SEMESTER – I

CC I - INORGANIC CHEMISTRY – I

Int Mark : 25	**Subject Code : PQA**
Ext Mark: 75	**Exam Hours :3**

Pre-requisite:

B. Sc. Degree, Basic inorganic chemistry and periodic properties

OBJECTIVES:

1. To understand the concepts of Acids and Bases.

2. To learn the structure of crystal lattice.

3. To study the concepts of different types of bonds.

UNIT – I: IONIC BOND AND CRYSTAL STRUCTURE (18 Hours)

Radius ratio rules-calculation of limiting ratio rules of Coordination number 3 to 6. Classification of ionic Radius Ratio rules – Calculation of some limiting radius ratio values for Coordination number.3 (planar Triangle), Coordination number.4 (tetrahedral), Coordination number.6 (octahedral).Classification of Ionic structures – AX(ZnS, NaCl, CsCl,), AX_2 (CaF_2, TiO_2, CdI_2).

Lattice energy- Born Lande equation –Kapustinski equation-High Tc superconductors- Solid state reactions- Types and examples.

UNIT – II: COVALENT AND CO-ORDINATE BOND (18 Hours)

Theories, nomenclature of mono and polynuclear complexes. Crystal field theory – shapes of d orbitals. Splitting of d orbitals in octahedral symmetry – CFSE – strong field and weak field splitting – calculation of CFSE for dn system. Splitting in tetrahedral symmetry – only weak field splitting – reasons. Tetragonal symmetry – difference between tetrahedral and tetragonal symmetry. Jahn – Teller distortion – splitting pattern in trigonal, square planar, trigonal bipyramidal, square pyramidal, cubic symmetries. Factors affecting the magnitude of splitting (10 Dq), Oxidation state of the ligands, nature of the ligands – spectrochemical studies. Jorgensens relation. Evidences for CFT.

M.O. Theory – Octahedral, tetrahedral and square planar complexes. Pi bonding and M.O. theory – ligands having filled and empty pi bonds – effects on 10 Dq. Evidences for pi bonding – Nephelauxetic effect – angular overlap model.

UNIT –III; Reaction Mechanism in Coordination Complexes(18 Hours)

Kinetics and mechanism of reactions in solution – labile and inert complexes – ligand displacement reactions in octahedral and square planar complexes – acid hydrolysis, base hydrolysis and anation reactions.

Trans effect – theory and applications – electron transfer reactions – electron exchange reactions – complementary and non-complementary types – inner sphere and outer sphere processes – application of electron transfer reactions in inorganic complexes –

isomerisation and racemisation reactions of complexes.

Molecular rearrangements of four- and six-coordinate complexes – interconversion of stereoisomers – reactions of coordinated ligands – template effect and its applications for the synthesis of macrocyclic ligands – unique properties.

UNIT – IV: ACIDS AND BASES (18 Hours)

Usanowich concept-generalised acid base concept-steric and solvation effect-measure of acid base strength. HSAB principle-classification of acid and base as hard and soft-E and C parameters-theoretical base of hardness and softness.

Non-aqueous solvent-Differentiating and Leveling Solvents-solvation number-medium effect-pH measurement in non-aqueous media-liquid ammonia, SO_2, H_2SO_4, HCN, HF as solvents.

UNIT – V: NUCLEAR CHEMISTRY (18 Hours)

Nuclear properties - modes of radio active decay. Alpha and beta decay, orbital electron capture, nuclear isomerism, internal conversion

Detection and determination of radio activity. Cloud chamber, nuclear emulsion, Geiger Muller counter, scintillation and cherankov counters

Nuclear reaction -Transmission, fission, fusion, spallation and fragmentation reactions. Neutron sources - neutron activation and isotopic dilution analysis.

TEXT BOOKS:

1. **J.D. Lee**, A new concise Inorganic chemistry, 4th edn. ELBS, 1995(Unit I & II).
2. **James E. Huheey, Ellen A. Keiter and Richard L. Keiter**, Inorganic chemistry, Principles of structure and reactivity, 4th edn., Addision – Wesley, New York
3. **Cotton & Wilkinson**, Advanced inorganic chemistry,V edition.,John Wiley and Sons.,Newyork.

