DEPARTMENT OF CHEMISTRY

B.Sc. Chemistry

Program Objective (PO)

PO1: Deliver comprehensive knowledge and understanding of basic concepts theories and principles in the field of science.

PO2: Be self-equipped and to engage in independent and life-long learning in the broadcast context of socio-cultural and technological changes.

PO3 : Enrich learners with subject related and transferable skills related with job trades and employment opportunities.

PO4 : Equip learners to demonstrate their own work and to investigate their awareness in relation to their wider research field.

PO5: Understand the issues related to the environmental context and sustainable development.

PO6 : Adequate the training in the application of digital knowledge at workplace and higher education/ research

PO7 : Commit to professional ethics and responsibilities of the science practices.

Program Specific Objective (PSO)

PSO1: Students should understand basic concepts of Physical, Organic, Inorganic, Analytical and Industrial chemistry

PSO2: Students should understand implementation of new tools and techniques involved in Analytical chemistry

PSO3: Students should understand applications in physical, organic, inorganic, Industrial and Environmental chemistry in pharmaceutical, agriculture and chemical industries.

PSO4 : Students should able to develop skill for transferring and applying the acquired basic knowledge of chemistry, including basic concepts, laws and principles.

They should have knowledge of instrumentation and analytical techniques used in various branches of chemistry.

PSO5: Students should be able to explain the importance of Periodic Table and Elements involved in it and also should be able to represent key aspects of it for gaining chemical information.

PSO6: Students will be able to apply and demonstrate knowledge of principles, theories, laws related to chemistry;

PSO7 : Students should develop and learn laboratory skills for enabling them to perform qualitative and quantitative be able to make conclusions based on analysis of given samples and should

PSO8: They should be able to utilize and persuade knowledge for benefits of society.

COURSE OUTCOMES

F.Y.B. Sc (Chemistry)

CH-101 PAPER I: PHYSICAL CHEMISTRY

CO1 Students will be able to apply thermodynamic principles to physical and chemical process.

Calculations of enthalpy, Bond energy, Bond dissociation energy, resonance energy

Variation of enthalpy with temperature –Kirchhoff's equation

Third law of thermodynamic and its applications

CO2 Knowledge of Chemical equilibrium will make students to understand

Relation between Free energy - equilibrium and factors affecting on equilibrium constant.

Exothermic and Endothermic reaction

Gas equilibrium, equilibrium constant - molecular interpretation of equilibrium constant

Van't Haff equation and its application

CO3 Ionic equilibria chapter will lead students to understand

Concept to ionization process occurred in acids, bases and pH scale

Related concepts such as Common ion effect hydrolysis constant, ionic product

Degree of hydrolysis and pH for different salts , buffer solutions

CH-102 PAPER II ORGANIC CHEMISTRY

CO1 Atom being most important micro particle in construction of matter, modern developments of its structure is presented.

The quantization of energy and duality of matter in this context is elaborated .

Schrodinger equation is the basis of quantum chemistry that has been introduced for simplest system hydrogen atom.

CO2 Natural changes are understood with the help of second and third laws of thermodynamics. These laws are presented with the help of state function entropy. Entropy changes in various processes and under various conditions have been discussed.

CO3 Students understand, valence, valence shell electrons and their contribution in bonding, atomic orbital, molecular orbital, hybridization, theories for overlapping of atomic orbitals, Synthesis of molecules with different geometry and effect of lone pairs on shape of molecule with examples.

CH-103 PRACTICAL COURSE-I

CO1 Importance of chemical safety and Lab safety while performing experiments in laboratory and also should handle laboratory glassware's, hazardous chemicals safely in laboratory;

CO2 Determination of thermo chemical parameters and related concepts and also set up the apparatus properly for experiments. Perform all the activities in the laboratory with neatness and cleanness;

CO3 Techniques of pH measurements and maintain records of quantitative and qualitative analysis;

CO4 Elemental analysis of organic compounds (non instrumental) and also acquire laboratory skills for the purpose of collecting, interpreting, analyzing, and reporting (in written form) chemical data;

CO5 Should explain physical chemistry principle with the help of experiments;

CO6 Describe and demonstrate

CH-201 PAPER II: INORGANIC CHEMISTRY

CO1 Various theories and principles applied to revel atomic structure

Origin of quantum mechanics and its need to understand structure of hydrogen atom

Schrodinger equation for hydrogen atom, Radial and angular part of hydrogenizes wave functions, Significance of quantum numbers, Shapes of orbitals.

CO2 Explain rules for filling electrons in various orbitals- Aufbau's principle, Pauli exclusion principle, Hund's rule of maximum multiplicity, Discuss electronic configuration of an atom and anomalous electronic configurations, Describe stability of half-filled and completely filled orbitals, Discuss concept of exchange energy and relative energies of atomic orbitals

Design Skeleton of long form of periodic table, Describe Block, group, modern periodic law and periodicity, Classification of elements as main group, transition and inner transition elements, Write name, symbol, electronic configuration, trends and properties.

