Chemistry Honours.

Year : 2019-2020

Class : B.Sc 1st Semester (Hons.) **Paper: C1T** **Sub: Organic Chemistry**

Course outcome:

- **Bonding and Physical Property**:
  1. Understanding the concept of valance bond Theory ,MO theory ,Hybridization theory , aromaticity and application of these to physical properties of organic molecules.
- **Basic principle of organic Reaction mechanism:**
  1.Classification of reaction nature of bond fission ,bond formation reagent etc.
- **Stereochemistry:**
  1.Student will learn The way of learning organic Chemistry which is 3D in nature and also the optical properties of different organic molecules.

Organic Chemistry Lab-I (C1P):

By the end of this practical students should be able to

1.Carry out the different organic reaction as prescribed in the syllabus.

Year : 2019-2020

Class : B.Sc 1st Semester (Hons.) **Paper: C2T** **Sub: physical Chemistry**

- **Kinetic theory of gaseous state:**
- **Course outcome:**

1. understand the kinetic molecular theory of gases and apply it to derive the relations of binary collision frequency, wall collision , rate of effusion and mean free path of gas molecules.

2. Describe the Maxwell's law of distribution of molecular speeds in 1D,2D and 3D and its applications.

3. Apply the principle of equipartition of energy along with the concept of degree of freedom to describe heat capacity of gases.

4.Explain intermolecular forces of attraction and Lennard – jones potential.

- **Chemical thermodynamics:**

Course outcome:

1.Understand the terminologies used in the study of thermodynamics, concept of state function, internal energy and enthalpy.

2. Use the laws of thermochemistry to find the enthalpy change.

3. understand the concept of heat engine, carnot engine, and refrigerator.

4. understand and application of 2nd law of thermodynamics, concept of entropy.

5. Explain joule- Thomson experiment and its consequences.

6.Understand 3rd law of thermodynamics for determination of absolute entropy.

7. To know spontaneity of chemical reaction.

- **Chemical kinetics:**

Course outcome:

1. Students will learn reaction mechanism and kinetics of chemical reactions.

2.Explain effect of temperature on rate constant of a reaction.

3.Understand the kinetics of enzyme catalysis reaction.

4. Learn different methods for determining order of a reaction.

- **Physical chemistry Lab –(i):C2P**

Carry out all experiments as prescribed in the syllabus.

Generic Elective

Year : 2019-2020

Class : B.Sc 1st Semester (GE) Paper: GE-1T Sub: Inorganic & Organic Chemistry

Course Outcome:

- **Atomic Structure**
  1. Understand atomic spectra of hydrogen atom.
  2. Learn shape of orbital , radial node & angular node.

- **Chemical Peroodicity:(s,p,d,f)**
  By the end of this topic, students should be able to -
  1. Describe the relative stability of different oxidation states, diagonal relationship and anomalous behavior of tint member of each group.
  2. Explain the allotropy and catenation property.
  3. Study of the following compounds with emphasis on structure, bonding, preparation, properties and use – Boric acids, Boron Nitrides, Borates, Graphitic compounds, silanes, oxides and oxo-acides of nitrogen phosphorus, sulphur, Chlorine, Peroxo of sulpher, Sulpher – nitrogen compounds, interhalogen compounds, polyhalides ion, pseudo halogen, fluorocarbon and basic properties of halogen.

- **Acids and bases and redox reaction:**
  1. Understand the concept of acid and base.
  2. Learn conjugate acid and bases .
  3. Know application of HSAB process.
  4. Learn the balance of redox reaction by ion electron and oxidation number method.

- **Stereochemistry :**
  1. Understand 3D Conformation and configuration of optically active molecule
  2. Know the different isomerism and determine R/S, E/Z nomenclature .

- **Aliphatic Hydrocarbon:**
  1. Learn addition elimination reaction mechanism of different molecules.
  2.Learn oxidation reaction of alkanes ,alkenes & alkines

Chemistry Lab(GE-1P):

By the end of this practical students should be able to

1.Carry out the different organic reaction as prescribed in the syllabus

Class : B.Sc. 1st Year (Hons.) (Semester-II)	Paper : CC-3 (T)	Course : (Inorganic Chemistry - II)

Course Outcome:

- **Atomic Structure**
  1. Understand atomic spectra of hydrogen atom.
  2. Learn shape of orbital , radial node & angular node.

- **Chemical Periodicity:**
  1.Discuss about IUPAC periodic table ,effective nuclear charge,screening effect and penetration.
  2. Understand different electronegativity scales and their applications.
- **Acid Base reaction:**
  1. Explain different concept of acid and bases,solvent leveling and differentiating effects.
  2. Explain HSAB Principle and its application.
  3. Understand PH and its significance.
  4.Define buffer solution ,its type and know how to mixed such solution.
- Redox & Precipitation reactions:
  1. Define redox potential ,standered redox potential and the nernst's equation.
  2.Blance the Chemical equation of Ion electron and oxidation number method.
  3. Explain the application of the solubility product principle .

Green Chemistry Lab-II(CC-3P):

By the end of this practical students should be able to

1.Carry out the different organic reaction as prescribed in the syllabus.

Year : 2019-2020

Class : B.Sc 2nd Semester (Hons.) **Paper: C4T** **Sub: Organic Chemistry**

Stereochemistry II :

1**. Chirality arising out of stereoaxis**: Know the stereoisomerism of substituted cumulenes with even and odd number of double bonds; chiral axis in allenes, spiro compounds, alkylidenecycloalkanes and biphenyls; related configurational descriptors (Ra/Sa and P/M); atropisomerism; racemisation of chiral biphenyls; buttressing effect. Concept of prostereoisomerism: prostereogenic centre; concept of (pro) n -chirality: topicity of ligands and faces (elementary idea); pro-R/pro-S, pro-E/pro-Z and Re/Si descriptors; pro-r and pro-s descriptors of ligands on propseudoasymmetric centre.

2.Conformation: Discuss the conformational nomenclature: eclipsed, staggered, gauche, syn and anti; dihedral angle, torsion angle; Klyne-Prelog terminology; P/M descriptors; energy barrier of rotation, concept of torsional and steric strains; relative stability of conformers on the basis of steric effect, dipole-dipole interaction and H-bonding; butane gauche interaction; conformational analysis of ethane, propane, n-butane, 2-methylbutane and 2,3- dimethylbutane; haloalkane, 1,2-dihaloalkanes and 1,2-diols (up to four carbons); 1,2- halohydrin; conformation of conjugated systems (s-cis and s-trans).

Course OutCome: Student will learn The way of learning organic Chemistry which is 3D in nature and also the optical properties of different organic molecules.

General Treatment of Reaction Mechanism II:

1**.Reaction thermodynamics:**

Understand the free energy and equilibrium, enthalpy and entropy factor, calculation of enthalpy change via BDE, intermolecular & intramolecular reactions. Concept of organic acids and bases: effect of structure, substituent and solvent on acidity and basicity; proton sponge; gas-phase acidity and basicity; comparison between nucleophlicity and basicity; HSAB principle; application of thermodynamic principles in acid-base equilibria.

2.Tautomerism: Understand prototropy (keto-enol, nitro - aci-nitro, nitroso-oximino, diazo-amino and enamine-imine systems); valence tautomerism and ring-chain tautomerism; composition of the equilibrium in different systems (simple carbonyl; 1,2- and 1,3-dicarbonyl systems, phenols and related systems), factors affecting keto-enol tautomerism; application of thermodynamic principles in tautomeric equilibria.

