

C.H.L. Govt. College, Chhara (Jhajjar)
Lesson Plan (Session 2025-2026)
Program: B.Sc. (Life Sciences/Physical Sciences)

Semester-I DSC (Fundamental Chemistry - I)

Maximum Marks: 50

Credits: 02

Duration of Examination: 02 Hrs.

Course code: 24CHEM401DS01

(External Marks: 35, Internal Marks: 15)

Hours per Week: 02

Dr. Gobind Goyat, Extension Lecturer (Department of Chemistry)

Sr. No.	Topics	Week	Additional
1.	Ionic bond lattice energy, Born-Haber cycle and its applications.	July 25 week 4	
2.	Fajan's rules, hydration energy, bond moment, dipole moment and percentage ionic character. Resonance and resonance energy: study of some inorganic and organic compounds.	August 25 week 1	
3.	Molecular Orbital Approach: LCAO method, bonding and antibonding MOs and their characteristics for s-s, s-p and p-p combination of atomic orbitals, non- bonding combination of orbitals.	August 25 week 2	
4.	MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including idea of s-p mixing) and heteronuclear diatomic molecules such as O_2^- , O_2^{2-} , N_2^- , CO, NO^+ , CN^- . Comparison of VB and MO approaches.	August 25 week 3	
5.	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.	August 25 week 4	Class Test
6.	Oxyacids of sulphur – structures and acidic strength, H_2O_2 -structure, properties and uses. Basic properties of halogen, interhalogen compounds-types and properties, halogen-acids and oxyacids of chlorine – structure and comparison of acidic strength.	September 25 week 1	
7.	Acids and Bases: Brønsted–Lowry concept, conjugate acids and bases, relative strengths of acids and bases, effects of substituent and solvent, differentiating and levelling solvents. Lewis acid-base concept, classification of Lewis acids and bases, Lux-Flood concept.	September 25 week 2	
8.	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.	September 25 week 3	
9.	Deviation of real gases from ideal behaviour, derivation of Vander Waals Equation of state and its applications in the calculation of Boyle's temperature (compression factor), explanation of behavior of real gases using Vander Waals equation.	September 25 week 4	Assignment
10.	Critical Phenomenon: Critical temperature, critical pressure, critical volume and their determination. PV isotherms of real gases, continuity of states, isotherms of Vander Waals equation, relationship between critical constants and Vander Waals constants, compressibility factor. Law of corresponding states.	October 25 week 1	
11.	Electronic displacements and its applications, reaction intermediates and concept of aromaticity. Concept of isomerism, types of isomerism, optical isomerism, optical activity.	October 25 week 2	
12.	Vacations (Diwali)	October 25 week 3	
13.	Elements of symmetry, molecular chirality, enantiomers, stereogenic centre, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds.	October 25 week 4	
14.	Resolution of enantiomers, inversion, retention and racemization, relative and absolute configuration, sequence rules, R & S system of nomenclature.	November 25 week 1	
15.	Review and revision of syllabus/some important questions	November 25 week 2	

C.H.L. Govt. College, Chhara (Jhajjar)

Lesson Plan (Session 2025-2026)

Program: B.Sc. (Life Sciences)

Semester-I SEC (Role of Chemistry in Society)

Maximum Marks: 50

Credits: 02

Course code: 24CHE401SE01

(Internal Marks: 20+20+10)

Hours per Week: 02

Dr. Gobind Goyat, Extension Lecturer (Department of Chemistry)

