

Government College for Women, Rohtak
Lesson plan, Even Semester Session
2021-2022

Department of Chemistry
Name of Extension Lecturer: **SANGITA**
B.Sc. 1 (Physics Hons.) 2nd semester

March 2022

First Week - Bonding in organic molecules and its effects on shape, chirality .

Second week- RS nomenclature as applied to chiral centres .

Third Week- Treatment of chirality upto three chiral centres. Conformation of acrylic and cyclic systems.

Fourth Week- conformational analysis of di-substituted cyclohexanes.

April 2022

First Week- Geometrical isomerism and E-2 nomenclature. Electronic displacements in organic molecules.

Second Week- Aromaticity. Reactivity of organic molecules. Heterolytic and homolytic fission. Nucleophiles, electrophiles, acids and bases and their relative strengths (including carbon acids).

Third week – Nucleotides, electrophoresis, acids and bases and their relative strengths(including carbon acids)

Fourth Week- Addition, elimination and substitution reactions (including electrophonic, nucleophilic and aromatic types).

May 2022

First week- Arynes and carbons as reaction intermediates. Functional Group Chemistry: Rationalisation of functional group reactivity on mechanistic basis of the following groups: hydroxyl, carbonyl.

Second week- Rationalization of Functional groups reactivity on mechanistic basis of the following groups: hydroxyl and carbonyl.

Third week- Functional Group Chemistry: Rationalisation of functional group reactivity on mechanistic basis of the following groups: carboxyl and its derivatives such as ester and amide, cyano, nitro and amino.

Fourth Week- Class tests, Assignments

June 2022

First week- Orientation effect in aromatic substitution, polymerisation and overview of polymers.

Second week- Organic reactions as synthetic tools: Claisen, Cannizzaro, Grignard, Michael, Mannich.

Third Week- Organic reactions as synthetic tools: Darzen, aldol, Dieckmann, Perkin etc.

FFourthWeek- Revision, Class tests.

Government PG College for Women, Rohtak
Lesson plan, Even Semester Session
2021-2022

Department of Chemistry
B.Sc. II (Medical and Non Medical) 4th semester
INORGANIC CHEMISTRY

March, 2022

Fourth Week – Chemistry of f – block elements Lanthanides Electronic structure, oxidation states

April, 2022

First Week – Ionic radii and lanthanide contraction, complex formation, Occurrence and isolation, lanthanide compounds

Second Week – Actinides-General features and chemistry of actinides, Chemistry of separation of Np, Pu and Am from U

Third Week -- Comparison of properties of Lanthanides and Actinides and with transition elements

Fourth Week -- Revision and test of lanthanides and Actinides

May, 2022

First Week – Theory of Qualitative and Quantitative Inorganic Analysis-I

Second Week – Chemistry of analysis of various acidic radicals

Third Week -- Chemistry of identification of acid radicals in typical combinations

Fourth Week -- Chemistry of interference of acid radicals including their removal in the analysis of basic radicals.

June, 2022

First Week – Theory of Qualitative and Quantitative Inorganic Analysis-II

Second Week – Chemistry of analysis of various groups of basic radicals

Third Week – Theory of precipitation, co- precipitation, Post- precipitation, purification of precipitates.

Fourth Week – revision and test of Unit III

Concerned Faculty – Dr. Sonika

Ms. Preeti

PHYSICAL CHEMISTRY

March, 2022

Fourth Week – Thermodynamics-III Second law of thermodynamics, need for the law, different statements of the law, Carnot's cycles and its efficiency, Carnot's theorem

April, 2022

First Week – Thermodynamics scale of temperature. Concept of entropy – entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physical change

Second Week – entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases

Third Week -- Thermodynamics-IV Third law of thermodynamics: Nernst heat theorem, statement of concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions

Fourth Week -- Variation of G and A with P, V and T, Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities, A & G as criteria for thermodynamic equilibrium and spontaneity

May, 2022

First Week – Electrochemistry-III Electrolytic and Galvanic cells – reversible & Irreversible cells, conventional representation of electrochemical cells. EMF of cell and its measurement

Second Week – Weston standard cell, activity and activity coefficients. Calculation of thermodynamic quantities of cell reaction (G, H & K)

Third Week -- Types of reversible electrodes – metal-metal ion gas electrode, metal – insoluble salt- anion and redox electrode

Fourth Week -- Test of Unit I

June, 2022

First Week – Electrode reactions, Nernst equations, derivation of cell EMF and single electrode potential

Second Week – Standard Hydrogen electrode, reference electrodes, standard electrodes potential, sign conventions, electrochemical series and its applications.

