

Teaching Plan

July 2025- November 2025

Name of the Teacher: Dr. Monika Gupta

Subject: Chemistry

Class: B.Sc. 5th SEM

Paper: Organic Chemistry

1st week	Introduction of Organometallic compounds with special reference to Grignard reagent. Structure and chemical reactions of Grignard reagent
2nd week	Preparation and reactions organozinc and organolithium compounds. Problems.
3rd week	Assignment/Test of Organometallic compounds. Introduction of Spectroscopic techniques, principle of NMR spectroscopy
4th week	Equivalent and non-equivalent protons. Calculation of number of signals
5th week	Position of signals, concept of chemical shift. Shielding and deshielding of protons
6th week	Chemical shift value of some typical characteristic proton types. Study of peak area and Proton counting, Intensity of peak
7th week	Factors affecting Chemical shift, splitting of signals.
8th week	Rules for spin-spin splitting of proton signals, Coupling constant and magnetically equivalent protons
9th week	Discussion and explanation of PMR spectra of Ethyl bromide; n-propyl bromide; isopropyl bromide; 1,1 dibromomethane; 1,1,2 tribromoethane Numerical problems on PMR spectroscopy
10th week	Study of spectra of ethanol, acetaldehyde, ethylacetate, toluene, benzaldehyde, acetophenone. Applications of PMR spectroscopy Numerical problems on PMR spectroscopy
11th week	Carbohydrates, classification, glucose & fructose- Osazone formation, mutarotation & mechanism. Interconversion of glucose & fructose
12th week	Chain lengthening & Shortening, Epimerisation, Fischer and Hawarth projection of glucose & fructose and determination of ring structure. Erythro & threo isomers.
13th week	Configuration of saccharides. Properties of Sucrose, inversion of cane sugar, Fischer and Hawarth projection of sucrose.
14th week	Properties of Maltose and its structure, Properties of Lactose and its ring structure. Structure of ribose & deoxyribose. Properties of Starch, distinction between Amylose and Amylopectin. Test of NMR Spectroscopy.
15th week	Structure of cellulose. Derivative of cellulose and their applications .Revision of Disaccharides and polysaccharides and problem solving
16th week	Test of NMR Spectroscopy. Problems of carbohydrates.
17th week	Discussion and problems taken, Tests/Seminars/Assignment
18th week	Discussion and problems taken, Tests/Seminars/Assignment

Teaching Plan
July 2025- November 2025

Name of the Teacher: Dr. Monika Gupta

Subject: Chemistry (Minor)

Class: B.Sc. 3rd SEM

Paper: Chemistry of Metals & Non Metals, Hydrocarbons and Solutions

1st week	Alkanes: General methods of preparation and Reactions:
2nd week	Alkanes: Free radical substitution reaction
3rd week	Alkenes: General methods of preparation
4th week	Reactions of Alkenes: cis-addition (alk. KMnO ₄) and trans-addition (bromine)
5th week	Reactions of Alkenes: addition of HX (Markownikoff's and anti-Markownikoff's addition), hydration
6th week	Reactions of Alkenes: ozonolysis, oxymecuration-demercuration, hydroboration oxidation
7th week	Alkynes: General methods of preparation
8th week	Reactions of Alkynes: formation of metal acetylides and acidity of alkynes, hydration to form carbonyl compounds
9th week	Reactions of Alkynes: addition of bromine and alkaline KMnO ₄ , ozonolysis and oxidation with hot alk. KMnO ₄
10th week	Test/Assignment of Alkanes, Alkenes & Alkynes
11th week	Structure of benzene (Kekule, hybrid and resonance)
12th week	Preparation of benzene, electrophilic substitution reactions in benzene
13th week	Electrophilic substitution reactions in benzene citing examples of nitration, halogenation
14th week	Mechanism of Friedel Craft's alkylation and acylation
15th week	Carbocationic rearrangement, side chain oxidation of alkyl benzene.
16th week	Test of aromatic hydrocarbons
17th week	Discussion and problems taken, Seminars/Assignment
18th week	Discussion and problems taken, Seminars/Assignment

Teaching Plan

July 2025- November 2025

Name of the Teacher: Dr. Monika Gupta

Subject: Chemistry (Major)

