GCW, Hisar Dept. of Chemistry Session : 2025-26 Odd Sem
NAME OF TEACHER: Dr. Satyender Kumar

CLASS: B.Sc. III (Vth SEM)

PAPER-CCL 503(ii): CHEMISTRY OF MAIN GROUP ELEMENTS, THEORIES OF ACIDS AND BASES-I

PAPER-CCS 505(ii): FUEL CHEMISTRY

Week 1	PAPER I
	Acids and Bases: Bronsted–Lowry concept, conjugate acids and bases.
Week 2	
	Relative strengths of acids and bases, effects of substituent and solvent, differentiating and levelling solvents.
Week 3	
	Lewis acid-base concept, classification of Lewis acids and bases, Lux-Flood concept and solvent system concept.
Week 4	
	Hard and soft acids and bases (HSAB concept), applications of HSAB process.
Week 5	General Principles of Metallurgy
	General Principles of Metallurgy: Chief modes of occurrence of metals based on standard electrode potentials **Assignment**
Week 6	
	Ellingham diagrams for reduction of metal oxides using carbon and carbon monoxide as reducing agents.
Week 7	
	Hydrometallurgy with reference to cyanide process for gold and silver. Methods of purification of metals (Al, Pb, Ti, Fe, Cu, Ni, Zn, Au)
Week 8	
	Electrolytic refining, zone refining, van Arkel-de Boer process, Parting Process, Mond's process and Kroll Process.
	Class Test
Week 9	
	s- and p-Block Elements Periodicity in s- and p-block elements with respect to electronic configuration, atomic and ionic size, ionization enthalpy, electron gain enthalpy, electronegativity (Pauling scale).

Week 10	
	General characteristics of s-block metals like density, melting and boiling points, flame colour and reducing nature. Oxidation states of s- and p-block elements,
Week 11	
	Inert-pair effect, diagonal relationships and anomalous behaviour of first member of each group. Allotropy in C, P and S
Week 12	
	Complex forming tendency of s block elements and a preliminary idea of crown ethers and cryptates, structures of basic beryllium acetate, salicylaldehyde/ acetylacetonato complexes of Group 1 metals.
Week 13	**(SEC) FUEL CHEMISTRY**
	Review of energy sources (renewable and non-renewable). Classification of fuels and their calorific value. Coal:Uses of coal (fuel and nonfuel) in various industries, its composition, carbonization of coal. Coal gas, producer gas.
	Assignment
Week 14	
	water gas—composition and uses. Fractionation of coal tar, uses of coal tar bases chemicals, requisites of a good metallurgical coke, Coal gasification (Hydro gasification and Catalytic gasification), Coal liquefaction and Solvent Refining. Petroleum and Petrochemical Industry: Composition of crude petroleum, Refining and different types of petroleum products and their applications.
Week 15	
	Fractional Distillation (Principle and process), Cracking (Thermal and catalytic cracking), Reforming Petroleum and non-petroleum fuels (LPG, CNG, LNG, bio-gas, fuels derived from biomass), fuel from waste, synthetic fuels (gaseous and liquids), clean fuels.
	CLASS TEST
Week 16	
	Petrochemicals: Vinyl acetate, Propylene oxide, Isoprene, Butadiene, Toluene and its derivatives Xylene. Lubricants: Classification of lubricants, lubricating oils (conducting and nonconducting) Solid and semisolid lubricants, synthetic lubricants. Properties of lubricants (viscosity index, cloud point, pore point) and their determination **ASSINGMENT**
Week 17	
	Revision

GCW, Hisar Dept. of Chemistry Session : 2025-26 Odd Sem
NAME OF TEACHER: Dr. Satyender Kumar

CLASS: B.Sc. II (3rd SEM)

PAPER-C24SEC328T: FUEL CHEMISTRY

Week 1	Renewable and non-renewable energy sources
Week 2	Classification of fuels and their calorific values
Week 3	Uses of coal as fuel and non-fuel in industries
Week 4	Carbonisation of coal, coal gas, producer gas, water gas- composition and uses
Week 5	Coal gasification- hydro gasification, catalytic gasification
Week 6	Composition of crude petroleum **ASSIGNMENT**
Week 7	Refining, different types of petroleum products and their applications
Week 8	Fractional distillation- principle and process **CLASS TEST**
Week 9	Thermal & catalytic cracking
Week 10	Reforming, petroleum and non-petroleum fuels
Week 11	LPG, CNG, LNG, Biogas, Syn Gas, Synthetic Natural Gas
Week 12	Classification of petrochemicals
Week 13	Classification and functions of lubricants
Week 14	Lubricating oils- conducting and non-conducting
Week 15	Solid and semi solid lubricants, synthetic lubricants
Week 16	Properties of lubricants, viscosity index, cloud point and pour point