REFERENCES :

1. **L. Pauling**, The Nature of the Chemical Bond, 3rd Ed., Cornell University Press,

2. **F. Basolo, R.G. Pearson**, Mechanism of Inorganic Reactions, 2nd Ed., John Wiley, 1967.

SEMESTER – I
CC II - PHYSICALCHEMISTRY – I

Int Mark : 25 **Subject code : PQB**
Ext Mark : 75 **Exam Hours : 3**

Pre-requisite:

Basic mathematics at the B.Sc I/II year levels. Preliminary knowledge of symmetry, Basic thermodynamics, chemical kinetics and group theory.

OBJECTIVES:

1. To study the theories of kinetics,
2. To understand the concepts of group theory and quantum chemistry.
3. To learn the chemical kinetics and statistical thermodynamics.

UNIT – I: CHEMICAL KINETICS – I (18 Hours)

Kinetics of complex reaction- opposing, consecutive and parallel reactions ,chain reactions – thermal and photochemical reaction between hydrogen and halogens, gas phase autoxidation, explosions , hydrogen – oxygen reaction.

Theory of unimolecular reactions – Lindemann's theory – Hinshelwood theory – treatment of ARR theory, Slater's treatment.

Principles of microscopic reversibility, steady state approximation –Theories of reaction rates – simple collision theory – absolute reaction rate theory (ARRT) to simple unimolecular and bimolecular processes – potential energy surfaces – kinetic isotopic effect.

UNIT – II: CHEMICAL KINETICS – II(18 Hours)

Factors influencing reaction rates in solution – application of ARRT to solution kinetics – effect of solvents, double sphere and single sphere model and effect to ionic strength – influence of pressure on rates in solution – significance of volume of activation – substituent effect , Hammett and Taft equations.

Homogeneous catalysis: Acid – base catalysis – Hammett – Deyrup acidity function – Bronsted relation – Enzyme catalysis – mechanism of single substrate reactions – Michaelis – Menten law – influence of pH and temperature.

Fast reaction: Luminescence and energy transfer processes – Study of kinetics by stopped flow technique, relaxation methods T and P jump methods flash photolysis and magnetic resonance method**.**

UNIT III: GROUP THEORY (18 Hours)

Elements of group theory : Properties of a group and subgroup – classes – group multiplication tables – isomorphism groups – symmetry elements and symmetry operations – interrelations among symmetry operations –point groups-assignment of point groups to molecules – matrix representation theory – consequences of great orthogonality theorem and construction of character tables – characters, reducible and irreducible representations – Direct products.

Application of group theory: Finding symmetry of normal and active modes of vibration for H_2O and BF_3 only. Symmetry selection rules for IR and Raman Spectra.

UNIT – IV: STATISTICAL MECHANICS (18 Hours)

Basic concepts and classical statistics : Statistical mechanics – calculation of thermodynamic probability of a system – Ensembles – phase space – Eragodic hypothesis – definition of micro and macro states – different methods of counting macro states – distinguishable and indistinguishable particles – classical statistics – derivation of Maxwell Boltzmann distribution law.

Translational, rotation, vibration, electronic partition function – calculation of enthalpy, internal energy, entropy and other thermodynamic functions in terms of partition functions – applications of partition function to mono atomic gases and diatomic molecules.

UNIT V :QUANTUM STATISTICS (18 Hours)

Quantum statistics – Bose Einstein and Fermi – Dirac statistics – comparison of them with Boltzmann statistics Heat capacity of solids – Einstein and Debye's treatments – concept of negative Kelvin temperature.

Third law of thermodynamics: Need for the third law – Nernst heat theorem and other forms of stating the third law. Thermodynamic quantities at absolute zero – statistical meaning of third law – apparent exception to the third law.

Non-equilibrium thermodynamics: Thermodynamics of irreversible processes – Onsager's reciprocal relations – Steady – state conditions.

TEXT BOOKS:

1.**J.Laidler**, chemical kinetics,Third edition.,Tata –McGraw Hill.

