIT-IV

Solutions - osmotic pressure – lowering of vapour pressures – depression of freezing point – elevation of boiling point –Determination of molecular weight in solution – association and dissociation of solutes.

Chemical kinetics – molecularity – order of reaction – first order – second order reactions – determination of order of reactions – temperature co efficient – energy of activation – collision theoryof reaction rates – activated complex theory.

UNIT-V

Colloids – general nature of colloidal solutions and their classifications – general methods of preparation and properties of colloids – coagulation protective action and gold number – absorption

Catalysis: Homogeneous and heterogeneous catalysis – promoters – poisoning.

Photochemistry: laws of photochemistry – simple numerical problems.

TEXT BOOKS:

1. R. Gopalan, P.S. Subramanian, K. Rangarajan – "Elements of Analytical Chemistry", Sultan Chand & Sons, 1995.
2. H.J. Arnikar – "Essential of Nuclear Chemistry", 4th Ed., Wiley Eastern Limited, 1986.
3. Puri, Shrama, Kalia – " Principles of Inorganic Chemistry". Shoban Lal, Nagin Chand and Co.,

UNIT I : Text Book 1
UNIT II : Text Book 2
UNIT III : Text Book 3
UNIT IV : Text Book 3
UNIT V : Text Book 3

REFERENCES:

1. James E. huheey, Ellen A. Keiter and Richard L., Keiter – Inorganic chemistry Principles of Structure and reactivity" 4 th Ed., Wessley, New York.
2. Cotton and Wilkinson – Advanced Inorganic Chemistry", 5 th ed., John wiley Sons , New York.
3. Paula Yurkanis Bruice, Organic chemistry, 3rd Edition, Pearson Education, Inc. (Singapore), New Delhi, reprint, 2002.

SEMESTER-I : ALLIED -I

INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - I

Course Code : 14UCH1A1:1 **Max. Marks : 50**
Hours/Week : 5 **Internal Marks : 20**
Credit : 2 **External Marks : 30**

Objectives:

- *To understand the concept of periodic properties and molecular orbital theory.*
- *To know the chemistry of biomolecules.*
- *To study the concept of stereochemistry electrochemistry and photochemistry .*
- *To learn the principles of separation techiniqes.*

Unit – I **15 hours**

1.1 **Periodic properties**- Ionization potential, electron affinity and electro negativity- variation in the periodic table

1.2 **Molecular Orbital Theory:** Some important basic concepts of molecular orbital theory **-** LCAO. Bonding , anti-bonding orbital and bond order – application of MO theory to H_2, He_2, O_2 and F_2 molecules

1.3 **Industrial Chemistry:**

Fuel gases – Water gas, Producer gas, L.P.G., Gobar gas and Natural gas. Fertilizers – N.P.K and mixed fertilizers.

#Soap and detergents – An elementary idea of soap and detergent. Cleansing action of soap and detergents**#**.

Unit – II **15 hours**

2.1 **Carbohydrates:**

Classification – Glucose and fructose – Preparation and properties – Sucrose – Manufacture and properties – Starch and cellulose – Properties and uses.

2.2 **Amino Acids and Proteins:**

Amino acids – Classification, preparation and properties. Peptides (Elementary treatment) – Proteins – Classification based on physical properties and biological functions.

2.3 **Nucleic acid:** DNA and RNA – functions - **#**Structure of DNA and RNA**#.**

Unit – III **15 hours**

3.1**. Synthetic polymers** – Teflon, Alkyl and Epoxy resins, Polyesters – definitions and uses Types of polymerization – Thermosetting and thermoplastics.

3.2**. Heterocyclic compounds** – Furan, thiophene, and pyridine – Preparation and properties.

3.3. **Stereoisomerism:** Optical isomerism – lactic and tartaric acid – Racemic mixture and resolution – Geometrical isomerism –**#**maleic and fumaric acid**#**.

Unit – IV **15 hours**

4.1 **Chromatography** – principles of column, paper and thin layer chromatography.

4.2 **Photochemistry:** Photochemical reaction – Lambert's law , Beer's law – Absorbtion, Extinction Coefficient – The law of Photochemical equivalence, Quantum efficiency, **#**Some of Photochemical and their quantum yield**#**.

