Semester: I
Title of the Paper CHC 101 Inorganic and Organic Chemistry
Class: F.Y.BSc
No. of Credits: 04 + 02

Objectives:

1. To understand the fundamentals of Inorganic and organic chemistry w.r.t. the structure of atom, the bonding involved in molecules, the theories used in explaining various types of bonds, the effects on various organic molecules, strength of organic acids, application of the Huckel's rule for the organic aromatic molecules.
2. To know the types of quantum numbers, to understand the shapes of various orbitals, the principles governing the filling up of orbitals, the effect 3D orientation of various organic molecules etc.
3. To explain the effect of polarisation on bond strength and to calculate percent ionic character in covalent bonds. To draw the molecular orbital diagrams for homo-nuclear and hetero-nuclear molecules. To explain the methods of preparation and reactions involved with the aliphatic hydrocarbons.

Course Content:

Atomic Structure, Chemical bonding and molecular structure, Fundamentals of organic chemistry, Stereochemistry, aliphatic Hydrocarbon.

Course Level Learning Outcomes:

- To **differentiate** between the various atomic models proposed.
- To **calculate** the various parameters in the wave equation.
- To **explain** the difference in bonding characteristics of ionic and covalent bonds.
- To **evaluate** the bond characteristics on the basis of bond order in homo-nuclear and hetero-nuclear molecules.
- To **predict** the effects, strength of organic acids & bases, and apply the concept of Huckel's rule to find the aromaticity.
- To **determine** the stereochemistry of organic molecules.
- To understand and apply the reactions for preparations of aliphatic hydrocarbons.

Suggested Reading:

1. J. D. Lee, Concise Inorganic Chemistry.
2. B. R. Puri, L. R. Sharma and K. C. Kalia, Principles of Inorganic Chemistry.
3. Graham Solomon, T.W., Fryhle, C.B. &Dnyder, S.A. *Organic Chemistry.*
4. McMurry, J.E. *Fundamentals of Organic Chemistry*.
5. Sykes, P. *A Guidebook to Mechanism in Organic Chemistry.*
6. Eliel, E.L. *Stereochemistry of Carbon Compounds*.

Semester: I
Title of the paper: CHG 103 Basic chemistry and Indian scientist
Class: F.Y.BSc
No.of credits: 04

Objectives:

1. To provide the basic Knowledge Organic Chemistry.
2. To make understand the involvement of Science in daily life.
3. Acquaint with contribution of Indian Scientist towards science.
4. To provide the basics of Non-metals.

Course content:

1. Involvement of science in daily life.
2. Indian Scientists: who made great contributions to science and cemented way for others to walk on.
3. Chemistry of Non-metals.
4. Chemical application in Industry.

Outcomes:

1. Students will able to describe and evaluate the benefits of science in daily life.
2. They will understand the contribution of Indian scientist towards science.
3. They will be equipped with Basics of Non-metals.

Bibliography:

1. Chemistry by Richard Harwood.
2. First Lady Doctor of India, The Telegraph.
3. Wings Of Fire: An autobiography by A.P.J Abdul Kalam.
4. Jagdish Chandra Bose by Sanjay Goyal.
5. Prof. CV Raman. A biography by Uma Parameswaran.

Semester: II
Title of the Paper: CHC 102 Physical Chemistry and Organic Chemistry
Class: F.Y.BSc
No. of Credits: 04 + 02

Objectives:

- To understand the basics of physical chemistry.
- To solve problems in physical chemistry.
- To understand the preparation of various Aromatic hydrocarbons, Alkyl & Aryl Halides, Alcohols, Phenols, Ethers and Carbonyl Compounds.
- To understand the reactions of Aromatic hydrocarbons, Alkyl & Aryl Halides, Alcohols, Phenols, Ethers and Carbonyl Compounds.
- To explain the name reactions and mechanisms involving it.