Third Week – Electrochemistry-IV Concentration cells with and without transference, liquid junction potential

Fourth Week – Application of EMF measurement i.e. valency of ions, solubility product activity coefficient, potentiometric titration (acid-base and redox). Determination of pH using Hydrogen electrode, Quinhydrone electrode and glass electrode by potentiometric methods

Concerned Faculty – Dr. Deepak

Ms. Preeti

Ms. Monika

ORGANIC CHEMISTRY

MARCH 2022

Week 3: Infrared (IR) absorption spectroscopy Molecular vibrations, bands, measurement of IR spectrum, fingerprint region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds

APRIL 2022

Week 1: Hooke's law, selection rules, intensity and position of IR bands and Applications of IR spectroscopy in structure elucidation of simple organic compounds

Week 2: . Amines Structure and nomenclature of amines, physical properties. Separation of a mixture of primary, secondary and tertiary amines. Structural features affecting basicity of amines

Week 3: Preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles, reductive amination of aldehydic and ketonic compounds. Gabrielphthalimide reaction, Hofmann bromamide reaction. electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid

Week 4: Diazonium Salts Mechanism of diazotisation, structure of benzene diazonium chloride, Replacement of diazo group by H, OH, F, Cl, Br, I, NO₂ and CN groups, reduction of diazonium salts to hydrazines, coupling reaction and its synthetic application

MAY 2022

Week 1: Nitro Compounds Preparation of nitro alkanes and nitro arenes and their chemical reactions. Mechanism of electrophilic substitution reactions in nitro arenes and their reductions in acidic, neutral and alkaline medium

Week 2: Aldehydes and Ketones Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, advantage of oxidation of alcohols with chromium trioxide (Sarett reagent) pyridinium chlorochromate (PCC) and pyridinium dichromate

JUNE 2022

Week 1: Physical properties. Comparison of reactivities of aldehydes and ketones.

Week 2: Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations

Week 3: Condensation with ammonia and its derivatives. Wittig reaction. Mannich reaction.

Week 4: Oxidation of aldehydes, Baeyer–Villiger oxidation of ketones, Cannizzaro reaction. MPV, Clemmensen, Wolff-Kishner, LiAlH₄ and NaBH₄ reductions

Concerned Faculty – Dr. Nidhi

Ms. Monika

Government PG College for Women, Rohtak
Lesson plan, Even Semester Session
2021-2022

Department of Chemistry

B.Sc. I (Medical & Non-Medical) 2nd semester

Inorganic Chemistry

March 2022

Week 4: Introduction of Syllabus and Marks Distribution Hydrogen Bonding & Vander Waals Forces Hydrogen Bonding

April 2022

Week 1: Definition, Types, effects of hydrogen bonding on properties of substances, application Brief discussion of various types of Vander Waals Forces.

Week 2: Metallic Bond and Semiconductors Metallic Bond- Brief introduction to metallic bond, band theory of metallic bond Semiconductors- Introduction, types and applications.

Week 3: s-Block Elements Comparative study of the elements including , diagonal relationships, Salient features of hydrides (methods of preparation excluded), solvation and complexation tendencies including their function in biosystems.

Week 4: Chemistry of Noble Gases Chemical properties of the noble gases with emphasis on their low chemical reactivity, Chemistry of xenon, structure and bonding of fluorides, oxides & oxyfluorides of xenon.

May 2022

Week 1: Emphasis on comparative study of properties of p-block elements (including diagonal relationship and excluding methods of preparation)

Week 2: Boron family (13th gp):- Diborane – properties and structure (as an example of electron – deficient compound and multicentre bonding),

Week 3: Borazene – chemical properties and structure Trihalides of Boron – Trends in Lewis acid character structure of aluminium (III) chloride.

Week 4: Carbon Family (14th group): Catenation, $p\pi-d\pi$ bonding (an idea), carbides, fluorocarbons, silicates structural aspects), silicons – general methods of preparations, properties and uses.

June 2022

Week 1: Nitrogen Family (15th group): Oxides – structures of oxides of N,P. oxyacids – structure and relative acid strengths of oxyacids of Nitrogen and phosphorus. Structure of white, yellow and red phosphorus.

Week 2: Oxygen Family (16th group): Oxyacids of sulphur – structures and acidic strength H_2O_2 –structure, properties and uses.

