

Rita Sharma (Associate Professor) Lesson plan of Organic Chemistry B.Sc – Non-Medical, Medical and BioTech 3rd semester, (Session 2020-2021)	
WEEKS	CHAPTER
1.	Alcohols Monohydric alcohols nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters.
2.	Hydrogen bonding. Acidic nature. Reactions of alcohols. Dihydric alcohols — nomenclature, methods of formation, chemical reactions of vicinal glycols,
3.	oxidative cleavage [$\text{Pb}(\text{OAc})_4$ and HIO_4] and pinacol-pinacolone rearrangement.
4.	Epoxides Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides
5.	Phenols Nomenclature, structure and bonding. Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion.
6.	Reactions of phenols — electrophilic aromatic substitution, Mechanisms of Fries rearrangement, Claisen rearrangement, Reimer-Tiemann reaction, Kolbe's reaction and Schotten and Baumann reactions
7.	Ultraviolet (UV) absorption spectroscopy Absorption laws (Beer-Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation.
8.	Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones, Woodward-Fieser rules,
9.	calculation of λ_{max} of simple conjugated dienes and α,β -unsaturated ketones. Applications of UV Spectroscopy in structure elucidation of simple organic compounds.
10.	Carboxylic Acids & Acid Derivatives Nomenclature of Carboxylic acids, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength.
11.	Preparation of carboxylic acids. Reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction. Reduction of carboxylic acids.
12.	Mechanism of decarboxylation. Structure, nomenclature and preparation of acid chlorides, esters, amides and acid anhydrides. Relative stability of acyl derivatives.
13.	Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution. Mechanisms of esterification and hydrolysis (acidic and basic).

Dr. Shish Ram Yadav (Associate Professor) Lesson plan of Organic Chemistry B.Sc–Non-Medical, Non-Medical and BioTech 2nd semester, Session 2020-2021	
WEEKS	CHAPTER
1.	Structure and Bonding Localized and delocalized chemical bond, vander Waals interactions, resonance conditions,
2.	resonance effect and its applications, hyperconjugation, inductive effect, Electromeric effect & their comparison
3.	Stereochemistry of Organic Compounds-I Concept of isomerism. Types of isomerism. Optical isomerism, elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity
4.	properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds
5.	Resolution of enantiomers, inversion, retention and racemization.
6.	Stereochemistry of Organic Compounds-II Relative and absolute configuration, sequence rules, R & S systems of nomenclature. Geometric isomerism determination of configuration of geometric isomers. E & Z system of nomenclature,
7.	Conformational isomerism conformational analysis of ethane and n-butane, conformations of cyclohexane, axial and equatorial bonds,.
8.	. Newman projection and Sawhorse formulae, Difference between configuration and conformation.
9.	Mechanism of Organic Reactions Curved arrow notation, drawing electron movements with arrows, half-headed and double-headed arrows, homolytic and heterolytic bond breaking.
10.	Types of reagents – electrophiles and nucleophiles. Types of organic reactions. Energy considerations. Reactive intermediates carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (formation, structure & stability). Assigning formal charges on intermediates and other ionic species.
11.	Alkanes and Cycloalkanes IUPAC nomenclature of branched and unbranched alkanes, the alkyl group, classification of carbon atoms in alkanes. Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction,
12.	Corey-House reaction and decarboxylation of carboxylic acids), physical properties. Cycloalkanes nomenclature, synthesis of cycloalkanes and their derivatives – photochemical (2+2) cycloaddition reactions,
13.	dehalogenation of -dihalides, pyrolysis of calcium or barium salts of dicarboxylic acids, Baeyer's strain theory and its limitations., theory of strainless rings.