Course Content:

Chemical Equilibrium:

Le Chatelier's principle. Relationships between *Kp, Kc*and *Kx*for reactions involving ideal gases.

Ionic Equilibria:

Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect. Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Solubility and solubility product of sparingly soluble salts.

Course Level Learning Outcomes:

At the end of this course students will be able to:

- Apply Le Chartelier's principle to reversible reactions.
- Differentiate between strong, moderate and weak electrolytes.
- Calculate hydrolysis constant, degree of hydrolysis and pH for different salts.
- Prepare buffer solutions.
- Explain the three Laws of Thermodynamics.
- Discuss the concepts used in thermodynamics like Enthalpy, Entropy, Free energy.
- Correlate the feasibility of chemical reactions with Enthalpy, Entropy, Free energy.
- Explain reversible reactions and their equilibria.
- Calculate equilibrium constants for different types of reactions.
- To **determine** the mechanism of organic molecules.
- To understand and apply the reactions for preparations Aromatic hydrocarbons, Alkyl & Aryl Halides, Alcohols, Phenols, Ethers and Carbonyl Compounds.

Suggested Reading:

1. Bahl, A. &Bahl, B.S. Advanced Physical Chemistry, S. Chand, 2010.
2. J. N. Gurtu and AayushiGurtu, Undergraduate Physical Chemistry.

3. Barrow, G.M. Physical Chemistry Tata McGraw-Hill (2007).
4. Castellan, G.W. Physical Chemistry 4th Ed. Narosa (2004).
5. Kotz, J.C., Treichel, P.M. & Townsend, J.R. General Chemistry Ltd., New Delhi (2009).
6. Mahan, B.H. University Chemistry 3rd Ed. Narosa (1998).
7. Petrucci, R.H. General Chemistry 5th Ed. Macmillan Publishing Co.
8. Graham Solomon, T.W., Fryhle, C.B. &Dnyder, S.A. *Organic Chemistry*.
9. McMurry, J.E. *Fundamentals of Organic Chemistry*. 2013.
10. Sykes, P. *A Guidebook to Mechanism in Organic Chemistry.*
11.Bahl, A &Bahl, B.S. advanced organic chemistry, S. Chand, 2010.

Semester: II
Title of the paper :CHG 104Chemistry in Everyday life.
Class: F.Y.BSc
No.of credits: 04

Objectives:
1. To understand the different techniques in Chemistry.
2. To make understand the organic chemistry in medical sciences.
3. To understand and apply the basics of Acids, Bases, Salts, corrosion and Nanomaterial.
4. To explain the macro and micronutrients in health science and Environmental pollution.

Course content:
1. Different techniques in Chemistry
2. Organic Chemistry in medical sciences.
3. Medicinal plants and Cellulose and starch.
4. Acids, Bases, Salts and Corrosion.
4. Nanomaterials
5. Macro and micro nutrients in Health Sciences and Environmental Pollution.

Course level Learning Outcomes:
1. Students will be equipped with different techniques in Chemistry.
2. They will understand the organic chemistry in medical sciences.
3.They will understand and apply the basics of Acids, Bases, Salts, corrosion and Nanomaterial.
4. They will be equipped with the basics of the macro and micronutrients in health science and Environmental pollution.

Bibliography:

1. Chemistry, Richard Harwood.
2. B. K. Sharma. Instrumental Methods of Chemical Analysis.
3. Medicinal Chemistry by A. Kar. .
4. Sambamurthy A.V.S.S &Subramanyam N.S. 1989. A text book of Economic Botany.
5. Pharmaceutical Chemistry Organic Volume II, by G. R. Chatwal, Himalaya Publishing House.

Semester: III
Class: S.Y.BSc
Title of the Paper :CHC 103 Physical chemistry and Organic Chemistry
No. of Credits:04 + 02

Objectives:
1.Introduction to various concepts on solutions, phase equilibria.
2.Learning electrochemistry
3. Introduction to different concepts on conductance
4.To get the Knowledge of the Synthesis and reactions shown by different Organic substances.
5. Make use of Spectroscopic Techniques for identification of Organic compounds.