CO3 Attainment of stable electronic configurations. Define various types of chemical bonds- Ionic, covalent, coordinate and metallic bond, Explain characteristics of ionic bond, types of ions, energy consideration in ionic bonding, lattice and solvation energy and their importance in the context of stability & solubility of ionic compounds, Summarize Born-Lande equation and Born-Haber cycle, Define Fajan's rule, bond moment, dipole moment and percent ionic character. Describe VB approach, Hybridization with example of linear, trigonal, square planer, tetrahedral, TBP, and octahedral. Discuss assumption and need of VSEPR theory.

CH- 202 PAPER II: ANALYTICAL CHEMISTRY

CO1 Analytical Chemistry –branch of chemistry

pH meter and electrodes for pH measurement

Calibration of pH

Working of pH meter

Applications of pH meter

Perspectives of analytical Chemistry

analytical problems

CO2 Calculations of mole, molar concentrations and various units of concentrations which will be helpful for preparation of solution

Relation between molecular formula and empirical formula

Stoichiometric calculation

Define term mole, millimole, molar concentration, molar equilibrium concentration and Percent

Concentration.

SI units, distinction between mass and weight

Units such as parts per million, parts per billion, parts per thousand, solution-dilatant volume ratio,

function density and specific gravity of solutions.

CO3 Separation of binary mixtures and analysis

Elemental analysis -Detection of nitrogen, sulfur, halogen and phosphorous by Lassiagen's test.

Purification techniques for organic compounds.

CO4 Basics of chromatography and types of chromatography

Theoretical background for Paper and Thin Layer Chromatography

CH-203 PRACTICAL COURSE-I

CO1 Importance of chemical safety and Lab safety while performing experiments in laboratory and also should handle laboratory glassware's, hazardous chemicals safely in laboratory;

CO2 Determination of thermochemical parameters and related concepts and also set up the apparatus properly for the given experiments. Perform all the activities in the laboratory with neatness and cleanness;

CO3 Techniques of pH measurements and maintain records of quantitative and qualitative analysis;

CO4 Elemental analysis of organic compounds (non instrumental) and also acquire laboratory skills for the purpose of collecting, interpreting, analysing, and reporting (in written form) chemical data;

CO5 Should explain physical chemistry principle with the help of experiments;

CO6 Describe and demonstrate

S.Y.B. Sc -Chemistry

CH-301 PAPER-I PHYSICAL AND ANALYTICAL CHEMISTRY

CO1 After studying the Chemical Kinetics student will able to-

Define / Explain concept of kinetics, terms used, rate laws, molecularity, order.

Explain factors affecting rate of reaction.

Explain / discuss / derive integrated rate laws, characteristics, expression for half-lifeand examples of zero order, first order, and second order reactions.

Determination of order of reaction by integrated rate equation method, graphicalmethod, half-life method and differential method.

Explain / discuss the term energy of activation with the help of energy diagram.

Explanation for temperature coefficient and effect of temperature on rate constant k.

Derivation of Arrhenius equation and evaluation of energy of activation graphically.

Derivations of collision theory and transition state theory of bimolecular reaction and comparison.

Solve / discuss the problem based applying theory and equations.

CO2 Define / explain adsorption, classification of given processes into physical and chemical adsorption.

Discuss factors influencing adsorption, its characteristics, differentiates types as Classification of Adsorption Isotherms, to derive isotherms.

Explanation of adsorption results in the light of Langmuir adsorption isotherm,

Freundlich's adsorption Isotherm and BET theory.

Apply adsorption process to real life problem.

Solve / discuss problems using theory.

CO3 Define, explain and compare meaning of accuracy and precision.

Apply the methods of expressing the errors in analysis from results.

Explain / discuss different terms related to errors in quantitative analysis.

Apply statistical methods to express his / her analytical results in laboratory.

Solve problems applying equations.

CO4 After studying the Volumetric Analysis student will able to-1. Explain / define different terms in volumetric analysis such as units of concentration,

indicator, equivalence point, end point, standard solutions, primary and secondary

standards, complexing agent, precipitating agent, oxidizing agent, reducing agent,

redox indicators, acid base indicators, metallochome indicators, etc.

Perform calculations involved in volumetric analysis.

Explain why indicator show color change and pH range of color change.

To prepare standard solution and b. perform standardization of solutions.

To construct acid – base titration curves and performs choice of indicator for particular titration.

Acid-base titrations, complexometric titration/precipitation titration/redox titration.

Apply volumetric methods of analysis to real problem in analytical chemistry / industry.

CH-302 Paper-I Organic and Inorganic Chemistry

CO1 Define terms related to molecular orbital theory (AO, MO, sigma bond, pi bond, bond order, magnetic property of molecules, etc.).

Explain and apply LCAO principle for the formation of MO's from AO's.

Explain formation of different types of MO's from AO's.

