CODE	COURSE TITLE
18CHUC101	**CORE CHEMISTRY - I**

Category	CIA	ESE	L	T	P	Credit
CORE	25	75	41	4	-	4

Preamble

The course aims to provide understanding of the formation of ionic and covalent bonding with the concept of hybridization and introduces the polar effects in organic chemistry and imparts knowledge about the hydrocarbons.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1.	Recognize the formation of ionic bonding and their characteristics	K2, K3
CO2.	Apply the concept of hybridization and explore molecular geometry	K2
CO3.	Acquire knowledge of polar effects and reactive intermediates	K1,K3
CO4.	Interpret the Chemistry of Alkenes and Dienes	K2,K3
CO5.	Realize the chemistry of Cycloalkanes, Alkynes and concept of Conformations,	K2, K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1.	M	S	M	S	S
CO2.	S	M	M	S	S
CO3.	M	M	M	S	S
CO4.	M	L	M	S	S
CO5.	M	L	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **(9 hrs.)**

Ionic Bonding: General characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy. Properties of Ionic Crystals -High Melting Point – Hardness - Electrical Conductivity In Molten Condition and in solution. Polarizing power and polarizability. Fajan's rules. Solubility Of Ionic Compounds in Polar Solvent.Ionic character in covalent compounds

UNIT II **(9 hrs.)**

Covalent Bonding: VB Approach- Shapes of inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral,trigonal bipyramidal and octahedral arrangements. Concept of resonance and resonating structures in various inorganic compounds.

MO Approach- Rules for the LCAO method, bonding and antibonding MOs. MO treatment of homonuclear and heteronuclear diatomic molecules viz., H_2, O_2, N_2, CO, NO and NO^+. Comparison of VB and MO approaches.

UNIT III **(9 hrs.)**

Polar Effects: Electronic Displacements- Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Influence of polar effects on acidity and basicity of organic compounds.

Cleavage of Bonds: Homolysis and Heterolysis. Generation, Structure and reactivity of Nucleophiles and electrophiles- Carbocations -Carbanions and free radicals.

UNIT IV **(9 hrs.)**

Alkenes: Preparation By Wittig Reaction - Mechanisms Of Beta Elimination – E_1, E_2 Elimination - Hoffmann's Rule And Saytzeff's Rule - Addition Reactions With Hydrogen – Halogen - Hydrogen Halide (Markownikoff's Rule), Hydrogen Bromide (Peroxide Effect), Hydroboration and Ozonolysis.

Dienes: Stability of Isolated and Conjugated Dienes. Electrophonic Addition of HBr and Bromine. Free Radical addition. Diels –Alder Reaction.

UNIT V **(9 hrs.)**

Cycloalkanes: Preparation by Dieckmann Ring Closure and by Reduction of Aromatic Hydrocarbons – Ring Opening Reactions of Cyclopropane with H_2, Br_2 and HI.

Alkynes: General methods of preparation of alkynes, properties of alkynes –acidity, hydration, hydroboration, oxidation with $KMnO_4$ and ozonolysis.

Conformations*:* Ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations.

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Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Bhal B.S. & Arun Bahl	Advanced of Organic Chemistry	S. Chand & Co., New Delhi	2016, 1st Edition
2.	Puri, Sharma & Kalia	Principles of Inorganic Chemistry	Milestone Publisher	2011, 11th Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Jain M.K. & Sharma S.C.	Modern Organic Chemistry	Vishal Publishing Co, New Delhi	2014, 4th Edition
2.	Madan R.D.	Modern Inorganic Chemistry	S. Chand & Co, New Delhi	2011, 3rd Revised Edition
3.	Mughergee S.M., Singh S.P. & Kapoor R.P.	Organic Chemistry (Volume I, II & III),	Newage International (P) Limited, New Delhi	Vol: I - 1990, 1st Edition Vol: II - 2014, 2nd Edition Vol: III - 2015, 2nd Edition
4.	Soni P.L. & Chawla H.M.	Text Book of Organic Chemistry	Sultan Chand & Sons, New Delhi	2010, 27th Edition
5.	Soni P.L.	Text Book of Inorganic Chemistry	Sultan chand & sons, New Delhi	2003, 20th Edition