Name Dr Manju		-
Lesson plan of Physical Chemistry		-
B.Sc. -Nonmedical, Medical and Biotech 5th semester, session-2021-2022		-
WEEKS	CHAPTER	-
<u>1.</u>	Chapters 1. Unit-1: Quantum Mechanics-I Black-body radiation, Plank's radiation law, photoelectric effect, heat capacity of solids, Compton effect, wave function and its significance of Postulates of quantum mechanics.	-
<u>2.</u>		-
<u>3.</u>	2. Quantum mechanical operator, commutation relations, Hamiltonian operator, Hermitian operator, average value of square of Hermitian as a positive quantity.	-
<u>4.</u>	Role of operators in quantum mechanics, To show quantum mechanically that position and momentum cannot be predicated simultaneously.	-
<u>5.</u>	Determination of wave function & energy of a particle in one dimensional box, Pictorial representation and its significance.	-
<u>6.</u>	<u>Doubts, Class test</u>	-
<u>7.</u>	Unit-2: Physical Properties and Molecular Structure Optical activity, polarization – (Clausius – Mossotti equation	-
<u>8.</u>	Orientation of dipoles in an electric field, dipole moment, induced dipole moment, measurement of dipole moment-temperature method	-
<u>9.</u>	refractivity method, dipole moment and structure of molecules.	-
<u>10.</u>	Magnetic permeability, magnetic susceptibility and its determination. Application of magnetic susceptibility,	-
<u>11.</u>	magnetic properties – paramagnetism, diamagnetism and ferromagnetics.	-
<u>12.</u>	<u>Doubts, Class test</u>	-

Manju bala (Ext Lecturer) Lesson plan of Physical Chemistry B.Sc - Pass Course, Medical and BioTech 1stsemester, 2020-21	
WEEKS	CHAPTER
1.	Gaseous state :- Maxwell's distribution of velocities and energies, calculation of root mean square velocity, average velocity and most probable velocity.
2.	Collision diameter, collision frequency and mean free path, deviation of real gases from ideal behaviour.
3.	Derivation of vander waals equation of state ,its application in the calculation of Boyle's temperature, explanation of behaviour of real gases using vander waals equation.
4.	Critical phenomenon:- critical temperature, critical pressure, critical volume and their determination, PV isotherms of real gases.
5.	<i>Continuity of state</i> , isotherms of vander waals equation,
6.	Relationship between critical constants and vander waals constant, critical compressibility factor, law of corresponding state.
7.	Assignment and test of gaseous state and critical phenomenon.
8.	Liquid state:- structure of liquid, properties of liquid- surface tension, viscosity, vapour pressure and optical rotation and their determination.
9.	Solid state:- classification of solids, laws of crystallography -law of constancy of interfacial angles, law of rationality of indices, law of symmetry. Symmetry elements of crystal.
10.	Definition of unit cell and space lattice, bravais lattice crystal system. X- RAY diffraction by crystal. Derivation of bragg equation. Determination of crystal structure of Nacl and Kcl.
11.	Liquid crystal:- difference between solids,liquids and liquid Crystals, types of liquid crystal, application of liquid crystal.
12.	Assignment and test of liquid state and solid state

Lesson plan of Physical Chemistry Dr. Rajkumari Jadon (Extension Lecturer) B.Sc.-Nonmedical, Medical and Biotech 5th semester, Session 2020-21	
Weeks	Chapters
1	Unit-3: <u>Spectroscopy-I Introduction</u>: Electromagnetic radiation, regions of spectrum, basic features of spectroscopy.
2	Statement of Born oppenheimer approximation, Degrees of freedom.
3	Rotational Spectrum Diatomic molecules. Energy levels of rigid rotator (semi-classical principles), selection rules,
4	spectral intensity distribution using population distribution (Maxwell-Boltzmann distribution)
5	Determination of bond length, qualitative description of non-rigid rotor, isotope effect.
6	Doubt and class test
7	Unit-4: <u>Spectroscopy-II Vibrational spectrum Infrared spectrum</u>: Energy levels of simple harmonic oscillator, selection rules.
8	Pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies.
9	Effects of anharmonic motion and isotopic effect on the spectra, idea of vibrational frequencies of different functional groups.
10	<u>Raman Spectrum</u>: Concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules,
11	selection rules, Quantum theory of Raman spectra.
12	Doubt and class test

Amit Gupta (Ext Lecturer) Lesson plan of Physical Chemistry
B.Sc – Non-medical, Medical and BioTech 3rd semester 2020-2021