Distinguish between atomic and molecular orbitals, bonding, anti-bonding and nonbonding Molecular orbitals.

Draw and explain MO energy level diagrams for homo and hetero diatomic molecules.

Explain bond order and magnetic property of molecule. Explain formation and stability of molecule on the basis of bond order.

Apply MOT to explain bonding in diatomic molecules other than explained in syllabus.

CO2 Define different terms related to the coordination chemistry (double salt, coordination compounds, coordinate bond, ligand, central metal ion, complex ion, coordination number, magnetic moment, crystal field stabilization energy, types of ligands, chelate effect, etc.)

Explain Werner's theory of coordination compounds.

Differentiate between primary and secondary valency. Correlate coordination number and structure of complexion.

Coordination-Compound:IUPAC nomenclature.

CO3 After studying the aromatic hydrocarbons student will able to

Identify and draw the structures aromatic hydrocarbons from their names or from structure name can be assigned.

Explain / discuss synthesis of aromatic hydrocarbons.

Give the mechanism of reactions involved.

Explain /Discuss important reactions of aromatic hydrocarbon.

To correlate reagent and reactions.

CO4 Identify and draw the structures alkyl / aryl halides from their names or from structure name can be assigned.

Explain / discuss synthesis of alkyl / aryl halides.

Write / discuss the mechanism of Nucleophilic Substitution reactions.

Explain /Discuss important reactions of alkyl / aryl halides.

To correlate reagent and reactions.

Give synthesis of expected alkyl / aryl halides.

CO5 After studying the Alcohols and Phenols student will able to-

Identify and draw the structures alcohols / phenols from their names or from structure name can be assigned.

Able to differentiate between alcohols and phenols

Explain / discuss synthesis of alcohols / phenols.

Write / discuss the mechanism of various reactions involved.

Explain /Discuss important reactions of alcohols / phenols.

To correlate reagent and reactions of alcohols / phenols

Give synthesis of expected alcohols / phenols.

CH-303 PAPER-III PRACTICAL CHEMISTRY

CO1 Verify theoretical principles experimentally.

Interpret the experimental data on the basis of theoretical principles.

CO2 Correlate theory to experiments. Understand/verify theoretical principles by experiment

observations; explain practical output / data with the help of theory.

Understand systematic methods of identification of substance by chemical methods.

CO3 Write balanced equation for the chemical reactions performed in the laboratory.

Perform organic and inorganic synthesis and is able to follow the progress of the chemical

reaction by suitable method (colour change, ppt. formation, TLC).

CO4 Set up the apparatus / prepare the solutions - properly for the designed experiments.

Perform the quantitative chemical analysis of substances explain principles behind it.

Systematic working skill in laboratory will be imparted in student.

CH-401 PAPER-I-PHYSICAL AND ANALYTICAL CHEMISTRY

CO1 Define the terms in phase equilibria such as- system, phase in system, components in

system, degree of freedom, one / two component system, phase rule, laws, differentiate ideal and no-ideal solutions.

Discuss meaning of phase, component and degree of freedom. • Derive of phase rule.

Explain of one component system with respect to: Description of the curve, Phase rule

relationship and typical features for i) Water system ii) Carbon dioxide system iii) Sulphur system

CO2 Discuss / explain thermodynamic aspects of Ideal solutions-Gibbs free energy change,

Volume change, Enthalpy change and entropy change of mixing of Ideal solution.

Differentiate between ideal and non-ideal solutions and can apply Raoult's law.

Interpretation of i) vapour pressure–composition diagram ii) temperature-composition diagram.

Discuss / explain solubility of partially miscible liquids- systems with upper critical.

Solution temperature, lower critical solution temperature and having both UCST and LCST. Explain / discuss concept of distribution of solute amongst pair of immiscible solvents.

CO3 Explain distillation of liquid solutions from temperature – composition diagram.

Explain / discuss azeotropes, Lever rule, Henrys law and its application.

Explain meaning and Types of equilibrium such as true or static, metastable-unstable equilibrium.

Explain / define different terms in conductometry such as electrolytic conductance, resistance, conductance, Ohm's law, cell constant, specific and equivalent conductance, molar conductance, Kohlrausch's law, etc. Explain / define different terms in Colorimetry such as radiant power, transmittance.

Correlate different terms with each other and derive equations for their correlations.

CO4 Derive distribution law and its thermodynamic proof.

Apply solvent extraction to separate the components of from mixture interest.

Solve problem by applying theory. absorbance, molar, Lamberts Law, Beer's Law, molar absorptivity

Discuss / explain / derive Beer's law of absorptivity. Explain construction and working of colorimeter. Apply colorimetric methods of analysis to real problem in analytical laboratory. Solve problems based on theory / equations. Correlate different terms with each other and derive equations for their correlations. Discuss / explain Kohlrausch's law and its Applications, Conductivity Cell, Conductivity.

CO5 Solve problems based on theory / equations.