3.Reaction kinetics:

Know the rate constant and free energy of activation; concept of order and molecularity; free energy profiles for one-step, two-step and three-step reactions; catalyzed reactions: electrophilic and nucleophilic catalysis; kinetic control and thermodynamic control of reactions; isotope effect: primary

and secondary kinetic isotopic effect (kH /kD); principle of microscopic reversibility; Hammond's postulate.

Course Outcome: The student will learn basic principle of reaction mechanism,Kinetics & Thermodynamics

Substitution and Elimination Reactions :

1.**Free-radical substitution reaction:**

Explanation of halogentaion alkanes, mechanism (with evidence) and stereochemical features; reactivity-selectivity principle in the light of Hammond's postulate. Nucleophilic substitution reactions: substitution at sp3 centre: mechanisms (with evidence), relative rates & stereochemical features: SN1, SN2, SN2', SN1' (allylic rearrangement) and SNi; effects of solvent, substrate structure, leaving group and nucleophiles (including ambident nucleophiles, cyanide & nitrite); substitutions involving NGP; role of crown ethers and phase transfer catalysts; [systems: alkyl halides, allyl halides, benzyl halides, alcohols, ethers, epoxides].

2. **Elimination reactions:**

Explain E1, E2, E1cB and Ei (pyrolytic syn eliminations); formation of alkenes and alkynes; mechanisms (with evidence), reactivity, regioselectivity (Saytzeff/Hofmann) and stereoselectivity; comparison between substitution and elimination; importance of Bredt's rule relating to the formation of C=C.

Course Outcome: The student will learn mechanism of nucleophilic substitution reaction.

Organic Chemistry Lab-II (C4P):

By the end of this practical students should be able to

1.Carry out the different organic reaction as prescribed in the syllabus.

Year : 2019-2020

Class : B.Sc 2nd Semester (GE) Paper: GE-2T Sub: Inorganic & physical chemistry

Course Outcome:

- **Kinetic theory of gaseous state:**

1. understand the kinetic molecular theory of gases and apply it to derive the relations of binary collision frequency, wall collision , rate of effusion and mean free path of gas molecules.

2. Describe the Maxwell's law of distribution of molecular speeds in 1D,2D and 3D and its applications.

3. Apply the principle of equipartition of energy along with the concept of degree of freedom to describe heat capacity of gases.

4.Explain intermolecular forces of attraction and Lennard – jones potential

- **Chemical kinetics:**

1. Students will learn reaction mechanism and kinetics of chemical reactions.

2.Explain effect of temperature on rate constant of a reaction.

3.Understand the kinetics of enzyme catalysis

4. Learn different methods for determining order of a reaction.

- **Transport Process:**

1. Know transport properties of substance(liquid).

2. Learn how to measure conductance experimentally.

3. Learn about conductometric titration.

4. Understand the DEBYE – HUCKEL theory of ionic atmosphere and its application.

- **<u>Chemical Bonding – I</u>**

By the end of this topic, students should be able to -

1.Discuss the general characteristics, types of ion, size effects, radius ratio rule and its application and limitation.

2 .Understand the packing of ions in crystals, Born-Lande equation with derivation.

3.Understand the kapnstinskii expression for lattice energy, medelung constant.

4.Explain the Born-Haber cycle and its application.

5.Define the defects in solids and solubility energies of dissolution process.

- **'P' block element:**

  By the end of this topic, students should be able to -
  1. Describe the relative stability of different oxidation states, diagonal relationship and anomalous behavior of tint member of each group.
  2. Explain the allotropy and catenation property.
  3. Study of the following compounds with emphasis on structure, bonding, preparation, properties and use – Boric acids, Boron Nitrides, Borates, Graphitic compounds, silanes, oxides and oxo-acides of nitrogen phosphorus, sulphur, Chlorine, Peroxo of sulpher, Sulpher – nitrogen compounds, interhalogen compounds, polyhalides ion, pseudo halogen, fluorocarbon and basic properties of halogen.

Chemistry Lab(GE-2P):

By the end of this practical students should be able to

1.Carry out the different organic reaction as prescribed in the syllabus.

Year : 2019-2020

Class : B.Sc. 3rd semester (Hons.) **Paper: C5T** **Sub: physical Chemistry**

- **Transport Process:**

  Course outcome:

  1. Know transport properties of substance(liquid).

  2. Learn how to measure conductance experimentally.

  3. Learn about conductometric titration.

  4. Understand the DEBYE – HUCKEL theory of ionic atmosphere and its application.

- **Quantum mechanics:**

  Course outcome:

  1. Understand dual nature of electron and also light.

  2. Learn concept about various type of algebraic operator and its application.

  3. Understand the difference between classical and quantum mechanics.

  4.Understand various type of model problem like 1D BOX, S.H.O and rigid rotor and its application .

  5. Know the concept about Schrodinger equation and its application.

- **Application of thermodynamics I :**

  Course outcome:

  1. Understand the concept of chemical potential and its application .

  2. Know the Nernst Distribution law and its application part for laboratory experiment.

  3. Explain the concept of ideal solution, ideally dilute solution and Raoult's law.

  4. Understand different thermodynamic criteria of open system.

- **Physical chemistry Lab- (ii): C5P**

  Carry out all experiments as prescribed in the syllabus

YEAR: 2019-20

Class : B.Sc. 2nd Year (Hons.) (Semester-III)	Paper : CC-6 (T) (Inorganic Chemistry - II)	Course :

Course Outcome

- **Chemical Bonding – I**

  By the end of this topic, students should be able to -

1. Discuss the general characteristics, types of ion, size effects, radius ratio rule and its application and limitation.
2. Understand the packing of ions in crystals, Born-Lande equation with derivation.
3. Understand the kapnstinskii expression for lattice energy, medelung constant.
4. Explain the Born-Haber cycle and its application.
5. Define the defects in solids and solubility energies of dissolution process.

- **Chemical Bonding – II**

  By the end of this topic, students should be able to -

1. Understand the molecular orbital concept of bonding.
2. Define the sigma, Pi and delta interaction.
3. Describe the orbital designation, gerade, ungerade, HOMO, LUMO, Orbital mixing.
4. Define the Mo. Diagram of (H_2, Li_2, Be_2, C_2, N_2, O_2, F_2)
5. Hetero nuclear molecular orbital's CO, NO, NO^+,CN^-, HF, BeH_2, CO_2 and H_2O
6. Discuss the metallic bond, semiconductors, and insulator and defects in solids.
7. Describe the vanderwals forces, Hydrogen Bonding, Halogen Bonds, Effect of Chemical force melting and boiling points.

- **Radioactivity**

  By the end of this topic, students should be able to -

1. Understand the nuclear stability and Binding energy.
2. Define the nuclear quantum number, magic number, nuclear reaction.
3. Understand the separation and use of isotops.
4. Describe the principals of determination of age of rocks and minerals, radious-carbon dating.