Week 3: Halogen Family: Basic properties of halogen, interhalogens types properties, hydro and oxyacids of chlorine – structure and comparison of acid strength .

Week 4: Revision and Test
Assignment

Concerned Teacher: Mrs. Shammy Iaj
Mrs. Meena
Mrs. Neha Sapra

Organic Chemistry

March 2022

Week 4: Nomenclature of alkenes, Mechanisms of Dehydration of alcohols and dehydrohalogenation of alkyl halides. The Saytzeff rule, Hofmann elimination, Physical properties and Relative Stabilities of Alkenes.

April 2022

Week 1: Chemical reactions of alkenes mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule.

Week 2: Hydroboration–oxidation, Oxymercuration reduction, Ozonolysis, Hydration, Hydroxylation and Oxidation with $KMnO_4$.

Week 3: Arenes and Aromaticity Nomenclature of benzene derivatives: Aromatic nucleus and side chain. Aromaticity: the Huckel rule, aromatic ions.

Week 4: Annulenes up to 10 carbon atoms, aromatic, anti - aromatic and non - aromatic compounds.

May 2022

Week 1: Aromatic electrophilic substitution general pattern of the mechanism, mechanism of nitration, halogenation,

Week 2: Dienes and Alkynes Nomenclature and classification of dienes: isolated, conjugated and cumulated dienes.

Week 3: Structure of butadiene, Chemical reactions 1,2 and 1,4 additions (Electrophilic & free radical mechanism).

Week 4: Diels-Alder reaction, Nomenclature, structure and bonding in alkynes. Methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of Electrophilic and nucleophilic addition reactions, Hydroboration- oxidation of alkynes.

June 2022

Week 1: Sulphonation, and Friedel-Crafts reaction. Energy profile diagrams. Sulphonation, and Friedel-Crafts reaction. Energy profile diagram's. Activating, Deactivating substituents and Orientation.

Week 2: Nomenclature and classes of alkyl halides, Methods of formation, Chemical reactions. Mechanisms and stereochemistry of nucleophilic substitution reactions of alkyl halides, SN2 and SN1 reactions with energy profile diagrams.

Week 3: Methods of formation and reactions of aryl halides, the addition elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides.

Week 4: Test of Arenes and Aromaticity, Assignment and Viva, Test.

Concerned Teacher: Mrs. Shammy Iaj

Dr. Aarti

Mrs. Manu

Physical Chemistry

March 2022

Week 4: introduction of kinetic, rate of rxn, rate equation, order of rxn

April 2022

Week 1: factor affecting rate of rxn, zero order rxn, second and third order rxn, half life period of rxn

Week 2: method of determination of order of rxn, Arrhenius equation

Week 3: simple collision theory for unimolecular and biomolecular

Week 4: transition state theory, Electrolytic conduction, factors affecting electrolytic conduction,

May 2022

Week 1: Specific conductance, equivalent conductance, molar conductance and relation among them

Week 2: specific conductivity, equivalent conductivity and molar conductivity, Variation of conductance with concentration

Week 3: Arrhenius theory of ionization, Ostwald's dilution law, Debye- Huckel Onsager's equation for strong electrolytes

Week 4: Migration of ions and transport number, Methods to determine transport number- Hittorf's method

June 2022

Week 1: Kohlrausch law, calculation of molar ionic conductance, specific conductance, effect of viscosity

Week 2: effect of temp. and pressure, application of Kohlrausch law, application of conductivity measurement, determination of degree of dissociation

Week 3: determination of solubility product of sparingly soluble salts conductometric titrations, pH, pKa (definitions)

Week 4: buffer solution, buffer action, Henderson-Hasselbalch equation, buffer action
Test and assignments

Concerned Teacher: Mrs. Seema
Mrs. Neha
Mrs. Manu

Government college for women Rohtak

Department of Chemistry

Bsc. 6thsem

Physical chemistry

March 2022

Forth Week : Electronic Spectrum

Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and frank condon principle

April 2022

First Week : Qualitative description of sigma and Pii and n molecular orbitals, their energy levels and respective transitions.

Second Week : Photochemistry

Interaction of radiation with matter, difference between thermal and photochemical processes.

Third week: Laws of photochemistry, Grotthus drapper law, stark Einstein law.

Forth Week : Jablonski diagram depicting various processes occurring in excited states, qualitatave description of fluorescence, phosphorescence, nonradiative processes.

May 2022

First Week : Quantum yield photosensitized reactions, energy transfer processes, simple examples.