Discuss / explain separation of ionic substances using resins.

Discuss / explain separation of substances using silica gel / alumina.

Apply column chromatographic process for real analysis in analytical laboratory.

CH-402 PAPER-I-ORGANIC AND INORGANIC CHEMISTRY

CO1 Identify and draw the structures amines from their names or from structure name can be assigned.

After studying the aromatic hydrocarbons student will able to- Identify / explain / discuss inner and outer orbital complexes. To identify Td and Sq. Pl complexes on the basis of magnetic properties / unpaired electrons. Identify and draw the structures aldehydes/ketones from their names and vice a versa.

Identify and draw the structures carboxylic acids and their derivatives from their names or from structure name can be assigned.

CO2 After studying the aromatic hydrocarbons student will able to-

Correlate no of unpaired electrons and orbitals used for bonding. Isomerism in coordination complexes Explain different types of isomerism in coordination complexes.

Explain / discuss limitation of VBT.

CO3 After studying the aromatic hydrocarbons student will able to-

Explain principle of CFT.

Explain: i) strong field and weak field ligand approach in Oh complexes ii) Magnetic properties of coordination compounds on the basis of weak and strong ligand field ligand concept. iii) Origin of colour of coordination complex.

Calculate field stabilization energy and magnetic moment for various complexes.

Explain spectrochemical series, tetragonal distortion / Jahn-Teller effect in Cu(II) OH complexes only.

CO4 Write / discuss the mechanism reactions aldehydes and ketones. To correlate reagent and reactions of aldehydes and ketones

Give synthesis of expected aldehydes and ketones. Perform inter conversion of functional groups.

CO5 Explain / discuss synthesis of carboxylic acids and their derivatives.

Write / discuss the mechanism reactions carboxylic acids and their derivatives.

Explain /Discuss important reactions of carboxylic acids and their derivatives.

CO6 Apply principles of VBT to explain bonding in coordination compound of different geometries.

Correlate reagent and reactions of carboxylic acids and their derivatives

Give synthesis of expected carboxylic acids and their derivatives.

Perform inter conversion of functional groups

Explain / discuss synthesis of carboxylic amines.

Write / discuss the mechanism reactions carboxylic amines.

To correlate reagent and reactions of carboxylic amines.Give synthesis diazonium salt from amines and reactions of diazonium salt. Perform inter conversion of functional groups.

CO7 Draw the structures of different conformations of cyclohexane.

Define terms such as axial hydrogen, equatorial hydrogen, confirmation, substituted cyclohexane.

Convert one conformation of cyclohexane to another conformation and should able to

Explain / discuss stability with respect to potential energy of different conformations of cyclohexane.

Draw structures of conformations of methyl / t-butyl Cyclohexane and 1, 2 dimethyl cyclohexane.

Identify cis-trans-isomers of 1, 2 dimethyl cyclohexane and able to compare their stability.

CH-403 PAPER-III-PRACTICALCHEMISTRY

CO1 Verify theoretical principles experimentally

CO2 Interpret the experimental data on the basis of theoretical principles.

Correlate the theory to the experiments. Understand / verify theoretical principles by

experiment or explain practical output with the help of theory.

CO3 Understand systematic methods of identification of substance by chemical methods.

Write balanced equation for all the chemical reactions performed in the laboratory.

CO4 Perform organic and inorganic synthesis and able to follow the progress of the chemical reaction.

Set up the apparatus properly for the designed experiments.

CO5 Perform the quantitative chemical analysis of substances and able to explain principles behind it.

CO6 Use molar concentrations for volumetric /estimations/synthesis experiments.

Use optimum concentrations and volumes

CO7 Two burette method should be used for volumetric analysis (Homogeneous Mixtures)

Use of Micro scale technique is recommended wherever possible.

T.Y.B. Sc -Chemistry

CH-501 PHYSICAL CHEMISTRY

CO1 After successfully completion, students will be able to:

Know historical of development of quantum mechanics in chemistry.

Understand and explain the differences between classical and quantum mechanics.

Understand the idea of wave function

Understanding of De Broglie hypothesis and the uncertainty principle

Understanding the operators: Position, momentum and energy

Solving Schrodinger equation for 1D, 2D and 3D model

Physical interpretation of the ψ and $\psi 2$ and sketching the wave function

Applications to conjugated systems, zero-point energy and quantum tunnelling, Numerical Problems

CO2 Understand the term additive and constitutive properties.

Understand the term specific volume, molar volume and molar refraction.

Understand the meaning of electrical polarization of molecule, induced and orientation polarization.

Dipole moment and its experimental determination by temperature variation method.

Electromagnetic spectrum, Nature of wave and its characteristics such as wavelength, wave number, frequency and velocity, Energy level diagram,

Classification of molecules on the basis of moment of Inertia,

Rotational spectra of rigid diatomic molecules, selection rules, nature of spectral lines.

