

C.H.L. Govt. College, Chhara (Jhajjar)
Lesson Plan (Odd Semester 2026) **B.Sc. Ist (LS/PS)**
Semester-I DSC (Fundamental Chemistry - I) Course code: 24CHEM401DS01
Maximum Marks: 50(35+15) **Duration of Examination: 02 Hrs.**

Session (2026-2027)
Dr. Gobind Goyat, Extension Lecturer (Department of Chemistry)

Sr. No.	Topics	Week	Additional
1.	Ionic bond lattice energy, Born-Haber cycle and its applications.	August 26 week 2	
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 26 week 3	
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 26 week 4	
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.	September 26 week 1	
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.	September 26 week 2	
6.	Oxyacids of sulphur – structures and acidic strength, H_2O_2 -structure, properties and uses.	September 26 week 3	Class Test
7.	Basic properties of halogen, interhalogen compounds-types and properties, halogen-acids and oxyacids of chlorine – structure and comparison of acidic strength.	September 26 week 4	
8.	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.	October 26 week 1	
9.	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.	October 26 week 2	
10.	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.	October 26 week 3	
11.	Critical Phenomenon: Critical temperature, critical pressure, critical volume and their determination. PV isotherms of real gases, continuity of states.	October 26 week 4	Assignment
12.	Isotherms of Vander Waals equation, relationship between critical constants and Vander Waals constants, compressibility factor. Law of corresponding states.	November 26 week 2	
13.	Electronic displacements and its applications, reaction intermediates and concept of aromaticity. Concept of isomerism, types of isomerism, optical isomerism, optical activity.	November 26 week 3	
14.	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.	November 26 week 4	
15.	Resolution of enantiomers, inversion, retention and racemization, relative and absolute configuration, sequence rules, R & S system of nomenclature.	December 26 week 1	

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C.H.L. Govt. College, Chhara (Jhajjar)**Lesson Plan (Odd Semester 2026)****B.Sc. Ist (LS)****Semester-I SEC (Role of Chemistry in Society) Course code: 24CHE401SE01****Maximum Marks: 50(35+15)***Session (2026-2027)***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.	August 26 week 2	
2.	Complexometric titrations, Chelation, chelating agents, use of indicators.	August 26 week 3	
3.	Estimation of calcium and magnesium ions in soil, Definition of pure water, sources responsible for contaminating water, water sampling methods.	August 26 week 4	
4.	Water purification methods, determination of dissolved oxygen of a water sample	September 26 week 1	
5.	Chemistry in Cosmetics: A general study including preparation and uses of the following: Hair dye, Soap, Shampoo,	September 26 week 2	
6.	A general study including preparation and uses of the following: Suntan lotions, Talcum powder.	September 26 week 3	Class Test
7.	A general study including preparation and uses of the following: Face powder, Lipsticks, nail enamel.	September 26 week 4	
8.	Pesticides: General introduction to pesticides (natural and synthetic), benefits and adverse effects, changing concepts of pesticides.	October 26 week 1	
9.	Brief introduction of structure activity relationship, synthesis and technical manufacture and uses of representative pesticides in the following classes: organochlorines (gammexene).	October 26 week 2	
10.	Brief introduction of structure activity relationship, synthesis and technical manufacture and uses of representative pesticides in the following classes: organophosphates (malathion).	October 26 week 3	
11.	Experimental Techniques: Basic principle of pH metric, potentiometric.	October 26 week 4	Assignment
12.	Experimental Techniques: Basic principle of conductometric titrations.	November 26 week 2	
13.	Applications of conductivity measurements: determination of degree of dissociation, determination of K_a of acids and base.	November 26 week 3	
14.	Buffer solution, buffer action.	November 26 week 4	
15.	Henderson-Hazel equation, buffer mechanism of buffer action.	December 26 week 1	

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C.H.L. Govt. College, Chhara (Jhajjar)
Lesson Plan (Odd Semester 2026) **B.Sc. 2nd (LS/PS)**
Semester-III DSC (Fundamental Chemistry-III) **Course code: 25CHEM403DS01**
Maximum Marks: 50(35+15) **Duration of Examination: 02 Hrs.**

Session (2026-2027)

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.	August 26 week 2	
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 26 week 3	
3.	Some important compounds as laboratory reagents: potassium dichromate, potassium permanganate, potassium ferrocyanide, potassium ferricyanide, sodium nitroprusside and sodium cobaltinitrite.	August 26 week 4	
4.	Thermodynamics-II: Third law of thermodynamics: Nernst heat theorem, concept of residual entropy, evaluation of absolute entropy from heat capacity data.	September 26 week 1	
5.	Gibbs and Helmholtz functions, Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities, A & G as criteria for spontaneity.	September 26 week 2	
6.	Thermodynamic equilibrium and their advantage over entropy change. Variation of G and A with P, V and T. Partial molar quantities.	September 26 week 3	Class Test
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 26 week 4	
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.	October 26 week 1	
9.	Conductometric titrations. Definition of pH and pK _a , buffer solution, buffer action, Henderson – Hasselbalch equation, buffer mechanism of buffer action.	October 26 week 2	
10.	Reversible electrodes – Metal- metal ion gas electrode, metal – metal insoluble salt- anion electrode and redox electrode.	October 26 week 3	
11.	Alkyl halides: Nomenclature and classes of alkyl halides, general methods of preparation, physical properties and chemical reactions.	October 26 week 4	Assignment
12.	Mechanisms (S _N 1, S _N 2, E1, E2 and E1cb) and stereochemistry of nucleophilic substitution reactions of alkyl halides.	November 26 week 2	
13.	Nucleophilic substitution reactions of alkyl halides with energy profile diagrams, elimination vs substitution reactions.	November 26 week 3	
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 26 week 4	
15.	Reactivity and relative strength of C-halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides.	December 26 week 1	