Class: B.Sc. 3rd SEM

Paper: Fundamental Chemistry-III

1st week	Arrhenius theory of ionization, Ostwald's Dilution Law
2nd week	Debye-Huckel–Onsager's equation for strong electrolytes (elementary treatment only), transport number, definition and determination by Hittorf's methods
3rd week	Electrolytic conduction, factors affecting electrolytic conduction.
4th week	Applications of conductivity measurements: determination of dissociation constant (K_a) and degree of dissociation, determination of solubility product of sparingly soluble salts
5th week	Conductometric titrations and their curves
6th week	Definition of pH and p K_a , buffer solution, buffer action,
7th week	Henderson – Hasselbalch equation, buffer mechanism of buffer action.
8th week	Reversible electrodes – Metal- metal ion gas electrode, metal – metal insoluble salt- anion electrode and redox electrode.
9th week	Class Test/Assignment
10th week	Alkyl halide: Nomenclature and classes of alkyl halides, general methods of preparation, Physical properties
11th week	Chemical reactions of Alkyl halides, mechanisms (S_N1 , S_N2 , $E1$, $E2$ and $E1cb$) and stereochemistry of nucleophilic substitution reactions of alkyl halides with energy profile diagrams,
12th week	Elimination vs substitution reactions and Problem discussion
13th week	Aryl halides: Methods of preparation
14th week	Reactions: Aromatic nucleophilic substitution and effect of substituents on reactivity
15th week	Benzyne Mechanism: KNH_2/NH_3 (or $NaNH_2/NH_3$)
16th week	Reactivity and relative strength of C-halogen bond in alkyl, allyl and benzyl halides.
17th week	Discussion and problems taken, Seminars/Assignment
18th week	Discussion and problems taken, Seminars/Assignment

Teaching Plan
July 2025- November 2025

Name of the Teacher: Dr. Monika Gupta
Subject: Chemistry (Minor)
Class: B.Sc. 1st SEM
Paper: Basic concepts of Chemistry

1st week	Atomic models, Rutherford's model and its limitations
2nd week	Bohr's model and its applications
3rd week	Dual nature of matter and light, de Broglie's relationship, Heisenberg uncertainty principle
4th week	Concept of orbitals, quantum numbers
5th week	Shapes of s, p and d orbitals
6th week	Rules for filling electrons in orbitals - Aufbau principle, Pauli's exclusion principle and Hund's rule
7th week	Electronic configuration of atoms, stability of half-filled and completely filled orbitals
8th week	Numerical Problems
9th week	Class Test of Atomic structure & Assignment
10th week	Brief history of the development of periodic table
11th week	Modern periodic law and the present form of periodic table
12th week	Periodic trends in properties of elements -atomic radii, ionic radii, inert gas radii
13th week	Nomenclature of elements with atomic number greater than 100
14th week	Periodic trends in properties of elements - ionization enthalpy
15th week	Periodic trends in properties of elements - electron gain enthalpy
16th week	Periodic trends in properties of elements - electronegativity, valency
17th week	Test of Periodic trends in properties of elements.
18th week	Discussion and problems taken, Seminars/Assignment

Department of Chemistry
Lesson Plan

Name of the Assistant /Associate Professor: **DR. MUKESH KUMAR**

Class Section: **B.Sc. 5th Sem (Inorganic Chemistry)**

Department: **Chemistry**

Lesson Plan: **July 2025- November 2025**

1st week	Limitations of valence bond theory, an elementary idea of crystal-field theory
2nd week	Crystal field splitting in octahedral complexes
3rd week	Crystal field splitting in tetrahedral complexes
4th week	Crystal field splitting in square planar complexes
5th week	Factors affecting the crystal-field parameters, Discussion, and problems taken
6th week	A brief outline of the thermodynamic stability of metal complexes
7th week	Factors affecting the stability
8th week	Substitution reactions of square planar complexes of Pt(II), Discussion and problems taken
9th week	Types of magnetic behavior, methods of determining magnetic susceptibility
10th week	Spin-only formula, L-S coupling, correlation of s and eff values
11th week	Orbital contribution to magnetic moments
12th week	Application of magnetic moment data for 3d metal complexes, Discussion and problems taken
13th week	Types of electronic transitions, selection rules for d-d transitions,
14th week	Spectroscopic ground states, spectrochemical series
15th week	Orgel-energy level diagram for d^1 and d^9 states
16th week	Discussion of the electronic spectrum of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ complex ion, Discussion and problems taken
17th week	Discussion and problems taken, Tests/Seminars
18th week	Discussion and problems taken, Tests/Seminars