Simple Harmonic oscillator model, Born-Oppenheimer approximation. Vibrational spectra of diatomic molecules selection rules, nature of spectral lines.

Explain the difference between Rayleigh, Stokes and anti-Stokes lines in a Raman spectrum.

Justify the difference in intensity between Stokes and anti-Stokes lines.

Draw the Stokes and anti-Stokes lines in a Raman spectrum

Raman spectra: Concept of polarizability,

Pure rotational Raman spectra of diatomic molecules, Energy Expression, Selection rule, Rotational energy level diagram, Rotational Raman spectrum and Problems.

CO3 After studying this chapter, the student will be able to know and understand:

Difference between thermal and photochemical processes.

photochemical laws: Grothus - Draper law, Stark-Einstein law,

Quantum yield and reasons for high and low quantum yield,

factors affecting the quantum yield,

Experimental method for the determination of quantum yield

Photochemical reactions: photosynthesis, photolysis, photocatalysis, photosensitization

Various photochemical phenomena like fluorescence and phosphorescence, Chemiluminescence, Problems

CH-502 ANALYTICAL CHEMISTRY

CO1 Difference between qualitative and quantitative analysis. Types of analysis. Basic principles of gravimetric. Steps involved in gravimetric analysis.Perform quantitative calculations depending upon equations student has studied in the theory. Furthermore, student should able to solve problems on the basis of theory.

CO2 spectrophotometry, Beers law, absorbance, transmittance, molar absorptivity, monochromator, wavelength of maximum absorbance metal ligand ration

CO3 Differentiate / distinguish / Compare among the different analytical terms, process and analytical methods.

CO4 Select particular method of analysis if analyte sample is given to him.

CO5 Explain different principles involved in the gravimetric, spectrophotometer, parameters in instrumental analysis, qualitative analysis.

CO6 Apply whatever theoretical principles he has studied in theory during practical session in lab.

CO7 Demonstrate theoretical principles with help of practical.

CO8 Design analytical procedure for given sample.

CH-503 PHYSICAL CHEMISTRY PRACTICAL-I

CO1 Verify theoretical principles experimentally

CO2 Interpret the experimental data on the basis of theoretical principles.

Correlate the theory to the experiments. Understand / verify theoretical principles by experiment or explain practical output with the help of theory.

CO3 Understand systematic methods of identification of substance by chemical methods.

Write balanced equation for all the chemical reactions performed in the laboratory.

CO4 Perform organic and inorganic synthesis and able to follow the progress of the chemical reaction.

Set up the apparatus properly for the designed experiments.

CO5 Perform the quantitative chemical analysis of substances and able to explain principles

CO6 Use molar concentrations for volumetric /estimations/synthesis experiments.

Use optimum concentrations and volumes

CO7 Two burette method should be used for volumetric analysis (Homogeneous Mixtures)

Use of Micro scale technique is recommended wherever possible.

CH-504 INORGANIC CHEMISTRY

CO1 To understand about inert and labile complexes and stability of complexes in aqueous solutions Classification of reactions of coordination compounds

The basic mechanisms of ligand substitution reactions.

Substitution reactions of square planer complexes.

Tran's effect and applications of Trans effect

Stereochemistry of mechanism

Gain the knowledge of inorganic reaction mechanisms available in the literature to solve chemical problems

CO2 Explanation inert and labile complexes and stability of complexes in aqueous solutions

Classification of reactions of coordination compounds

The basic mechanisms of ligand substitution reactions.

Substitution reactions of square planer complexes.

Tran's effect and applications of Trans effect

Stereochemistry of mechanism

Gain the knowledge of inorganic reaction mechanisms available in the literature to solve chemical problems.

CO3 Explanation position of d-block elements in periodic table. General electronic configuration & electronic configuration of elements.

To know trends in periodic properties of these elements w.r.t. size of atom and ions, reactivity, catalytic activity, oxidation state, complex formation ability, color, magnetic properties, non-stoichiometry, density, melting point, boiling point.

CO4 The meaning of metal & semiconductor.

The difference between metal, semiconductor and insulator.

Metallic bond on the basis of band theory.

The energy band and energy curve.

Draw n (E) & N (E) curves.

Explain the electrical conductivity of metals with respect to valence electrons.

Explain the effect of temperature and impurity on conductivity of metals and semiconductors.

Intrinsic and extrinsic semiconductor.

The term valance band and conduction band.

n and p type of semiconductors. Non-stoichiometry and semi conductivity.

CH 505 INDUSTRIAL CHEMISTRY

CO1 Understand the principals involved, Manufacture of ammonia by modified Haber Bosch process, its uses. Sulphuric acid: Physicochemical principles involved, Manufacture of sulphuric acid by contact process, its uses, Nitric acid: Physicochemical principles involved, Manufacture of nitric acid by Ostwald's process, its uses. Define all the terms related to modern approach to chemical industry, agrochemicals, food and starch.