Pedagogy

- Lecture, PPT, Quiz, Assignment, Group Discussion, Seminar

CODE	COURSE TITLE
18CHUC102	**CORE CHEMISTRY - II**

Category	CIA	ESE	L	T	P	Credit
CORE	25	75	41	4	-	4

Preamble

The course enables the students to acquire knowledge about few inorganic elements, provides concepts on aromaticity, introduces liquid crystals and condensed phases and also imparts basic and higher level knowledge on quantum chemistry.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1.	Acquire Knowledge of Ozone, Hydrogen peroxide and Sulphur family elements.	K1, K2
CO2.	Apply the concept of aromaticity to benzenoid compounds and interpret the mechanisms of electrophilic substitution reactions.	K2
CO3.	Recognize the Liquid crystals and condensed phase.	K2, K3
CO4.	Understand the background of quantum chemistry and advanced approach to quantum mechanical model of atoms.	K2, K3
CO5.	Develop ideas on quantum mechanical approach to larger molecules.	K2, K3

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **(9 hrs.)**

Ozone And Hydrogen Peroxide: Preparation – Properties – Structure - Uses- Comparison Between the Two. **Sulphur, Selenium and Tellurium:** A Comparative Study of Sulphur – Selenium – Tellurium. Extraction and Allotropic forms - Properties – Uses - Oxides and Oxyacids of Selenium and Tellurium

UNIT II **(9 hrs.)**

Aromaticity: Huckel's rule and its applications to Benzene Naphthalene, Anthracene, Pyridine, Pyrrole, Cyclopropenyl cation and cyclopenta dienyl anion. **Aromatic Hydrocarbons:** Resonance and Resonance energy in Benzene – Electrophilic Substitution in Benzene, Arenium mechanism - Mechanism of Nitration – Sulphonation – Halogenation - *Friedel- Crafts Alkylation - Acylation.* Reactivity and orientation of monosubstituted benzene- o,p directing and m directing effects.

UNIT III **(9 hrs.)**

Liquid Crystals: The Concept of Mesomorphic State – Types of Liquid Crystals and their Properties - Properties of Liquid state- Surface Tension And Viscosity - Structural Differences Between Solids, Liquids and Gases. **Condensed Phases:** Coefficients of Thermal Expansion and Compressibility of Liquids and Solids- Methods of Determination.

UNIT IV **(9 hrs.)**

Quantum Chemistry I: Failure of Classical Theory in Explaining Black Body Radiation - Plancks Theory of Quantization of Energy –Einstein Theory of Photoelectric Effect – Compton Effect. De Broglie Theory of Wave Particle Dualism-Heisenberg's Uncertainity Principle.

UNIT V **(9 hrs.)**

Quantum Chemistry II: An Elementary Treatment of Schordinger Wave Equation –Quantum Numbers - Concept of Orbitals - Significance Of Ψ & Ψ^2 Free Particles and Particle in a Box (One And Three Dimensional) - The Covalent Bonds – The Hydrogen Molecule - The Valence Bond Method - Hydrogen Molecule Ion - Molecular Orbital Method - Molecular Orbitals for Homonuclear - Heteronuclear Diatomic Molecules.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Bhal B.S. & Arunbahl	Advanced of Organic Chemistry	S. Chand & Co, New Delhi	2016, 1st Edition
2.	Madan R.D.	Modern Inorganic Chemistry	S. Chand & co, New Delhi	2011, 3rd Revised Edition
3.	Puri B.R., Sharma L.R. & Pathania M.S.	Principles of Physical Chemistry	Sobanlal Nagin Chand & Co., New Delhi	2016, 47th Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Jain M.K. & Sharma S.C.	Modern Organic Chemistry	Vishal Publishing Co, New Delhi	2014, 4th Edition
2.	Kheterpal S.C.	Physical Chemistry Vol. I & II	Pradeep Publications, Jalandhar	2011, 2nd Edition
3.	Puri B.R. & Sharma L.R.	Principles of Inorganic Chemistry	Vishal Publishing Company, Jalandhar	2016, Revised Edition
4.	Soni P.L.& Chawla H.M.	Text Book of Organic Chemistry	Sultan Chand & Sons, New Delhi	2010, 27th Edition
5.	Soni P.L.	Text Book of Inorganic Chemistry	Sultan Chand & Sons, New Delhi	2003, 20th Edition

Pedagogy

- Lecture, PPT, Quiz, Assignment, Group Discussion, Seminar

CODE	COURSE TITLE
18CHUC203	**CORE CHEMISTRY - III**

Category	CIA	ESE	L	T	P	Credit
CORE	**25**	**75**	**41**	**4**	-	4

Preamble

To impart basic knowledge of coordination chemistry and a clear understanding of the gaseous laws. To enable the student to learn the basic concepts of thermodynamic transformations, apply the first law of thermodynamics and also to learn the concept of the substitution mechanisms in organic chemistry.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1.	Interpret the Key Features of Co-ordination Complexes and its applications	K1,
CO2.	Apply the concepts of gaseous law and to study their properties	K2, K3
CO3.	Realize the thermodynamic aspect of various energy transformations	K2,K3
CO4.	Analyze the potential of Thermo chemical conversions through 1^{st} law	K2, K3
CO5.	Investigate substitution mechanisms in organic conversions and the factors influencing	K2,K3