4.3 **Phase Rule:**Phase, Component, Degree of freedom, Phase Rule – Definition. One component system –Water system.

Unit – V **15 hours**

5.1. **Electrochemistry:** Specific and equivalent conductance – their determination – Effect of dilution on conductivities – An elementary idea about ionic theory – Ostwald's Dilution Law, Kohlrausch Law, Conductometric titrations.

5.2**.** **pH and Buffer:** Importance of pH and buffers in the living systems. pH determination by colorimetric and electrometric methods.

5.3 **Corrosion:** Types of corrosion, **#**Prevention**#**.

#_____**#** Self study

Text books

1. R.D. Madan, J.S. Tiwari and G.L. Mudhara – A Textbook of First Year B.Sc. Chemistry, S.Chand and Co.
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. B.R. Puri, L.R. Sharma and M.S. Pathania, "Principles of Physical Chemistry", Vishal Publications, Jalandhar, 2002.

UNIT I : Text Book 1,2
UNIT II : Text Book 3
UNIT III : Text Book 3
UNIT IV : Text Book 4
UNIT V : Text Book 4

References:

1. Bahl and Arun Bahl – "Advanced Organic Chemistry" – 19th Edition., (2005) – Sulthan and Chand company, New Delhi.
2. M.K. Jain – "Organic Chemistry" – 12th Ed., (2003) Sulthan and Chand Company, NewDelhi.
3. R.L. Madan, G.D. Tuli, "Simplified Course in Physical Chemistry", 5th revised and enlarged edition, S.Chand & Co., New Delhi, 2009.

SEMESTER-II: ALLIED -II

INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY – II

Course Code : 14UCH2A2:1 **Max. Marks : 50**
Hours/Week : 4 **Internal Marks : 20**
Credit :2 **External Marks : 30**

Objectives:

- *To understand the types of chemical bonding and the importance of coordination compound.*
- *To have knowledge of types for organic reaction and chemotheraphy.*
- *To study the importance of energetics and colloids.*
- *To know the concept of chemical equilibrium and catalysis.*

Unit – I **12 hours**

1.1. **Coordination Chemistry:**
Nomenclature of mononuclear complexes – Werner, Sidgwick and Pauling's Theory.Biological role of Haemoglobin and Chlorophyll. Application of complexes in qualitative and quantitative analysis.

1.2. **Metallic Bond:**
Electron gas, Pauling and Band Theories. Semiconductors - Intrinsic, n and p-type.

1.3. **#Compounds of Sulphur**: Peracids of sulphur and sodium thiosulphate**#**.

Unit – II **12 hours**

2.1**.** **Electron Displacement Effects**- Inductive effect – Relative strength of aliphatic acid and alkyl amines. Resonance – Condition for resonance - Consequences of resonance - Hyper conjugation – definition and examples- steric effect.

2.2. **Aromaticity** – Conditions – Huckel's rule - aromaticity of benzene.

2.3. **Substitution reactions**- Nitration, halogenation, sulfonation and **#**alkynation of benzene**#**.

Unit –III **12 hours**

3.1 **Halogen containing compounds**: Preparation and uses of Dichloromethane, Chloroform, Carbon tetrachloride, DDT, and BHC.

3.2. **Chemotherapy:** Struture and uses of Sulpha drugs – Sulpha pyridine, Sulpha thiazole and sulpha diazine –Antibiotics - Struture and uses of penicillin –G and **#**Chloromycetin**#**.

3.3. **Name reactions:** Benzoin, Perkin, Cannizaro, Claisen, Haloform, Carbylamine reactions – Biuret reaction.

Unit – IV **12 hours**

4.1 **Solid State:**
Typical crystal lattice – Unit cell. Elements of symmetry. Bragg's equation, Weiss indices, Miller indices, Simple, Body centered and face centered cubes.

4.2 **Energetics:**

Second Law of thermodynamics - Carnot's Theorem – Carnot Cycle.

4.3 **Colloids:**

Types of colloidal systems — Classification of colloidal systems, Lyophilic and Lyophobic Sols — properties of colloidal system – Dialysis – Electro-dialysis, Ultrafiltration. **#**Emulsion –types- preparation- emulsifier- Deemulsification- Gels-types- thixotrophy- synerisis, imbibition**#**.

