

KJM 3200 – Required Reading (Pensum), Spring 2016

- Paula Y. Bruice, "Organic Chemistry" 7nd ed. as specified below, *or* John McMurry: "Organic Chemistry" 8nd ed. as specified below.
- Lise-Lotte Gundersen "KJM 3200. Organic Chemistry II. Laboratory manual", 2016

Students who have used "McMurry" or "Bruice" in their first org. chem. course, can continue to use the same book. Students who have used none of these before, are advised to use "McMurry"

After completing the introductory course in organic chemistry (KJM1110) as well as KJM3200, the intention is that the student shall master the subjects presented in McMurry / Bruice, except most metabolic pathways and polymer chemistry, (and other parts about polymer chemistry and biochemistry elsewhere in the book), and except the spectroscopy covered by KJM3000

Required reading from "Bruice"

Topic	Chapt.	Title	Ca. No. of pages	
Dienes	8	Delocalized Electrons and Their Effect on Stability, pKa, and the Products of a Reaction	11	
		8.14		A molecular orbital description of stability
		8.17		Reactions of Dienes
		8.18		Thermodynamic versus kinetic control
Organo-metallics	12	Organometallic compounds	9	
		12.2		Transmetallation
		12.3		Organocuprates
		12.4		Palladium-catalyzed coupling reactions
		12.5		Alkene metathesis
Radical reactions	13	Radicals - Reactions with alkanes	9	
		13.4		The distribution of products depends on probability and reactivity
		13.5		The reactivity-selectivity principle
		13.7		The addition of radicals to an alkene
		13.8		The stereochemistry of radical substitution and addition reactions
Reactions of Aldehydes and Ketones	17	Reactions of Aldehydes and Ketones. More Reactions of Carboxylic Acid Derivatives. Reactions of α,β-Unsaturated Carbonyl Compounds	18	
		17.6		The reactions of aldehydes and ketones with cyanide ion
		17.10		The reactions of aldehydes and ketones with amine
		17.13		Protecting groups
		17.14		The addition of sulfur nucleophiles
		17.15		The reactions of aldehydes and ketones with a peroxy acid
		17.17		Designing a synthesis: Disconnection, synthons, and synthetic equivalents
		17.18-19		Nucleophilic addition to α,β -unsaturated carbonyl compounds

Carbonyl α-substitutions	18	Reactions at the α-Carbon of Carbonyl Compounds (The whole chapt. except 18.21)	31	
Aromatic compounds	19	Reactions of Benzene and Substituted Benzenes	3	
		8.12		A molecular orbital description of aromaticity and antiaromaticity
		19.21		Nucleophilic aromatic substitution: an addition-elimination reaction
Amines & Heterocycles	20 (+ some parts of 11, 16 and 19)	More About Amines – Reactions of Heterocyclic Compounds	20	
		20.3		Amines react as bases and as nucleophiles
		11.9		Amines do not undergo substitution or elimination reactions
		11.10		Quaternary ammonium hydroxides undergo elimination reactions
		20.4		The synthesis of amines + appendix
		16.18		The hydrolysis of an imide: A way to synthesize primary amines
		19.21		The synthesis of substituted benzenes using arenediazonium salts
		19.22		The arenediazonium ion as an electrophile
		19.23		The mechanism for the reaction of amines with nitrous acid
		20.5		Aromatic five-membered-ring heterocycles
		20.6		Aromatic six-membered-ring heterocycles
		20.7		Some amine heterocycles have important roles in Nature
Carbo-hydrates	21	The organic chemistry of Carbohydrates	24	
		21.1		Classification of carbohydrates
		21.2		The D and L notation
		21.3		The configuration of aldoses
		21.4		The configuration of ketoses
		21.5		The reactions of monosaccharides in basic solutions
		21.6		The oxidation-reduction reactions of monosaccharides
		21.7		Lengthening the chain: The Kilani-Fischer synthesis
		21.8		Shortening the chain: The Wohl degradation
		21.9		The stereochemistry of glucose: The Fisher proof
		21.10		Monosaccharides from cyclic hemiacetals
		21.11		Glucose is the most stable aldohexose
		21.12		Formation of glycosides
		21.13		The anomeric effect
		21.14		Reducing and nonreducing sugars
		21.15		Disaccharides
21.16	Polysaccharides			
Amino acids, peptides etc	22	The organic chemistry of amino acids, peptides and proteins	15	
		22.1		The nomenclature of amino acids
		22.2		The configuration of amino acids
		22.3		The acid-base properties of amino acids
		22.4		The isoelectric point