Course Content:
Solutions- Ideal and non-ideal, Azeotropes, partially miscible liquids, Phase equilibria- Phase rule and its applications to one and two component systems ,Conductance- Kohlrausch's law, Transport number, Applications, Electrochemistry- reversible and irreversible cells, concentration cells, liquid junction potential, pH determination.
Carboxylic acids and their derivatives and their reactions, Amines and Diazonium Salts and their reactions, Amino acids,Peptides reactions and preparation, UV-Visible Spectroscopy in Organic Chemistry, Carbohydrates Classification and Properties.

Course level Learning Outcomes:
At the end of the course students should be in a position to
1. Differentiate between ideal and non ideal solution and know to identify azeotropes, partially miscible liquids types.
2. Calculate consolute solution temperature
3. Carry out distillation of a pair of liquids based on its type.
4. Can differentiate between reversible and irreversible cells
5. Can construct an electrochemical or concentration cell and calculate its emf.
6. Can determine pH of unknown solutions.
7. Can carry out Conductometric acid base titrations.
8. Can calculate solubility product of a sparingly soluble salt.
9. Information on different Name reactions and use of these reactions in the synthesis of commercially viable compounds.
10. Methods to identify unknown compounds by applying UV-Visible Spectroscopy.

Suggested Reading:
1. Undergraduate Physical Chemistry, Vol II, J.N. Gurtu, PragatiPrakashan
2. Advanced Physical Chemistry, Gurtu and Gurtu, PragatiPrakashan
3.Castellan, G.W. Physical Chemistry.
4.Petrucci, R.H. General Chemistry.
5. Morrison, R.T. & Boyd, R.N. Organic Chemistry.

6.Finar, I.L. Organic Chemistry (Volume 1), Dorling Kindersley (India)Pvt. Ltd.
7. Finar, I.L. Organic Chemistry (Volume 2), Dorling Kindersley
M. Lehninger's Principles of Biochemistry

Semester: III
Class: S.Y.BSc
Title of the Paper : CHC 103 Physical chemistry and Organic Chemistry
No. of Credits: 04 + 02

Objectives:
1. To Learn About Natural resources, Coal, the destructive distillation of coal and various application of coal and coal products.
2. To learn the importance of natural gas, the origin of petroleum and about petroleum refining and petrochemicals
3. To apply scientific research which includes food chemistry and food safety to functions of ingredients in food and process controls.
4. To comprehend the various sources of water pollution and various steps involved in water purification.

Course Content:
Review of energy sources
Coal, Petroleum and Petrochemical Industry.
Analysis of food products, soil and water.

Course level Learning Outcomes:
Students will be able to interpret and apply nutrition concepts to evaluate and improve the nutritional health of communities.
Students will be able to understand the formation of coal, know the principle of fractional distilation, Analyse the uses of various fractions of petroleum.
Students will recognize the importance of coal , petroleum and all the limited natural resources.
Students will understand the importance of water and air resources.
Suggested Reading:

1. G.L. Patrick: Introduction to *Medicinal Chemistry, Oxford University* Press, UK.
2. Hakishan, V.K. Kapoor: *Medicinal and Pharmaceutical Chemistry,* VallabhPrakashan, Pitampura, New Delhi.
3. William O. Foye, Thomas L., Lemke , David A. William: *Principles of Medicinal Chemistry,* B.I. Waverly Pvt. Ltd. New Delhi.
4. Wilson, Gisvold and Doerge Textbook of Organic, Medicinal and Pharmaceutical Chemistry.
5. Lednicer and Meischer, Organic Chemistry of Drug Synthesis. Vol. I to III. John Wiley & Sons, 2005.