Department of Chemistry
Lesson Plan

Name of the Assistant /Associate Professor: **DR. MUKESH KUMAR**

Class Section: **B.Sc. 1ST SEM**

Department: **Chemistry**

Nomenclature - **Fundamental Chemistry – I (Major)**

Course code- **24CHEM401DS01**

Lesson Plan: **July 2025- November 2025**

1st week	Ionic bond, lattice energy, Born-Haber cycle, and its applications.
2nd week	Fajan's rules, hydration energy, Dipole moment, and percentage ionic character.
3rd week	Resonance and resonance energy: study of some inorganic and organic compounds. Molecular Orbital Approach: LCAO method
4th week	Bonding and antibonding MOs, and their characteristics for s-s, s-p, and p-p combination of atomic orbitals.
5th week	Non-bonding combination of orbitals, MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including the idea of s-p mixing).
6th week	Heteronuclear diatomic molecules such as O_2^- , O_2^{2-} , N_2^+ , CO, NO^+ , CN^- .
7th week	Comparison of VB and MO approaches.
8th week	Oxides – structures of oxides of N and P.
9th week	Oxyacids – structure and relative acid strengths of oxyacids of nitrogen and phosphorus.
10th week	Structure of white, yellow, and red phosphorus.
11th week	Oxyacids of sulphur – structures and acidic strength, H_2O_2 –structure, properties, and uses.
12th week	Basic properties of halogen, interhalogen compounds-types and properties,
13th week	Halogen-acids and oxyacids of chlorine – structure and comparison of acidic strength.
14th week	Brönsted–Lowry concept, conjugate acids and bases, relative strengths of acids and bases,
15th week	Effects of substituent and solvent, differentiating and leveling solvents.

16th week	Lewis acid-base concept, classification of Lewis acids and bases, Lux-Flood concept.
17th week	Discussion and problems taken, Tests/Seminars
18th week	Discussion and problems taken, Tests/Seminars

Department of Chemistry **Lesson Plan**

Name of the Assistant /Associate Professor: **DR. MUKESH KUMAR**

Class Section: **B.Sc. 3rd SEM**

Department: **Minor Chemistry**

Nomenclature - **Chemistry of Metals & Non-Metals, Hydrocarbons and Solutions**

Course code- **25CHE403MI01**

Lesson Plan: **July 2025- November 2025**

1st week	Occurrence of elements in nature
2nd week	Physical and chemical properties of metals and non-metals
3rd week	Minerals and ores, metallurgical processes benefaction, roasting,
4th week	Metallurgical processes, calcination and reduction of metal oxides pr
5th week	Refining of metals, metallurgy of Fe, and Zn
6th week	Refining of metals, metallurgy of Al and Cu.
7th week	Types of solutions
8th week	Expression of concentration of solutions of solids in liquids, solubility of gases in liquids, solid solutions,
9th week	Explanation of Raoult's law
10th week	Colligative properties - relative lowering of vapour pressure
11th week	Colligative properties - elevation of boiling point
12th week	Colligative properties - depression in freezing point

13th week	Colligative properties - osmotic pressure .
14th week	determination of molecular masses using colligative properties
15th week	Explanation of abnormal molecular mass
16th week	Concept of Van't Hoff factor .
17th week	Discussion and problems taken, Tests/Seminars
18th week	Discussion and problems taken, Tests/Seminars

Department of Chemistry **Lesson Plan**

Name of the Assistant /Associate Professor: **DR. MUKESH KUMAR**

Class Section: **B.Sc. 1ST SEM**

Department: **SEC Chemistry**

Nomenclature - **Role of Chemistry in Society**

Course code- **24CHE401SE01**

Lesson Plan: **July 2025- November 2025**

1st week	Composition of soil, concept of pH, and pH measurement of soil
2nd week	Complexometric titrations, chelation, chelating agents, use of indicators, estimation of calcium and magnesium ions in soil.
3rd week	Definition of pure water, sources responsible for contaminating water,
4th week	Water sampling methods, water purification methods, and the determination of dissolved oxygen of a water sample.
5th week	A general study including preparation and uses of the following: Hair dye, soap,
6th week	General study including preparation and uses of the following shampoo, suntan lotions, face powder,