CO2 Importance of chemical industry, meaning of the terms involved, Comparison between batch and continuous process. Knowledge of various industrial aspects list basic chemicals, petrochemicals and eco-friendly fuels, cement and glass industry.

CO3 Scope, Nutritive aspects of food constituents, Quality factors and their measurements, food deterioration factors and their control, food preservation and food additives recall information about basic chemicals used in industry, agrochemicals, fuels and their types, nutritive aspects of food.

CO4 Classify fuels, chemical reactions, plant nutrients, herbicides, pesticides, insecticides and fungicides, glass and cement.

CO5 Analyze applications and synthesis of different types of industrial chemicals

CO6 Select which principles are appropriate for industrial set up and to improve the yield of product.

CH-506 INORGANIC CHEMISTRY PRACTICAL –I

CO1 Basic concepts of gravimetric analysis, colorimetric analysis, coordination chemistry and group elements.

CO2 Students should know- Importance of the Practical, Basic skill development experiments

CO3 To know the proper way of experiment

CO4 Calculations and observations

CH 507 ORGANIC CHEMISTRY

CO1 Definition and types of organic acid and base

The pka and pkb concepts

Effect of temperature on pka/pkb

Comparison between strengths of acids/bases

What is acid-base catalysis

CO2 To draw different types of disubstituted cyclohexane in Chair form

To distinguish between geometrical and optical isomerism

Stability, energy calculations with potential energy diagram and optical activity of these conformers.

CO3 Definition and type of nucleophiles and leaving groups

Different types of nucleophilic substitution reactions

Definition of inversion and racemization

CO4 Solve the chemical Reactions for Aliphatic Nucleophilic, Aromatic electrophilic and Nucleophilic Substitution Reaction.

CO5 To predict product/s or supply the reagent/s for these reactions follows E1, E2 or E1cB mechanism

CO6 To predict product/s or supply the reagent/s for these reactions' aromatic substitution addition-Elimination or Elimination-addition mechanism, Ipso substitution.

CH-508 CHEMISTRY OF BIOMOLECULES

CO1 Understand basic concepts of unicellular and multicellular organisms

Explain the term prokaryotic and eukaryotic cell

Analyse the types of bonds in bio-molecules

Evaluate the types of organelles present.

CO2 Carbohydrates: After studying this topic students are expected to know-

Explain the term carbohydrates and classification of carbohydrates

To understand reactions of glucose

Evaluate the concept of mutarotation

Interpret reducing and non-reducing sugars

CO3 Understand the term lipids and classification of lipids

To understand reactions of lipids

Explain concept of saponification number, iodine number

Analyse concept and types of lipoproteins

CO4 Understand the term aminoacids and classification of aminoacids

Evaluate concept of isoelectric pH experimentally

Understand reactions of amino acids

Analyse primary, secondary and teriary structure of proteins

CO-5 Understand the term enzymes and classification of aminoacids

Evaluate concept of ES-complex formation

Understand factors affecting enzymes

Analyse types of enzyme inhibition

CO-6 Explain the term hormones

Understand the types of endocrine glands

Analyse the biochemical nature of hormones

CH-509 ORGANIC CHEMISTRY PRACTICAL-I

CO1 Understand preparation techniques

Analyse the content obtained.

CO2 Determine type of the solution

Explain the elements involved in it

Understand Lassaign'e test.

Interpret melting point or boiling point of the substance

Determine the functional group present.

CO3 Understand the preparation technique

Explain method of preparation

Calculate the yield of substance

Run TLC

CO4 Understand the term pH-meter and use of it

Interpret construction and working of pH-meter instrument

Use pH-meter experiment for calculation of pH.

CO-5 Understand the term volumetric analysis

Interpret amount of substance present in sample

Use different titration methods for calculating amount of substance present in the sample

CH-510B POLYMER CHEMISTRY

CO1 History of polymers.

Difference between simple compounds and polymer.

Names of polymers.

Various ways of nomenclature

CO2 Difference between natural, synthetic, organic and inorganic polymers.

Terms-Monomer, Polymer, Polymerization, Degree of polymerization, Functionality, Number average, Weight average molecular weight

CO3 Mechanisms of polymerization.

Polymerization techniques.

Uses & properties of polymers

CO4 Role of polymer industry in the economy.

Advantages of polymers

CH-511A ENVIRONMENTAL CHEMISTRY

CO1 Students should know- Importance and conservation of environment.

CO2 Segments of atmosphere

Hazards of flue gases

Ozone depletion

Ecological changes due to hazardous gases

Understand the social issues

CO3 Water resources

Quality of potable water

WHO limits for toxic materials in water stream

Quality measures

CO4 Need of green chemistry technology

Principles of green chemistry

Advantages of green chemistry

Simple examples to clarify the principles

Catalytic routes for sustainable developments

CH-601 PHYSICAL CHEMISTRY – II

CO1 Electrochemical Cell: After studying this topic students are expected to know-

What is mean by Electrochemical cell with specific example

Origin of EMF of electrochemical cell.