Unit – V **12 hours**

5.1 **Chemical Equilibrium:**

Criteria of homogeneous and heterogeneous equilibria.

Decomposition of HI and PCl_5.

5.2 **Chemical Kinetics:**

Order, Rate, Molecularity of the reaction and rate constant, Determination of order of the reaction – Activation energy, Effect of temperature on reaction rate.

5.3 **Catalysis:**

Catalysis – Types-Importance of catalysis, types of catalysis - Homogeneous and heterogeneous catalysis (Industrial catalyst – catalyst carrier, catalyst promoter, catalyst inhibitor, catalytic poison, activity of catalyst). Theory of catalysis - Intermediate complex theory –**#**concept of acid-base and enzyme catalysis**#**.

#_____**#** Self study

Text books:

1. P.L. Soni – "Text book of Inorganic Chemistry. S. Chand & Co., New Delhi (1999).
2. P.L. Soni and H.M. Chawla – "Text Book of Organic Chemistry" – 28th Ed., (1999) - Sulthan and Chand company, New Delhi.
3. B.R. Puri, L.R. Sharma and S. Pathania – Principles of Physical Chemistry: Shoban Lal Nagin Chand and Co., New Delhi
4. A.K. Srivastava – "Organic Chemistry" – 1st Ed.,(2002) – New Age International Publishers, New Delhi.

UNIT I : Text Book 1
UNIT II : Text Book 2
UNIT III : Text Book 4
UNIT IV : Text Book 3
UNIT V : Text Book 3

References:

1. R.D Madan – "Modern Inorganic Chemistry" (1987), S. Chand & Co Pvt Ltd.
2. B.R. Puri and L.R. Sharma – Principles of Inorganic Chemistry: Shoban Lal Nagin Chand and Co., New Delhi (2000).
3. R.L. Madan, G.D. Tuli, "Simplified Course in Physical Chemistry", 5th revised and enlarged edition, S.Chand & Co., New Delhi, 2009.

SEMESTER-I: ALLIED - I
INORGANIC AND ORGANIC CHEMISTRY
(*For B.Sc., Botany/ Zoology)*

Course Code : 14UCH1A1:2 **Max. Marks : 50**

Hours/Week : 5 **Internal Marks : 20**

Credit : 2 **External Marks : 30**

Objectives:

- *To understand the types of chemical bond, hybridization and chemical reactions*
- *To study about the type of fertilizer and their importance*
- *To understand theoretical aspects of quantitative and qualitative analysis*

UNIT – I **15 hours**

Chemical Bonding: Ionic bond, lattice energy. Covalent bond, Polarity of covalent bond. Lewis Concept of orbital overlap. VSEPR theory and geometry of molecules. Valence bond theory and hybridization. BeF_2, BF_3, CH_4, C_2H_4 and C_2H_2.(sp, sp^2, and sp^3 only).

UNIT – II **15 hours**

Co-ordination Compounds: Coordination Compounds – Introduction, ligands and coordination number. IUPAC formulation and nomenclature of mono-nuclear coordination compounds –theories of coordination – Werner's theory. Importance of coordination compounds in qualitative analysis, **#**extraction of metals and biological systems**#**.

UNIT – III **15 hours**

Industrial Chemistry: Fuel gases – Definition, requisites of good fuel, natural gas, water gas, and producer gas – composition and uses. Fertilizer – Definition, chief requisites of good fertilizer – classification of fertilizers (NPK) -Urea, super phosphate of lime, **#**triple super phosphate and potassium nitrate**#**.

UNIT –IV **15 hours**

Electron displacement effect : Inductive, electrometric, resonance and hyper conjugation effect – Electrophiles, nucleophiles, carbocations, carbanions and free radical –formation and their stability

Organic reactions: Common type of organic reaction –Substitution, addition, Elimination, Polymerization, **#**Condensation reaction**#** (Elementary idea only).

UNIT – V **15 hours**

Quantitative analysis: Various concentration terms - Normality, Molality, Molarity, mole fraction. Volumetric principle, concept of equivalent weight, standard solution – **#**primary standard and secondary standard**#**.

