

Topic	Comments	
Covalent Bonding and Shapes of Molecules		
1.1 Electronic Structure of Atoms	Concepts and principles and definitions you should know from General Chemistry	
1.2 Lewis Model of Bonding		
How To Draw Lewis Structures From Condensed Structural Formulas		
The Octet Rule		
1.3 Functional Groups		Know the ones presented in lectures
1.4 Bond Angles and Shapes of Molecules		Know the organic examples: alkanes; alkenes; alkynes
1.5 Polar and Nonpolar Molecules		Be able to classify both bonds & molecules as polar or nonpolar
1.6 Quantum or Wave Mechanics		Wave function; orbitals & shapes of orbitals (definitions)
1.7 The Molecular Orbital and Valence Bond Theories of Covalent Bonding		Hybridization-know all 3 types for C & the geometry & bond angles for each
1.8 Resonance		Know how to interconvert structures by moving pairs of e- and charges and double bonds
How To Draw Curved Arrows and Push Electrons	VSEPR & Resonance	
1.9 Molecular Orbitals for Delocalized Systems	In Alkanes, Alkenes & Alkynes	
1.10 Bond Lengths & Bond Strengths		
2 Alkanes and Cycloalkanes		
2.1 The Structure of Alkanes	C_nH_{2n+2} and sp^3 hybridization	
2.2 Constitutional Isomerism in Alkanes	definition and how to draw them	
2.3 Nomenclature of Alkanes & The IUPAC System	Basic IUPAC system	
2.4 Cycloalkanes	C_nH_{2n}	
2.5 Conformations of Alkanes and Cycloalkanes	Butane conformers; chair, boat, twist-boat	
2.6 Cis, Trans Isomerism in Cycloalkanes	definition and how to draw them	
How To Convert Planar Cyclohexanes to Chair Cyclohexanes	from 2D to 3D chairs	
3 Stereoisomerism and Chirality		
3.1 Chirality—The Handedness of Molecules	the concept & recognize chiral carbons	
3.2 Stereoisomerism	Definition and how to recognize it	
How To Draw Chiral Molecules	enantiomers	
3.3 Naming Chiral Centers—The R,S System	know rules of priority	
How To Assign R or S Configuration to a Chiral Center		
3.4 Acyclic Molecules with Two or More Chiral Centers	diastereomers; how to recognize them	
3.5 Cyclic Molecules with Two or More Chiral centers	use in cycloalkane systems	
3.6 Tying the terminology together		
3.7 Optical Activity—How Chirality Is Detected	know concept & definitions	
Cutoff for Exam 1 Material		
4 Acids and Bases		
4.1 Arrhenius Acids and Bases	definition and use in context	
4.2 Brønsted-Lowry Acids and Bases	definition and use in context	
4.3 Acid Dissociation Constants, pKa; Relative Strengths	know trends	
4.4 The Position of Equilibrium in Acid-Base Reactions	know how to determine	

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4.5 Thermochemistry & Mechanisms of Acid-Base	Rxn coordinate diagrams; "pushing electrons"
4.6 Molecular Structure and Acidity	trends in size; delocalization effects
4.7 Lewis Acids and Bases	definition
5 Alkenes: Bonding, Nomenclature, & Properties	
5.1 Structure of Alkenes	hybridization; geometry; π bonding
How To Calculate the Index of Hydrogen Deficiency	know format & how to apply it (CHO formulas only)
5.2 Nomenclature of Alkenes	IUPAC rules; common names
5.3 Physical Properties of Alkenes	Nonpolar hydrocarbons; BP trends
6 Reactions of Alkenes	
6.1 Reactions of Alkenes—An Overview	π bond as a Lewis base; acts as the nucleophile
6.2 Organic Reactions Involving Reactive Intermediates	protocols & rules for writing mechanisms
6.3 Electrophilic Additions	H ₂ O; X ₂ /H ₂ O; X ₂ /CH ₂ Cl ₂ mechanism for all
6.4 Hydroboration-Oxidation	BH ₃ ; H ₂ O ₂ ; OH and Hg(OAc) ₂ ; H ₂ SO ₄ - partial mechanism
6.5 Oxidation	OsO ₄ ; glycols; O ₃ (also see epoxidation 11.8(for final xm))
6.6 Reductions	Stereochemistry; rank order of alkene stabilities
Cutoff for Exam 2 Material	
7 Alkynes	
7.1 Structure of Alkynes	Bond angle is 180°
7.3 Physical Properties of Alkynes	Nonpolar hydrocarbons; BP trends
7.4 Acidity of 1-Alkynes	Terminal alkyne H pKa~25
7.5 Preparation of Alkynes	Dehydrohalogenation (twice)- mechanism
Alkyne anions as nucleophiles & bases	Know C-C bond rxn; use of R-C \equiv C Na as a base- mechanism
7.6 Electrophilic Addition to Alkynes	halogenations; addn of HX
7.7 Hydration of Alkynes to Aldehydes and Ketones	(sia) ₂ BH; H ₂ O ₂ ; OH and HgSO ₄ ; H ₂ SO ₄
	keto-enol tautomerism & how it is used
7.8 Reduction of Alkynes	Complete & partial; stereochemistry
7.9 Organic Synthesis	Know how to do simple two step synthesis-how to use the reactions in sequence.
8 Haloalkanes, Halogenation, and Radical	
8.1 Structure	Haloalkanes Classification as 1° 2° 3°
8.2 Nomenclature	Basic IUPAC
8.3 Physical Properties of Haloalkanes	Solubility trends; BP trends
8.4 Preparation of Haloalkanes by Halogenation of alkanes	Free radical substitution reaction
8.5 Mechanism of Halogenation of Alkanes	Initiation; chain reaction; termination
8.6 Allylic Halogenation- Mechanism	role of NBS; stability of the allylic radical
8.8 Radical Addition of HBr to Alkenes	Difference of radical vs ionic addn of HBr- Mechanism

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9 Nucleophilic Substitution and β-Elimination	
9.1 Nucleophilic Substitution in Haloalkanes	Definition
9.2 Mechanisms of Nucleophilic Aliphatic Substitution	Solvent properties-polar; nonpolar; protic; aprotic
9.3 Experimental Evidence for SN1 and SN2 Mechanisms	energy diagrams for both; arrow pushing for both
	Kinetics; stereochemistry; structure of RX
9.4 Analysis of Several Nucleophilic Sub Rxns	Conditions for SN1 vs SN2
Cutoff for Exam 3 Material	
9.5 β -Elimination	Definition
9.6 Mechanisms of β -Elimination	know both E1 and E2; stereochemistry
9.7 Experimental Evidence for E1 and E2 Mechanisms	Zaitsev's rule and exceptions to it
9.8 Substitution Versus Elimination	Conditions favoring S vs E reactions
9.9 Analysis of several E vs. Sub Rxns	
10 Alcohols	
10.1 Structure and Nomenclature of Alcohols	IUPAC rules; common names
10.2 Physical Properties of Alcohols	Solubility trends; BP trends
10.3 Acidity and Basicity of Alcohols	Bronsted-Lowry acidity; Lewis acidity of OH
10.4 Reaction of Alcohols with Active Metals	to form alkoxides
10.5 Conversion of Alcohols to Haloalkanes	reactions with HX; PBr ₃ SOCl ₂ ; mechanisms
10.6 Acid-Catalyzed Dehydration of Alcohols	to form alkenes; rearrangements; mechanisms
10.8 Oxidation of Alcohols	H ₂ CrO ₄ ; PCC