

**Maharana Pratap Government Degree College Amb**  
**Department of chemistry**  
**Teaching Plan**

**Class : B.sc. First Year**  
**CourseCode:CHEM101TH**

**COURSE TITLE: ATOMIC STRUCTURE, BONDING, GENERAL ORGANIC CHEMISTRY, ALIPHATIC  
HYDROCARBONS**

Months	Section	Topic Covered	Method of Teaching	Assignment	Remarks
July	Departmental Induction Meeting	Syllabus, Detail of CCA(Continuous Comprehensive Assessment) Distribution of Marks, House Exam, Attendance rule, Practical, Laboratory rule and format of Final Exam to be conducted by HP University, Pass Percentage in each Component(CCA, Practical, Theory) and overall Passpercentage and importance of Skill Enhancement Courses to be chosen by the student.	PPTsand Lecture Method		Queries from students are taken up during the induction session.
August	SECTION:A Atomic Structure	Review of Bohr's theory and its limitations, dual behavior of matter and radiation, de Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atom spectra. Need of a new approach to Atomic structure. Schrodinger wave equation and meaning of various terms in it. Radial and angular nodes and their significance. Radial distribution functions and the concept of the most probable distance with special reference to 1s and 2s atomic orbitals. Significance of quantum numbers, Shapes of s, p and d atomic orbitals, nodal plane. <b>Rules</b> for filling electrons in various orbitals, Electronic configurations of the atoms. Stability of half-filled and completely filled orbitals, concept of exchange energy. <b>Relative</b> energies of atomic orbitals, Anomalous electronic configurations. Slater ruler and applications.	PPTs and Lecture by faculty member	Weekly offlinetest	Question for practise
September	SECTION: B Chemical Bonding and	Chemical Bonding end Molecular Structure Ionic Bonding: General	PPTs and Lecture by faculty	Group Discussion	Assignment for CCA

	Molecular Structure	<p>Characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and salvation energy and their importance in the context of stability and solubility of <b>ionic</b> compounds. Statement of Born-Landé equation for calculation of lattice energy, Born-Haber <b>cycle</b> and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character.</p> <p>Covalent bonding • VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable example of linear, trigonal planar, tetrahedral, trigonal bipyramidal and octahedral arrangements. Concept of resonance and resonating structures in various inorganic and organic compounds. MO Approach: Ruler for the <b>LCAO</b> method, bonding and antibonding MO and their characteristic for s-s, s-p and p-p combinations of atomic orbitals, non bonding combination of orbitals, MO treatment of homo nuclear diatomic molecules up to Ne (including idea of s-p mixing) and heteronuclear diatomic molecules such as CO, NO and NO<sup>+</sup>. Comparing of VB And MO approaches.</p>	member		
October	SECTION: C Fundamentals of Organic Chemistry	<p>Physical effect Electronic displacement, Inductive effect, Electromeric effect, Resonance, Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis.</p> <p>Structure, shape and reactivity of organic molecules: Nucleophile and electrophile Reactive Intermediate: Carbocations, Carbanions and <b>free radicals</b>.</p> <p>Strength of organic acids and base:</p>	PPTs and Lecture by faculty member	Practise Question in the Class for revision	Important Questions for Home work

		<p>Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Huckel's rule.</p> <p><b>Stereochemistry</b></p> <p>Conformations with respect to ethane, butane and cyclohexane. interconversion of Wedge Formula, Newman, Sawhorse and Fisher projections. Concept of chirality (upto two carbon atoms). Configuration: Geometrical and Optical isomerism Enantiomerism, Diastereomerism and Meso compounds). Threo and erythro; D and L; cis - trans nomenclature; <b>CIP Rules</b> :R/S (for upto 2 chiral carbon atoms) and E/ Z Nomenclature (for upto two C=C systems).</p>			
November	SECTION :D Aliphatic Hydrocarbons	<p>Functional group approach for the following reaction (Preparation and reaction) to be studied in context to their structure:</p> <p><b>Alkane:</b> (Upto 5 Carbons). Preparation: Catalytic hydrogenation, Wurtz reaction, Kolbe synthesis, from Grignard reagent Reactions: Free radical Substitution: Halogenation, <b>Alkenes:</b> (Upto 5 Carbons) Preparation: Elimination reactions: dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkene (Partial catalytic hydrogenation) and trans alkenes (Birch reduction), Reactions: cis-addition (alk. KMnO<sub>4</sub>) and trans-addition (bromine), Addition of HX (Markownikoff and anti-Markownikoff's addition), Hydration, Ozonolysis, oxymercuration-demercuration, Hydroboration-oxidation,</p>	Lecture and Demonstration method	Class test	Practise Question of previous year