2.. **F.A.cotton**,chemical application of group theory,second edition.wiley-eastern press

REFERENCE:

1**. L.Amdur and G.G.hammes**,chemical kinetics-principle and selected topics, McGraw-hill(1966)

2. **Zemanseky**,Heat and thermodynamics, McGraw Hill edn.

3.**H.Clark,** A.First Course in Quantum Mechanics. ELBS (1983)

SEMESTER – I

CC III - ORGANIC CHEMISTRY PRACTICALS – I

Int Mark : 40	**Subject Code : PQCY**
Ext Mark : 60	**Exam Hours : 3**

Pre-requisite:

Undergraduate level Organic chemistry concepts

OBJECTIVES:

1. To perform the qualitative analysis of a given organic mixture.
2. To carry out the separation by paper chromatography technique.

1. Analysis of mixture of Organic Compounds
2. Separation by paper Chromatography Technique.

TEXT BOOKS:

1. **J. Mohan**, Organic Analytical Chemistry, Theory and Practice, Narosa, 2003.
2. **V.K. Ahluwalia, P. Bhagat, R. Aggarwal**, Laboratory Techniques in Organic Chemistry, I.K. International, 2005.
3. **N.S. Gnanaprakasam, G. Ramamurthy**, Organic Chemistry Lab Manual, S.V. Printers.

REFERENCE:

1. **A.I. Vogel, A.R. Tatchell, B.S. Furniss, A.J. Hannaford, P.W.G. Smith**, Vogel's Textbook of Practical Organic Chemistry, 5th Ed., Prentice Hall, 1996.

SEMESTER – I

CC IV - INORGANIC CHEMISTRY PRACTICALS –I

Int Mark : 40 **Subject Code : PQDY**

Ext Mark: 60 **Exam Hours : 3**

Pre-requisite

Undergraduate level Inorganic chemistry concepts

OBJECTIVES:

1. To estimate the metal ions using quantitative analysis.

I. Estimation of mixture solutions:

1. Estimation of Copper and Zinc
2. Estimation of Iron and Nickel
3. Estimation of Copper and Nickel
4. Estimation of Calcium and Magnesium

II. Colorimetric estimations of Copper, Iron, and Nickel

Reference Book:

1. A.I. Vogel's, Quantitative Inorganic Analysis, 5th Ed., Prentice Hall, 1996

SEMESTER – I

CC V - ORGANIC CHEMISTRY – I

Int Mark : 25 **Subject Code : PQE**

Ext Mark: 75 **Exam Hours : 3**

Pre-requisite

Basics in stereochemistry and physical organic chemistry

OBJECTIVES:

1.To introduce retrosynthetic analysis and modern synthetic reagents

2.To understand the nucleophilic and electrophilic substitution reactions.

3. To learn the addition and elimination reactions.

UNIT – I : AROMATIC COMPOUNDS (18 Hours)

Elements of aromaticity – Huckel's and Craig's rule – effects of aromaticity on bond lengths – ring currents. Nonbenzenoid aromatic compounds – aromatic character in three, five, seven and eight membered rings – anti aromaticity – systems with 2, 4, 8 and 10 electron systems. Annulenes and syndones – alternant and non – alternant hydrocarbons**.**

ELIMINATION REACTIONS:

E1, E2, E1CB and Ei – mechanisms – stereochemistry of eliminations – Hoffman and saytzeff rules – Competition between elimination and substitution reactions – Chugaev reaction dehydration of alcohols, dehydrohalogenation – Hoffman degradation. Cope elimination – Bredt's rule.

UNIT – II: ORGANIC STEREOCHEMISTRY (18 Hours)

Configurational nomenclature – D and L nomenclature R-S nomenclature of acylic and cyclic chiral compounds – stereochemistry of allenes, spiranes, biphenyls (atropisomerism), Stereochemistry of Ansa compounds, cyclophanes. Definition of terms prochirality. Enantiotopic and diastereotopic group – asymmetric synthesis – Cram's rule.