Qualitative analysis – Detection of nitrogen, sulphur, phosphorus and halogens. Identification and properties of functional groups (aldehyde, ketone, mono and dicarboxylic acid, amine, phenol)

#_____# Self study

TEXT BOOKS:

1. P.L. Soni – "Text book of Inorganic Chemistry. S. Chand & Co., New Delhi (1999).
2. P.L. Soni and H.M. Chawla – "Text Book of Organic Chemistry" – 28th Edition, (1999) - Sulthan and Chand company, New Delhi.
3. B.R. Puri, L.R. Sharma and M.S. Pathania, "Principles of Physical Chemistry", Vishal Publications, Jalandhar, 2002.

UNIT I : Text Book 1
UNIT II : Text Book 1
UNIT III : Text Book 1
UNIT IV : Text Book 2
UNIT V : Text Book 2,3

Reference:

1. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, 23rd edition, New Delhi, Shoban Lal, Nagin Chand & Co.,(1993)
2. Jain. M. K. Organic Chemistry 12th edition, Sulthan and Chand company, New Delhi.(2003)

SEMESTER-II : ALLIED - II
BIO-ORGANIC CHEMISTRY
(*For B.Sc., Botany/ Zoology)*

Course Code : 14UCH2A2:2 **Max. Marks : 50**

Hours/Week : 4 **Internal Marks : 20**

Credit : 2 **External Marks : 30**

Objectives:

- *To understand the types polymers*
- *To study about the purification technique of Chromatography*
- *To understand the application of natural product*

UNIT – I **12 hours**

Bio Polymers: Definition, Classifications of polymers, General methods of Polymerization – Addition and condensation, Bio medical applications of polymers – Polymers used in surgery – Polyurethane, Teflon, Polyethylene, Polyvinylchloride (structure and applications only)

Polymers used in medicine : Polypeptide antibiotics – Bacitracin - A, Polymyxin – B, Nystatin (sources and application), Synthetic polypeptides – Insulin, Oxytocin, Vasopressin (basic concept only).

UNIT – II **12 hours**

Industrial organic Compounds: preparation and uses of – Fermentation, Condition for fermentation of alcohols – absolute alcohol – acetone – preparation and uses. Vinegar – lactic acid, citric acid.

Chemical in Medicine and Health care: Analgesics, antibiotics, antiseptic, disinfectants, antihistamines and antacids (structure and uses only)

Chemical in food: Preservatives, artificial sweetening agents, **#**antioxidants and edible colours**#**.

UNIT – III **12 hours**

Separation and purification technique: Filtration, crystallization, sublimation, distillation, differential extraction.

Chromatography – Coloum, Thin layer chromatography and **#**paper chromatography**#** – Definition, principle, types and applications.

UNIT – IV **12 hours**

Carbohydrate: Classification, monosaccharide- structure and simple chemical reactions of glucose, Disaccharides : reducing and non-reducing sugars – sucrose, maltose and lactose, structure of sucrose (chemical reaction not required),Polysaccharides: **#**Elementary idea of structures of starch and cellulose**#**.

Proteins: amino acids : peptide bond, polypeptides, primary structure of proteins, simple idea of secondary and tertiary structure of proteins. Denaturation of proteins and enzymes.

UNIT – V **12 hours**

Nucleic acids: Types of nucleic acids, primary building blocks of nucleic acids (Chemical composition – DNA and RNA) primary structure of DNA and its double helix. Replication, transcription and protein synthesis, Genetic code.

Lipids: Classification, structural, **#**functions in biosystems**#**.

Hormones: Classification, structural features and functions in biosystems.

#_____**#** Self study

TEXT BOOKS:

1. K. Bagavathi Sundari – "Applied Chemistry" 1st Ed (2006), MJP Publishers, Chennai.
2. R. Gopalan, P.S. Subramanian, K. Rangarajan – "Elements of Analytical Chemistry", Sultan Chand & Sons, 1995.
3. S.M. Khopkar, "Basic concept of Analytical Chemistry", Wiley Eastern Ltd., 1998.
4. Jain. M. K. Organic Chemistry 12th edition, Sulthan and Chand company, New Delhi.(2003)

UNIT I : Text Book 1,2
UNIT II : Text Book 4
UNIT III : Text Book 2,3
UNIT IV : Text Book 4
UNIT V : Text Book 4