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **(9 hrs.)**

Coordination Chemistry: Nomenclature of Coordination Compounds - Conductivity and Precipitation Studies - Werner's Coordination Theory - Electronic Interpretation of Coordinate Bond by Sidgwick - Pauling's Valence Bond Theory and Crystal Field Theory – Interpretation of Magnetic Properties.

UNIT II **(9 hrs.)**

Gaseous state- Postulates of Kinetic Theory of Gases- Derivation of Kinetic Gas Equation- Derivation of Boyles law, Charles law, Avagadros law, Ideal gas equation, Graham's law of diffusion and Dalton's law of partial pressure from kinetic gas equation. Maxwells distribution of molecular velocities (derivation not required), Root Mean Square, average velocity, most probable velocity (derivation not required). **Collision:** diameter, frequency, mean free path (only definition).

UNIT III **(9 hrs.)**

Thermodynamic Terms: Definitions – Heat - Work of Expansion - Work of Compression - Maximum and Minimum Quantities of Work – Reversible and Irreversible Transformations - Energy and the I Law of Thermodynamics – Properties of Energy changes in Relation to changes in Properties of the System – Isothermal and Adiabatic Changes -Thermodynamic State Function Versus Path Function – Properties of exact and inexact Differentials – Relation between ΔE and ΔH -C_p and C_v.

UNIT IV **(9 hrs.)**

Application of the First Law of Thermodynamics to Chemical Reactions: The Heat of Reaction – Conventional Values of H - The Determination of Heats of Formation Sequences of Reactions – Hess's Law- Heats of Combustion – Determination by Bomb Calorimeter - Heats of Reaction at constant volume - Dependence of the Heat of Reaction on Temperature and Kirchoff's Equations.

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UNIT V **(9 hrs.)**

Nucleophilic Substitution: Mechanism- SN^1, SN^2, SN^i Reactions - Effect of solvent –Nucleophile - Structure of Substrate and Neighbouring group participation - Elimination Versus Substitution – Benzyne Mechanism - Intermediate Complex Mechanism.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Bhal B.S. & Arunbahl	Advanced of Organic Chemistry	S. Chand & Co New Delhi	2016, 1st Edition
2.	Puri B.R.& Sharma L.R.	Principles of Inorganic Chemistry	Vishal Publishing Company, Jalandhar	2016, Revised Edition
3.	Soni P.L.& Chawla H.M.	Text Book of Organic Chemistry	Sultan Chand & Sons, New Delhi	2010, 27th Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Soni P.L.& Dharma Rao D.P.	Text Book of Physical Chemistry	S. Chand & Co., New Delhi	2000, 21st Edition
2.	Madan R.D.	Modern Inorganic Chemistry	S. Chand & Co New Delhi	2011, 3rd Revised Edition
3.	Mughergee, S.M., Singh S.P. & Kapoor R.P.	Organic Chemistry (Volume I, II &III),	New Age International (P) Limited, New Delhi	Vol: I - 1990, 1st Edition Vol: II - 2014, 2nd Edition Vol: III - 2015, 2nd Edition
4.	Bahl B.S. & Tuli G.D.	Essentials of Physical Chemistry	S. Chand & Co., New Delhi	2014, 27th Edition

Pedagogy

- Lecture, PPT, Quiz, Assignment, Group Discussion, Seminar

CODE	COURSE TITLE
18CHUC204	**CORE CHEMISTRY - IV**

Category	CIA	ESE	L	T	P	Credit
CORE	25	75	41	4	-	4

Preamble

To enable the students to learn the principles of general methods of metal extraction techniques in Inorganic Chemistry and to gain knowledge of reactions of carbonyl compounds in Organic Chemistry. A comprehensive information about the II law of Thermodynamics is also aimed.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1.	Comprehend the principles and steps involved in the extraction of metals	K1,
CO2.	Compare the Physical and Chemical properties of Alkali and Alkaline Earth metals	K2,K3
CO3.	Interpret the reactions of carbonyl compounds- Aldehydes and Ketones	K2,K3
CO4.	Analyse thermodynamic processes and derive expressions for II law of Thermodynamics	K2,K3
CO5.	Apply the concepts of Chemical Equilibrium	K2,K3

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **(9 hrs.)**

General methods of extraction of metals: Ores and Minerals – Types of ores – Methods of ore dressing - Concentration – Gravity separation – Froth Floatation – Magnetic separation – Calcination – Roasting – Smelting – Aluminothermic process – Purification of metals – Electrolysis – Refining – Zone Refining – Van Arkel Refining – Electrolytic Refining – Extraction of radioactive elements – Uranium and Thorium only.

