

COMBINED CONCISE CLASS-WISE LESSON PLANS

Theory lesson plans consolidated from the uploaded PDFs

B.Sc. Third Year – Fifth Semester – Major Chemistry

Total Planned Contact Hours: 45 Hours

Unit I – Coordination Chemistry & Transition Metal Complexes

Class/Hr	Topic	Key Content	Teaching Method	Assessment
1	Werner's Theory	Coordination sphere; primary/secondary valencies	Lecture + diagrams	Concept check
2	EAN & Chelates	EAN; chelate effect; denticity	Examples + problems	EAN practice
3	Nomenclature	Ligands; oxidation state; coordination number	Board work	Naming worksheet
4	Structural Isomerism	Ionization, hydrate, linkage, coordination	Models + chart	Identify isomers
5	Stereoisomerism	Geometrical and optical isomerism	Molecular diagrams	Draw isomers
6	Valence Bond Theory	Hybridization; inner/outer orbital complexes	Derivation + sketches	VBT task
7	Crystal Field Theory	Octahedral, tetrahedral, square-planar splitting	Splitting diagrams	Label diagram
8	CFT Applications	Splitting factors; geometry comparison	Examples	Short quiz
9	Magnetic Properties	Para/diamagnetism; susceptibility	Lecture + examples	Questions
10	Spin-Only Formula	Unpaired electrons; magnetic moment	Numericals	Problem practice
11	L–S Coupling & Revision	Basic L–S coupling; revision/test	Discussion + test	Unit test

Unit II – Thermodynamics-II & Phase Equilibria

Class/Hr	Topic	Key Content	Teaching Method	Assessment
1	Third Law	Third Law; Nernst heat theorem	Lecture	Oral questions
2	Residual & Absolute Entropy	Residual entropy; heat-capacity data	Worked examples	Numericals
3	Gibbs Function	ΔG ; spontaneity/equilibrium	Derivation	Concept check
4	Helmholtz Function	A; constant T,V; comparison with G	Comparison	Quiz
5	Variation of G	G with P,V,T; differential relations	Derivation + graphs	Interpretation
6	Partial Molar Properties	Partial molar quantities; chemical potential	Examples	Short numerical
7	Chemical Potential	Phase/chemical equilibrium	Derivation	Think–pair–share
8	Phase Rule	Phase, component, degree of freedom; Gibbs rule	Derivation + examples	$F=C-P+2$
9	One-Component System	Phase equilibrium and diagram	Diagram teaching	Interpretation
10	Two-Component Systems	Solid–liquid equilibria; binary diagrams	Diagram construction	Label regions
11	Pb–Ag Eutectic & Revision	Eutectic point; revision/test	Case study + test	Unit test

Unit III – Quantum Mechanics-I, Spectroscopy-I & Rotational Spectrum

Class/Hr	Topic	Key Content	Teaching Method	Assessment
1	Black-Body Radiation	Classical failure; Planck law	Lecture + sketch	Concept check
2	Classical vs Quantum	Need for quantum mechanics	Chart + discussion	Think–pair–share
3	Postulates & Operators	Wave function; operators; eigenvalues	Board work	Operator task
4	Commutation & Hamiltonian	Commutation relations; Hamiltonian	Guided derivation	Worksheet
5	Schrödinger & 1-D Box	Equation; boundary conditions; quantized energies	Derivation + diagrams	Practice
6	EM Radiation & Spectrum	EM radiation and spectrum	Spectrum chart	Labelling
7	Molecular Spectroscopy	Molecular vs atomic; S/N; resolving power	Discussion	Quiz
8	Born–Oppenheimer Approximation	Electronic/nuclear separation; degrees of freedom	Concept map	One-minute paper
9	Rigid Rotator	Rotational levels; constant; transition rule	Derivation + diagram	Transition relation
10	Intensity & Maxwell–Boltzmann	Population; intensity; temperature	Graphs	Problems
11	Bond Length & Isotope Effect	Bond length; isotope effect; revision/test	Examples + test	Unit test