Semester: IV
Title of the Paper : CHC 104, (Section A-physical chemistry Section-B Inorganic Chemistry)
Class: S.Y.BSc
No. of Credits: 4+2

Objectives:
1. Introduction to and detailed study of the three states of matter
2. Learning concepts in chemical kinetics
3. To study and understand the periodic trends of transition and the inner transition elements.
4. To study the Werner's theory for coordination compounds and to learn the IUPAC names and properties of the coordination compounds.
5. To learn and understand the theories involved in the bonding of coordination compounds like Valence bond theory.
6. To understand the magnetic properties of the coordination compounds using Crystal field theory.

Course Content:
Kinetic molecular theory of gases. Real and ideal gases. Liquefaction of gases, Surface tension of a liquid and its determination. Viscosity of a liquid and its determination.
Transition Elements, Coordination chemistry, Crystal field theory.

Course level Learning Outcomes:
At the end of the course student will be able to
1. Explain the postulates of kinetic molecular theory and correlate the relation between pressure temperature and volume of real and ideal gases.
2. Explain the properties like viscosity and surface tension in liquids.
3. Correlate the properties like viscosity and surface tension with structure of liquids.
4. To explain the general properties of transition and the inner transition elements with emphasis on their electronic configuration.
5. To calculate the magnetic moment and to comment on the magnetic properties of the elements in the free and compounded state.
5. To comment on the theoretical aspects behind the formation of coordination compounds.
6. To draw the geometries of coordination compounds with various coordination numbers.
7. To deduce the electronic and magnetic properties of the coordination compounds based on the ligand environment.
8. To evaluate the merits and demerits of the theories utilised to explain the bonding.

Suggested Reading:
1. J. D. Lee, Concise Inorganic Chemistry, 5th Edn. Wiley India.
2. B. R. Puri, L. R. Sharma and K. C. Kalia, Principles of Inorganic Chemistry, 33rd Edn.
3. F. Albert Cottton, Geoffrey Wilkinson and Paul L. Gaus, Basic inorganic chem. 3 rdEdn. Wiley India.

Semester: IV
Title of the Paper :CHS 102: Chemistry of Cosmetics and Perfumes
Class: S.Y.BSc
No. of Credits: 3+1

Course Content:

1. Cosmetic Formulation, principles and preparations.
2. Herbal Cosmetics
3. Perfumes and Flavors

Course level learning outcomes:

1.**Explain** the term cosmeticology and **illustrate** thecleansing and care needs for various body parts.

2. **Discuss** the preparation and formulations of various marketed cosmetics and **Co-relate** them to their applicative use.

3. **Describe** herbs, herbal medicines, **Classify** herbal cosmetics and **Discuss** herbal drug preparations.

4. **Develop**ayurvedic and herbal formulations and **Evaluate** them using physical, chemical and microscopic techniques.

5. **Classify** perfumes, itsingredients and essential oils and Illustrate importance of various essential oils in cosmetic industry.

6. **Design** methods for obtaining these essential oils from their plant origins.

Suggested Reading:

1. E. Stocchi: *Industrial Chemistry*, Vol -I, Ellis Horwood Ltd. UK.
2. P.C. Jain, M. Jain: *Engineering Chemistry*, DhanpatRai& Sons, Delhi.
3. Sharma, B.K. & Gaur, H. *Industrial Chemistry*, Goel Publishing House, Meerut (1996).
4. G.L. Patrick: Introduction to *Medicinal Chemistry, Oxford University* Press, UK. 65.
5. Hakishan, V.K. Kapoor: *Medicinal and Pharmaceutical Chemistry*, VallabhPrakashan, Pitampura, New Delhi.
6. Keith Wilson and John Walker: Practical Biochemistry.