		22.5	Separation of amino acids (only the ninhydrin reaction)	
		22.6	The synthesis of Amino acids	
		22.7	The resolution of racemic mixtures of amino acids	
		22.8	Peptide bonds and disulfide bonds	
		22.10	The strategy of peptide bond synthesis: N-protection and C-activation	
		22.11	Automated peptide synthesis	
		22.13	How to determine the primary structure of a polypeptide or a protein	
Lipids, terpenoids etc	16	Reactions of Carboxylic Acids and Carboxylic Acid Derivatives		6
		16.4	Fatty acids are long-chain carboxylic acids	
		16.13	Fats and oils are triglycerides	
	25	The organic chemistry of metabolic pathways - Terpene biosynthesis		4
		25.16	Terpenes contain carbon atoms in multiples of five	
		25.17	How terpenes are synthesized	
25.18		How Nature synthesizes cholesterol		
Nucleic acids	26	The chemistry of the nucleic acids		8
		26.1	Nucleosides and nucleotides	
		26.3	Nucleic acids are composed of nucleotide subunits	
		26.13	The polymerase chain reaction	
Pericyclic reactions	8	Delocalized Electrons and Their Effect on Stability, pKa, and the Products of a Reaction		6
		8.19	The Diels-Alder reaction is a 1,4-addition reaction	
		8.20	Retrosynthetic analysis of the Diels-Alder reaction	
	28	Pericyclic reaction (the whole chapt.)		27
Total No. of pages*				191

* The number of pages does not include exercises, Highlights "A deeper look", "etc.

Required reading from "McMurry"

Topic	Chapt.	Title	Ca. No. of pages	
Dienes	14	Conjugated compounds and UV spectroscopy	16	
		14.1		Stability of conjugated dienes: MO theory
		14.2		Electrophilic addition to conjugated dieles: Allylic carbocations
		14.3		Kinetic vs thermodynamic control of reactions
Organo-metallics	10	Organohalides	3	
		10.7		Organometallic coupling reaction
Radical reactions	6	An overview of organic reactions	3	
		6.3		Radical reactions
	8	Alkenes: Reactions and synthesis	4	
		8.10		Radical additions to alkenes
	10	Organohalides	2	
		10.2		Radical halogenation
Reactions of Aldehydes and Ketones	17 & 19	Alcohols and Phenols / Aldehydes and Ketones: Nucleophilic addition reactions	8	
		19.6		Nucleophilic addition of HCN: Cyanohydrin formation
		19.8		Nucleophilic addition of amines: Imine and enamine
		17.18		Protection of alcohols
Carbonyl α-substitutions	22	Carbonyl alpha-substitution reactions (the whole chapt.)	20	
	23	Carbonyl condensation reactions (the whole chapt. except 23.13)	24	
Aromatic compounds	16	Chemistry of benzene: Electrophilic aromatic substitution	4	
		16.7		Nucleophilic aromatic substitution
		16.8		Benzyne
Amines & Heterocycles	24	Amines and heterocycles	10	
		24.6		Synthesis of amines
		24.7		Reactions of amines
		24.8		Reactions of arylamines
		24.9		Heterocyclic amines
Carbo-hydrates	25	Biomolecules: Carbohydrates	29	
		25.1		Classification of carbohydrates
		25.2		Depicting carbohydrate stereochemistry: Fisher projections
		25.3		D,L Sugars
		25.4		Configaration of aldoses
		25.5		Cyclic structures of monosaccharides: Anomers
		25.6		Reactions of monosaccharides
		25.8		Disaccharides
25.9	Polysaccharides and theirs synthesis			

Amino acids, peptides etc	26 and 24	Biomolecules: Amino acids, peptides and proteins (the whole chapt. 26 except 26.9-26.11)		23
		24.5	Biological amines and the Henderson-Hasselbach Eq.	
Lipids, terpenoids etc	27	Biomolecules: Lipids		22
		27.1	Waxes, fats and oil	
		27.2	Soap	
		27.5	Terpenoids	
		27.6	Steroids (not steroid hormones)	
		27.7	Biosynthesis of steroids	
Nucleic acids	28	Biomolecules: Nucleic acids		9
		28.1	Nucleotides and Nucleic acids	
		28.2	Base pairing in DNA: The Watson-Crick Model	
		28.7	DNA synthesis	
Pericyclic reactions	8	Alkenes: Reactions and Synthesis		3
		8.9	Addition of carbenes to alkenes: Cyclopropane synthesis	
	14	Conjugated compounds and UV spectroscopy		5
		14.4	The Diels Alder cycloaddition reaction	
		14.5	Characteristics of the Diels Alder reaction	
	18	Ethers and epoxides; thiols and sulfides		2
		18.4	Reactions of ethers: Claisen rearrangement	
	30	Orbitals and organic chemistry: Pericyclic reactions (the whole chapt.)		18
Total No. of pages*				203

* The number of pages does not include exercises, Highlights "A deeper look", "etc.