

GOVERNMENT COLLEGE FOR GIRLS, UNHANI

LESSON PLAN FOR ACADEMIC SESSION

Name – Samesh Chand

Department- Chemistry

Class-B.Sc. 1st year (1st Semester)


Session: 2025-26 (01.08.2025 onwards)

Sr. No./Week	Day/ Month/Year	Topic to be covered
1	04 th August-09 th August	Atomic Structure Dual behavior of matter and radiation, de Broglie's relation, Heisenberg's uncertainty principle, concept of atomic orbitals, significance of quantum numbers.
2	11 th August-16 th August	radial and angular wave functions, normal and orthogonal wave functions, significance of Ψ and Ψ^2 , shapes of s, p, d, f orbitals, Rules for filling electrons in various orbitals, effective nuclear charge, Slater's rules.
3	18 th August-23 th August	Periodic table and atomic properties Classification of periodic table, definition of atomic and ionic radii, ionization energy, electron affinity and electronegativity, trend in periodic table (in s and p-block elements), Pauling, Mulliken, Allred Rachow and Mulliken Jaffe's electronegativity scale, Sanderson's electron density ratio.
4	25 th August-30 th August	Gaseous State Kinetic theory of gases, Maxwell's distribution of velocities and energies (derivation excluded) Calculation of root mean square velocity, average velocity, and most probable velocity. Collision diameter, collision number, collision frequency and mean free path (Derivations excluded), Deviation of Real gases from ideal behavior.
5	1 st September-6 th September	Derivation of Van der Waal's Equation of State, its application in the calculation of Boyle's temperature (compression factor) Critical Phenomenon Concept of Critical temperature, critical pressure, critical volume, relationship between critical constants and Van der Waal's constants (Derivation excluded).
6	8 th September-13 th September	Structure and Bonding Localized and delocalized chemical bond, Van der Waals interactions. Concept of resonance and its applications,
7	15 th September-20 th September	hyperconjugation, inductive effect, Electrometric effect and their comparison.
8	22 th September-27 th September	Mechanism of Organic Reactions Curved arrow notation, homolytic and heterolytic bond fission.
9	29 th September-4 th October	Types of reagents: electrophiles and nucleophiles. Types of organic reactions: Substitution, Addition, Condensation, Elimination,
10	6 th October-11 th October	Rearrangement, Isomerization and Pericyclic reactions. Reactive intermediates: Carbocations, carbanions, free radicals, carbenes (structure & stability).
11	13 th October-18 th October	Liquid State Structure of liquids, Properties of liquids – surface tension, refractive

		index, viscosity, vapour pressure and optical rotation.
12	20 th October-25 th October	Diwali Vacation as per Academic Calendar (2024-2025) IGU Meerpur
13	27 th October-1 st November	Solid State Classification of solids, Law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry and symmetry elements, seven crystal systems and fourteen Bravais lattices.
14	3 rd November- 8 th November	X-ray diffraction, Bragg's law, a simple account of Laue method, rotating crystal method and powder pattern method.
15	10 th November-15 th November	Revision of Unit-1, Written & Oral Test
16	17 th November-22 th November	Revision of Unit-2, Written & Oral Test
17	24 th November-29 th November	Revision of Unit-3, Written & Oral Test
18	01.12.2025 onwards...	Revision of Unit-4, Written & Oral Test
19	02.12.2025 onwards...	Semester End examinations as per University Academic Calendar

References books as per university

1. Lee, J.D.; (2010), Concise Inorganic Chemistry, Wiley India.
2. Kapoor, K.L. (2015), A Textbook of Physical Chemistry, Vol 1, 6th Edition, McGraw Hill Education.
3. Clayden, J.; Greeves, N.; Warren, S. (2012), Organic Chemistry, Oxford.
4. Morrison, R. N.; Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
5. Khosla, B.D.; Garg, V.C.; Gulati, A. (2015), Senior Practical Physical Chemistry, R. Chand & Co, New Delhi.
6. Jeffery, G.H.; Bassett, J.; Mendham, J.; Denney, R.C. (1989), Vogel's Textbook of Quantitative Chemical Analysis, John Wiley and Sons.