Thermodynamics and EMF: Relation of EMF with ΔG, ΔG°,ΔH, ΔS and equilibrium constant K

CO2 The atom its nucleus and outer sphere.

Classification of nuclides with suitable examples such as isotope, isobar, isotone and isomers

Explanation of stability of nucleus through neutron to proton ratio, odd and even nature of proton and neutron, Mean binding energy.

CO3 Explain the term polymorphism /allotrophism , Distance between the planes for 100, 110 and 111 type of simple, body centred and face centred cubic crystals , Bragg's experiment and Derivation of ($n\lambda = 2d\sin\theta$)Bragg's equation.

CO4 Radioactivity

Types and properties of radiations: alpha, beta and gamma

Detection and Measurement of Radioactivity: Cloud chamber, Ionization Chamber, Geiger-Muller Counter, Scintillation Counter, Film Badges

CH-602 PHYSICAL CHEMISTRY – III

CO1 History of polymers. Meaning of the terms-Solution, electrolytes, nonelectrolytes and colligative properties,

Lowering of vapour pressure of solvent in solution,

Elevation of B.P. of solvent in solution, Landsberger's method,

freezing point depression, Beckmann's method Osmosis and Osmotic pressure, Berkeley and Hartley method,

CO2 Classification of polymers

Rate laws for reactions in solid state

Applying rate laws for solid state reactions

Results of kinetics studies

Cohesive Energy of ionic crystals based on coulomb's law and Born Haber Cycle

Correspondence between energy levels in the atom and energy bands in solid

Band structure in solids – Na , Ca and diamond

CO3 Conductors and insulators – Its correlation with Extent of energy in energy bands

phenomena of photoconductivity

Semiconductors – Role of impurity in transformation of insulator into semiconductor

Temperature dependant conductivity semiconductors

Cohesive Energy in metals,

Application of colligative properties to determine molecular weight of nonelectrolyte, abnormal molecular weight, Relation between Vant Hoff's factor and degree of dissociation of electrolyte by colligative property Factors affecting on solid state reactions.

CO4 Chemical bonding & Molecular forces in Polymer

Molecular weight of polymers

Practical significance of polymer molecular weights

Molecular weight determination

Problem, Numericals based on cohesive energy

CH-604 INORGANIC CHEMISTRY-I

CO1 Understand meaning of metal & semiconductor. Understand the role of metals in non-enzymatic processes. The essential properties of homogeneous catalysts- Define the homogenous catalyst and heterogeneous catalysis, give examples of heterogeneous catalysts, and understand the essential properties of heterogeneous catalysts.

CO2 Predict Electronic configuration of lanthanides and actinides. Oxidation states of lanthanides and actinides and common oxidation states.

CO3 Differentiate between the defects. Understand the essential properties of heterogeneous catalysts. The catalytic reactions used in industries around.

Classify the nature of solids, know the crystal structures of void, calculate the effect of radius ratio in determining the crystal structure, draw the structure of Vit.B12 and give its metabolism. Draw Born-Haber cycle.

CO4 Give the brief account of homogeneous catalysis; Give the classification of metals as enzymatic and non-enzymatic, Give the brief account of biodiesel synthesis using heterogeneous catalysis. Enlist the catalysts used for benzimidazole synthesis.

Solve simple problems based on Born- Haber cycle. Give the catalytic reactions for Wilkinson's Catalysis, Zeigler Natta Catalysis, and Monsanto acetic acid synthesis.

CH-605 INORGANIC CHEMISTRY-II

CO1 To know toxic chemical in the environment, the impact of toxic chemicals on enzyme, the biochemical effect of Arsenic, Cd, Pb, Hg, the defects in Ionic solids.

CO2 Students able to define Pauling's univalent radius and crystal radius. Various methods of nanoparticle synthesis, Properties and Application of Nan particles, to differentiate between the defects, the C.N. of an ion in ionic solid.

CO3 To explain biological methylation. Identify the type of void; learn the concept of acid base and their theories. come to know different properties of acids and bases.

CO4 To solve simple problems based on Born- Haber cycle.

Problems based on Pauling's univalent radii and crystal radii. Strength of various types acids.

CO5 Know about carbon nano-tube and its application. How acid and base strengths get affected in non-aqueous solvents.

CH-606 INORGANIC CHEMISTRY PRACTICAL –II

CO1 Basic concepts of FES, Column chromatography.

CO2 Students should know- Importance of the Practical, Basic skill development experiments

CO3 To know the proper way of experiment

CO4 Calculations and observations

CH-607 ORGANIC CHEMISTRY

CO1 Understand basic concepts of spectroscopy

Explain the types of spectroscopy

understand and evaluate the terms like frequency, wavenumber.etc

Solve the numerical problems based on this topic.

CO2 Ultra Violet and Visible Spectroscopy: After studying this topic students are expected to know-

Explain the terms like chromophore, auxochrome, bathochromic shift

Understand applications of spectroscopy

Analyse different electronic transitions

Solve the numerical problems based on this topic.