UNIT II **(9 hrs.)**

Alkali Metals: Group discussion – Lithium extraction – Properties and uses of Li – Diagonal relationship with Magnesium. **Alkaline earth metals:** Group discussion – Extraction, Properties and Uses of Beryllium and Magnesium).

UNIT III **(9 hrs.)**

Reactions of Aldehydes and Ketones: Nucleophilic addition reactions – Aldol Condensation – Perkins – Knoevenagal – Claisen - Dieckmann – Reformatsky reactions – Reactions with $LiAlH_4$ and $NaBH_4$ – Wolf-Kishner and MPV reactions – Simple and crossed Cannizaro reaction.

UNIT IV **(9 hrs.)**

II Law of Thermodynamics: Need for the II law of Thermodynamics – Different Statements of II law – Numerical definition of Entropy – Carnot cycle – Carnot theorem – Derivation of Entropy from Carnot cycle – Entropy change in an irreversible process – Entropy change for an ideal gas with T and V as variables – P and T as variables – Entropy of mixing of Ideal gas – Gibbs Helmholtz equation.

UNIT V **(9 hrs.)**

Chemical Potential: Gibbs Duhem equation – Variation of Chemical potential with P and T – Chemical potential in a system of Ideal gases – Clapeyron-Clausius equation – **Chemical Equilibrium**: Spontaneous reactions – Standard free energy change- Conditions for equilibrium and spontaneity. Law of mass action – Relation between Kp, Kc and Kx – Vont Hoff Isotherm and Isochore – Statement of III law of Thermodynamics – Exceptions of III law. Zeroth Law-Absolute temperature.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Bhal B.S. & Arunbahl	Advanced of Organic Chemistry	S. Chand & Co, New Delhi	2016, 1st Edition
2.	Kheterpal S.C.	Physical Chemistry Vol. I & II	Pradeep Publications, Jalandhar	2011, 2nd Edition
3..	Madan R.D.	Modern Inorganic Chemistry	S. Chand & Co, New Delhi	2011, 3rd Revised Edition
4.	Puri B.R., Sharma L.R. & Pathania M.S.	Principles of Physical Chemistry	Sobanlal Nagin chand & Co., New Delhi	2016, 47th Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Puri B.R., Sharma L.R.	Principles of Inorganic Chemistry	Vishal Publishing Company, Jalandhar	2016, Revised Edition
2.	Soni P.L.	Text Book of Inorganic Chemistry	Sultan Chand & Sons, New Delhi	2003, 20th Edition
3.	Bahl B.S. & Tuli G.D.	Essentials of Physical Chemistry	S. Chand & Co., New Delhi	2014, 27th Edition
4.	Soni P.L.& Dharma Rao D.P.	Text Book Of Physical Chemistry	S. Chand & Co., New Delhi	2000, 21st Edition

Pedagogy

- Lecture, PPT, Quiz, Assignment, Group Discussion, Seminar

CODE	COURSE TITLE
18CHUCP01	**Core Chemistry Practical I** **INORGANIC QUALITATIVE SEMI MICRO ANALYSIS**

Category	CIA	ESE	L	T	P	Credit
CORE	40	60	-	-	45	3

Preamble

The course aims to impart analytical skills by learning to analyze mixtures of inorganic substances Containing four ions and provide skills to eliminate interfering anions from mixtures.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1.	Perform systematic semi micro qualitative analysis	K1
CO2.	Interpret the nature of various inorganic anions and cations	K2 K3
CO3.	Identify and detect various anions and cations through their reactions	K2
CO4.	Eliminate interfering anions from the inorganic mixtures	K2 K3
CO5.	Identify and cations group according to their properties	K1 K3

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

Cations To Be Analysed: Lead – Copper – Iron - Zinc- Manganese – Cobalt – Nickel – Barium – Strontium - Magnesium - Ammonium.

Anions To Be Analysed: Carbonate – Sulphate – Nitrate – Chloride- Bromide –Fluoride - Oxalate - Borate - Phosphate.