Semester: V
Title of the paper:CHC105 Physical Chemistry
Class: T Y BSc
Credits: 04 + 02

Objectives:
1. Detailed study of concepts in electrochemistry, Quantum chemistry
2.Theoretical basis of Spectroscopic techniques like Microvave and IR

Course Content:
1. Nuclear Chemistry- Composition of nucleous, theory of nuclear forces, nuclear models, units of radioactivity, artificial radioactivity, detection and measurement of radioactivity,
2. Electrochemistry I
Ion-selective electrodes: applications of ion selective electrodes. Decomposition potential, overvoltage and overpotential, Fuel cells, electrochemical sensors, principle, advantages and applications.

3. Quantum Chemistry I
Postulates of quantum mechanics, Schrodinger equation and its application, Angular momentum, Rigid rotator model of rotation of diatomic molecule. Schrodinger equation in Catesian and spherical polar .Spherical harmonics, qualitative description of LCAO-MO treatment of homonuclear and heteronuclear diatomic molecules. (HF, LiF).
4. Molecular Spectroscopy I
Interaction of electromagnetic radiation with molecules and various types of spectra, Born Oppenheimer approximation. Rotational Spectroscopy, Vibrational spectroscopy, Vibration –rotation spectroscopy, Raman spectroscopy.

1) Kinetics of reactions 2) Interpretation of vibrational- rotational spectra
3.Conductometry 4. pH-metry 5. Potentiometry 6. Adsorption

Course level learning outcomes:

After learning this paper students will be able to
1)will be able to evaluate practically decomposition potential, overpotential
2)apply the knowledge of decomposition potential, overpotential in experimental electrolysis
3)will know the use of electrochemical sensors and ion selective electrodes in practical chemistry
4)will be able to calculate the values of quantity force constant, Bond length, isotopic mass
5)will be able to determine and predict the microwave, IR Raman spectra
6) will be able to apply the MO theory and LCAO for molecular bonding.

Suggested Reading:
1. J.N. Gurtu, Physical Chemistry Vol-III,
2. N. B. Laxmeshwar, S. M. Malushte, A. S. Mulye, V. N. Kulkarni, Concepts of Physical Chemistry.

3. P. C. Jain, Monika Jain, Engineering Chemistry.
4. Barnwell, C.N. &McCash, E.M., Fundamentals of Molecular Spectroscopy, 4th Ed. Tata McGraw Hill, New Delhi (2006)
5. U. N. Dash, Nuclear Chemistry, S. Chand Publication
6. H. J. Arnikar, Essentials of Nuclear Chemistry.
7. Gurdeep Raj, Advanced Physical Chemistry Goel Publication.
8. Chandra, A.K., Introductory Quantum Chemistry, Tata McGraw –Hill (2001).
9. House., J.E., Fundamentals of Quantum Chemistry, 2ND Ed. Elsevier: USA (2004)
10. Lowe. J.P. & Peterson., K., Quantum Chemistry, Academic Press (2005)
11. Kakkar., R., Atomic and Molecular Spectroscopy, Cambridge University Press
12.. Systematic experimental Physical Chemistry by W. Rajbhoj, T.K. Chondhekar, Anjali publication.
13. Practicals in Physical Chemistry – a modern approach by P.S. Sindhu, published by Macmillan India Ltd.
14. Practical Physical Chemistry by B. Viswanathan, P.S. Raghavan, published by Viva Books Private Ltd.
15. Senior Practical Physical chemistry by B.D. Khosla, V.C. Garg, Adarsh Gulati, published by R. Chand and Co.

Semester: VI
Title of the paper:CHC105Physical Chemistry
Class: T Y BSc
Credits: 04 + 02

Objectives:
1. Detailed study of concepts in applied electrochemistry, bonding in simple molecules.
2. Theoretical basis of Spectroscopic techniques like NMR, ESR

Course Content:
1. Quantum Chemistry II -Qualitative treatment of hydrogen atom and hydrogen ion, Chemical bonding, LCAO and VBT
2. Nuclear Chemistry II- Nuclear fission, Reactors, Chain reaction, reprocessing of fuels, tracers, effects of radiation.
3. Electrochemistry II-pH, pOH, pKa, pKb, Buffer, Debye Huckel Theory, Batteries
4. Molecular Spectroscopy II- Electronic spectroscopy, NMR, ESR