REFERENCES:

1. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, 23rd edition, New Delhi, Shoban Lal, Nagin Chand & Co.,(1993)
2. Puri B.R., Sharma L.R., Pathania M.S., Principle of Physical Chemistry, (23rd edition) New Delhi, Shoban Lal, Nagin Chand & Co., (1993)

SEMESTER- I : MAJOR BASED ELECTIVE - I
VOLUMETRIC ANALYSIS - PRACTICAL

Course Code	**: 14UCH1M1P**	**Max. Marks**	**: 100**
Hours/Week	**: 3**	**Internal Marks**	**: 40**
Credit	**: 3**	**External Marks**	**: 60**

Objectives:

- *To know the basic principles of volumetric analysis*
- *To understand the concepts of indicators and equivalent weight*

Titrimetric Quantitative Analysis

1. Estimation of HCl by NaOH using a standard oxalic acid solution.
2. Estimation of Na_2CO_3 by HCl using a standard Na_2CO_3 solution.
3. Estimation of oxalic acid by $KMnO_4$ 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 Fe(III) by $K_2Cr_2O_7$ using a standard Mohr's salt solution (internal and external indicators).
6. Estimation of copper(II) sulphate by $Na_2S_2O_4$.
7. Estimation of Mg(II) by EDTA.
8. Estimation of Ca(II) by EDTA.

Scheme of valuation

Procedure writing - 10 marks

Results

1-2%	-	50 marks
2-3%	-	40 marks
3-4%	-	30 marks
>4%	-	20 marks

Reference:

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

SEMESTER- II: MAJOR BASED ELECTIVE - II
INDUSTRIAL CHEMISTRY - PRACTICAL

Course Code	**: 14UCH2M2P**	**Max. Marks**	**: 100**
Hours/Week	**: 3**	**Internal Marks**	**: 40**
Credit	**: 3**	**External Marks**	**: 60**

Objectives:

- *To compare the experimental and standard values of certain commercial substances*
- *To check the purity of some samples.*

1. Estimation of total hardness of water using EDTA

2. Determination of Iodine value of an 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 an edible oil

Scheme of valuation

Procedure writing	-	10 marks

Results

1-2%	-	50 marks
2-3%	-	40 marks
3-4%	-	30 marks
>4%	-	20 marks

Reference:

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

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SEMESTER- III : MAJOR BASED ELECTIVE - III
DOMESTIC PRODUCTS PREPARATION - PRACTICAL

Course Code : 14UCH3M3P **Max. Marks : 100**
Hours/Week : 3 **Internal Marks : 40**
Credit : 3 **External Marks : 60**

Objectives:

- *To develop self employment skills*
- *To become entrepreneur*

1. Preparation of detergent washing powder
2. Preparation of utensils cleaning powder
3. Preparation of normal shampoo
4. Preparation of poly vinyl alcohol adhesive
5. Preparation of room freshener
6. Preparation of liquid blue
7. Preparation of pain relieving balm
8. Preparation of jasmine perfume liquid
9. Preparation of tooth powder
10. Preparation of face powder
11. Preparation of white phenol
12. Preparation of automobile decarboniser
13. preparation of tooth paste
14. Preparation of talcum powder

Scheme of valuation

Procedure writing - 10 marks

Results - 50 marks

Reference:

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

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SEMESTER- IV: CORE - V
INORGANIC QUALITATIVE ANALYSIS – PRACTICAL

Course Code : 14UCH4C5P	**Max. Marks : 100**
Hours/Week : 4	**Internal Marks : 40**
Credit : 4	**External Marks : 60**

Objectives:

- *To understand the basic concepts of qualitative analysis*
- *To study the applications of solubility product, common ion effect in group separation*
- *To distinguish interfering and non interfering radicals*

Semi micro Inorganic Qualitative analysis

Analysis of a mixture containing **two cations** and **two anions** of which one will be an **interfering ion.** Semi micro methods using the conventional scheme with hydrogen sulphide may be adopted.

Cations to be analysed: lead, copper, bismuth, cadmium, tin, iron, zinc, manganese, cobalt, nickel, barium, calcium, strontium, magnesium and ammonium.