WEEKS	CHAPTER
1.	Thermodynamics-I: - Definition of thermodynamic terms: system, surrounding etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process.
2.	Thermodynamics scale of temperature. Concept of entropy- Entropy as a state function, entropy as a function of "V", "T" and "P", Entropy change in reversible and irreversible process
3.	Heat capacity, heat capacities at constant volume and pressure and their relationship.
4.	Joule's law – Joule – Thomson coefficient for ideal gas and real gas: and inversion temperature.
5.	Thermodynamics-II Calculation of w.q. dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process
6.	Temperature dependence of enthalpy, Kirchhoff's equation. Bond energies and applications of bond energies.
7.	Chemical Equilibrium: - Equilibrium constant and free energy, concept of chemical potential, Thermodynamic derivation of law of chemical equilibrium.
8.	Temperature dependence of equilibrium constant; Van't Hoff reaction isochore, Van't Hoff reaction isotherm
9.	Le-Chatelier's principle and its applications Clapeyron equation and Clausius – Clapeyron equation its applications.
10.	Distribution Law :- Nernst distribution law – its thermodynamic derivation,
11.	Modification of distribution law when solute undergoes dissociation,
12.	association and chemical combination. Applications of distribution law:
13.	(i) Determination of degree of hydrolysis and hydrolysis constant of aniline hydrochloride.
14.	(ii) Determination of equilibrium constant of potassium tri-iodide complex and process of extraction
15.	Test and revision

Department of Chemistry
Name-ANU YADAV (Assistant Professor)
Subject-Inorganic Chemistry
Class-B.Sc.-Nonmedical, Medical and Biotech
Semester-3rd semester
Session 2020-21

Weeks	Chapter
1.	Unit-1: Chemistry of Elements of 1st transition series: Definition of transition elements, position in the periodic table, General characteristics & properties of 1st transition elements.
2.	Structures & properties of some compounds of transition elements – TiO_2 , VOCl_2 , FeCl_3 , CuCl_2 and $\text{Ni}(\text{CO})_4$
3.	Unit-2: General characteristics and properties of the 2nd and 3rd transition elements.
4.	Comparison of properties of 3d elements with 4d & 5d elements with reference only to ionic radii, oxidation state, magnetic and Spectral properties and stereochemistry.
5.	Revision of Unit-1 and Unit-2, Class Test
6.	Unit-3: Coordination Compounds Werner's coordination theory.
7.	Effective atomic number concept, chelates, nomenclature of coordination compounds.
8.	Isomerism in coordination compounds.
9.	Valence bond theory of transition metal complexes.
10.	Unit-4: Physical properties of a solvent, types of solvents
11.	General characteristics of solvent and reactions in non-aqueous solvents with reference to liquid NH_3 and liquid SO_2
12.	Revision of Unit-3 and Unit-4, Class Test

Department of Chemistry

Name of the Teacher – Pooja Rani

Paper - Inorganic Chemistry

Semester – Ist sem Session 2020-2021

Days	Topic to be covered
First Week	Idea of de Broglie Matter Waves, Heisenberg Uncertainty Principle
Second Week	Atomic Orbitals, Quantum Numbers
Third Week	Radial and Angular Wave Functions, Probability Distribution curves
Fourth Week	Shapes of s, p, d orbital's
Fifth Week	General Principles of Periodic Table: Aufbau and Pauli Exclusion Principles, Hund's Multiplicity Rule. Electronic Configurations of the Elements, Effective Nuclear Charge, Slater's Rules
Sixth Week	Atomic and Ionic Radii, Ionization Energy, Electron Affinity and Electronegativity - Definition
Seventh Week	Methods of Determination or Evaluation, Trends in Periodic Table (ins & p block elements)
Eight Week	Valence Bond Theory and Its Limitations, Directional Characteristics of Covalent Bond, Various Types of Hybridization and Shapes of Simple Inorganic Molecules and Ions (BeF_2 , BF_3 , CH_4 , PF_5 , SF_6 , IF_7 , SO_4^{2-} , ClO_4^-)
Ninth Week	Valence shell electron pair repulsion (VSEPR) Theory to NH_3 , H_3O^+ , SF_4 , ClF_3 , ICl_2^- and H_2O . MO Theory of Heteronuclear (CO and NO) Diatomic Molecules, Bond Strength and bond energy, Percentage Ionic character from Dipole Moment and Electronegativity Difference
Tenth Week	Ionic Structures (NaCl , CsCl , ZnS (Zinc Blende), CaF_2) Radius Ratio Effect and Coordination Number, Limitation of Radius Ratio Rule, Lattice Defects
Eleventh Week	Semiconductors, Lattice Energy (Mathematical Derivation Excluded) and Born-Haber Cycle
Twelfth Week	Salvation Energy and its Relation With Solubility of Ionic Solids, Polarizing Power and Polarisability of Ions, Fajan's rule.