Pedagogy

Demonstration, PPT, Experimental work

CODE	COURSE TITLE
18CHUA101	ALLIED CHEMISTRY I (FOR B.Sc PHYSICS)

Category	CIA	ESE	L	T	P	Credit
ALLIED	20	55	55	5	-	4

Preamble

To enable the students to acquire knowledge about chemical bonding and geometry of various molecules, familiarize with Fertilizers and water treatment processes, understand various organic reactions and their mechanisms, have insight into the chemistry of dyes, Sulpha drugs and vitamins and understand the concepts of chemical kinetics and chromatography

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1.	Understand the nature of chemical bonding and geometry of various molecules	K1
CO2.	Recognise Inorganic fertilizers, Hardness of Water and Treatment of water for municipal Supply	K2 K3
CO3.	Interpret various organic reactions and their mechanism, stereoisomerism	K2
CO4.	Understand the chemistry of dyes, sulpha drugs, penicillin and vitamins	K2 K3
CO5.	Analyse the concepts of chemical kinetics and chromatography	K3

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **(12 hrs.)**

Chemical Bonding: Molecular Orbital Theory – Bonding - Antibonding and Non-Bonding Orbitals - Molecular Orbitals - MO Configuration Of H_2, N_2, O_2, F_2. Bond order Diamagnetism and Paramagnetism.

VSEPR Theory and Geometry of Molecules: Hybridization and Geometry of Molecules $SnCl_2$, BF_3, BrF_3, CH_4, XeF_4, SiF_4, PCl_5, IF_5, SF_6, and IF_7.

UNIT II **(12 hrs.)**

Fertilizers: Need for Fertilizers – Role of Primary and Secondary Nutrients in the Plant growth – Inorganic Fertilizers - Urea - Ammonium Nitrate - Ammonium Sulphate - Superphosphate of Lime - Triple Superphosphate.

Water: Potability of Water – Hardness of Water – Determination using EDTA -Treatment of Water for Municipal Supply – Screening – Clarification - Coagulation – Sedimentation – Sterilization and Disinfection – Aeration - Chlorination.

UNIT III **(12 hrs.)**

Organic Reactions and their Mechanism: Homolytic Fission – Heterolytic Fission –Classification of Reagents – Electrophile – Nucleophile – Free Radical – Electron Displacement Effects - Inductive Effect – Mesomeric Effect.

Stereoisomerism: Geometric Isomerism of Maleic and Fumaric Acids - Optical Isomerism – Cause of Optical Activity – Lactic Acid - Tartaric Acid – Racemisation – Resolution.

UNIT IV **(12 hrs.)**

Dye Chemistry: Chromophore – Auxochrome - Bathochromic Shift - Hypsochromic Shift - Preparation and Uses – Azodye - Methyl Orange - Mordant Dye- Alizarin - Vat Dye - Indigo.

Chemotherapy: Preparation - Uses and Mode of Action of Sulpha Drugs - Structure and uses of Penicillin – Chloramphenicol - Vitamins - Classification – Sources – Deficiency Diseases of Vitamin A, B, C,D,E and K (Structure Not Necessary)

UNIT V **(12 hrs.)**

Kinetics: Rate – Order – Molecularity - Pseudo Unimolecular Reactions – Zero Order Reactions - Determination of Order of a Reaction - Effect of Temperature on Reaction Rate – Arrhenius Activation Energy.

Chromatography: Principle And Application of Column - Paper - Thin Layer Chromatography.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Veeraiyan V.	Allied Chemistry Paper I & II	Highmount Publishing House	2005, 2nd Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Bhal B.S. & Arunbahl	Advanced of Organic Chemistry	S. Chand & co, New Delhi	2016, 1st Edition
2.	Bahl B.S. & Tuli G.D.	Essentials of Physical Chemistry	S. Chand & co., New Delhi	2014, 27th Edition
3.	Puri B.R., Sharma L.R. & Pathania M.S.	Principles of Physical Chemistry	Sobanlal Nagin chand & co., New Delhi	2016, 47th Edition
4.	Puri B.R. & Sharma L.R.	Principles of Inorganic Chemistry	Vishal Publishing Company, Jalandhar	2016, Revised Edition
5.	Soni P.L.	Text Book of Inorganic Chemistry	Sultan chand & sons, New Delhi	2003, 20th Edition