7th week	General study including preparation and uses of the following lipsticks, talcum powder, and nail enamel.
8th week	General introduction to pesticides (natural and synthetic), benefits and adverse effects, and changing concepts of pesticides
9th week	Brief introduction of the structure-activity relationship, synthesis, and technical manufacture
10th week	Uses of representative pesticides in the following classes: organochlorines (gammexene), organophosphates (malathion).
11th week	Basic principles of pH metric, potentiometric, and conductometric titrations.
12th week	Applications of conductivity measurements: determination of the degree of dissociation.
13th week	Determination of K_a of acids and bases, buffer solution, buffer action.
14th week	Henderson–Hazel equation.
15th week	Buffer mechanism of buffer action.
16th week	Basic principles of pH metric, potentiometric, and conductometric titrations.
17th week	Discussion and problems taken, Tests/Seminars
18th week	Discussion and problems taken, Tests/Seminars

Department of Chemistry
Lesson Plan

Name of the Assistant Professor: **Dr. Poonam**

Class/Section: **B.Sc.1stSem.(Major Chemistry)**

Department: **Chemistry**

Lesson Plan: July2025-November2025

1st week	Maxwell's distribution of velocities and energies (derivation excluded), calculation of root mean square velocity, average velocity and most probable velocity
2nd week	Collision diameter, collision number, collision frequency and mean free path,
3rd week	Deviation of real gases from ideal behavior, Derivation of Vander Waals Equation of state
4th week	Explanation of behavior of real gases using Vander Waals equation, applications in the calculation of Boyle's temperature (compression factor)
5th week	Critical temperature, critical pressure, critical volume and their determination.
6th week	PV isotherms of real gases, continuity of states,
7th week	Isotherms of Vander Waals equation, relationship between critical constants and Vander Waals constants, compressibility factor
8th week	Law of corresponding states and problem discussion
9th week	Class Test
10th week	Electronic displacements and its applications
11th week	Reaction intermediates
12th week	Concept of aromaticity, Concept of isomerism, types of isomerism, optical isomerism, optical activity
13th week	Assignments
14th week	Elements of symmetry, molecular chirality, enantiomers, stereogenic centre, properties of enantiomers,
15th week	Chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds

16th week	Resolution of enantiomers, inversion, retention and racemization
17th week	Relative and absolute configuration, sequence rules,
18th week	R & S system of nomenclature and Problem discussion

Name: Dr. Poonam
Subject: Chemistry
Designation: Asst. Professor
 Vaish College, Rohtak

Name of the Assistant Professor: **Dr. Poonam**
 Class/Section: **B.Sc. 1stSem.(Minor Chemistry)**
 Department: **Chemistry**
 Lesson Plan: July2025-November2025

1st week	Atomic mass, mole concept and molar mass, Avogadro's number and its significance
2nd week	Mole concept
3rd week	Percentage composition, empirical and molecular formula
4th week	Chemical reactions
5th week	Ways of expressing concentration of solutions (molarity, normality)
6th week	Ways of expressing concentration of solutions (molality, mole percentage, strength)
7th week	Stoichiometric calculations involving reactants and products
8th week	Problem discussion
9th week	Class Test
10th week	Electronic displacements: Inductive effect, electromeric effect
11th week	Resonance, hyperconjugation.
12th week	Cleavage of bonds: homolysis and heterolysis. Reaction intermediate:

	carbocation
13th week	Assignments
14th week	Carbanions, free radicals
15th week	Carbenes
16th week	Electrophiles and nucleophiles
17th week	Aromaticity: benzenoids and Huckel's rule.
18th week	Seminar and Problem discussion

Name: Dr. Poonam
Subject: Chemistry
Designation: Asst. Professor
 Vaish College, Rohtak

Name of the Assistant Professor: **Dr. Poonam**
 Class/Section: **B.Sc.3rdSem.(Major Chemistry)**
 Department: **Chemistry**
 Lesson Plan: July2025-November2025

1st week	General characteristics of transition metals
2nd week	Brief discussion of differences between the first, second and third transition series, stability of various oxidation states, magnetic and spectral properties
3rd week	Binary compounds and complexes illustrating relative stability of their oxidation states
4th week	Chemistry of Ti, V, Cr, Mn, Fe, Co, Mo and W in various oxidation states
5th week	Some important compounds as laboratory reagents: potassium dichromate, potassium permanganate
6th week	Some important compounds as laboratory reagents: potassium ferrocyanide, potassium ferricyanide
7th week	Some important compounds as laboratory reagents: sodium nitroprusside and sodium cobaltinitrite.