Course Content
1) Kinetics of reactions 2) Interpretation of vibrational- rotational spectra
3.Conductometry 4. pH-metry 5. Potentiometry 6. Adsorption

Course level learning outcomes: After learning this paper students will be able to
1)will be able to write and explain schrodinger equation for H atom, H like ions and many electron atoms.
2)explain chemical bonding in simple molecules likeH2, HF, LiF on the basis of MO and VBT.
3)will understand the structure of nuclear reactor and its key components.

4)will know the use of radioisotopes in various fields of science.
5)will be able to prepare buffers and calculate their pH values.
6) will be able to apply the basic principles of electronic spectroscopy, NMR, ESR to simple molecules.

Suggested readings:

1. J.N. Gurtu, Physical Chemistry Vol-III, A pragati edition.
2. N. B. Laxmeshwar, S. M. Malushte, A. S. Mulye, V. N. Kulkarni, Concepts of Physical Chemistry, ChetanaPrakashan.
3. P. C. Jain, Monika Jain, Engineering Chemistry, 15th edition, DhanpatRai Publishing Co.
4. Barnwell, C.N. &McCash, E.M., Fundamentals of Molecular Spectroscopy, 4th Ed. Tata McGraw Hill, New Delhi (2006)
5. U. N. Dash, Nuclear Chemistry, S. Chand Publication
6. H. J. Arnikar, Essentials of Nuclear Chemistry, New Age International Publishers, 4th Revised Edition
7. Gurdeep Raj, Advanced Physical Chemistry Goel Publication.
8. Chandra, A.K., Introductory Quantum Chemistry, Tata McGraw –Hill (2001).
9. House., J.E., Fundamentals of Quantum Chemistry, 2ND Ed. Elsevier: USA (2004)
10. Lowe. J.P. & Peterson., K., Quantum Chemistry, Academic Press (2005)
11. Kakkar., R., Atomic and Molecular Spectroscopy, Cambridge University Press (2015)
12. Systematic experimental Physical Chemistry by W. Rajbhoj, T.K. Chondhekar, Anjali publication.
13. Practicals in Physical Chemistry – a modern approach by P.S. Sindhu, published by Macmillan India Ltd.
14. Practical Physical Chemistry by B. Viswanathan, P.S. Raghavan, published by Viva Books Private Ltd.
15. Senior Practical Physical chemistry by B.D. Khosla, V.C. Garg, Adarsh Gulati, published by R. Chand and Co.

Semester: V
Title of the Paper: CHC 106Inorganic Chemistry
Class: T.Y.BSc
No. of Credits: 04

Objectives:

1. To make understand the Periodic table and their properties.
2. To explain chemistry of Halogens and Nobel gases with respect to structure and synthesis.
3. To understand the fundamental concepts of Solid State chemistry.
4. To make understand the bonding in coordination compounds with respect to different theories.
5. To explain concepts of oxidation and reduction in Inorganic Chemistry, Nano chemistry and Bioinorganic Chemistry.

Course Content:

1. Periodicity of Elements
2. Chemistry of halogens and Nobel gases
3. Inorganic Solid State Chemistry
4. Bonding in Co-ordination Compounds.
5. Oxidation and Reduction
6. Selected Topics: Nanochemistry,Bio-inorganic Chemistry

Course Level Learning Outcomes:

1. Students will be able to understand the trends in periodic table.
2. Students will equipped with knowledge of Crystal Field Theory and Molecular Orbital Theory for Coordination compounds.
3. Students will gain knowledge of Halogens and Nobel gases.
4. Students will able to explain the fundamentals of Solid State Chemistry and applications in Nano-chemistry.
5. Students will be able to understand Oxidation and Reduction and apply it to various fields.
6. They will understand the overview of Bio-inorganic chemistry.