- **Inorganic Practical's C- 6 (P) : LAB**

  By the end of this topic, students should be able to -

1. Carry-out the Iodo/Iodometric Titration of the followings :-
   a) Estimation of Cu(II)
   b) Estimation of Vitamin (C)
   c) Estimation of (i) Arsenite and (ii) antimony in tartar-emetic iodimetrically.
   d) Estimation of available chlorine in bleaching powder.
   Carry – out the
2. Estimation of metal content in some selective samples –
   a) Estimations of Cu in brass
   b) Estimation of Cr and Mn in Steel
   c) Estimation of Fe in Cement

Year : 2019-2020

Class : B.Sc 3rd Semester (Hons.) Paper: C7T Sub: Organic Chemistry

Chemistry of alkenes and alkynes :

1.Addition to C=C: mechanism (with evidence wherever applicable), reactivity, regioselectivity (Markownikoff and anti-Markownikoff additions) and stereoselectivity; reactions:

Understand the hydrogenation, halogenations, iodolactonisation, hydrohalogenation, hydration, oxymercuration-demercuration, hydroboration-oxidation, epoxidation, syn and antihydroxylation, ozonolysis, addition of singlet and triplet carbenes; electrophilic addition to diene (conjugated dienes and allene); radical addition: HBr addition; mechanism of allylic and benzylic bromination in competition with brominations across C=C; use of NBS; Birch reduction of benzenoid aromatics; interconversion of E - and Z - alkenes; contrathermodynamic isomerization of internal alkenes.

2.Addition to C≡C (in comparison to C=C): Explain the mechanism, reactivity, regioselectivity (Markownikoff and anti-Markownikoff addition) and stereoselectivity; reactions: hydrogenation, halogenations, hydrohalogenation, hydration, oxymercuration-demercuration, hydroboration-oxidation, dissolving metal reduction of alkynes (Birch); reactions of terminal alkynes by exploring its acidity; interconversion of terminal and non-terminal alkynes.

Course Outcome : Student will learn the chemistry(preparation & properties with mechanism) of **C≡C & C=C**

Aromatic Substitution:

1.Electrophilic aromatic substitution:

Know the mechanisms and evidences in favour of it; orientation and reactivity; reactions: nitration, nitrosation, sulfonation, halogenation, Friedel-Crafts reaction; one-carbon electrophiles (reactions: chloromethylation, Gatterman-Koch, Gatterman, Houben-Hoesch, Vilsmeier-Haack, Reimer-Tiemann, Kolbe-Schmidt); Ipso substitituion. Nucleophilic aromatic substitution: addition-elimination mechanism and evidences in favour of it; SN1 mechanism; cine substitution (benzyne mechanism), structure of benzyne.

Couse Outcome : The students will learn the mechanism of electrophilic & nucleophilic substitution reaction.

Carbonyl and Related Compounds :

1.Addition to C=O:

Know the structure, reactivity and preparation of carbonyl compounds; mechanism (with evidence), reactivity, equilibrium and kinetic control; Burgi-Dunitz trajectory in nucleophilic additions; formation of hydrates, cyano hydrins and bisulphite adduct; nucleophilic addition-elimination reactions with alcohols,

thiols and nitrogen- based nucleophiles; reactions: benzoin condensation, Cannizzaro and Tischenko reactions, reactions with ylides: Wittig and Corey-Chaykovsky reaction; Rupe rearrangement, oxidations and reductions: Clemmensen, Wolff-Kishner, LiAlH4, NaBH4, MPV, Oppenauer, BouveaultBlanc, acyloin condensation; oxidation of alcohols with PDC and PCC; periodic acid and lead tetraacetate oxidation of 1,2-diols.

2. Exploitation of acidity of α-H of C=O: Explain the formation of enols and enolates; kinetic and thermodynamic enolates; reactions (mechanism with evidence): halogenation of carbonyl compounds under acidic and basic conditions, Hell-Volhard-Zelinsky (H. V. Z.) reaction, nitrosation, SeO2 (Riley) oxidation; condensations (mechanism with evidence): Aldol, Tollens', Knoevenagel, Claisen-Schmidt, Claisen ester including Dieckmann, Stobbe; Mannich reaction, Perkin reaction, Favorskii rearrangement; alkylation of active methylene compounds; preparation and synthetic applications of diethyl malonate and ethyl acetoacetate; specific enol equivalents (lithium enolates, enamines, aza-enolates and silyl enol ethers) in connection with alkylation, acylation and aldol type reaction.

3. Elementary ideas of Green Chemistry: Explain the Twelve (12) principles of green chemistry; planning of green synthesis; common organic reactions and their counterparts: reactions: Aldol, Friedel-Crafts, Michael, Knoevenagel, Cannizzaro, benzoin condensation and Dieckmann condensation. Nucleophilic addition to α,β-unsaturated carbonyl system: general principle and mechanism (with evidence); direct and conjugate addition, addition of enolates (Michael reaction), Stetter reaction, Robinson annulation. Substitution at sp2 carbon (C=O system): mechanism (with evidence): BAC2, AAC2, AAC1, AAL1 (in connection to acid and ester); acid derivatives: amides, anhydrides & acyl halides (formation and hydrolysis including comparison).

Course Outcome: The students will learn basic idea of green chemistry of carbonyl compound.

Organometallics :

1.Grignard reagent; Organolithiums; Gilman cuprates: preparation and reactions (mechanism with evidence); addition of Grignard and organolithium to carbonyl compounds; substitution on -COX; directed ortho metalation of arenes using organolithiums, conjugate addition by Gilman cuprates; Corey-House synthesis; abnormal behavior of Grignard reagents; comparison of reactivity among Grignard, organolithiums and organocopper reagents; Reformatsky reaction; Blaise reaction; concept of umpolung and base-nucleophile dichotomy in case of organometallic reagents.

Course outcome: The students will learn elementary idea of organometallic reagents.

Organic Chemistry Lab-III (C7P):

By the end of this practical students should be able to

1.Carry out the different organic reaction as prescribed in the syllabus.

Year : 2019-2020

Class : B.Sc 3rd Semester (Hons.) Paper: SEC-1T Sub: Pharmaceutical chemistry

Course outcome:

- **Drugs and pharmaceutical:**
  1. **Understanding the concept of drug discovery , design , development .**
  2. **Knowing the concept of representative drugs of antipyretic , antibiotics etc.**

- **Fermentation I:**
  1. **Discuss the production of ethyl alcohol and citric acid , Lysine , Vitamin C , antibiotics etc.**

Organic Chemistry Lab-III (SEC-1P):

By the end of this practical students should be able to

1.Carry out the different organic reaction as prescribed in the syllabus.

Year : 2019-2020

Class : B.Sc 3rd Semester (GE) Paper: GE-3T Sub: organic & physical chemistry

Course outcome:

- **Chemical energetics:**

1.Understand the terminologies used in the study of thermodynamics, concept of state function, internal energy and enthalpy.

2. Use the laws of thermochemistry to find the enthalpy change.

3. understand the concept of heat engine, carnot engine, and refrigerator.

4. understand and application of 2nd law of thermodynamics, concept of entropy.

5. Explain joule- Thomson experiment and its consequences.

6.Understand 3rd law of thermodynamics for determination of absolute entropy.

7. To know spontaneity of chemical reaction.

- **Ionic and Chemical Equilibrium:**

1. Learn thermodynamic condition for spontaneity
2. Learn the concept of PH and effect of temperature on pH.

- **Aromatic Hydrocarbon:**

1. Learn Preparation and reaction of aromatic hydrocarbon like Benzene.
2. Learn Preparation reaction of alcohols,Phenols & ethers
3. know reaction mechanism of aldehydes & ketones.

Chemistry Lab(GE-3P):

By the end of this practical students should be able to

1.Carry out the different organic reaction as prescribed in the syllabus.