Pedagogy

- Lecture, PPT, Quiz, Assignment, Group Discussion, Seminar

CODE	COURSE TITLE
18CHUA001/ 18CHUA303	**ALLIED CHEMISTRY I (FOR B.Sc N&D,BOTANY and ZOOLOGY)**

Category	CIA	ESE	L	T	P	Credit
ALLIED	20	55	55	5	-	4

Preamble

To enable the students to acquire knowledge about oils and fats, familiarize with organic Fertilizers, have insight the knowledge into the chemistry of dyes, sulpha drugs and vitamins and understand the concepts of chemical kinetics and chromatography

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1.	Distinguish and analyse the quality of oils and fats	K1
CO2.	Recognise Inorganic fertilizers, Hardness of Water and Treatment of water for municipal Supply.	K2, K3
CO3.	Describe the quality and types of fuels	K2
CO4.	Recognize various polymers and their applications	K2, K3
CO5.	Interpret the principles of adsorption and apply them to various processes.	K2, K3

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **(12 hrs.)**

Oils and Fats: Difference between oils and fats-properties-Analysis of oils and fats-saponification value-ester value - acid value-iodine value-Wij's method-Reichert -Meissel value-Henher value-Elaiden test-Aniline point. Hydrogenation of oils.

UNIT II **(12 hrs.)**

Fertilizers: Need For Fertilizers – Role of Primary And Secondary Nutrients in the Plant Growth – Inorganic Fertilizers - Urea - Ammonium Nitrate - Ammonium Sulphate - Superphosphate of Lime - Triple Superphosphate.

Water: Potability of Water – Hardness of Water – Determination using EDTA. Treatment of Water for Municipal supply – Screening – Clarification - Coagulation – Sedimentation – Sterilization and Disinfection – Aeration - Chlorination.

UNIT III **(12 hrs.)**

Fuels: Characteristics of good fuel-classification-calorific value-comparison between solid, liquid and gaseous fuels. Gaseous fuels-Composition, production and uses of water gas-producer gas-semi water gas-gobar gas-LPG-CNG-Hydrogen as fuel.

UNIT IV **(12 hrs.)**

Polymers: Monomers – Polymers – Types Of Polymerization – Addition – Condensation Plastics - Thermo setting plastics – Thermo plastics – Applications - Preparation and Applications of PVC – Teflon – Polyesters – Buna –S Rubber. **Silicones:** Synthesis – Properties - Uses

UNIT V **(12 hrs.)**

Adsorption: Definition-classification-Difference between chemical and physical adsorption-Characteristics-Adsorption of gases on solids-adsorption of solutes from solutions- Applications of adsorption. Ion exchange adsorption in water softening (Zeolite process only)

Chromatography: Principle And Application of Column - Paper - Thin Layer Chromatography.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition

1.	Veeraiyan V.	Allied Chemistry Paper I & II	Highmount Publishing House	2005, 2nd Edition
2.	B.K.Sharma	Industrial Chemistry	Goel publishing House	2013, 17th Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Bhal B.S. & Arunbahl	Advanced of Organic Chemistry	S. Chand & co, New Delhi	2016, 1st Edition
2.	Jain and Jain	Engineering Chemistry	Dhanpat Rai Publishing Company	2010, 15th Edition
3.	Puri B.R., Sharma L.R. & Pathania M.S.	Principles of Physical Chemistry	Sobanlal Nagin chand & co., New Delhi	2016, 47th Edition
4.	Puri B.R. & Sharma L.R.	Principles of Inorganic Chemistry	Vishal Publishing Company, Jalandhar	2016, Revised Edition
5.	Soni P.L.	Text Book of Inorganic Chemistry	Sultan chand & sons, New Delhi	2003, 20th Edition

Pedagogy

- Lecture, PPT, Quiz, Assignment, Group Discussion, Seminar

CODE	COURSE TITLE
18CHUA202	ALLIED CHEMISTRY II (for B.Sc PHYSICS)

Category	CIA	ESE	L	T	P	Credit
ALLIED	20	55	55	5	-	4

Preamble

To enable the students toacquire knowledge about chemical bonding and geometry of various molecules, familiarize with organic Fertilizers, understand various organic reactions and their mechanisms, have insight the knowledge into the chemistry of dyes, sulpha drugs and vitamins and understand the concepts of chemical kinetics and chromatography

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1.	Realise the principles of metallurgy with the process involved and have basic knowledge on coordination chemistry	K1
CO2.	Interpret the sunstitution reactions of benzene and know the chemistry of heterocyclics	K2 K3
CO3.	Classify and characterize Amino acids and Carbohydrates	K2
CO4.	Familiarize with various polymers and applications	K2 K3
CO5.	Recognise the principles of electrochemistry and apply them to Biological Systems	K1 K3

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **(12 hrs.)**

General Methods Of Extraction Of Metals: Types Of Ores - Method Of Ore Dressing - Reduction Methods - Electrical Methods - Types Of Refining - Van Arkel - Zone Refining. **Coordination Chemistry:** Co-ordination Number - Ligands – Monodentate – Bidentate - Nomenclature Of Complexes - Theories – *Werner* – Sidgwick - Pauling.