DYNAMIC STEREOCHEMISTRY:

Quantitative correlation between conformation and reactivity, Winstein – Eliel equation, Curtin – Hammett principle. Conformation, reactivity and mechanisms of cyclic systems – saponification of an ester, esterification of an alcohol, chromic acid oxidation of 2,2-aminocyclohexanol – stereospecific, stereoselective,diastereoselective & Enantioselective reaction

UNIT – III : STEROIDS (18 Hours)

Classification – structural elucidation of cholesterol (synthesis not required) – structural elucidation and synthesis of vitamin D – estrone, progesterone, ergosterol, stigmasterol, equilenin, androsterone and cortisone**.**

UNIT–IV: MOLECULAR REARRANGEMENTS & ITS MECHANISMS

(18 Hours)

C=C REARRANGEMENTS: Wagner Meerwein, Dienone – phenol, Stevens, Wittig, Favorski rearrangements.

C=N REARRANGEMENTS: Wolf, Lossen, Schmidt rearrangements.

C=O REARRANGEMENTS: Bayer – Villiger rearrangement

HETEROCYCLES:

Synthesis and reactions of azoles – pyrazole, imidazole, oxazole and thiazole – synthesis and reactions of oxazine, pyridazine, pyrimidine and pyrazine.

.**UNIT -V: Modern Synthetic methodology**

Retrosynthetic analysis or Synthon approach. -- An introduction to reterosynthesis - synthon – synthetic equivalent – target molecule, functional group interconversion. Disconnection approach-One group disconnections-Disconnection of alcohols,olefins, ketones. Two group disconnections – 1,3-dioxygenated skeletons-1,5-dicarbonyl compounds .Illogical two group disconnections strategy.

TEXT BOOKS:

1. **D. Nasipuri,** Stereochemistry of Organic Compounds-Principles and Applications, 2nd Ed., New Age International, 2002
2. **Warren, S., Wyatt, P.,** Organic Synthesis: The Disconnection Approach, Wiley, **2008**

REFERENCES:

1. **J. March**, Advanced Organic Chemistry; Reactions, Mechanisms and Structure, 6th Ed., Wiley-Interscience, 2007.

2.E.L. Eliel, Stereochemistry of carbon compounds McGraw Hill, 1975.

3. **O.P.Agarwal**, Chemistry of organic natural products Vol. I and Vol. II, 1997 Goel Publications.
4. **Willis, C. L., Wills, M.,** Organic Synthesis, Oxford Chemistry Primers, 31, Oxford Science
Publications, **1996**.

5.**Starkey, L., S**., Introduction to Strategies for Organic Synthesis, Wiley, **2012**

SEMESTER – II

CC VI - ORGANIC CHEMISTRY – II

Int Mark : 25 **Subject Code : PQF**

Ext Mark: 75 **Exam Hours : 3**

Pre-requisite

Basic organic chemistry

OBJECTIVES

To introduce the concepts of photochemistry, pericyclics, and name reactions

UNIT – I: NAMING REACTIONS (18 Hrs)

Addition to carbon – carbon multiple bonds: Birch reduction, hydroxylation, hydroboration, epoxidation, Diels – Alder reaction, Michael addition, ozonolysis, carbenes and their addition to double bonds.

Addition to carbonyl groups : Mannich, crossed Cannizzaro, Stobbe, Benzoin, formation of ketenes, Oppenauer oxidation, MPV reduction, Darzon's glycidic ester condensation, Wittig reaction.

UNIT – II : ALIPHATIC NUCLEOPHILIC SUBSTITUTION (18 Hrs)

SN_1, SN_2 and SN_I mechanisms – effects of substrate structure, leaving group,

attacking nucleophiles and solvent – neighbouring group participation – substitutions at allylic carbons and reactivity – ambident nucleophiles.

ALIPHATIC ELECTROPHILIC SUBSTITUTION - SE_1, SE_2 and SE_I mechanisms – effect of substrate structure, leaving group and solvent – Stark – enamine reaction – decarboxylation of aliphatic acids – halogenation of aldehydes and ketones.

AROMATIC ELECTROPHILIC SUBSTITUTION –Aromatic ion mechanism – Orientation and reactivity – nitration, halogenation – Friedel – Crafts reaction – Gattermann, Kolbe – Schmidt, Reimer – Tiemann, Hauben – Haesch reaction.