Sr. No.	Topics	Week	Additional
1.	Analysis of Soil and Water: Composition of soil, Concept of pH and pH measurement of soil, complexometric titrations, Chelation, chelating agents, use of indicators.	August 25 week 4	
2.	Estimation of calcium and magnesium ions in soil, Definition of pure water, sources responsible for contaminating water, water sampling methods.	September 25 week 1	
3.	Water purification methods, determination of dissolved oxygen of a water sample	September 25 week 2	Assignment-I
4.	Chemistry in Cosmetics: A general study including preparation and uses of the following: Hair dye, Soap, Shampoo, Suntan lotions, Talcum powder.	September 25 week 3	
5.	A general study including preparation and uses of the following: Face powder, Lipsticks, nail enamel.	September 25 week 4	Class Test -I
6.	Pesticides: General introduction to pesticides (natural and synthetic), benefits and adverse effects, changing concepts of pesticides. Brief introduction of structure activity relationship, synthesis and technical manufacture and uses of representative pesticides in the following classes: organochlorines (gammexene).	October 25 week 1	
7.	Brief introduction of structure activity relationship, synthesis and technical manufacture and uses of representative pesticides in the following classes: organophosphates (malathion).	October 25 week 2	Assignment-II
8.	Vacations (Diwali)	October 25 week 3	
9.	Experimental Techniques: Basic principle of pH metric, potentiometric and conductometric titrations.	October 25 week 4	Class Test -II
10.	Applications of conductivity measurements: determination of degree of dissociation, determination of K_a of acids and base.	November 25 week 1	Presentation
11.	Buffer solution, buffer action, Henderson–Hazel equation, buffer mechanism of buffer action.	November 25 week 2	

C.H.L. Govt. College, Chhara (Jhajjar)
Lesson Plan (Session 2025-2026)
Program: B.Sc. (Life Sciences/Physical Sciences)

Semester-III DSC (Fundamental Chemistry - III)

Maximum Marks: 50

Credits: 02

Duration of Examination: 02 Hrs.

Course code: 25CHEM403DS01

(External Marks: 35, Internal Marks: 15)

Hours per Week: 02

Dr. Gobind Goyat, Extension Lecturer (Department of Chemistry)

Sr. No.	Topics	Week	Additional
1.	Chemistry of Transition series elements: General characteristics of transition metals, brief discussion of differences between the first, second and third transition series.	July 25 week 4	
2.	Stability of various oxidation states, magnetic and spectral properties. Binary compounds and complexes illustrating relative stability of their oxidation states. Chemistry of Ti, V, Cr, Mn, Fe, Co, Mo and W in various oxidation states.	August 25 week 1	
3.	Some important compounds as laboratory reagents: potassium dichromate, potassium permanganate, potassium ferrocyanide, potassium ferricyanide, sodium nitroprusside and sodium cobaltinitrite.	August 25 week 2	
4.	Thermodynamics-II: Third law of thermodynamics: Nernst heat theorem, concept of residual entropy, evaluation of absolute entropy from heat capacity data.	August 25 week 3	
5.	Gibbs and Helmholtz functions, Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities, A & G as criteria for spontaneity.	August 25 week 4	Class Test
6.	Thermodynamic equilibrium and their advantage over entropy change. Variation of G and A with P, V and T. Partial molar quantities.	September 25 week 1	
7.	Electrochemistry: Arrhenius theory of ionization, Ostwald's Dilution Law. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only), transport number, definition and determination by Hittorf's methods.	September 25 week 2	
8.	Electrolytic conduction, factors affecting electrolytic conduction. Applications of conductivity measurements: determination of dissociation constant (K _a) and degree of dissociation, determination of solubility product of sparingly soluble salts.	September 25 week 3	
9.	Conductometric titrations. Definition of pH and pK _a , buffer solution, buffer action, Henderson – Hasselbalch equation, buffer mechanism of buffer action.	September 25 week 4	Assignment
10.	Reversible electrodes – Metal- metal ion gas electrode, metal – metal insoluble salt- anion electrode and redox electrode.	October 25 week 1	
11.	Alkyl halides: Nomenclature and classes of alkyl halides, general methods of preparation, physical properties and chemical reactions.	October 25 week 2	
12.	Vacations (Diwali)	October 25 week 3	
13.	Mechanisms (S _N 1, S _N 2, E1, E2 and E1c _b) and stereochemistry of nucleophilic substitution reactions of alkyl halides with energy profile diagrams, elimination vs substitution reactions.	October 25 week 4	
14.	Aryl halides: Methods of preparation, Reactions: Aromatic nucleophilic substitution and effect of substituents on reactivity. Benzyne Mechanism: KNH ₂ /NH ₃ (or NaNH ₂ /NH ₃).	November 25 week 1	
15.	Reactivity and relative strength of C-halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides.	November 25 week 2	

C.H.L. Govt. College, Chhara (Jhajjar)
Lesson Plan (Session 2025-2026)
Program: B.Sc. (Life Sciences/Physical Sciences)