UNIT II **(12 hrs.)**

Aromatic Compounds - Electrophilic Substitution In Benzene - Mechanism Of Nitration – Halogenation - *Alkylation* - *Acylation* - Sulphonation – Isolation – Preparation - Properties And Structural Elucidation Of Naphthalene. **Heterocyclics:** Preparation And Properties Of Furan – Pyrrole - Thiophene And Pyridine.

UNIT III **(12 hrs.)**

Amino Acids: Classification - Preparation - Properties – Peptides – Dipeptide Synthesis. **Proteins:** Classification – Characteristics – Colour Reactions – Biological Functions - Structure

Carbohydrates : Classification - Glucose And *Fructose* - Preparation – Properties - Open Chain Structure - Glucose - Fructose Interconversion

UNIT IV **(12 hrs.)**

Polymers: Monomers – Polymers – Types Of Polymerization – Addition – Condensation Plastics - Thermo Setting – Thermo Plastics – Applications - Preparation And Applications Of PVC – Teflon – Polyesters – Buna –S Rubber – **Silicones:** Synthesis – Properties - Uses

UNIT V **(12 hrs.)**

Electrochemistry : Kohlrausch Law – Conductometric Titrations - Galvanic Cell - Standard Electrode Potential – Calculation Of EMF From Single Electrode Potential- Electrochemical Series And Its Applications - pH And Its Determination By Conductivity Method – EMF method (Using Hydrogen Electrode Only) - *Buffer Solutions* And Its Importance In Biological Systems.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Veeraiyan V.	Allied Chemistry Paper I & II	Highmount Publishing House	2005, 2nd Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Bhal B.S. & Arunbahl	Advanced of Organic Chemistry	S. Chand & co., New Delhi	2016, 1st Edition
2.	Bahl B.S. & Tuli G.D.	Essentials of Physical Chemistry	S. Chand & co., New Delhi	2014, 27th Edition
3.	Jayashree Ghosh	Applied Chemistry	Sultan chand & sons, New Delhi	2006, 1st Edition
4.	Puri B.R., Sharma L.R. & Pathania M.S.	Principles of Physical Chemistry	Sobanlal Nagin chand & co., New Delhi	2016, 47th Edition
5.	Sharma B.K.	Industrial Chemistry	Goel Publishing House	2011, 16th Edition
6.	Soni P.L.	Text Book of Inorganic Chemistry	Sultan chand & sons, New Delhi	2003, 20th Edition
7.	Sivakumar R. & Sivakumar N.	Engineering Chemistry I & II	Tata McGraw-Hill Publishing Company Limited, New Delhi	2013, 3rd Edition

Pedagogy

- Lecture, PPT, Quiz, Assignment, Group Discussion, Seminar

CODE	COURSE TITLE
18CHUA002/ 18CHUA404	ALLIED CHEMISTRY II (FOR B.Sc N&D,BOTANY and ZOOLOGY

Category	CIA	ESE	L	T	P	Credit
ALLIED	20	55	55	5	-	4

Preamble

To enable the students to acquire knowledge about the concepts of Coordination and Bio inorganic chemistry, sources of carbohydrates and vitamins, chemistry of amino acids, proteins and drugs and understand the chemistry of PCPs.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1.	Realize the concepts of chemistry of coordination compounds and Bio inorganic chemistry	K1
CO2.	Classify and identify the sources of carbohydrates and vitamins	K2 K3
CO3.	Interpret the properties of amino acids and proteins and acquire skills in first aid.	K2
CO4.	Familiarize the nature of various therapeutic drugs	K2 K3
CO5.	Categorize the chemistry of different cosmetics and soaps	K1 K3

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **(12 hrs.)**

Coordination Chemistry: Co-ordination Number - Ligands – Monodentate – Bidentate - Nomenclature Of Complexes - Theories – Werner – Sidgwick - Pauling. Analytical applications. Haemoglobin and Chlorophyll.

Bio inorganic Chemistry: Role of alkali and alkaline earth metal ions in biological systems-biological functions and toxicity of elements like Cr, Mn, Co, Ni, Cu, As, Se, Cd, Hg, Pb, Fe, Zn and Mo.