8th week	Problem discussion
9th week	Class Test
10th week	Third law of thermodynamics: Nernst heat theorem
11th week	Concept of residual entropy, evaluation of absolute entropy from heat capacity data.
12th week	Gibbs and Helmholtz functions, Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities
13th week	Assignments
14th week	A & G as criteria for spontaneity, thermodynamic equilibrium and their advantage over entropy change.
15th week	Variation of G and A with P, V
16th week	Variation of G and A with T, Partial molar quantities.
17th week	Partial molar quantities
18th week	Problem discussion

Name: Dr. Poonam

Subject: Chemistry

Designation: Asst. Professor
Vaish College, Rohtak

Name of the Assistant Professor: **Dr. Poonam**

Class/Section: **B.Sc. 3th Sem. (SEC Chemistry)**

Department: **Chemistry**

Lesson Plan : July 2025-November 2025

1st week	Components of cells and batteries, classification of cells and batteries
2nd week	Operation of a cell, theoretical cell voltage, capacity, energy, specific energy and energy density of practical batteries
3rd week	General introduction, designing to eliminate potential safety problems

4th week	Battery safeguards when using discrete batteries, battery construction, design of rechargeable batteries
5th week	Factors affecting battery performance
6th week	General characteristics and applications of primary batteries, types and characteristics of primary batteries
7th week	Comparison of the performance characteristics of primary battery systems, recharging primary batteries
8th week	Zinc-Carbon Batteries (Leclanche' and Zinc Chloride Cell Systems): General characteristics, cell chemistry, types of cells and batteries, construction, cell components.
9th week	Magnesium and Aluminum Batteries: General characteristics, cell chemistry, construction of Mg/MnO ₂ batteries
10th week	Performance characteristics of Mg/MnO ₂ batteries, sizes and types of Mg/MnO ₂ batteries, other types of magnesium primary batteries.
11th week	Class Test/Seminar
12th week	General characteristics and applications of secondary batteries, types and characteristics of secondary batteries
13th week	Comparison of performance characteristics for secondary battery systems and introduction, chemistry, construction, performance characteristics, charging characteristics of Lead batteries
14th week	Introduction, chemistry, construction, performance characteristics, charging characteristics of Lithium ion batteries, Iron electrode batteries
15th week	Introduction, chemistry, construction, performance characteristics, charging characteristics of Nickel-Cadmium, Nickel-Metal hydride batteries
16th week	Introduction, chemistry, construction, performance characteristics, charging characteristics of Nickel Zinc batteries and problem discussion
17th week	Assignments and problem discussion
18th week	Class Test

Name: Dr. Poonam
Subject: Chemistry
Designation: Asst. Professor
 Vaish College, Rohtak

Name of the Assistant Professor: **Dr. Poonam**
 Class/Section: **B.Sc. 5thSem.(Physical Chemistry)**
 Department: **Chemistry**
 Lesson Plan: July2025-November2025

1st week	Black-body radiation, Plank's radiation law, photoelectric effect, heat capacity of solids, Compton effect
2nd week	Wave function and its significance of Postulates of quantum mechanics , quantum mechanical operator, commutation relations, Hamiltonian operator
3rd week	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
4th week	Determination of wave function & energy of a particle in one dimensional box, Pictorial representation and its significance, Discussion and problems taken
5th week	Optical activity, polarization– (clausius– Mossotti equation). Orientation of dipoles in an electric field, dipole moment, induced dipole moment
6th week	Measurement of dipole moment-temperature method and refractivity method, dipole moment and structure of molecules
7th week	Magnetic permeability, magnetic susceptibility and its determination. Application of magnetic susceptibility
8th week	Magnetic properties– paramagnetism, diamagnetism and ferromagnetism, Discussion and problems taken
9th week	Introduction: Electromagnetic radiation, regions of spectrum, basic features of spectroscopy
10th week	Statement of Born-oppenheimer approximation, Degrees of freedom
11th week	Diatomic molecules. Energy levels of rigid rotator (semi-classical principles), selection rules
12th week	Spectral intensity distribution using population distribution (Maxwell-Boltzmann distribution), determination of bond length
13th week	Qualitative description of non-rigid rotor, isotope effect, Discussion and problems taken
14th week	Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity
15th week	Determination of force constant and qualitative relation of force constant and bond energies, effects of anharmonic motion and isotopic effect on the spectra
16th week	Idea of vibrational frequencies of different functional groups, Discussion and problems taken
17th week	Discussion and problems taken, Test
18th week	Discussion and problems taken, Test

Name: Dr. Poonam
Subject: Chemistry
Designation: Asst. Professor
 Vaish College Rohtak