		<p><b>Alkyne:</b> (Upto5Carbons)  Preparation: Acetylene from CaC<sub>2</sub> and conversion into higher alkynes; by dehalogenation of tetrahalides and dehydrohalogenation of vicinal-dihalides.  Reactions: Formation of metal acetylides, addition of bromine and <u>Alkaline</u> KMnO<sub>4</sub>, Ozonolysis and oxidation with hot alkalineKMnO<sub>4</sub>.</p>			
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<b>December: Preparation of House Exam and Conduction of House Exam</b>					
<b>Winter Break</b>					
February	SECTION:A	Atomic Structure,	Lecture and doubts discussion		
	SECTION: B	Chemical Bonding and Molecular Structure			
February	SECTION:C	Stereochemistry	Lecture and doubts discussion		
	SECTION:D	Aliphatic Hydrocarbon			
March	Revision			To Solve Previous Year University questions	

**Maharana Pratap Government Degree College Amb**  
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**Class : B.sc. First Year**  
**CourseCode:CHEM101P**

**COURSE TITLE: ATOMIC STRUCTURE, BONDING, GENERAL ORGANIC CHEMISTRY ALIPHATIC  
HYDROCARBONS**

Months	Section	Topic Covered	Method of Teaching	Assignment	Remarks
July	Departmental Induction Meeting	Syllabus, Detail of CCA (Continuous Comprehensive Assessment) Distribution of Marks, House Exam, Attendance rule, Practical, Laboratory rule and format of Final Exam to be conducted by HP University, Pass Percentage in each Component (CCA, Practical, Theory) and overall Pass percentage and importance of Skill Enhancement Courses to be chosen by the student.	PPTs and Lecture Method		Queries from students are taken up during the induction session.
August	Basic Understanding of Safe Chemistry Laboratory Rule	<ol style="list-style-type: none"> <li>1. Laboratory Etiquettes</li> <li>2. Safety Rule</li> <li>3. Hazardous Chemical</li> <li>4. Disposal of chemical waste</li> <li>5. Error in handling of apparatus</li> <li>6. Fire Extinguisher</li> <li>7. Preparation of standard Solution</li> </ol>	Lecture and PPTs by faculty member		
September	Inorganic Chemistry: Volumetric Analysis	Basic of Volumetric Analysis: Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.	Lecture Method Followed by Practical Demonstration	Performance by Students and result of the Experiments	Observation and Calculation are Checked on the spot
September	Inorganic Chemistry: Volumetric Analysis	Estimation of oxalic acid by titrating it with $\text{KMnO}_4$	Lecture Method Followed by Practical Demonstration	Performance by Students and result of the Experiments	Observation and Calculation are Checked on the spot
October	Inorganic Chemistry: Volumetric Analysis	Estimation of water of crystallization in Mohr's salt by titrating with $\text{KMnO}_4$	Lecture Method Followed by Practical Demonstration	Performance by Students and result of the Experiments	Observation and Calculation are Checked on the spot

October	Inorganic Chemistry: Volumetric Analysis	Estimation of Fe(II) ions by titrating it with $K_2Cr_2O_7$ using internal indicator	Lecture Method Followed by Practical Demonstration	Performance by Students and result of the Experiments	Observation and Calculation Are Checked on the spot
November	Organic Chemistry	Purification of organic compounds by crystallization(from water and alcohol) and distillation.	Lecture Method Followed by Practical Demonstration	Performance by Students and result of the Experiments	Observation and Calculation Are Checked on the spot
November	Organic Chemistry	Separation of mixtures by Chromatography : Measure of $R_f$ value of mixture of two organic compound	Lecture Method Followed by Practical Demonstration	Performance by Students and result of the Experiments	Observation and Calculation are Checked on the spot
December	Preparation of House Exam and Conduction of House Exam				
January	Winter Break				
February	Revision of Practical for the Students whose experimental Results are not up to the mark				
March	Viva and Final Checking of the Practical Notebooks				