UNIT – III: NATURAL PRODUCTS (18 Hrs)

Antibiotics : Structural elucidation and synthesis of penicillin, streptomycin – cephalosporin C.

Terpenes : Structural elucidation, medicinal values and synthesis of α – pinene, camphor and zingiberene, biosynthesis of terpenes

Alkaloids : Structural elucidation, medicinal values and synthesis of quinine, reserpine morphine – Cinchonine and papaverine. Biosynthesis of alkaloids.

Vitamins : Physiological importance – structural elucidation of vitamins – B_6, B_{12}, E,K.

UNIT – IV: ORGANIC PHOTOCHEMISTRY (18 Hrs)

Fundamental concepts – Joblonski diagram – energy transfer – characteristics of photoreaction and photoxidation – photoreaction of ketones and enones – Norrish type I & II reactions. Photochemistry of alkenes, dienes and aromatic compounds. Photosensitisation – photoaddiation – Barton reaction – paterno – Buchi reaction. Phosphorescence, fluorescence, chemi luminescence.

PERICYCLIC REACTIONS - Concerted reactions – stereochemistry – orbital symmetry and correlation diagram – Frontier molecular orbital approach – Woodward Hoffmann rules – electrocyclic reactions – cycloadditions, selection rules, sigmatropic rearrangements – selection rules with simple examples – 1, 3 and 1, 5 – hydrogen shifts – Cope and Claisen rearrangements.

UNIT V : MASS SPECTROSCOPY (18 Hrs)

Basic principles – resolutions – base peaks, isotopic peaks, metastable peaks, parent peaks, determination of molecular formula – recognition of molecular ion peak, FAB fragmentation – general rules. Nitrogen rule – pattern fragmentation of various classes of compounds. McLafferty rearrangement, importance of metastable peaks.

OPTICAL ROTATORY DISPERSION AND CIRCULAR DICHROISM :

Introduction to theory and terminology, cotton effect and ORD curves. Axial haloketone rule and its applications – Octant rule and its applications. Application of ORD to determine absolute configuration of simple monocyclic ketones – comparison between ORD and CD and their inter-relationship.

TEXT BOOKS:

1. **Y.R.Sharma,** Elementary organic spectroscopy, Principle and chemical applications, S.Chand. 1992.
2. **Jerry March,** Advanced Organic Chemistry, Reactions Mechanisms and structure, 4th edition, Wiley, 1999.
3. **Raj K.Bansal,** Organic reaction Mechanisms, 3rd edition, 1998.
4. **I.L. Finar,** Organic chemistry Vol. II 5th edition ELBS – 1975
5. **O.P. Agarwal,** Chemistry of organic natural products, Goel publication Vol. I & II.
6. **M.G.Arora,** Organic Photochemistry and Pericyclic Reactions**.**
7. **William Kemp,** Organic spectroscopy, ELBS Macmillan 1991**.**
8. **I.L.Finar,** Organic chemistry Vol. II 5th edn. ELBS, 1993.

REFERENCES :

1.P.M.Silverstein, G.C.Bassler and T.C.Morrill, Spectroscopic identification of organic compounds. 3rd edn. 1974.

2.P.S.Kalsi, Spectroscopy of organic compounds, Wiley, 1993.

SEMESTER – II

PQG - CORE COURSE –VII - INORGANIC CHEMISTRY – II

Int Mark: 25 **Subject Code : PQG**

Ext Mark: 75 **Exam Hours : 3**

Pre-requisite:

Basic inorganic chemistry

OBJECTIVES:

1. To introduce the concepts of organometallics, bonding, structure, reaction mechanism, catalysis and spectroscopy to study them
2. To introduce the Medicinal Bioinorganic Chemistry and inorganic photochemistry.
3. To learn the electronic spectra.