Dr. Satyender Kumar

GOVERNMENT COLLEGE FOR WOMEN, HISAR
Department of Chemistry
Lesson Plan (Odd Semester)
SESSION 2025-26

Name of Assistant Professor: Dr. Rakesh Kumar
Class:- B.Sc-Ist (Semester- Ist)
Subject: - Discipline Specific Course (DSC) Chemistry – I [C24CHE101T **]**

Subject	Month	Syllabus to be Covered
C24CHE101T	**July 2025**	**Atomic Structure** Dual behaviour of matter and radiation, de-Broglie's relation, Heisenberg's uncertainty principle, Quantum mechanics. Time independent Schrodinger equation (Derivation Excluded). Significance of Ψ and Ψ2, Normal and orthogonal wave functions, Concept of atomic orbitals, Significance of quantum numbers, shapes of *s*, *p* and *d* orbitals, Rules for filling electrons in various orbitals, Electronic configurations of the atoms, Stability of half-filled and completely filled orbitals.
C24CHE101T	**August 2025**	**Structure and Bonding** Localized and delocalized chemical bond, Van der Waals interactions, Concept of resonance and its applications, Hyperconjugation, Inductive effect, Electromeric effect and their comparison. **Mechanism of Organic Reactions** Curved arrow notation, homolytic and heterolytic bond fission, Types of reagents: electrophiles and nucleophiles. Types of organic reactions: Substitution, Addition, Condensation, Elimination, Rearrangement, Isomerization. Reactive intermediates: Carbocations, Carbanions, Free radicals and Carbenes (structure & stability). **Class Test**
C24CHE101T	**September 2025**	**Stereochemistry** Type of Streoisomers, Conformations with respect to ethane, butane and cyclohexane. Optical isomerism, Elements of symmetry, Concept of chirality (upto two carbon atoms). Enantiomerism, Diastereomerism, Threo and erythro diasteromers and Meso compounds;

		Configuration: (relative and absolute), sequence rules D and L; R and S (for upto 2 chiral carbon atoms) system of nomenclature; Geometrical isomerism; *cis* - *trans* nomenclature; and *E*/*Z* Nomenclature (for up to two C=C systems). **Assignment**
C24CHE101T	**October 2025**	**Gaseous State** Kinetic theory of gases and derivation of the kinetic gas equation. Maxwell's distribution of velocities and energies (Graphic representation - derivation excluded), Temperature dependence of these distributions, Most probable velocity, Average velocity and Root Mean Square Velocity (Derivations excluded), Relationship among three types of velocities, Collision diameter, Collision number, Collision frequency and Mean free path (with Derivations), Deviation of real gases from ideal behaviour, Compressibility factor, Causes of deviation, Derivation of Van der Waal's Equation of State, its application in the calculation of Boyle's temperature.

Dr. Rakesh Kumar
Assistant Professor (Chemistry)

GOVERNMENT COLLEGE FOR WOMEN, HISAR
Department of Chemistry
Lesson Plan (Odd Semester)
SESSION 2025-26

Name of Assistant Professor: Dr. Rakesh Kumar
Class:- B.Sc-2nd (Semester- 3rd)
Subject: - Discipline Specific Course (DSC) Chemistry – III [C24CHE301T **]**

Subject	Month	Syllabus to be Covered
C24CHE301T	**July 2025**	**Transition Elements (3d series)** General group trends with special reference to electronic configuration, variable valency, colour, magnetic and catalytic properties, ability to form complexes and stability of various oxidation states (Latimer diagrams) for Fe and Cu. **Lanthanoids and Actinoids** Electronic configurations, oxidation states, colour, magnetic properties, lanthanide contraction, separation of lanthanides (ion exchange method only).
C24CHE301T	**August 2025**	**Alkyl and aryl halides** Alkyl Halides Preparation: From Alkenes and Alcohols, Reactions: Nitrite and Nitro formation, Nitrile and isonitrile formation. Williamson's ether synthesis. Types of Nucleophilic Substitution (SN1, SN2 and SNi) reactions. Aryl Halides Preparation (Chloro, bromo and iodo-benzene case): From phenol, Sandmeyer & Gattermann reactions. Chemical reactions (Chlorobenzene): Aromatic nucleophilic substitution (replacement by – OH group) and effect of nitro substituent. Benzyne Mechanism: KNH2/NH3 (or NaNH2/NH3). Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, vinyl and aryl halides. **Class Test**
C24CHE301T	**September 2025**	**Alcohols and Phenols** Alcohols Preparation: Preparation of 1o, 2o and 3o alcohols using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones

		and esters. Acidic nature reactions: With sodium, HX (Lucas test), Esterification, Oxidation (with PCC and acidic dichromate). Phenols Preparation: From Cumene, diazonium salts and Grignard reagent. Acidic nature, Chemical reactions: Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer-Tiemann Reaction, Claisen rearrangement, Fries rearrangement and Schotten-Baumann Reaction, Kolbe's reaction (with mechanism) **Assignment**
C24CHE301T	**October 2025**	**Conductance and Conductivity** Introduction, Equivalent and Molar conductivity and their variation with dilution for weak and strong electrolytes, Kohlrausch's law of independent migration of ions, Transport number, Ionic mobility, Applications of conductance measurements: Determination of degree of ionization of weak electrolyte, Solubility and Solubility products of sparingly soluble salts, Ionic product of water. Conductometric titrations (only acid-base): Concept of pH and pKa, buffer solution, buffer action, Henderson-Hasselbalch equation.

Dr. Rakesh Kumar
Assistant Professor (Chemistry)

GOVERNMENT COLLEGE FOR WOMEN, HISAR
Department of Chemistry
Lesson Plan (Odd Semester)
SESSION 2025-26

Name of Assistant Professor: Dr. Rakesh Kumar
Class:- B.Sc-2nd (Semester- 3rd)
Subject: - Minor Course (MIC) Basic Chemistry – I [C24MIC131T]

Subject	Month	Syllabus to be Covered
C24MIC131T	**July 2025**	**Covalent Bond** Valence bond theory approach, Various type of hybridisation and shapes of simple inorganic molecules and ions with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements (BeF_2, BF_3, CH_4, PF_5, SF_6, IF_7,
C24MIC131T	**August 2025**	**Covalent Bond** SO_4^{2-}, ClO_4^-, NO_3^-), Valence Shell Electron Pair Repulsion (VSEPR) theory to NH_3, H_3O^+, SF_4, ClF_3, H_2O, $SnCl_2$, ClO_3^- and ICl_2^-). **Class Test**
C24MIC131T	**September 2025**	**Alkanes** Nomenclature, Classification of carbon atoms in alkanes and its structure. Isomerism in alkanes. Methods of formation: Wurtz reaction, Corey-House reaction. **Assignment**
C24MIC131T	**October 2025**	**Alkanes** Kolbe electrolytic reaction, and decarboxylation of carboxylic acids. Mechanism of free radical halogenation of alkanes: reactivity and selectivity

Dr. Rakesh Kumar
Assistant Professor (Chemistry)

GOVERNMENT COLLEGE FOR WOMEN, HISAR
Department of Chemistry
Lesson Plan (Odd Semester)
SESSION 2025-26

Name of Assistant Professor: Dr. Rakesh Kumar
Class:- B.Sc-2nd (Semester- 3rd)
Subject: - Minor Course (MIC) Basic Chemistry – III [C24MIC331T]

Subject	Month	Syllabus to be Covered
C24MIC331T	**July 2025** **August 2025** **September 2025** **October 2025**	**Mechanism of Organic Reactions** Curved arrow notation, Homolytic and heterolytic bond fission, Types of reagents: electrophiles and nucleophiles. Types of organic reactions: Substitution, Addition, Condensation, Elimination, Rearrangement, Isomerization. Reactive intermediates: Carbocations, Carbanions, Free radicals and Carbenes (structure & stability). **Class Test** **Assignment**

Dr. Rakesh Kumar
Assistant Professor (Chemistry)

GOVERNMENT COLLEGE FOR WOMEN, HISAR

LESSON PLAN ODD SEMESTER,

SESSION 2025-26

Department of Chemistry

NAME EXTENSION LECTURER: Dr. PRIYANKA

Class:- B.Sc-III (Sem-6th)

DAYS: 3,4

Subject: - CCL-504(ii) Discipline Specific Course-II(ii) Chemistry of Main Group Elements-II