Unit IV – Organic Synthesis via Enolates & Heterocyclic Compounds

Class/Hr	Topic	Key Content	Teaching Method	Assessment
1	Acidity of α -Hydrogens	Acidity; resonance stabilization	Mechanism + discussion	Concept questions

Class/Hr	Topic	Key Content	Teaching Method	Assessment
2	Enolate Formation	Formation; resonance; stability	Mechanism teaching	Resonance forms
3	Malonic Ester Synthesis	Alkylation; applications	Stepwise mechanism	Reaction worksheet
4	Acetoacetic Ester Synthesis	Alkylation; synthetic utility	Mechanism + examples	Predict products
5	Claisen Condensation	Mechanism; ethyl acetoacetate synthesis	Board mechanism	Mechanism completion
6	Keto–Enol Tautomerism	Equilibrium; structural/electronic factors	Comparison	Major tautomer
7	Heterocycles: Introduction	Aromaticity; MO picture	MO sketches	Aromaticity check
8	Pyrrole, Furan & Thiophene	Structure; synthesis; reactions	Reaction map	Reaction matching
9	Pyridine	Structure; aromaticity; synthesis/reactions	Mechanism + comparison	Quiz
10	Electrophilic Substitution	Mechanism; orientation	Mechanism teaching	Worksheet
11	Basicity Comparison	Pyridine vs piperidine vs pyrrole	Concept map	Ranking
12	Revision & Assessment	Integrated revision; mechanisms/synthesis	Revision + test	Unit test

Common framework: Interactive lecture, board work, diagrams/structures, guided practice and questioning; formative quizzes/worksheets; unit assessment; remedial recap and doubt-clearing.

B.Sc. First Year – First Semester – Minor Chemistry

Total Planned Contact Hours: 15 Hours

Unit I – Covalent Bond

Class/Hr	Topic	Key Content	Teaching Method	Assessment
1	VSEPR Theory	Electron-pair repulsion; bonding/lone pairs	Lecture + sketches	Classify pairs
2	Molecular Shapes	Linear, trigonal planar, tetrahedral	Board diagrams	Shape worksheet
3	Hybridization	sp, sp ² , sp ³ ; geometry	Orbital diagrams	Match geometry
4	Integrated Practice	VSEPR + hybridization; bond angles; revision	Problem solving + quiz	Unit quiz

Unit II – Chemical Kinetics

Class/Hr	Topic	Key Content	Teaching Method	Assessment
1	Reaction Rates	Average/instantaneous rate; rate law; factors	Graphs + examples	Rate practice
2	Order & Molecularity	Meaning, determination, comparison	Discussion	Quiz
3	Zero-Order Kinetics	Integrated expression; graph; half-life	Derivation + numericals	Worksheet
4	First-Order Kinetics & Assessment	Integrated expression; half-life; comparison	Problem solving	Unit test

Unit III – Alkanes (up to 5 Carbon Atoms)

Class/Hr	Topic	Key Content	Teaching Method	Assessment
1	Nomenclature & Classification	IUPAC nomenclature up to C ₅ ; carbon classification	Structure drawing	Naming exercise
2	Isomerism	Chain isomerism; isomers up to C ₅	Structures + peer practice	Isomer worksheet
3	Preparation Methods	Wurtz and Kolbe reactions	Mechanisms + examples	Product prediction
4	Corey–House & Decarboxylation	Corey–House; decarboxylation; revision	Reaction map + quiz	Unit test

Unit IV – Metallic Bond & Semiconductors

Class/Hr	Topic	Key Content	Teaching Method	Assessment
1	Metallic Bond	Electron delocalization; physical properties	Concept + diagrams	Concept questions
2	Band Theory	Energy bands; valence/conduction bands; gap	Band diagrams	Label diagrams
3	Conductors, Semiconductors & Insulators	Comparison; intrinsic semiconductor; revision	Comparison + quiz	Assessment

Common framework: Interactive lecture, board work, diagrams/structures, guided practice and questioning; formative quizzes/worksheets; unit assessment; remedial recap and doubt-clearing.