Suggested readings:

1.J. D. Lee, Concise Inorganic Chemistry.
2. B. R. Puri, L. R. Sharma and K. C. Kalia, Principles of Inorganic Chemistry.
3. F. Albert Cottton, Geoffrey Wilkinson and Paul L. Gaus, Basic inorganic chem. 3rd Edn. Wiley India
4. James E. Huheey, Ellen A. Keiter, Richard L.Keiter and Okhil K. Medhi, Inorganic Chemistry, Principles of Structure and Reactivity. 4th Edn. Pearsons
5. K. V. S. Laxmi Devi, N. C. Patel, S.S. Dhume, A. Venkatachalam, S. P. Turakhia, Chhaya Dixit and R. A. Mirji, College Inorganic Chemistry for T.Y. B. Sc.
6. Lesley E. Smart, Elaine A. Moore, Pub- Taylor and Francis, Solid State Chemistry.
7. D. E. Shriver, P.W. Atkins and C.H. Langford, Inorganic Chemistry,
8. G.D. Tuli, S. K. Basu and R.D. Madan, Advance inorganic chemistry.

Semester: VI
Title of the Paper: CHC 109 Inorganic Chemistry
Class: T.Y.BSc
No. of Credits: 04

Objectives:

1. To provide Knowledge on Organometallic Chemistry, Spectra and Magnetic properties of coordination compounds.
2. To make understand Reaction Kinetics and mechanism for Coordination Compounds.
3. To provide knowledge on Acids, Bases and Non-aqueous Solvents.
4. To make them understand the Symmetry and Term Symbols

Course Content:

1. Organometallic Chemistry
2. Spectra and Magnetic properties of Coordination Compounds.
3. Reaction Kinetics and Mechanism of Coordination Compounds.
4. Acid Bases and Non-aqueous Solvents
5. Symmetry and Term Symbols

Course Level Learning Outcomes:

1. Students will be able to understand and explain Organometallic Chemistry, Spectra and Magnetic properties of coordination compounds.
2. They will equipped with knowledge of Reaction Kinetics and mechanism for Coordination Compounds.
3. They will in position to explain Symmetry and Term Symbols.
4. Concepts of Acids, Bases and Non Aqueous solvents will be clear to them.

Suggested readings:

1. J. D. Lee, Concise Inorganic Chemistry.
2. B. R. Puri, L. R. Sharma and K. C. Kalia, Principles of Inorganic Chemistry.
3. F. Albert Cottton, Geoffrey Wilkinson and Paul L. Gaus, Basic inorganic chemistry. 4. 4.James E. Huheey, Ellen A. Keiter, Richard L.Keiter and Okhil K. Medhi, Inorganic Chemistry, Principles of Structure and Reactivity.
5. K. V. S. Laxmi Devi, N. C. Patel, S.S. Dhume, A. Venkatachalam, S. P. Turakhia, Chhaya Dixit and R. A. Mirji, College Inorganic Chemistry for T.Y. B. Sc.
6. Lesley E. Smart, Elaine A. Moore, Pub- Taylor and Francis, Solid State Chemistry.
7. D. E. Shriver, P.W. Atkins and C.H. Langford, Inorganic Chemistry,
8. G.D. Tuli, S. K. Basu and R.D. Madan, Advance inorganic chemistry.
9. F. A. Cotton, Chemical Applications of Group Theory, Wiley India
10. P.K Bhattacharya,Group Theory and its Chemical Applications Himalaya Publications.

Semester: V and VI
Title of the Paper: CHC 107 Organic Chemistry

No. of Credits: 04 + 02

Objectives:

To develop the following skills:

1. Technical
2. Intellectual
3. Problem solving
4. Scientific thinking
5. Interpret data from range of spectroscopic techniques.
6. Research.