Subject	Month	Syllabus to be covered
CCL-504(ii) Discipline Specific Course-II(ii) Chemistry of Main Group Elements-II	**JULY**	**UNIT-I** Structure, bonding and properties (acidic/ basic nature, oxidizing/ reducing nature and hydrolysis of the following compounds and their applications in industrial and environmental chemistry wherever applicable:
	AUGUST	Diborane and concept of multicentre bonding, hydrides of Groups 13 (EH3), 14, 15, 16 and 17. Oxides of N and P, Oxoacids of P, S and Cl **UNIT-II** Halides and oxohalides of P and S (PCl3, PCl5, SOCl2 and SO2Cl2) Interhalogen compounds. A brief idea of pseudohalides (8 Hours) (7 Hours)**ASSIGNMENT**
	SEPTEMBER	**UNIT-III** Noble gases: Rationalization of inertness of noble gases, clathrates, preparation and properties of XeF2, XeF4 and XeF6 ,bonding in these compounds using VBT and shapes of noble gas compounds using VSEPR Theory (7 Hours) **TEST**
	OCTOBER	**UNIT-IV** Inorganic Polymers: Types of inorganic polymers and comparison with organic polymers, structural features, classification and important applications of silicates.
	NOVEMBER	Synthesis, structural features and applications of silicones.Borazines and cyclophosphazenes – preparation, properties and reactions. Bonding in (NPCl2)3. **REVISION**

NAME EXTENSION LECTURER: Dr. PRIYANKA

Class:- B.A & B.COM-II (Sem-4th)

DAYS= 5,6

Subject: - Chemistry Multidisciplinary Course (MDC) Chemistry of Oils and Dyes (Semester-I) Paper Code: C24MDC104T

Subject	Month	Syllabus to be covered
Subject: - Chemistry Multidisciplinary Course (MDC) Chemistry of Oils and Dyes (Semester-I) Paper Code: C24MDC104T	**AUGUST**	UNIT-1 Chemistry of Oils Introduction to oils and fats, classification, common fatty acids present in oils and fats, difference between fats and oils,
	SEPTEMBER	Saponification value, acid value and iodine value (Only definitions). Applications and uses of different oils and fats **TEST, ASSIGNMENT**
	OCTOBER	UNIT-II Chemistry of Dyes Definition; Colour and constitution; Classification on the basis of origin & application methods, applications and uses of the following dyes: Methyl orange (azo dye); Malachite green (tiphenylmethane dye), **ASSIGNMENT**
	NOVEMBER	Phenolphthalein (Phthalein dye), Alizarin (anthraquinone dye), Indigo dye. **REVISION**

NAME EXTENSION LECTURER: Dr. PRIYANKA

Class:- B.Sc (Sem-4th) Minor

DAYS= 3-5

Subject: Chemistry Minor Course (MIC) Basic Chemistry – III (Semester-III) Paper Code: C24MIC331T

Subject	Month	Syllabus to be covered
Chemistry Minor Course (MIC) Basic Chemistry – III (Semester-III) Paper Code: C24MIC331T	**AUGUST**	UNIT-1 Periodic table and Properties Classification of periodic table: s, p, d and f blocks, Periodic properties: atomic and ionic radii, ionization energy, electron affinity and electronegativity- trend in periodic properties (in s and p-block elements)
	SEPTEMBER	UNIT-III Ionic Equilibria Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect. TEST, ASSIGNMENT
	OCTOBER	UNIT-IV Van der Waals forces and Hydrogen Bonding Brief discussion of various types of Van der Waals forces. Hydrogen Bonding – Definition, types, effects of hydrogen bonding on properties of substances, Applications.
	NOVEMBER	REVISION

NAME EXTENSION LECTURER: Dr. PRIYANKA

Class:- B.A-I & B.COM (Sem-I)

Subject: Chemistry Multidisciplinary Course (MDC)

Energy Resources and Water Treatment (Semester-III)

Paper Code: C24MDC304T

DAYS: 1,2

Subject	Month	Syllabus to be covered
	JULY	UNIT-I Energy Resources Energy resources: Renewable and Non-Renewable resources,
	AUGUST	Cells and Batteries, Fuel cell, Solar cell. UNIT-II Water Sources of drinking
	SEPTEMBER	water and uses, water conservation, Permissible TDS, Water pollution, Techniques of purification of water, R.O. water purification process TEST
	OCTOBER	(Osmosis and Reverse Osmosis), wastewater management Energy Resources and Water Treatment Lab ASSIGNMENT
	NOVEMBER	REVISION