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**Class : B.sc. First Year**  
**Course Code:CHEM102TH**

**COURSE TITLE : STATES OF MATTER,CHEMICAL KINETICS & FUNCTIONAL ORGANIC CHEMISTRY**

Months	Section	Topic Covered	Method of Teaching	Assignment	Remarks
July	Departmental Induction Meeting	Syllabus, Detail of CCA(Continuous Comprehensive Assessment) Distribution of Marks ,House Exam, Attendance rule, Practical, Laboratory rule and Format of Final Exam to be Conducted by HP University, Pass Percentage in each Component(CCA, Practical, Theory) and overall Pass Percentage and importance of Skill Enhancement Courses to Be chosen by the student.	PPTs and Lecture Method		Queries from students are Taken up During the induction session.
August	SECTION:A <b>Kinetic Theory of Gases</b>	Postulates of Kinetic Theory of Gases and derivation of the kinetic gas equation. Deviation of real gases from ideal behaviour, compressibility factor, Causes of deviation. vander Waals equation of State for real gases. Boyle temperature(derivation not required). Critical phenomena, critical constants and their calculation from van der Waals equation. Andrews Isotherms of CO <sub>2</sub> . Maxwell Boltzmann distribution laws of molecular velocities and Molecular energies(graphic representation-derivation not required) and their importance.	PPTs and Lecture by faculty member	Weekly off line test	Question for practise through Whats App group

		<p>Temperature dependence of these distributions .Most probable, average and root mean square velocities(no derivation). Collision cross section, collision number, collision frequency, collision diameter and mean free path of molecules. Viscosity of gases and effect of temperature and pressure on coefficient of viscosity (qualitative treatment only).</p> <p><b>Liquids:</b> Surface tension and its determination using stalagmometer. Viscosity of a liquid and determination of coefficient of viscosity using Ostwald viscometer. Effect of temperature on surface tension and coefficient of viscosity of a liquid (qualitative treatment only).</p>			
September	SECTION: B Solids Chemical Kinetics	<p><b>Solids</b> Forms of solids. Symmetry elements, unit cells, crystal systems, Bravais latticetypes and identification of lattice planes. Laws of Crystallography –Law of constancy of interfacial angles. Law of rational indices. Miller indices. X-Ray diffraction by crystals, Bragg's law. Structures of NaCl, KCl and CsCl (qualitative treatment only). Defects in crystals.</p> <p><b>Chemical Kinetics</b> The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction. Derivation of integrated rate equations for zero, first and second order</p>	PPTs and Lecture by faculty member	Group Discussion	Assignment for CCA



		<p>Reactions (both for equal and unequal concentrations of reactants). Half-life of a reaction. General methods for determination of order of a reaction. Concept of activation energy and its calculation from Arrhenius equation.</p> <p>Theory of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only).</p>			
October	SECTION:C Aromatic Hydrocarbons	<p>Functional group approach for the following reactions (preparations &amp; reactions) to be studied in context to their structure.</p> <p><b>Aromatic hydrocarbons</b> Preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid. Reactions: (Case benzene): Electrophilic substitution: nitration, halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation) (upto 4 carbons on benzene). Side chain oxidation of alkyl benzenes (upto 4 carbons on benzene).</p> <p><b>Alkyl Halides</b> (Upto 5 Carbons) Types of Nucleophilic Substitution (SN<sub>1</sub>, SN<sub>2</sub> and SN<sub>i</sub>) reactions.</p> <p><b>Preparation:</b> from alkenes and alcohols. <b>Reactions:</b> hydrolysis, nitrite &amp; nitro formation, nitrite &amp; isonitrile formation, Williamson's ether synthesis. Aryl Halides Preparation: (Chloro, bromo and iodo-benzenes): from phenol, Sandmeyer &amp; Gattermann reactions.</p>	PPTs and Lecture by faculty member	Practise Question in the Class for revision	Important Question for Home work