UNIT-I:. OXYGEN TRANSPORT AND ENERGY TRANSFER OF METAL PROTEINS: (18 Hours)

Haemoglobin and myoglobin – Oxygen transport and storage. Electron transfer and Oxygen activation. Ferridoxins and rubredoxins – Copper proteins – Classification – Electron transfer, Oxygen transport. Oxidases and reductases – Cytochrome oxidases – superoxide dismutase (Cu, Zn), Urease and hydrogenases.

Catalysis by organo metallic compounds hydrogenation and hydroformulation of olefins – oxidation of olefins to aldehydes and ketones –polymerisation of alkenes cyclo-oligomerisation of acetylene- fischer –Tropschs synthesis.

UNIT-II : ORGANO METALLIC COMPOUNDS (18 Hours)

Complexes of pi-acceptor ligands. Carbonyls-18 electron rule-application to structure of carbonyls(simple and polynuclear). Carbonylate anions, carbonyl anions, Carbonylate hydrides-Dinitrogen complexes.

CARBON PI DONOR COMPLEXES:

Synthesis, structure and bonding of olefin, alkyne and allyl complexes. Metallocenes-stability and reactivity. Molecular orbital concept of Metallocenes.

UNIT –III: INORGANIC PHOTOCHEMISTRY

Electronic transitions in metal complexes, metal-centered and charge-transfer transitions – various photophysical and photochemical processes of coordination compounds.

Unimolecular charge-transfer photochemistry of cobalt(III) complexes – mechanism of CTTM, photoreduction – ligand-field photochemistry of chromium(III) complexes – Adamson's rules, photoactive excited states, V-C model – photophysics and photochemistry of ruthenium – polypyridine complexes, emission and redox properties.

Photochemistry of organometallic compounds – metal carbonyl compounds – compounds with metal-metal bonding – Reinecke's salt chemical actinometer.

UNIT-IV: MEDICINAL BIOINORGANIC CHEMISTRY

Bioinorganic chemistry of quintessentially toxic metals – lead, cadmium, mercury, aluminium, chromium, copper and plutonium – detoxification by metal chelation – drugs that act by binding at the metal sites of metalloenzymes.

Chemotherapy – chemotherapy with compounds of certain non-essential elements – platinum complexes in cancer therapy – cisplatin and its mode of action – cytotoxic compounds of other metals.

Gold containing drugs as anti-rheumatic agents and their mode of action – lithium in psychopharmacological drugs – radiopharmaceuticals – technetium.

UNIT – V: ELECTRONIC SPECTRA : (18Hours)

Electronic spectra of molecules dissociation energy – rotational fine structure of electronic vibrational transitions. Fortrat diagram predissociation.

Terms, states and micro states of atoms and ions – derivation of term symbols (p2 and d2) spectroscopic terms – L-S coupling and J-J coupling – effect of inter electronic repulsion and spin-orbit coupling – Recah parameters B and C – selection rules and the break down of selection rules – mixing of orbitals – orgel diagram or dn weak field systems – Tanabe –sugano diagrams-prediction and assignment of transitions- calculation of B and 10 Dq for simple octahedral complexes of co and Ni Charge transfer spectra.

TEXT BOOKS:

1. **Shriver, Atkins and Langford.** Inorganic chemistry, ELBS. 1994 (Unit II)
2. **A.F.A.Kettle** Co-ordination Compounds ,EIBS(Unit III,IV,V
3. **S. J. Lippard and J. M. Berg**, Principles of Bioinorganic Chemistry; Panima Publishing Company, New Delhi, 1997.

4 A. W. Adamson, Concept of Inorganic Photochemistry; John Wiley and Sons, New

REFERENCES:

1.James E. Huheey Fllon A.Keiter and Richard L.Keiter, - Inorganic chemistry, 4th edn. Addison – Wesley, (Unit I, III, IV).

2. Keith F.Purcell and John C.Kotz, Inorganic chemistry, Saunders Golden Sunburst series**, W.B. Saunders company, Philadelphia, 1977 (Unit IV and V).**

3.R.S.Drago Physical methods in inorganic chemistry

4.W. Kaim and B. Schewederski, Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life; 2nd Ed., John Wiley and Sons, New York, USA, 2013.

5. G. L. Eichhorn, Inorganic Biochemistry; Volumes 1 and 2, 2nd Ed., Elsevier Scientific Publishing Company, New York, 1975.