 Samesh Chand
 Assistant Professor
 Department of Chemistry

GOVERNMENT COLLEGE FOR GIRLS, UNHANI

LESSON PLAN FOR ACADEMIC SESSION

Name – Sameesh Chand


Department- Chemistry

Class-B.Sc. 3rd year (5th semester)

Session: 2025-26 (01.08.2025 onwards)

Month	Organic chemistry	Inorganic chemistry	Physical chemistry
August	NMR Spectroscopy-I Principle of nuclear magnetic resonance, the PMR spectrum, number of signals, peak areas, equivalent and nonequivalent protons positions of signals and chemical shift, shielding and deshielding of protons, proton counting, splitting of signals and coupling constants, magnetic equivalence of protons.	Metal-ligand Bonding in Transition Metal Complexes Limitations of valence bond theory, an elementary idea of crystal field theory, crystal field splitting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal-field parameters.	Quantum Mechanics-I Black-body radiation, Planck's radiation law, photoelectric effect, heat capacity of solids, Compton effect, wave function and its significance of Postulates of quantum mechanics, quantum mechanical operator, commutation relations, Hamiltonian operator, Hermitian operator, average value of square of Hermitian as a positive quantity. Role of operators in quantum mechanics, To show quantum mechanically that position and momentum cannot be predicated simultaneously, Determination of wave function & energy of a particle in one dimensional box, Pictorial representation and its significance.
September	NMR Spectroscopy-II Discuss ion of PMR spectra of the molecules: ethyl bromide, n-propyl bromide, isopropyl bromide, 1,1-dibromoethane, 1,1,2-tribromoethane, ethanol, acetaldehyde, ethyl acetate, toluene, benzaldehyde and acetophenone.. Simple problems on PMR spectroscopy for structure determination of organic compounds.	Thermodynamic and Kinetic Aspects of Metal Complex A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes of Pt(II).	Physical Properties and Molecular Structure Optical activity, polarization – (Clausius – Mossotti equation), Orientation of dipoles in an electric field, dipole moment, included dipole moment, measurement of dipole moment-temperature method and refractivity method, dipole moment and structure of molecules, Magnetic permeability, magnetic susceptibility and its determination. Application of magnetic susceptibility, magnetic properties – paramagnetism, diamagnetism and ferromagnetism.
October		Magnetic Properties of Transition Metal Complexes	Spectroscopy-I

	<p>Carbohydrates-I Classification and nomenclature. Monosaccharides, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and three diastereomers. Conversion of glucose in to mannose. Formation of glycosides, ethers and esters.</p> <p>Determination of ring size of glucose and fructose. Open chain and cyclic structure of D(+)-glucose & D(-) fructose. Mechanism of mutarotation. Structures of ribose and deoxyribose.</p>	<p>Types of magnetic behaviour, methods of determining magnetic susceptibility, spin-only formula. L-S coupling, correlation of s and eff values, orbital contribution to magnetic moments, application of magnetic moment data for 3d metal complexes.</p>	<p>Introduction: Electromagnetic radiation, regions of spectrum, basic features of spectroscopy, statement of Born-Oppenheimer approximation. Degrees of freedom.</p> <p>Rotational Spectrum Diatomic molecules. Energy levels of rigid rotator (semi-classical principles), selection rules, spectral intensity distribution using population distribution (Maxwell-Boltzmann distribution), determination of bond length, qualitative description of non-rigid rotor, isotope effect.</p>
November	<p>Carbohydrates-II An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.</p> <p>2. Organometallic Compounds Organomagnesium compounds: the Grignard reagents-formation, structure and chemical reactions. Organozinc compounds: formation and chemical reactions. Organolithium compounds: formation and chemical reactions.</p>	<p>Electron Spectra of Transition Metal Complexes Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectrochemical series. Orgel-energy level diagram for d1 and d9 states, discussion of the electronic spectrum of $[Ti(H_2O)_6]^{3+}$ complex ion.</p>	<p>Vibrational spectrum Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and bond qualitative relation of force constant and bond energies, effects of anharmonic motion and isotopic effect on the spectra, idea of vibrational frequencies of different functional groups.</p> <p>Raman Spectrum: Concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules, Quantum theory of Raman spectra.</p>
Text Books	<ol style="list-style-type: none"> 1. Pradeep publication 2. Laxmi. (Vijaya Publisher) 3. Modern 	<ol style="list-style-type: none"> 1. Pradeep publication 2. R. Chand 3. Laxmi (Vijaya Publisher) 4. Modern 	<ol style="list-style-type: none"> 1. Pradeep publication 2. R. Chand 3. Laxmi (Vijaya Publisher) 4. Modern


 Samesh Chand
 Assistant Professor
 Department of Chemistry