Year : 2019-2020

Class : B.Sc 4th Semester (Hons.) **Paper: C8T** **Sub: physical Chemistry**

- **Application of thermodynamics-(II):**

  Course outcome :

  1. Learn the concept about colligative properties and its application for determination of osmotic pressure of dilute solution.

  2. Explain the process of osmosis and its application .

  3. Derive Gibbs phase rule that also help us to determine he degree's of freedom.

  4. Know about the phase diagram , phase transition of different component system.

- **Electrical properties of molecules :**

  Course outcome:

  1. Understand Debye – Huckel limiting law that also used to determine the activity coefficient of electrolyte.

  2. Derive the equation of mean ionic activity co-efficient for different electrolyte.

  3. Understand potentiometric titration .

  4. Determine P^H value, free energy entropy of a cell reaction .

  5. Know types of cells (reversible & irreversible)

- **Quantum Mechanics**

  Course outcome:

  1. Understand separation of variable technique for solving shrodinger wave equation in spherical co-ordinate.

  2. Explain nature of electron using four quantum numbers & its significance.

  3. Explain the physical significance of commutation relations.

  4. Derive and solved schrodinger equation for hydrogen & Hydrogen like system.

  5.Know LCAO & HF-SCF method to understand MOT,VBT to explain bonding, antibonding orbital of many electron atom.

- . **Physical chemistry Lab- (iii): C8P**

  Carry out all experiments as prescribed in the syllabus

Class : B.Sc. 2nd Year (Hons.) (Semester-IV)	Paper : C-9 (T) & C-9(P) (Inorganic Chemistry - III)	Course :

Course Outcome

- **General Principles of Metallurgy**

  By the end of this topic, students should be able to -

  1. Explain the modes of occurrence of metals based on standard electronic potentials.
  2. Describe the Ellingham diagram for reduction of metals oxides using carbon and carbon monoxide as reducing agent.
  3. Explain the different methods for purification of metals.
  4. Explain Electrolytic Kroll Process, Parting Process, Van Arkel-De-Boer process and Mondi Process.
  5. Describe Hydrometallurgy and zone refining.

- **Chemistry of S and P Block elements**

  By the end of this topic, students should be able to -

  1. Describe the relative stability of different oxidation states, diagonal relationship and anomalous behavior of tint member of each group.
  2. Explain the allotropy and catenation property.
  3. Study of the following compounds with emphasis on structure, bonding, preparation, properties and use – Boric acids, Boron Nitrides, Borates, Graphitic compounds, silanes, oxides and oxo-acides of nitrogen phosphorus, sulphur, Chlorine, Peroxo of sulpher, Sulpher – nitrogen compounds, interhalogen compounds, polyhalides ion, pseudo halogen, fluorocarbon and basic properties of halogen.

- **Nobel Gases**

  By the end of this topic, students should be able to -

  1. Describe the occurrence and uses.
  2. Rationalization of interness of nobel gases.
  3. Explain the clathrata, preparation and properties of XeF_2, XeF_4, XeF_6
  4. Determination of molecular shapes of nobel gas compounds by USEPR theory.

- **Inorganic Polymers**

  By the end of this topic, students should be able to -

  1. Classification of Polymers
  2. Describe the various types of Inorganic polymers and synthesis, structural aspects.
  3. Comparison with organic polymers.
  4. Explain the application of Silicon, Siloxanes, Borazines, Silicates and Phosphazenes.

- **Co-ordination Chemistry – I**

  By the end of this topic, students should be able to -

  1. Explain the Werner's theory of Co-ordination complex
  2. Classification of Ligands.
  3. Describe the Ambidentate ligands, Chelates.
  4. Discuss the Co-ordination numbers IUPAC nomenclature of coordination complex up to two metal centers.
  5. Describe the Isomerism in co-ordination compounds constitutional and stereo isomerism , geometrical and optical isomerism in square planar and octahedral complex.

- **Inorganic : chemistry C9 (P) : LAB**

  By the end of this practical students should be able to –

1. Carry out the complexometric titration of the following –
   a) Zn(II)
   b) Zn (II) in a Zn (II) and Cu (II) mixture.
   c) Ca (II) and Mg(II) in a mixture.
   d) Hardness of water.
2. Carry out the various inorganic preparations line –
   a) $(Cu(CH_3CN)_4)PF_6/Clo_4$
   b) Cis and trans $K(Cr(C_2O_4)_2\ (H_2o)_2)$
   c) Potassium diaquadioxalatochromate (III)
   d) Tetraanmine Carbonatocobalt (III) ion
   e) Potassium tris(oxalato) Ferrate (III)
   f) Tris- (ethylene diamine) nickel (II)chloride
   g) $(Mn(acac)_3)$ and $(Fe\ (acac)_3)$ (acac- Acetylactone)

Year : 2019-2020

Class : B.Sc 4th Semester (Hons.) Paper: C10T Sub: Organic Chemistry

Course outcome:

Nitrogen compounds Amines:

1.Aliphatic & Aromatic: preparation, separation (Hinsberg's method) and identification of primary, secondary and tertiary amines; reaction (with mechanism): Know Eschweiler–Clarke methylation, diazo coupling reaction, Mannich reaction; formation and reactions of phenylenediamines, diazomethane and diazoacetic ester.

2. Nitro compounds (aliphatic and aromatic): preparation and reaction (with mechanism): Know the reduction under different conditions; Nef carbonyl synthesis, Henry reaction and conjugate addition of nitroalkane anion.

3. Alkylnitrile and isonitrile: preparation and reaction (with mechanism):Mechanism of thorpe nitrile condensation, von Richter reaction.

4. Diazonium salts and their related compounds: reactions (with mechanism) involving replacement of diazo group; reactions: Know Gomberg, Meerwein, Japp-Klingermann.

Course Outcome: The students will learn the synthesis of nitrogen heterocyclic compounds.

Rearrangements :

1.Rearrangement to electron-deficient carbon: Explain the Wagner-Meerwein rearrangement, pinacol rearrangement, dienone-phenol; Wolff rearrangement in Arndt-Eistert synthesis, benzil-benzilic acid rearrangement, Demjanov rearrangement, Tiffeneau–Demjanov rearrangement.

2.Rearrangement to electron-deficient nitrogen: Know rearrangements: Hofmann, Curtius, Lossen, Schmidt and Beckmann.

3. Rearrangement to electron-deficient oxygen: Describe Baeyer-Villiger oxidation, cumene hydroperoxidephenol rearrangement and Dakin reaction.

4.Aromatic rearrangements: Describe Migration from oxygen to ring carbon: Fries rearrangement and Claisen rearrangement.

5.Migration from nitrogen to ring carbon: Know Hofmann-Martius rearrangement, Fischer-Hepp rearrangement, N-azo to C-azo rearrangement, Bamberger rearrangement, Orton rearrangement and benzidine rearrangement. Rearrangement reactions by green approach: Fries rearrangement, Claisen rearrangement, Beckmann rearrangement, Baeyer-Villiger oxidation.

Course outcome: The students will learn different mechanism of rearrangement reaction.

The Logic of Organic Synthesis :

1.Retrosynthetic analysis: Know the disconnections; synthons, donor and acceptor synthons; natural reactivity and umpolung; latent polarity in bifunctional compounds: consonant and dissonant polarity; illogical electrophiles and nucleophiles; synthetic equivalents; functional group interconversion and addition (FGI and FGA); C-C disconnections and synthesis: one-group and two-group (1,2- to 1,5-dioxygenated compounds), reconnection (1,6-dicarbonyl); protectiondeprotection strategy (alcohol, amine, carbonyl, acid).