7. J. Ferraudi, Elements of Inorganic Photochemistry; Wiley, New York, 1988

SEMESTER – II

CC VIII - ORGANIC CHEMISTRY PRACTICALS – II

Int Mark : 40 **Subject Code : PQHY**
Ext Mark : 60 **Exam Hours : 3**

Pre-requisite:

Single step preparations

OBJECTIVES:

1. To estimate the organic compounds.
2. To carry out the two stage preparation of organic compounds

I. Estimation of organic compounds

1. Estimation of Phenol
2. Estimation of Aniline
3. Estimation of Ketone
4. Estimation of Glucose

II. Two Stage Preparations

1. Preparation of p – bromoacetanilide from aniline
2. Preparation of p – nitroaniline from acetanilide
3. Preparation of aspirin from methyl salicylate
4. Preparation of benzilic acid from benzoin.
5. Preparation of p-Nitro benzoic acid from p-Nitro toluene

Reference Books

1. **J. Mohan**, Organic Analytical Chemistry, Theory and Practice, Narosa, 2003.

2. **V.K. Ahluwalia, P. Bhagat, R. Aggarwal**, Laboratory Techniques in Organic Chemistry, I.K. International, 2005.

3. **N.S. Gnanaprakasam, G. Ramamurthy**, Organic Chemistry Lab Manual, S.V. Printers, 1987.

4. **A.I. Vogel, A.R. Tatchell, B.S. Furnis, A.J. Hannaford, P.W.G. Smith**, Vogel's Textbook of Practical Organic Chemistry, 5th Ed., Prentice Hall, 1996.

EMESTER – II

CCIX - INORGANIC CHEMISTRY PRACTICALS –II

Int Mark : 40 **Subject Code : PQIY**

Ext Mark: 60 **Exam Hours : 3**

Pre-requisite:

Single step preparations

OBJECTIVES:

1. To perform the qualitative analysis of a given Inorganic mixture.
2. To carry out the preparation of Inorganic complexes.

1. **Qualitative Analysis of Common and less common cations by Semi-micro technique.**
2. **Estimation by Complexometry :**
    1. Estimation of Zinc
    2. Estimation of Magnesium
    3. Estimation of Calcium
    4. Estimation of Nickel.
3. **Preparation of the following Inorganic complexes.**
    1. Leadtetraacetate
    2. TrithioureaCopper(II)Sulphate
    3. TetrammineCopper(II)Sulphate
    4. Prussion Blue
    5. HexathioureaPlumbousNitrate (II)

Reference Books

1. **V.V. Ramanujam**, Inorganic Semi Micro Qualititative analysis, National Pubs, 1988.
2. **A.I. Vogel**, Text Book of Quantitative Inorganic Analysis, 3rd Ed., Longman, 1966.

SEMESTER – II

EC I - NON – CONVENTIONAL ENERGY SOURCES

Int Mark : 25 **Subject Code : PQE1**

Ext Mark: 75 **Exam Hours : 3**

Pre-requisite

Undergraduate level Renewable Energy Sources concepts

OBJECTIVES:

1. To understand the various types of energy sources.
2. To learn the Solar, Wind and Bio energy.
3. To know the different tidal power plants.

UNIT: I ENERGY SOURCES (18 Hours)

Introduction to energy - Different forms of energy - Primary & Secondary Energy sources - Various types of Conventional Energy Sources- Fossil fuel energy,Hydraulic energy & Nuclear energy - Various types of Non-Conventional Energy Sources - Wind energy,Tidal energy & Solar energy.

UNIT: II SOLAR ENERGY (18 Hours)

Introduction - Solar Constant - Solar Radiation at the Earth's Surface - Solar Energy applications - Solar Cooker - Design principle , constructional details and limitations of Solar Cooker - Solar Water heater - Solar distillation - Solar Pumping - Electricity from Solar Energy - Street lighting system.

UNIT: III WIND ENERGY AND FUEL CELLS (18 Hours)

Wind energy - Classification of wind mills - Horizontal Wind mills, Vertical Wind Mills – Advantages & Disadvantage of Wind energy.