CO3 Explain the term infrared spectroscopy

Understand different molecular vibrations

Analyse different Infrared spectroscopy applications

Solve the numerical problems based on this topic.

CO4 Explain the term nuclear magnetic resonance spectroscopy

Understand shielding and dieshielding effect

Analyse concept of spin-spin coupling, chemical shift

Solve the numerical problems based on Spectroscopy

CO-5 Explain the concept of geometrical and optical isomerism

Understand and evaluate stablity and energy content of 1,2-disubstituted cyclohexane

Analyse the concept of stablity and energy content of 1,3-disubstituted cyclohexane

Understand the concept of stablity and energy content of 1,4-disubstituted cyclohexane

CH-608 ORGANIC CHEMISTRY-III

CO1 Understand basic terms of Retrosynthetic analysis

Explain one group disconnection

Understand synthesis of organic molecules

Analyse reterosynthetic reactions

CO2 Reactive Intermediates: After studying this topic students are expected to know-

Understand basic terms of reactive intermediates like carbonium, carbanion.

Explain different rearrangement reactions.

Understand mechanism involved in different rearrangement reactions

Analyse structural problems and chemical reactions.

CO3 Understand basic terms like oxidation, reduction, oxidising agents and reducing agents.

Explain different reactions involving oxidising and reducing agents.

Understand role of oxidising agents in reaction

Analyse reducing agents in chemical reactions.

CO4 Understand the term natural products.

Explain classification and spectral methods used in natural products.

Understand different chemical reactions for synthesis of natural products.

Analyse molecular weight of polymers.

CH-609 PRACTICALS IN ORGANIC CHEMISTRY-II

CO1 Understand preparation techniques

Analyse the content obtained.

CO2 Determine type of the natural compound

Explain the technique involved

Interpret melting point or boiling point of the substance

Determine the functional group present.

CO3 Understand the preparation technique

Explain method of preparation

Calculate the yield of substance

Run TLC

CO4 Understand the term IR and NMR

Interpret substance by using IR and NMR

Use IR and NMR spectra for explain characteristics of the compound

CO-5 Understand the term volumetric analysis

Interpret amount of substance present in sample

Use different titration methods for calculating amount of substance present in the sample

CH-610A CHEMISTRY OF SOIL AND AGROCHEMICALS

CO1 Understood various components of soil and soil properties and their impact on plant growth.

Understood the classification of the soil.

Explores the problems and potentials of soil and decide the most appropriate treatment for land use. Understood the Reclamation and management of soil physical and chemical constraints.

CO2 Useful in making decisions on nutrient dose, choice of fertilizers and method of application etc. practiced in crop production.

Got experience on advanced analytical and instrumentation methods in the estimation of soil.

CO3 Understood various Nutrient management concepts and Nutrient use efficiencies of major and micronutrients and enhancement techniques. Proper understanding of chemistry of pesticides will be inculcated among the students.

CO4 Imparts knowledge on different pesticides, their nature and, mode of action and their fate in soil so as to monitor their effect on the environment.

CH-611A ANALYTICAL CHEMISTRY

CO1 Define basic terms in solvent extraction,

basics of chromatography, HPLC, GC, and AAS and AES.

Some important terms are: solvent extraction, aqueous and organic phase, distribution ratio and coefficient, solute remain unextracted, percent extraction, ion association complex, theoretical plate, HETP, retention time, selectivity, resolution, stationary phase, normal and reverse phase, ion exchange, column efficiency, carrier gas, split and spitless injection, packed column, tubular column, atomic absorption and emission spectroscopy, electronic excitation in atoms, nebulization, atomization, reduction of metal ions in flame, absorbance by atoms in flame, flame atomizers, furnace atomizers, interference in AES and FES, HCL, hydride generator, etc. ous extraction (c) counters current extraction. Difference between batch and multiple extractions.

CO2 Identify important parameters in analytical processes or estimations. Example: minimum analyte concentration in particular method, reagent concentration for particular analysis, reagent for particular analysis, reaction condition to convert analyte into measurable form, wavelength selection in HPLC with spectrophotometric and fluorometric detector, solvent or carrier gas in HPLC and GC, choice method for the sample preparation in atomic spectroscopic methods, choice of filter and HCL in atomic spectroscopic methods, etc.

CO3 Explain different principles involved in the analyses using solvent extraction, basics of instrumental chromatography, HPLC, GC, and atomic spectroscopic techniques.

CO4 Discuss / Describe procedure for different types analyses included in the syllabus. Select particular method of analysis if analyte sample is given to him. Differentiate / distinguish / compare among the different analytical terms, process and analytical methods.

CO5 To solve the numerical problems. Demonstrate / explain theoretical principles with help of practical. Design analytical procedure for given sample. Apply whatever theoretical principles he has studied in theory during practical in laboratory.