Semester-III SEC (Batteries)
Maximum Marks: 50
Credits: 02

Course code: 25CHE403SE01
(Internal Marks: 20+20+10)
Hours per Week: 02

Dr. Gobind Goyat, Extension Lecturer (Department of Chemistry)

Sr. No.	Topics	Week	Additional
1.	Basic Concepts: Components of cells and batteries, classification of cells and batteries, operation of a cell,	August 25 week 4	
2.	Theoretical cell voltage, capacity, energy, specific energy and energy density of practical batteries.	September 25 week 1	
3.	Battery Design and Factors Affecting Battery Performance: General introduction, designing to eliminate potential safety problems, Battery safeguards when using discrete batteries.	September 25 week 2	Assignment-I
4.	Battery construction, Design of rechargeable batteries, factors affecting battery performance.	September 25 week 3	
5.	Primary Batteries: General characteristics and applications of primary batteries, types and characteristics of primary batteries.	September 25 week 4	Class Test -I
6.	Comparison of the performance characteristics of primary battery systems, recharging primary batteries. A) Zinc-Carbon Batteries (Leclanche' and Zinc Chloride Cell Systems): General characteristics, cell chemistry, types of cells and batteries, construction, cell components.	October 25 week 1	
7.	B) Magnesium and Aluminum Batteries: General characteristics, cell chemistry, construction of Mg/MnO ₂ batteries, performance characteristics of Mg/MnO ₂ batteries, sizes and types of Mg/MnO ₂ batteries, other types of magnesium primary batteries.	October 25 week 2	Assignment-II
8.	Vacations (Diwali)	October 25 week 3	
9.	Secondary Batteries: General characteristics and applications of secondary batteries, types and characteristics of secondary batteries.	October 25 week 4	Class Test -II
10.	Comparison of performance characteristics for secondary battery systems and introduction, chemistry, construction, performance characteristics, charging characteristics of following batteries: Lead batteries, Lithium ion batteries, Iron electrode batteries.	November 25 week 1	Presentation
11.	Comparison of performance characteristics for secondary battery systems and introduction, chemistry, construction, performance characteristics, charging characteristics of following batteries: Nickel-Cadmium, Nickel-Metal hydride, Nickel, Zinc batteries.	November 25 week 2	

C.H.L. Govt. College, Chhara (Jhajjar)

Lesson Plan (Session 2025-2026)

Program: B.Sc. III

Semester-V

Maximum Marks: 36

Hours per Week: 02

Subject: Inorganic Chemistry

(External Marks: 29, Internal Marks: 07)

Duration of Examination: 03 Hrs.

Dr. Gobind Goyat, Extension Lecturer (Department of Chemistry)

Sr. No.	Topics	Week	Additional
1.	Limitation of valence bond theory, An elementary idea of crystal field theory.	July 25 week 4	
2.	Crystal field splitting in octahedral complexes.	August 25 week 1	
3.	Crystal field splitting in tetrahedral and square planar complexes.	August 25 week 2	
4.	Factors affecting the Crystal field parameters.	August 25 week 3	
5.	A brief outline of thermodynamic stability of complexes.	August 25 week 4	Class Test
6.	Factors affecting the stability of complexes, Irving William Series.	September 25 week 1	
7.	Substitution reactions of square planar complexes of Pt(II), Trans effect.	September 25 week 2	Assignment
8.	Types of Magnetic materials, Magnetic susceptibility, Methods of determining magnetic susceptibility.	September 25 week 3	
9.	Spin only formula, L-S coupling, correlation of spin only magnetic moment and effective magnetic moment.	September 25 week 4	
10.	Orbital contribution to magnetic moments, application of magnetic moment data for 3d- metal complexes.	October 25 week 1	
11.	Selection rule for d-d transitions, Spectroscopic ground states.	October 25 week 2	
12.	Vacations (Diwali)	October 25 week 3	
13.	Spectrochemical series, Orgel-energy level diagram for d^1 and d^9 states.	October 25 week 4	
14.	Discussion of the electronic spectrum of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ complex ion.	November 25 week 1	
15.	Review and revision of syllabus/some important questions	November 25 week 2	

C.H.L. Govt. College, Chhara (Jhajjar)

Lesson Plan (Session 2025-2026)

Program: B.Sc. III

Semester-V

Maximum Marks: 36

Hours per Week: 02

Subject: Physical Chemistry

(External Marks: 29, Internal Marks: 07)

Duration of Examination: 03 Hrs.