Anions to be analysed: carbonate, sulphide, sulphate, nitrate, chloride, bromide, **fluoride, borate, oxalate and phosphate**.

Scheme of valuation

Procedure : 10 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

Reference:

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

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SEMESTER- V: CORE - VI
GRAVIMETRIC ESTIMATION AND PHYSICAL CONSTANTS DETERMINATION - PRACTICAL

Course Code : 14UCH5C6P **Max. Marks : 100**
Hours/Week : 5 **Internal Marks : 40**
Credit : 4 **External Marks : 60**

Objectives:

- *To learn the complex preparation*
- *To study the reagent for separation of metal ions*
- *To know the stoichiometry of the complexes*
- *To study physical constants of solids and liquid organic compounds*

Gravimetric Estimation:

Sintered Crucible

1. Ni as nickel dimethyl glyoxime
2. Zn as zinc oxinate.
3. Pb as lead chromate.
4. Ba as barium chromate.
5. Ca as calcium oxalate monohydrate(110^0 temperature should be maintained)

Silica Crucible

1. Ca as calcium sulphate.
2. Pb as lead sulphate.
3. SO_4 as barium sulphate

Determination of physical constants

Determination of boiling / melting point by semi micro method.

Melting Points:

1. Acetamide, 2. *m*-dinitrobenzene, 3. Benzoic acid, 4. Benzamide, 5. Urea, 6. Cinnamic acid.

Boiling Points:

1.Water, 2. EMK, 3.Ester, 4. Toluene, 5.CCl_4

Scheme of valuation

Procedure writing : 10 marks

Gravimetric estimation: 40 Marks; Physical constant: 10 marks

Results

<1%	-	40 marks
1-2%	-	30 marks
2-3%	-	20 marks
3-4%	-	10 marks

Reference:

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

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SEMESTER- V: MAJOR BASED ELECTIVE - IV

PHYSICAL CHEMISTRY ELECTRICAL - PRACTICAL

Course Code : 14UCH5M4P **Max. Marks : 100**

Hours/Week : 3 **Internal Marks : 40**

Credit : 3 **External Marks : 60**

Objectives:

- *To understand the conductometric and potentiometric principles*
- *To know different types of chemical reaction*
- *To study electrode potential of single electrodes, EMF*

1. Determination of equivalent conductance of a strong electrolyte.
2. Determination of strength of strong acid (HCl) by conductometry using NaOH.
3. Determination of strength of a weak base by conductometry.
4. Determination of strength of K_2SO_4 by conductometry.
5. Determination of strength of a strong acid by potentiometry.
6. Determination of strength of weak acid by potentiometry.
7. Determination of pH of a buffer solution by potentiometry.
8. Determination of strength of Fe(II) ion by potentiometry.

Scheme of valuation

Procedure with formula : 10

Practical : 50

<1%	-	50 marks
1-2%	-	40 marks
2-3%	-	30 marks
3-4%	-	20 marks
>4%	-	10 marks

Reference:

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

2. Daniels et al., Experimental Physical Chemistry, (7thedition), New York, McGraw Hill,(1970).

3. Findlay, A., Practical Physical Chemistry, (7th edition), London, Longman (1959)

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SEMESTER- VI: CORE - XIV
ORGANIC ANALYSIS AND PREPARATION - PRACTICAL

Course Code	**: 14UCH6C14P**	**Max. Marks**	**: 100**
Hours/Week	**: 5**	**Internal Marks**	**: 40**
Credit	**: 4**	**External Marks**	**: 60**

Objectives:

- *To learn the techniques of organic qualitative analysis*
- *To learn the methods of organic preparations*
- *To study physical constants of organic compounds*

Organic Qualitative Analysis and Organic Preparation:

Organic Analysis

Analysis of Simple Organic compounds

(a) characterization of functional groups

(b) confirmation by preparation of solid derivatives / characteristic colour reactions.