Course Content:

Syllabus - semester V
Aromaticity, alkaloids, Spectroscopic methods in Organic Chemistry, Chemistry of heterocyclic compounds, vitamins and hormones, dyes.

Syllabus - Semester Vl,
Name reactions mechanism, enolates, stereochemistry, photochemistry, terpines, carbohydrates.

Semester V practicals,
Two step organic preparations, organic estimations, Interpretation of IR, NMR of simple Organic Compounds. Technique of Separation of Organic binary mixtures.

Semester Vlpracticals,
Separation of organic binary mixtures and identification.

Course Level Learning Outcomes:

1) Students will be able to analyse row material and inished product.
2) Students will be able to operate analytical instruments.
3) Students will be able to isolate and characterize natural products.
4) Students will be able to set up a reaction.

Suggested readings:

1. I.L.Finar, Organic Chemistry Vols I and II, Orient Longman
2. Morrison and Boyd, Organic Chemistry; 6th Edn. Prentice Hall India
3. J. March, Advanced Organic Chemistry: Reaction, Mechanism and Structure, Wiley, 2010.
4. P.S. Kalsi, Spectroscopy of Organic compounds, New Age International Pub.
Ltd. & Wiley Eastern Ltd., Second edition, 1995.
5. Francis Carey, Organic Chemistry, 10th Edition.

SEMESTER-V& VI

TITLE: GREEN METHODS AND SAFETY ASPECTS IN CHEMISTRY

CLASS: T.Y.BSc

NO.OF CREDITS: 04

OBJECTIVES:

1. To encourage the usage of green methods for the synthesis over the conventional methods.
2. To minimise the usage and generation of hazardous substances.
3. To inculcate the knowledge about the “standard operating procedures” for various equipment’s used in the lab.

OUTCOMES:

1. To predict the atom economy

2. To determine the energy efficiency of a given process.

3. To identify the risks and hazards while handling chemicals or working in a chemical industry.

COURSE CONTENT:

1. Introduction to Green chemistry and green chemistry techniques.
2. Real world cases in green chemistry
3. Introduction to Laboratory Safety and Laboratory emergencies.
4. Waste Handling.

BIBLIOGRAPHY:

1. Green chemistry: Environmentally Benign Reactions-by V.K Ahluwalia.
2. Green chemistry Experiments – by Sharma ,R.K , Sidhwani
3. Green chemistry: Theory and Practical – by Anastas ,P.T & warner

SEMESTER-V& VI

TITLE: BASIC TOPICS IN ANALYTICAL CHEMISTRY

CLASS: T.Y.BSc

NO.OF CREDITS: 04

OUTCOMES: **Section I**

1. **Associate** the interaction between light energy and matter and **distinguish** compounds based on this interaction.

2. **Describe** the principle behind the techniques used for analysis and **Solve** numerical problems based on the learned principle.

3. **Classify** different techniques based on chromatography and **apply** the same for industrial use.

4. **Analyse**the data obtained from all the learned chromatographic techniques.

5. **Develop** the apparatus required for the instrumentation anddescribe them as well as practically **apply** the same at industrial and research level.

6. **Design** a protocol for analysis of compounds for research purposes based on the learned instrumentation.

Section II

7. **Describe** various electronic components and **distinguish** the same.

8. **Discuss** various techniques based on thermal, flourimetry and radiochemical analysis and **co-relate** their results.

9.**Design** a protocol foranalysis of compounds for research purposes based on the learned instrumentation.

COURSE CONTENT:

1. Principles of Volumetric analysis and Gravimetric analysis.
2. Sampling Techniques & Solvent Extraction
3. Evaluation of Analytical Data.
4. Chromatography Techniques.
5. Electro-analytical Methods.

BIBLIOGRAPHY:

1. College Analytical Chemistry by Baliga and Shetty,15th edition ,Himalaya Publishing House.
2. Basic Principles of Analytical Chemistry by K.Raghuraman, D.V Prabhu&A.Sathe.