Dr. Gobind Goyat, Extension Lecturer (Department of Chemistry)

Sr. No.	Topics	Week	Additional
1.	Black-body radiation.	July 25 week 4	
2.	Plank's radiation law.	August 25 week 1	
3.	Photoelectric effect, heat capacity of solids, Compton Effect.	August 25 week 2	
4.	Wave function and its significance, Postulates of quantum mechanics.	August 25 week 3	
5.	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.	August 25 week 4	Class test
6.	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 25 week 1	
7.	Optical activity, Polarization-(Clausius-Mossotti equation). Orientation of dipoles in an electric field, dipole moment, induced dipole moment.	September 25 week 2	
8.	Measurement of dipole moment-temperature method and refractivity method, dipole moment and structure of molecules. Magnetic permeability, magnetic susceptibility & its determination. Application of magnetic susceptibility, magnetic properties-paramagnetism, diamagnetism & ferromagnetism.	September 25 week 3	
9.	Electromagnetic radiation, regions of spectrum, basic features of spectroscopy, statement of Born-Oppenheimer approximation. Degrees of freedom.	September 25 week 4	Assignment
10.	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.	October 25 week 1	
11.	Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity.	October 25 week 2	
12.	Vacations (Diwali)	October 25 week 3	
13.	Determination of force constant and 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.	October 25 week 4	
14.	Raman spectra: Concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules, Quantum theory of Raman spectra.	November 25 week 1	
15.	Review and revision of syllabus/some important questions	November 25 week 2	

C.H.L. Govt. College, Chhara (Jhajjar)

Lesson Plan (Session 2025-2026)

Program: B.Sc. III

Semester-V

Maximum Marks: 38

Hours per Week: 02

Subject: Organic Chemistry

(External Marks: 30, Internal Marks: 08)

Duration of Examination: 03 Hrs.

Dr. Gobind Goyat, Extension Lecturer (Department of Chemistry)

Sr. No.	Topics	Week	Additional
1.	Principal of nuclear magnetic resonance, The PMR spectrum, Number of Signals, Peak Area, Equivalent & Non-equivalent Protons	July 25 week 4	
2.	Position of Signals, Chemical shift, Shielding & deshielding of protons, Proton counting, splitting of signals & coupling constants, Magnetic equivalence of protons	August 25 week 1	
3.	Discussion of PMR Spectra of various molecules: ethyl bromide, n-propyl bromide, isopropyl bromide, 1,1-dibromoethane, 1,1,2-tribromoethane, Ethanol, acetaldehyde, ethylacetate, toluene, benzaldehyde and acetophenone.	August 25 week 2	
4.	Simple problems on PMR spectroscopy for structure determination of organic compounds.	August 25 week 3	
5.	Classification & nomenclature. Monosaccharides, Mechanism of osazone formation.	August 25 week 4	Class test
6.	Interconversion of glucose & fructose, chain lengthening & chain shortening of aldoses.	September 25 week 1	
7.	Configuration of monosaccharides, erythro & threo diastereomers, Conversion of glucose into mannose. formation of glycosides, ethers & esters.	September 25 week 2	
8.	Determination of ring size of glucose & fructose, open chain & cyclic structure of D (+) glucose & D (-) fructose	September 25 week 3	
9.	Mechanism of mutarotation Structures of Ribose & Deoxyribose. An introduction to disaccharides (maltose, sucrose & lactose).	September 25 week 4	Assignment
10.	Polysaccharides(starch and cellulose) without involving structure determination.	October 25 week 1	
11.	Organomagnesium compounds: the Grignard reagent-formation, structure & chemical reactions.	October 25 week 2	
12.	Vacations (Diwali)	October 25 week 3	
13.	Organozinc compound: formation & chemical reactions.	October 25 week 4	
14.	Organolithium compounds: formation & chemical reactions.	November 25 week 1	
15.	Review and revision of syllabus/some important questions	November 25 week 2	