2.Strategy of ring synthesis: Know thermodynamic and kinetic factors; synthesis of large rings, application of high dilution technique.

3.Asymmetric synthesis: Know stereoselective and stereospecific reactions; diastereoselectivity and enantioselectivity (only definition); enantioselectivity: kinetically controlled MPV reduction; diastereoselectivity: addition of nucleophiles to C=O adjacent to a stereogenic centre: FelkinAnh and Zimmermann-Traxler models.

Couse Outcome: The students will learn about the logic synthesis of organic chemistry**.**

Organic Spectroscopy

1.UV Spectroscopy: Describe introduction; types of electronic transitions, end absorption; transition dipole moment and allowed/forbidden transitions; chromophores and auxochromes; Bathochromic and Hypsochromic shifts; intensity of absorptions (Hyper-/Hypochromic effects); application of Woodward's Rules for calculation of λmax for the following systems: conjugated diene, α,βunsaturated aldehydes and ketones (alicyclic, homoannular and heteroannular); extended conjugated systems (dienes, aldehydes and ketones); relative positions of λmax considering conjugative effect, steric effect, solvent effect, effect of pH; effective chromophore concentration: keto-enol systems; benzenoid transitions.

2.IR Spectroscopy: Describe introduction; modes of molecular vibrations (fundamental and nonfundamental); IR active molecules; application of Hooke's law, force constant; fingerprint region and its significance; effect of deuteration; overtone bands; vibrational coupling in IR; characteristic and diagnostic stretching frequencies of C-H, N-H, O-H, C-O, C-N, C-X, C=C (including skeletal vibrations of aromatic compounds), C=O, C=N, N=O, C≡C, C≡N; characteristic/diagnostic bending vibrations are included; factors affecting stretching frequencies: effect of conjugation, electronic effects, mass effect, bond multiplicity, ring-size, solvent effect, H-bonding on IR absorptions; application in functional group analysis.

3. NMR Spectroscopy: Describe introduction; nuclear spin; NMR active molecules; basic principles of Proton Magnetic Resonance; equivalent and non-equivalent protons; chemical shift and factors influencing it; ring current effect; significance of the terms: up-/downfield, shielded and deshielded protons; spin coupling and coupling constant (1st order spectra); relative intensities of first-order multiplets: Pascal's triangle; chemical and magnetic equivalence in NMR ; elementary idea about non-

first-order splitting; anisotropic effects in alkene, alkyne, aldehydes and aromatics; NMR peak area, integration; relative peak positions with coupling patterns of common organic compounds (both aliphatic and benzenoid-aromatic); rapid proton exchange; interpretation of NMR spectra of simple compounds. Applications of IR, UV and NMR spectroscopy for identification of simple organic molecules.

Course Outcome: The students will learn about UV,IR,NMR sptroscopy of organic chemistry.

Organic Chemistry Lab-IV(C10P):

By the end of this practical students should be able to

1.Carry out the different organic reaction as prescribed in the syllabus.

Year : 2019-2020

Class : B.Sc 4th Semester (Hons.) Paper: SEC-2 Sub: Chemistry of cosmetics and perfumes

Course Outcome:

- **Chemistry of cosmetics and perfumes:**

  1 . Discuss the general studies including preparation and uses like as hair dye , hair spray , shampoo ,face powder , cold cream , etc.

  2. Explain the essential oils and importance of cosmetics industries .

Organic Chemistry Lab-IV(SEC-2P):

By the end of this practical students should be able to

1.Carry out the different organic reaction as prescribed in the syllabus.

Year : 2019-2020

Class : B.Sc 3rd Semester (GE) Paper: GE-4T Sub: Environmental & physical chemistry

Course Outcome:

- **Solution & Phase Diagram:**

  1. Learn the concept about colligative properties and its application for determination of osmotic pressure of dilute solution.

  2. Explain the process of osmosis and its application .

  3. Derive Gibbs phase rule that also help us to determine he degree's of freedom.

  4. Know about the phase diagram , phase transition of different component system.

- **Conductance & Electrochemistry:**

  1. Understand Debye – Huckel limiting law that also used to determine the activity coefficient of electrolyte.

  2. Derive the equation of mean ionic activity co-efficient for different electrolyte.

  3. Understand potentiometric titration .

  4. Determine P^H value, free energy entropy of a cell reaction .

  5. Know types of cells (reversible & irreversible)

- **Environmental Chemistry:**

  1. Understand about the atmosphere, Hydrosphere, Lithosphre.

Chemistry Lab(GE-4P):

By the end of this practical students should be able to

1.Carry out the different organic reaction as prescribed in the syllabus.

Class : B.Sc. 3rd Year (Hons.) (Semester-V)	Paper : CC-11(T) (Inorganic Chemistry - IV)	Course :

Course Outcome

- **Co-ordination Chemistry – II**

  By the end of this topic, students should be able to -

1. Define VB description and its limitation .
2. Explain crystal field theory, splitting of d^n configuration in octahedral, square planar, and tetrahedral fields, crystal-field stabilization energy (CFSE) in weak and strong field.
3. Discuss the spectrochemical series, John –teller distortion, OSSE metal-ligand bonding.
4. Expalin the magnetism and colour orbital and spin magnetic moments.
5. Describe the d-d transition, L-S coupling orbital diagrams of $3d^1$ to $3d^9$.
6. Define Racah parameter, Charge-transfer spectra, spectrochemical series of ligands.

- **Chemistry of d and f Block Elements**

  By the end of this topic, students should be able to -

1. Expalin the 3d, 4d, and 5d elements in terms of electronic configuration.
2. Describe the oxidation states of transition elements.
3. Expalin the redox properties of transition elements.

- **Lanthanides and Actinoids**

  By the end of this topic, students should be able to -

1. Describe the general comparison on Electronic Configuration, Oxidation states.
2. Explain the color and spectral and magnetic properties.
3. Describe the process of separation of lanthanides.

- **Inorganic Practical's C. 11 (P)**

  By the end of this topic, students should be able to -

1. Carry out the chromatographic separation of the following metal ions –
   a) Ni (II) and Co (II)
   b) Fe (III) and Al (III)

2. Carryout the gravimetry analysis of the following metals –
   a) Estimation of Ni (II) using DMG
   b) Estimation of copper as CuScN
   c) Estimation of Al (III) by precipitating with oxine and weighing as Al $(Oxine)_3$
   d) Estimation of Chloride.

3. Carry out the spectrophotometry analysis –
   a) Measurement of 10Dq by spectrophotometric methods.
   b) Deterination of $\wedge_{max}$ of (Mn $(acac)_3$) and (Fe $(acac)_3$)

Year : 2019-2020

Class : B.Sc 5th Semester (Hons.) Paper: C12T Sub: Organic Chemistry

Carbocycles and Heterocycles :

1.Polynuclear hydrocarbons and their derivatives: Describe the synthetic methods include Haworth, Bardhan-Sengupta, Bogert-Cook and other useful syntheses (with mechanistic details); fixation of double bonds and Fries rule; reactions (with mechanism) of naphthalene, anthracene, phenanthrene and their derivatives.