Fuel cells – Introduction - Working of Fuel Cell - Advantages of Fuel Cells

UNIT: IV BIO ENERGY (18 Hours)

Introduction - Bio Gas and its Compositions - Process of Bio gas, generation – Wet Process, dry Process - Raw Materials available for Bio gas Fermentation - Constructional Details of Biogas Plant - Utilization and benefits of Biogas Technology - Economical, social environmental and health benefits of bio gas - Utilization - KVIC Bio gas Plant - Advantages of Bio Gas technology.

UNIT: V TIDAL POWER PLANTS (18 Hours)

Introduction to Tidal Power Plants - Classification of tidal Power Plants - Working of Different Tidal Power Plants - Factors affecting the suitability of the site for tidal power plant - Advantages and disadvantages of Tidal Power Plants - Components of Tidal Power plants.

TEXT BOOKS*:*

1**. Roger H.Charlier, Charles W**. " Ocean Energy- Tide and Tidal Power"ISBN: Library of Congress Control Number: 2008929624_c Springer-Verlag Brerlin Heidelberg 2009.

2. **John Twidell & Toney Weir: E&F.N. Spon**, "Renewable Energy Sources", Taylor & Francis New York, 2nd edition.

REFERENCE :

1. **John F.Walker & N.Jenkins**, "Wind Energy Technology", John Willey and Sons Chichester, U.K – 1997.

2. **T H Taylor** Alternate Energy Sources by**.Adam Hilger Ltd, Bristol**

SEMESTER – II

EC I - COMPUTER APPLICATIONS AND C-PROGRAMMING

Int Mark : 25 **Subject Code :**

Ext Mark: 75 **Exam Hours : 3**

Pre-requisite

Basic concepts of Computers in Chemistry

OBJECTIVES:

1. To study details about the basic concepts of computing and Networking.
2. To understand the C-Programming and its applications.

UNIT – I: BASIC CONCEPTS OF COMPUTING AND NETWORKING(18 Hours)

Introduction of computer and computing- basic organization of a computer- cpu - main memory - secondary storage - I/O devices – software – system and application software – high and low level languages – compilers - algorithms and flowcharts.

Introduction to networking - computer networks – network components hubs, switches, repeaters, bridges – brouters and gateways – network topologies – star, bus and band rings – LAN, WAN, internet and internet - world web – internet for chemists – online search of chemistry database – search engines for chemistry – chemweb - slide- designing and slide preparation

UNIT – II: C-PROGRAMMING – I (18 Hours)

C-Programming – structure of a C program – data types, variables, constants, keywords, operators, expression.

Control structure – if, if-else, nested if else while, while-do, for, nested for, go to, continue, break, switch case statement.

UNIT – III : C-PROGRAMMING – II (18 Hours)

Arrays – user defined function (Recursion, call by value and call by reference) string functions – preprocessors – storage class – structure union.

Pointers: Pointer expressions arithmetic passing pointers through arrays and functions, file handling, introduction to oops.

UNIT – IV: C-PROGRAMMING APPLICATIONS (18 Hours)

C-Programming – simple applications to chemistry, determination calculation of (1) Bohr Radius, (2) Average, R.M.S. and Most probable velocities of gas molecule (anyone), (3) D for atomic spectral transition using Rydberg equation, (4) Energy of Electromagnetic radiations (given wave length of frequency)

UNIT-V: C-PROGRAMMING APPLICATIONS

C-Programming, (1) Anharmonicity constant dissociation energy of a molecule, (2) Enthalpy change using clapeyron – clausius equation, (3) Rate constant for a first order reaction, (4) pH of a buffer solution (using Henderson's equation), (5) Calculation of vanderwalls constant.

TEXT BOOKS:

1.E.Balagurusamy-"Object Oriented Programming With C++"-Second Ed,(2003) – Tata Mc Graw –Hill Publising company limited-New Delhi.

REFERENCES:

1..K.V.Raman-"Computers in Chemistry"-First Ed,(2000) - Tata Mc Graw –Hill Publising company limited-New Delhi.