B.Sc. Second Year – Third Semester – MDC Chemistry

Total Planned Contact Hours: 30 Hours

Unit I – Pollution and Its Types

Class/Hr	Topic	Key Content	Teaching Method	Assessment
1	Introduction to Pollution	Pollutants; primary/secondary; major types	Lecture + concept map	Diagnostic questions
2	Pollution Sources	Natural/anthropogenic; point/non-point	Discussion	Classification task
3	Plastic & Polythene Pollution	Persistence; microplastics; effects	Case study	Quiz
4	Plastic Recycling	Segregation; reuse; recycling; alternatives	Flowchart + discussion	Flowchart
5	Greenhouse Effect	Radiation balance; greenhouse gases	Diagram lecture	Label diagram
6	Climate Change Connection	Gases; sources; consequences; mitigation	Data discussion	Exit ticket
7	Ozone Depletion	ODS; catalytic destruction; ozone hole	Mechanism + schematic	Concept questions
8	Revision & Assessment	Integrated pollution; causes/effects/controls	Revision + test	Unit test

Unit II – Energy

Class/Hr	Topic	Key Content	Teaching Method	Assessment
1	Energy Sources	Conventional and alternative sources	Lecture + chart	Classification
2	Renewable Sources	Solar, wind, hydro, biomass	PPT + cases	Comparison
3	Non-Renewable Sources	Coal, petroleum, gas, nuclear	Discussion + data	Quiz
4	Electrochemical Cells	Components; redox; cell potential	Diagram + board	Label diagram
5	Batteries	Series/parallel; rechargeable/non-rechargeable	Examples	Worksheet
6	Fuel Cells	Principle; H ₂ -O ₂ cell; applications	Schematic + discussion	Flow sequence
7	Solar & Polymer Cells	Photovoltaic effect; polymer cells	Concept diagrams	Concept check
8	Revision & Assessment	Energy technologies; sustainability	Revision + test	Unit test

Unit III – Water

Class/Hr	Topic	Key Content	Teaching Method	Assessment
1	Sources & Uses	Surface/groundwater; drinking water; uses	Source map	Identification
2	Water Conservation	Rainwater harvesting; reuse	Discussion + case	Action plan
3	TDS & Water Quality	TDS; significance; interpretation	Examples	TDS questions
4	Water Purification	Sedimentation; filtration; disinfection	Flowchart	Completion
5	Osmosis	Membrane; gradient; osmotic pressure	Diagram	Labelling
6	Reverse Osmosis	Pressure separation; purifier; pros/cons	R.O. schematic	Explain steps
7	Wastewater Management & Assessment	Sources; treatment/reuse; sustainability	Case study + test	Unit test

Unit IV – Pesticides and Herbicides

Class/Hr	Topic	Key Content	Teaching Method	Assessment
1	Introduction	Definitions; pesticide vs herbicide	Lecture + terminology map	Quiz
2	Biological Control	Natural enemies; microbial/ecological control	Case study	Compare methods
3	Chemical Control	Synthetic control; applications; benefits/risks	Discussion	Risk–benefit chart
4	Natural & Synthetic Pesticides	Classification; persistence; environmental behaviour	Classification table	Exercise
5	DDT & BHC	Persistence; bioaccumulation/biomagnification	Case study + food chain	Analysis
6	Malathion & Sustainable Use	Features; uses; integrated pest management	Discussion + comparison	Worksheet
7	Revision & Assessment	Integrated comparison; environmental impacts	Revision + test	Unit test

Common framework: Interactive lecture, board work, diagrams/structures, guided practice and questioning; formative quizzes/worksheets; unit assessment; remedial recap and doubt-clearing.