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Lesson Plan (Odd Semester 2026)

B.Sc. 2nd (LS)

Semester-III SEC (Batteries)

Course code: 25CHE403SE01

Maximum Marks: 50(35+15)

Session (2026-2027)

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.	August 26 week 2	
2.	Operation of a cell, Theoretical cell voltage, capacity, energy.	August 26 week 3	
3.	Specific energy and energy density of practical batteries. Battery Design and Factors Affecting Battery Performance: General introduction, designing to eliminate potential safety problems,	August 26 week 4	
4.	Battery safeguards when using discrete batteries, Battery construction.	September 26 week 1	
5.	Design of rechargeable batteries, factors affecting battery performance.	September 26 week 2	
6.	Primary Batteries: General characteristics and applications of primary batteries, types and characteristics of primary batteries.	September 26 week 3	Class Test
7.	Comparison of the performance characteristics of primary battery systems, recharging primary batteries.	September 26 week 4	
8.	A) Zinc-Carbon Batteries (Leclanche' and Zinc Chloride Cell Systems): General characteristics, cell chemistry, types of cells and batteries, construction, cell components.	October 26 week 1	
9.	B) Magnesium and Aluminum Batteries: General characteristics, cell chemistry, construction of Mg/MnO ₂ batteries.	October 26 week 2	
10.	performance characteristics of Mg/MnO ₂ batteries, sizes and types of Mg/MnO ₂ batteries, other types of magnesium primary batteries.	October 26 week 3	
11.	Secondary Batteries: General characteristics and applications of secondary batteries, types and characteristics of secondary batteries.	October 26 week 4	Assignment
12.	Comparison of performance characteristics for secondary battery systems and introduction, chemistry, construction, performance characteristics, charging characteristics of following batteries: Lead batteries, Lithium ion batteries.	November 26 week 2	
13.	Comparison of performance characteristics for secondary battery systems and introduction, chemistry, construction, performance characteristics, charging characteristics of following batteries: Iron electrode batteries, Nickel-Cadmium.	November 26 week 3	
14.	Comparison of performance characteristics for secondary battery systems and introduction, chemistry, construction, performance characteristics, charging characteristics of following batteries: Nickel-Metal hydride.	November 26 week 4	
15.	Comparison of performance characteristics for secondary battery systems and introduction, chemistry, construction, performance characteristics, charging characteristics of following batteries: Nickel, Zinc batteries.	December 26 week 1	

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Lesson Plan (Odd Semester 2026)

B.Sc. 3rd (LS/PS)

Semester-V DSC (Fundamental Chemistry-V) Course code:26CHEM405DS01

Maximum Marks: 50(35+15)

Duration of Examination: 02 Hrs.

Session (2026-2027)

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

Sr. No.	Topics	Week	Additional
1.	Definition, nature of metal carbon bond, classification of organometallic compounds by bond types viz. i) covalent ii) ionic iii) electron deficient iv) cluster compounds v) bond compounds including sandwich derivatives. Structure and bonding in metal-ethylenic,	August 26 week 2	
2.	Metal-acetylenic complexes. Metal carbonyls and cyclopentadienyl derivative. Properties and bonding of alkyls of Li, Al, Hg and Sn, concept of hapticity of organic ligand, Zeise salt and ferrocene.	August 26 week 3	
3.	EAN rule applied to carbonyls. Preparation, structure, bonding and properties of mononuclear and polynuclear carbonyls of 3d metals. π – acceptor behavior of carbon monoxide.	August 26 week 4	
4.	Synergic effects (VB approach, MO diagram of CO can be referred for synergic effect to IR frequencies). Applications of organometallic compounds.	September 26 week 1	
5.	Black-body radiation, Plank's radiation law, photoelectric effect, heat capacity of solids.	September 26 week 2	
6.	Compton effect, Wave function and its significance, postulates of quantum mechanics, quantum mechanical operator, commutation relations,	September 26 week 3	Class Test
7.	Hamiltonian operator, Hermitian operator, average value of square of Hermitian as a positive quantity, role of operators in quantum mechanics, Heisenberg uncertainty principle.	September 26 week 4	
8.	Mechanisms of Aldol and Benzoin condensation, Knoevenagel condensation, Claisen-Schmidt, Perkin, Cannizzaro, Wittig and Beckmann reaction.	October 26 week 1	
9.	Benzil-Benzilic acid rearrangements, haloform reaction and Baeyer-Villiger oxidation, α -substitution reactions, oxidations and reductions (Clemmensen, WolffKishner, LiAlH_4 , NaBH_4 , MPV, PDC).	October 26 week 2	
10.	Preparation and reactions of acid chlorides, anhydrides, esters and amides, comparative study of nucleophilic substitution at acyl group -Mechanism of acidic and alkaline hydrolysis of esters.	October 26 week 3	
11.	Claisen condensation, Dieckmann and Reformatsky reactions, Hoffmann-bromamide degradation and Curtius rearrangement.	October 26 week 4	Assignment
12.	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 threo diastereomers.	November 26 week 2	
13.	Conversion of glucose into mannose. Formation of glycosides, ethers and esters. Determination of ring size of glucose and fructose. Open chain and cyclic structure of D(+) glucose & D(-) fructose.	November 26 week 3	
14.	Mechanism of mutarotation, structures of ribose and deoxyribose. An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.	November 26 week 4	
15.	Colour and constitution (electronic concept). Classification of dyes, chemistry and synthesis of methyl orange, congo red, malachite green, crystal violet, phenolphthalein, fluorescein, alizarin and indigo.	December 26 week 1	

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