2.Heterocyclic compounds: To know about 5- and 6-membered rings with one heteroatom; reactivity, orientation and important reactions (with mechanism) of furan, pyrrole, thiophene and pyridine; synthesis (including retrosynthetic approach and mechanistic details): pyrrole: Knorr synthesis, Paal-Knorr synthesis, Hantzsch; furan: Paal-Knorr synthesis, FeistBenary synthesis and its variation; thiophenes: Paal-Knorr synthesis, Hinsberg synthesis; pyridine: Hantzsch synthesis; benzo-fused 5- and 6-membered rings with one heteroatom: reactivity, orientation and important reactions (with mechanistic details) of indole, quinoline and isoquinoline; synthesis (including retrosynthetic approach and mechanistic details): indole: Fischer, Madelung and Reissert; quinoline: Skraup, Doebner- Miller, Friedlander; isoquinoline: Bischler-Napieralski synthesis.

Course Outcome: The students will learn 5 & 6 membered rings of carbocycles & heterocyclic compounds.

Cyclic Stereochemistry :

1.Alicyclic compounds: Know the concept of I-strain; conformational analysis: cyclohexane, mono and disubstituted cyclohexane; symmetry properties and optical activity; topomerisation; ring-size and ease of cyclisation; conformation & reactivity in cyclohexane system: consideration of steric and stereoelectronic requirements; elimination (E2, E1), nucleophilic substitution (SN1, SN2, SNi, NGP), merged substitution-elimination; rearrangements; oxidation of cyclohexanol, esterification, saponification, lactonisation, epoxidation, pyrolytic syn elimination and fragmentation reactions.

Course Outcome: The students will learn Cyclic stereochemistry of alicyclic compounds.

Pericyclic reactions :

1.Mechanism, stereochemistry, regioselectivity in case of

a)Electrocyclic reactions: Know the FMO approach involving 4π- and 6π-electrons (thermal and photochemical) and corresponding cycloreversion reactions.

b)Cycloaddition reactions: Know the FMO approach, Diels-Alder reaction, photochemical [2+2] cycloadditions.

c)Sigmatropic reactions: Know the FMO approach, sigmatropic shifts and their order; [1,3]- and [1,5]-H shifts and [3,3]-shifts with reference to Claisen and Cope rearrangements.

Course Outcome: The students will learn reactions that does not involved any reagents**.**

Carbohydrates:

1.Monosaccharides: Know the aldoses up to 6 carbons; structure of D-glucose & D-fructose (configuration & conformation); ring structure of monosaccharides (furanose and pyranose forms): Haworth representations and non-planar conformations; anomeric effect (including stereoelectronic explanation); mutarotation; epimerization; reactions (mechanisms in relevant cases): Fischer glycosidation, osazone formation, brominewater oxidation, HNO3 oxidation, selective oxidation of terminal –CH2OH of aldoses, reduction to alditols, Lobry de Bruyn-van Ekenstein rearrangement; stepping–up (Kiliani-Fischer method) and stepping–down (Ruff's & Wohl's methods) of aldoses; end-group-interchange of aldoses; acetonide (isopropylidene) and benzylidene protections; ring-size determination; Fischer's proof of configuration of (+)-glucose.

2.Disaccharides: Know the glycosidic linkages, concept of glycosidic bond formation by glycosyl donor-acceptor; structure of sucrose, inversion of cane sugar.

3. Polysaccharides: Draw the starch (structure and its use as an indicator in titrimetric analysis).

Course Outcome: The students will learn about Carbohydrate Compounds.

Bio-molecules :

1.Amino acids: Explain the synthesis with mechanistic details: Strecker, Gabriel, acetamido malonic ester, azlactone, Bücherer hydantoin synthesis, synthesis involving diketopiperazine; isoelectric point, zwitterions; electrophoresis, reaction (with mechanism): ninhydrin reaction, Dakin-West reaction; resolution of racemic amino acids.

2.Peptides: Know the peptide linkage and its geometry; syntheses (with mechanistic details) of peptides using N-protection & C-protection, solid-phase (Merrifield) synthesis; peptide sequence: C-terminal and N-terminal unit determination (Edman, Sanger & 'dansyl' methods); partial hydrolysis; specific cleavage of peptides: use of CNBr.

3.Nucleic acids: Know pyrimidine and purine bases (only structure & nomenclature); nucleosides and nucleotides corresponding to DNA and RNA; mechanism for acid catalysed hydrolysis of nucleosides (both pyrimidine and purine types); comparison of alkaline hydrolysis of DNA and RNA; elementary idea of double helical structure of DNA (Watson-Crick model); complimentary base–pairing in DNA.

Coouse Outcome: The students will learn structure and synthesis of peptides bonds & protines**.**

Organic Chemistry Lab-V(C12P):

By the end of this practical students should be able to

1.Carry out the different organic reaction as prescribed in the syllabus.

Year : 2019-2020

Class : B.Sc 5th Semester (Hons.) Paper: DSE-1T Sub: Advanced physical Chemistry

- **Crystal structure:**

  Course outcome:

  1. Explain Bravais lattice , types of solids, law of crystallography and space lattice.

  2. Understand unit cells, crystal plane, void, void space.

  3. Know about conductors, types of conductors.

  4. Explain the method for determination of crystal structure.

- **Statistical thermodynamics:**

  Course outcome:

  1. Understand microstate, configuration and equilibrium configuration

  2. Learn about Boltzmann formula and its application.

  3. Learn about ensembles, partition functions.

  4. Learn about residual entropy of molecules.

- **Special selected topics:**

  Course outcome:

  1.Understand concept about Dulong-petit's law, Einstein law , and Debye T^3 law and its application for determination of partition function.

  2. Explain the concept about 3rd LAW OF THERMODYNAMICS.

  3. Explain the concept for approaching to the low temperature.

  4. Explain the concept of polymer, classification of polymer, kinetics of polymerization reaction and reaction of polymerization reaction.

- . **Physical chemistry Lab- (iv): DSE-1P**

  Carry out all experiments as prescribed in the syllabus

Year : 2019-2020

Class : B.Sc 5th Semester (Hons.) Paper: DSE-2T Sub: Analytical methods in chemistry.

Course outcome:

1. Know the qualitative and quantitative aspects of analysis procedure and calculate evaluation of analytical data, errors , accuracy, etc
2. Explain the concept of uv visible spectrometry, basic principle of quantitative analysis, infrared spectrometry and flame atomic absorption and emission spectrometry.
3. Discuss about the concept of separation techniques of solvent extraction .
4. Know the concept of thermal method analysis .

- **Physical chemistry Lab- (v): DSE-2P**

  Carry out all experiments as prescribed in the syllabus

Class : B.Sc. 3rd Year (Hons.) (Semester-VI)	Paper : CC-13(T) and CC-13(P) (Inorganic Chemistry - V)	Course :

Course Outcome

- **Bio-inorganic Chemistry**

  By the end of this topic students should be able to -

1. Define the major, trace and ultratrace elements,.
2. Understand the basic chemical reactions in biological systems and the role of metal ions (Na+, K+, Mg2+, Ca2+, Fe2+, Cu2+, and Zu2+).
3. Discuss the metal-ion transport across biological membrane Na+/K+ ion pump.
4. Understand the Haemoglobin, Myoglobin, Hemocyanin, Hemerythrin.
5. Understand the cytochromes and Ferrodoxims, and hydrolytic enzymes, carbonate bicarbonate buffering system and carbonic anhydrase and carboxyanlydrase A.
6. Understand the Biological nitrogen fixation photosysthesis – photosystem-I, photosystem – II.