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

Preparation of organic compounds involving the following chemical conversions

1. Oxidation (Benzoic acid from benzaldehyde)
2. Hydrolysis (Benzoic acid from ethyl benzoate)
3. Nitration (*m*-Dinitrobenzene from nitrobenzene)
4. Bromination(*p*-Bromoacetanilide from acetanilide, Tri-bromoaniline from aniline)
5. Diazotization (Methylorange from aniline)

Scheme of valuation

Procedure	: 10
Organic analysis	: 40
Organic preparation	: 10
Special elements present / absent	- 5 marks
Aromatic/ aliphatic	- 5 marks
Saturated/ unsaturated	-5 marks
Functional group present	-15 marks
Derivative	-10 marks

Reference:

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

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SEMESTER- VI : CORE – XV
PHYSICAL CHEMISTRY NON-ELECTRICAL - PRACTICAL

Course Code	**: 14UCH6C15P**	**Max. Marks**	**: 100**
Hours/Week	**: 4**	**Internal Marks**	**: 40**
Credit	**: 4**	**External Marks**	**: 60**

Objectives:

- *To study colligative properties of organic compounds*
- *To understand the concept of chemical equilibrium*
- *To study phase rule and its applications*

List of Experiments:

1. Critical Solution Temperature of Phenol –Water system.
2. Effect of impurity (NaCl) on Critical solution Temperature of Phenol –Water system.
3. Determination of Transition Temperature of a salt hydrate.
4. Determination of molecular weight by Rast´s macro method.
5. Determination of Kf by Rast´s macro method.
6. Phase diagram(Simple eutectic system)
7. Determination of rate constant of acid catalyst hydrolysis of an ester
8. Determination of Partition co-efficient of iodine between water and carbon tetrachloride

Scheme of valuation

Procedure with formula: 10 Marks

Practicals: 50 Marks

Up to 10%	-	50 marks
10-15%	-	35 marks
15-20%	-	25 marks
>20%	-	15 marks

Reference:

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

2. Daniels et al., Experimental Physical Chemistry, (7thedition), New York, McGraw Hill,(1970).

3. Findlay, A., Practical Physical Chemistry, (7th edition), London, Longman (1959).

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SEMESTER- I: ALLIED–I
ALLIED CHEMISTRY PRACTICAL - I
VOLUMETRIC ANALYSIS

Course Code	**: 14UCH1A1P**	**Max. Marks**	**: 50**
Hours/Week	**: 3**	**Internal Marks**	**: 20**
Credit	**: 2**	**External Marks**	**: 30**

Objectives:

- *To know the basic principles of volumetric analysis*
- *To understand the concepts of indicators and equivalent weight*

1. Estimation of Sodium Hydroxide

   (Na_2CO_3 X HCl X NaOH)

2. Estimation of Hydrochloric Acid

   ($H_2C_2O_4$ X NaOH X HCl)

3. Estimation of Oxalic Acid

   ($FeSO_4$ X $KMnO_4$ X $H_2C_2O_4$)

4. Estimation of Ferrous Sulphate

   ($H_2C_2O_4$ X $KMnO_4$ X $FeSO_4$)

5. Estimation of $KMnO_4$

   ($K_2Cr_2O_7$ X FAS X $KMnO_4$)

6. Estimation of Zn by EDTA

   ($MgSO_4$ X EDTA X $ZnSO_4$)

7. Estimation of Mg by EDTA

8. Estimation of Cu by iodometry

   ($K_2Cr_2O_7$ X thio X $CuSO_4$)

9. Estimation of Iodine

   ($K_2Cr_2O_7$ X thio X I_2)

Reference:

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

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SEMESTER-II: ALLIED–II
ALLIED CHEMISTRY PRACTICAL – II
ORGANIC ANALYSIS

Course Code	**: 14UCH2A2P**	**Max. Marks**	**: 50**
Hours/Week	**: 3**	**Internal Marks**	**: 20**
Credit	**: 2**	**External Marks**	**: 30**

Objectives:

- *To learn the techniques of organic qualitative analysis*
- *To learn the Nitrogen containing compounds.*

A study of reactions of the following organic compounds:

1. Carbohydrate
2. Amide
3. Aldehyde
4. Ketone
5. Monocarboxylic acid
6. Dicarboxylic acid
7. Amine
8. Monohydric phenol
9. Ester
10. Nitro

The students may be trained to perform the specific reactions like test for element (Nitrogen only), aliphatic or aromatic, saturated or unsaturated and functional group present and record their observation.

Reference:

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

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