Second Week : Ideal and nonideal solutions, method of expressing conc. Of sol., activity and activity coffieicients, dilute sols.

Third Week : Colligative properties, Raults law, relative lowering of vapour pressure, molecular weight determination, osmosis law of osmotic pressure and its measurement.

Forth Week : Determination of molecular weight from osmotic pressure, elevation of boiling point and depression of freezing point. **Test**

June 2022

First Week : Thermodynamic derivation of relation between molecular weight and elevation in boiling point and depression in freezing point Experimental methods for determining various colligative properties, abnormal molar mass, degree of dissociation and association of solutes.

Second Week : Statement and meaning of terms phase components and degree of freedom. Thermodynamic derivation of Gibbs Phase rule, phase equilibria of one component system

Third Week : Thermodynamic derivation of Gibbs Phase rule, phase equilibria of one component system

Forth Week : Water and sulphur system, phase equilibria of two component systems, solid liquid equilibria. Physical Simple eutectic example lead, silver system, desilverization of lead.

Teacher concerned: MS. Pooja Chahal, Ms. Pooja Chaudhary

INORGANIC CHEMISTRY:

March 2022

Week 4: Organometallic Chemistry

Definition, Nomenclature & Introduction of Organometallic Compounds.
Types of Organometallic Compounds & Nature of Metal Carbon Bond.

April 2022

Inorganic

Week 1: Effective atomic number for other Organometallic Compounds. Bonding in Organometallic Compounds. Preparation, properties & applications of some Organometallic Compounds.

Week 2: Preparation, properties & bonding of organotin, organolithium and organoaluminium Compounds.

Week 3: Brief account of metal ethylenic complexes, mononuclear carbonyls & nature of bonding in metal carbonyls.

Week 4: Acids and Bases, HSAB Concept

Introduction & classification of acids and bases, Pearson's HSAB principle and its applications.

May 2022

Week 1: Arrhenius and Bronsted Lowry concept of acids and bases. Limitations of HSAB principle, Symbiosis and Lux Flood & Lewis concept of acids and bases.

Week 2: Theoretical basis of hardness and softness: HSAB principle. Electronegativity and hardness – softness, Relative strength of acids & bases. (**Assignment** Topic in extra lecture).

Week 3: Bioinorganic Chemistry

Introduction, essential & trace elements, Essential bulk and essential trace elements. Brief account of Metalloporphyrins. Function & cooperativity of Myoglobin & Haemoglobin.

Week 4: Biological role of alkali & alkaline earth metal ions with special reference to Ca²⁺ and Nitrogen Fixation. **Silicone sand Phosphazenes**

Introduction, nomenclature and properties of silicones. Preparation of silicone & silicone products.

.June 2022

Week 1: Types of elastomers. Equilibration and ring opening polymerization (ROP) of Cyclosiloxanes. History of polyphosphazenes & polysiloxanes copolymers.

Week 2: Preparation & properties of phosphonitrilic compounds. Polymerization of organo or organometallic substituted cyclic phosphazenes.

Week 3: Structure and properties of cyclic phosphonitrilic halides & Chlorides.

Week 4: Group Discussion & Problem Solving.

Teacher concerned: Dr. Anita Singhal, Dr. Suman

Organic Chemistry:

March 2022

Week 4:

Introduction, Nomenclature of thiols, Structural features, Methods of formation, Physical properties & Chemical properties.

April 2022

Week 1: Nomenclature of thioethers, Structural features, Methods of formation, Physical properties, Chemical properties.

Week 2: Nomenclature of sulphonic acids, Structural features, Methods of formation of sulphonic acids.

Week 3: Physical & Chemical properties of sulphonic acids, Sulphonamides.

Week 4: Sulphaguanidine & synthetic detergents.

May 2022

Week 1: Amino acids, Peptides & Proteins

Introduction, Nomenclature, structure & classification of α -Amino acids.

Week 2: Stereochemistry and acid base behavior of amino acids, Isoelectric point of amino acids: Electrophoresis.

Week 3: Preparation of α -Amino acids.

Week 4: Nomenclature, classification & Geometry of peptide bond. Classification of proteins, Peptide structure determination, end group analysis.

June 2022

Week 1: Selective hydrolysis, Classical peptide synthesis, solid phase peptide synthesis.

Week 2: Structure of peptides and proteins.

Week 3: Group Discussion.

Week 4: Problem Solving.

Teacher concerned: Ms. Savita Pruthi, Ms. Vijeita, Dr. Suman, Ms. Pooja Chaudhary