		<p><b>Reactions</b>  <b>(Chlorobenzene):</b> Aromatic nucleophilic substitution (replacement by -OH group) and effect of nitro substituent. Benzyne  Mechanism: <math>\text{KNH}_2/\text{NH}_3</math> (or <math>\text{NaNH}_2/\text{NH}_3</math>).  Reactivity and Relative strength of C-Halogen bonding alkyl, allyl, benzyl, vinyl and aryl halides.</p>			
November	SECTION:D Alcohols, Phenols and Ethers	<p><b>Alcohols, Phenols and Ethers (Upto 5 Carbons)</b>  Alcohols: Preparation: Preparation of <math>1^\circ</math>, <math>2^\circ</math> and <math>3^\circ</math> alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters.  Reactions: With sodium, HX (Lucas test), esterification, oxidation (with PCC, alk. <math>\text{KMnO}_4</math>, acidic dichromate, cone. <math>\text{HNO}_3</math>). Oppeneauer oxidation Diols: (Upto 6 Carbons) oxidation of diols. Pinacol-Pinacolone rearrangement.  <b>Phenols:</b> (Phenol case) Preparation: Cumene hydro peroxide method, from diazonium salts. Reactions: Electrophilic substitution: Nitration, halogenations and sulphonation. Reimer-Tiemann Reaction, Guermann-Koch Reaction, Houben-Hoesch Condensation, Scholten - Baumann Reaction.  <b>Ethers (aliphatic and aromatic):</b> Cleavage of ethers</p>	Lecture and Demonstration method	Class test	Practise Question of previous year

		<p>with <b>HI</b>.</p> <p><b>Aldehydes and ketones (aliphatic and aromatic):</b> (Formaldehyde, acetaldehyde, acetone and benzaldehyde)</p> <p><b>Preparation:</b> From acid chlorides and from nitriles.</p> <p><b>Reactions:</b> Reaction with HCN, ROH, NaHSO<sub>3</sub>, NH<sub>2</sub>-G derivatives. Iodoform test. Aldo! Condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation. Clemensen reduction and Wolff Kishner reduction. Meerwein-Ponndorf Verley reduction.</p>			
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<b>December: Preparation of House Exam and Conduction of House Exam</b>					
<b>Winter Break</b>					
February	SECTION:A	Kinetic Theory of Gases	Lecture and doubts discussion		
	SECTION: B	Solids and Chemical kinetics			
February	SECTION:C	Aromatic Hydrocarbons	Lecture and doubts discussion		
	SECTION:D	Alcohols, Phenols and Ethers.			
March	Revision			To Solve Previous Year University questions	

**Maharana Pratap Government Degree College Amb**  
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Class : Bsc First Year  
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September	Physical Chemistry:	Determination of surface tension of a liquid or a dilute solution using a Stalagmometer	Lecture Method Followed by Practical Demonstration	Performance by Students and result of the Experiments	Observation and Calculation are Checked on the spot
September	Physical Chemistry:	Study of the variation of surface tension of a detergent solution with concentration	Lecture Method Followed by Practical Demonstration	Performance by Students and result of the Experiments	Observation and Calculation are Checked on the spot
October	Physical Chemistry:	Determination of the relative and absolute viscosity of a liquid using an Ostwald's viscometer	Lecture Method Followed by Practical Demonstration	Performance by Students and result of the Experiments	Observation and Calculation are Checked on the spot
October	Physical Chemistry:	Study of the variation of viscosity of an aqueous solution with concentration of solute	Lecture Method Followed by	Performance by Students and result of	Observation and Calculation

			Practical Demonstration	the Experiments	Are Checked on the spot
November	<b>Organic Chemistry</b>	Systematic Qualitative organic analysis of organic compounds possessing mono functional groups.	Lecture Method Followed by Practical Demonstration	Performance by Students and result of the Experiments	Observation and Calculation are Checked on the spot
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Prepared By:  
 Dr. Krishan Sharma  
 Assistant Professor Chemistry  
 HOD-Department of Chemistry

Principal  
 M. P. Govt. College, Amp  
 Distt. Una (H.P.)