UNIT II **(12 hrs.)**

Carbohydrates : Classification - Glucose And Fructose - Preparation – Properties - Open Chain Structure - Glucose - Fructose. Interconversions-Glucose to Fructose and vice versa.

Vitamins: Classification-sources and deficiency diseases of Vitamin A, B, C, D, E and K

UNIT III **(12 hrs.)**

Amino Acids: Classification - Preparation - Properties – Peptides – Dipeptide Synthesis.

Proteins: Classification – Characteristics – Colour Reactions – Biological Functions.

First Aid: First aid box-First aid for accidents-cuts, abrasions and Bruises-Bleeding-Fractures-Burns-Fainting-Poisonous bites.

UNIT IV **(12 hrs.)**

Chemotherapy: Biological classification-Sulpha drugs-Preparation of Sulphanamide-Sulphapyridine Mode of Action -Therapeutic uses-Antibiotics- Definition- Structure and uses of Penicillin G – Chloramphenicol - Paracetamol preparation and therapeutic uses-Antimalarial-Life cycle of malarial parasites-uses of Chloroquine as antimalarial.

UNIT V **(12 hrs.)**

Chemistry of Cosmetics: Skin Care - Hair Care - Deodorants and Antiperspirants - Colour Cosmetics – Mascara - Eyeshadow and Eyebrow Pencils - Sun screen lotions. Shampoo- Perfumes.

Soaps: Preparation -Properties-Cleansing action-Advantages-Disadvantages-Difference between soaps and detergents.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Veeraiyan V.	Allied Chemistry Paper I & II	Highmount Publishing House	2005, 2nd Edition
2.	B.K.Sharma	Industrial Chemistry	Goel publishing House	2013, 17th Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Bhal B.S. & Arunbahl	Advanced of Organic Chemistry	S. Chand & co., New Delhi	2016, 1st Edition
2.	Bahl B.S. & Tuli G.D.	Essentials of Physical Chemistry	S. Chand & co., New Delhi	2014, 27th Edition
3.	Jayashree Ghosh	Applied Chemistry	Sultan chand & sons, New Delhi	2006, 1st Edition
4.	Puri B.R., Sharma L.R. & Pathania M.S.	Principles of Physical Chemistry	Sobanlal Nagin chand & co., New Delhi	2016, 47th Edition
5.	Jain and Jain	Engineering Chemistry	Dhanpat Rai Publishing Company	2010, 15th Edition
6.	Soni P.L.	Text Book of Inorganic Chemistry	Sultan chand & sons, New Delhi	2003, 20th Edition
7.	Sivakumar R. & Sivakumar N.	Engineering Chemistry I & II	Tata McGraw-Hill Publishing Company Limited, New Delhi	2013, 3rd Edition

Pedagogy

- Lecture, PPT, Quiz, Assignment, Group Discussion, Seminar

CODE	COURSE TITLE
18CHUAPO1	ALLIED CHEMISTRY PRACTICALS

Category	CIA	ESE	L	T	P	Credit
CORE	20	30	-	-	45	2

Preamble

The course aims to impart the principles and procedure for quantitative analysis to the students of other science disciplines and the qualitative analysis organic functional groups

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1.	Perform quantitative analysis of solutions containing inorganic substances	K1
CO2.	Carryout skillfully the qualitative and quantitative analysis of solutions	K2 K3
CO3.	Identify and detect various organic functional groups.	K2
CO4.	Identify the special elements present in organic compounds	K3
CO5.	Analyze the aliphatic/aromatic , saturated unsaturated character of organic compounds	K3

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

I VOLUMETRIC ANALYSIS

1. Estimation Of Sodium Hydroxide Using Standard Sodium Carbonate
2. Estimation Of Hydrochloric Acid-Standard Oxalic Acid
3. Estimation Of Oxalic Acid –Standard Sulphuric Acid
4. Estimation Of Ferrous Sulphate-Standard Mohr's Salt Solution.
5. Estimation Of Oxalic Acid –Standard Ferrous Sulphate
6. Estimation Of Potassium Permanganate.

II ORGANIC ANALYSIS

1. Detection Of Elements (N, S And Halogens)
2. To Distinguish Between Aliphatic And Aromatic, Saturated And Unsaturated Compounds.
3. Functional Group Tests For Mono Hydric Phenol, Acids (Mono And Di), Aromatic Primary Amine, Amide, Diamide And Glucose. Systematic Analysis Of Organic Compounds Containing One Functional Group And Characterization By Confirmatory Tests.

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Pedagogy

Demonstration ,PPT, Experimental work