- **Organometallic Chemistry**

  By the end of this topic students should be able to -

1. Understand the definition and classification of organometallic compounds.
2. Understand the 18-e and 16-e rules
3. Describe the application of 18-electron rule to metal carbonyls, nitrosyls, cyanides.
4. Understand the general methods of preparation of mono and binuclear carbonyls of 3d series.
5. Describe the Zeise's salt preparation structure.
6. Understand the oxidative addition, reductive elimination and insertion reaction.

- **Catalysis of Organometallic Chemistry**

  By the end of this topic students should be able to -

1. Understand the Wilkinson's catalyst, Hydroformylation, Wacker Process.
2. Describe the synthetic gasoline, Ziegler-Natta Catalysis of Olefin Polymerization.

- **Reaction Kinetics and Mechanism**

  By the end of this topic students should be able to -

1. Understand the substitution reaction in square planar complexes.
2. Understand the trans effect and its application.
3. Understand the Thermodynamic and Kinetic Stability.
4. Describe the Ligand field effects and reaction rates.

- **Inorganic Practical's – C 13 (P) (LAB)**

  By the end of this topic students should be able to –

1. Carry out the quantitative semi micro analysis of mixtures containing four radicals line-
   Cation Radicals :- Na^+, K^+, $NH4^+$, $Mg2^+$
   Anion Radicals :- F^-, Cl^-, No_3^-/No_2^-
   Insoluble Materials :- Al_2O_3, Fe_2O_3, $BaSo_4$, CaF_2

Year : 2019-2020

Class : B.Sc 6th Semester (Hons.) **Paper: C14T** **Sub: physical Chemistry**

- **Molecular spectroscopy:**

  Course outcome:

  1. Learn about rotational spectroscopy for determination of bond length, permanent dipole moment of heteroatomic molecule.

  2. Vibrational spectroscopy to explain stretching frequency of different molecules.

  3. Raman spectroscopy to understand and explain the spectral properties of homonuclear diatomic molecules.

  4. NMR – to determination structure of the organic molecules.

  5. ESR/EPR – spectroscopy to explain the hyperfine structure of molecules.

- **Photochemistry:**

  Course outcome:

  1. Derive Lambert- Beer's law and its application.

  2. Know about monochromatic radiation.

  3. Learn about how to find quantum yield.

  4. Explain various photochemical process(ISC,IC AND FRANK CONDON PRINCIPLE).

- **Surface phenomena :**

  Course outcome:

  1. Know surface phenomena like surface tension and experimentally calculate its value for such liquid (water, glycerol).

  2. Understand the process of adsorption and its application.

  3. Derive Gibbs adsorption equation for determination of surface excess concentration .

  4. Known about sol, gel , emulsion and its preparation and its physical characteristics.

- . **Physical chemistry Lab- (v): C14P**

  Carry out all experiments as prescribed in the syllabus

Year : 2019-2020

Class : B.Sc 6th Semester (Hons.) Paper: DSE-3T Sub: Green Chemistry

Introduction to Green Chemistry:

What is Green Chemistry? Need for Green Chemistry. Goals of Green Chemistry. Limitations/ Obstacles in the pursuit of the goals of Green Chemistry Principles of Green Chemistry and Designing a Chemical synthesis: Twelve principles of Green Chemistry with their explanations and examples and special Designing a Green Synthesis using these principles; Prevention of Waste/ byproducts; maximum incorporation of the materials used in the process into the final products , Atom Economy, calculation of atom economy of the rearrangement, addition, substitution and elimination reactions.

• Prevention/ minimization of hazardous/ toxic products reducing toxicity. risk = (function) hazard × exposure; waste or pollution prevention hierarchy.

• Green solvents– supercritical fluids, water as a solvent for organic reactions, ionic liquids, fluorous biphasic solvent, PEG, solventless processes, immobilized solvents and how to compare greenness of solvents.

• Energy requirements for reactions – alternative sources of energy: use of microwaves and ultrasonic energy.

• Selection of starting materials; avoidance of unnecessary derivatization – careful use of blocking/protecting groups.

• Use of catalytic reagents (wherever possible) in preference to stoichiometric reagents; catalysis and green chemistry, comparison of heterogeneous and homogeneous catalysis, biocatalysis, asymmetric catalysis and photocatalysis.

• Prevention of chemical accidents designing greener processes, inherent safer design, principle of ISD "What you don't have cannot harm you", greener alternative to Bhopal Gas Tragedy (safer route to carcarbaryl) and Flixiborough accident (safer route to cyclohexanol) subdivision of ISD, minimization, simplification, substitution, moderation and limitation.

• Strengthening/ development of analytical techniques to prevent and minimize the generation of hazardous substances in chemical processes.

Couse Outcome: The students will learn about elementary idea of Green Chemistry.

Examples of Green Synthesis/ Reactions and some real world cases:

1. Green Synthesis of the following compounds: adipic acid, catechol, disodium iminodiacetate (alternative to Strecker synthesis)

2. Microwave assisted reactions in water: Hofmann Elimination, methyl benzoate to benzoic acid, oxidation of toluene and alcohols; microwave assisted reactions in organic solvents Diels-Alder reaction and Decarboxylation reaction

3. Ultrasound assisted reactions: sonochemical Simmons-Smith Reaction (Ultrasonic alternative to Iodine)

4 Surfactants for carbon dioxide – replacing smog producing and ozone depleting solvents with CO2 for precision cleaning and dry cleaning of garments.

5 Designing of Environmentally safe marine antifoulant.

6 Rightfit pigment: synthetic azopigments to replace toxic organic and inorganic pigments

7.An efficient, green synthesis of a compostable and widely applicable plastic (poly lactic acid) made from corn.

8. Healthier Fats and oil by Green Chemistry: Enzymatic Inter esterification for production of no Trans-Fats and Oils

9. Development of Fully Recyclable Carpet: Cradle to Cradle Carpeting

Future Trends in Green Chemistry:

Oxidation reagents and catalysts; Biomimetic, multifunctional reagents; Combinatorial green chemistry; Proliferation of solventless reactions; co crystal controlled solid state synthesis (C2 S3); Green chemistry in sustainable development.

Course Outcome: The students will be learn synthesis & mechanism and also future trend in green Chemistry.

Green Chemistry Lab(DSE-3P):

By the end of this practical students should be able to

1.Carry out the different organic reaction as prescribed in the syllabus.

Year : 2019-2020

Class : B.Sc 6th Semester (Hons.) **Paper: DSE4 T** **Sub: Polymer Chemistry**

- **Polymer Chemistry:**

1. Knowing the basic introduction and history of polymeric materials .
2. Discuss the concept of functionality and its importance .
3. Understanding the kinetics of polymerization reaction .
4. Know the concept of crystallization and crystallinity .
5. Understanding the nature and structure of poymer.

- . **Physical chemistry Lab- (vi): DSE 4P**

Carry out all experiments as prescribed in the syllabus

General Chemistry

Year : 2019-2020

Class : B.Sc 1st Semester (General) Paper: DSC-1A Sub: Organic & Inorgnic Chemistry

Course Outcome:

- **Chemical Bonding – I**

  By the end of this topic, students should be able to -

6. Discuss the general characteristics, types of ion, size effects, radius ratio rule and its application and limitation.
7. Understand the packing of ions in crystals, Born-Lande equation with derivation.
8. Understand the kapnstinskii expression for lattice energy, medelung constant.
9. Explain the Born-Haber cycle and its application.
10. Define the defects in solids and solubility energies of dissolution process.

- **Chemical Bonding – II**

  By the end of this topic, students should be able to -

8. Understand the molecular orbital concept of bonding.
9. Define the sigma, Pi and delta interaction.
10. Describe the orbital designation, gerade, ungerade, HOMO, LUMO, Orbital mixing.
11. Define the Mo. Diagram of (H_2, Li_2, Be_2, C_2, N_2, O_2, F_2)
12. Hetero nuclear molecular orbital's CO, NO, NO^+,CN^-, HF, BeH_2, CO_2 and H_2O
13. Discuss the metallic bond, semiconductors, and insulator and defects in solids.
14. Describe the |Vanderwalls forces, Hydrogen Bonding, Halogen Bonds, Effect of Chemical force melting and boiling points.

- **Atomic Structure**

  1. Understand atomic spectra of hydrogen atom.

  2. Learn shape of orbital , radial node & angular node.

- **Stereochemistry:**

  1. Understand 3D Conformation and configuration of optically active molecules

- **Aliphatic Hydrocarbon:**

  1. Learn addition elimination reaction mechanism of different molecules.

  2.Learn oxidation reaction of alkanes ,alkenes & alkines.

Organic Chemistry Lab(DSC-1AP):

By the end of this practical students should be able to

1.Carry out the different organic reaction as prescribed in the syllabus.

Year : 2019-2020

Class : B.Sc 2nd Semester (General) Paper: DSC-1BT Sub: Organic & Physical Chemistry

Course outcome:

- **Chemical thermodynamics:**

1.Understand the terminologies used in the study of thermodynamics, concept of state function, internal energy and enthalpy.

2. Use the laws of thermochemistry to find the enthalpy change.

3. understand the concept of heat engine, carnot engine, and refrigerator.

4. understand and application of 2nd law of thermodynamics, concept of entropy.

5. Explain joule- Thomson experiment and its consequences.

6.Understand 3rd law of thermodynamics for determination of absolute entropy.

7. To know spontaneity of chemical reaction.

- **Aromatic Hydrocarbon:**

1. Learn Preparation and reaction of aromatic hydrocarbon like Benzene.
2. Learn Preparation reaction of alcohols,Phenols & ethers
3. know reaction mechanism of aldehydes & ketones.

Chemistry Lab(DSC-1BP):

By the end of this practical students should be able to

1.Carry out the different organic reaction as prescribed in the syllabus.

Year : 2019-2020

Class : B.Sc 3rd Semester (General) Paper: DSC-1CT Sub: Organic & Physical Chemistry

Course outcome:

- **Solution & Phase Diagram:**

  1. Learn the concept about colligative properties and its application for determination of osmotic pressure of dilute solution.

  2. Explain the process of osmosis and its application .

  3. Derive Gibbs phase rule that also help us to determine he degree's of freedom.

  4. Know about the phase diagram , phase transition of different component system.

- **Conductance & Electrochemistry:**

  1. Understand Debye – Huckel limiting law that also used to determine the activity coefficient of electrolyte.

  2. Derive the equation of mean ionic activity co-efficient for different electrolyte.

  3. Understand potentiometric titration .

  4. Determine P^H value, free energy entropy of a cell reaction .

  5. Know types of cells (reversible & irreversible)

- **Carboxylic Acids and their derivatives:**

  1. Understand many reaction & preparation of Organic compounds upto 5 carbons.

- **Amines, Diazonium salts ,Amino Acid ,peptides & Proteins:**

  1.Understand preparation & properties of nitrogen containing compounds**.**

  2. understand the 3D structure of protein and preparation of peptides bonds.

Chemistry Lab(DSC-1CP):

By the end of this practical students should be able to

1.Carry out the different organic reaction as prescribed in the syllabus.

Year : 2019-2020

Class : B.Sc 4th Semester (General) Paper: DSC-1DT Sub: Inorganic & Physical Chemistry

Course Outcome:

- **Co-ordination Chemistry – II**

  By the end of this topic, students should be able to -

7. Define VB description and its limitation .
8. Explain crystal field theory, splitting of d^n configuration in octahedral, square planar, and tetrahedral fields, crystal-field stabilization energy (CFSE) in weak and strong field.
9. Discuss the spectrochemical series, John –teller distortion, OSSE metal-ligand bonding.
10. Expalin the magnetism and colour orbital and spin magnetic moments.
11. Describe the d-d transition, L-S coupling orbital diagrams of $3d^I$ to $3d^9$.
12. Define Racah parameter, Charge-transfer spectra, spectrochemical series of ligands.

- **Transition Elements(3d series):**

1. know about the electronic Configuration,Colour ,magnetic properties & variable valancy.
2. know the separation process of lanthanides elements.

- **Co-ordination Chemistry – II & CFT:**

  By the end of this topic, students should be able to -

13. Define VB description and its limitation .
14. Explain crystal field theory, splitting of d^n configuration in octahedral, square planar, and tetrahedral fields, crystal-field stabilization energy (CFSE) in weak and strong field.
15. Discuss the spectrochemical series, John –teller distortion, OSSE metal-ligand bonding.
16. Expalin the magnetism and colour orbital and spin magnetic moments.
17. Describe the d-d transition, L-S coupling orbital diagrams of $3d^I$ to $3d^9$. 18.
18. Define Racah parameter, Charge-transfer spectra, spectrochemical series of ligands

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- **Kinetic theory of gaseous state:**

  1. understand the kinetic molecular theory of gases and apply it to derive the relations of binary collision frequency, wall collision , rate of effusion and mean free path of gas molecules.

  2. Describe the Maxwell's law of distribution of molecular speeds in 1D,2D and 3D and its applications.

  3. Apply the principle of equipartition of energy along with the concept of degree of freedom to describe heat capacity of gases.

4.Explain intermolecular forces of attraction and Lennard – jones potential

- **Chemical kinetics:**
  1. Students will learn reaction mechanism and kinetics of chemical reactions.
  2.Explain effect of temperature on rate constant of a reaction.
  3.Understand the kinetics of enzyme catalysis
  4. Learn different methods for determining order of a reaction.
- **Transport Process:**
  Course outcome:
  1. Know transport properties of substance(liquid).
  2. Learn how to measure conductance experimentally.
  3. Learn about conductometric titration.
  4. Understand the DEBYE – HUCKEL theory of ionic atmosphere and its application.

Chemistry Lab(DSC-1DP):

By the end of this practical students should be able to

1.Carry out the different organic reaction as prescribed in the syllabus.

Year : 2019-2020

Class : B.Sc 5th Semester (General) Paper: DSE-1A Sub: Polymer Chemistry

Course Outcome:

- **Polymer Chemistry:**

  1.Explain the concept of polymer, classification of polymer, kinetics of polymerization reaction and reaction of polymerization reaction.

  2. Understand solubility of Polymer and thermodynamic criteria of Polymer solution.

Chemistry Lab(DSE-1AP):

By the end of this practical students should be able to

1.Carry out the different organic reaction as prescribed in the syllabus.

Year : 2019-2020

Class : B.Sc 6th Semester (General) Paper: DSE-1B Sub: Green Chemistry

Course Outcome:

Green Chemistry:

2.Know the future trends in Green Chemistry.

3. Explain green Synthesis and some real world cases.

Chemistry Lab(DSE-1BP):

By the end of this practical students should be able

1.Carry out the different organic reaction as prescribed in the syllabus