208B Assigned Homework Problems

Chapter 15: Major concepts: Allylic position, dienes, resonance, kinetic and thermodynamic control of reactions.

Omit sections 15-3 and 15-8 (Molecular orbitals), 15-12, and 15-13 (pericyclic reactions and UV-VIS spectroscopy). Skip section 15-11 (Diels-Alder reaction): we will cover this reaction later in the semester.

1, 2, 4-12, 24, 25a-g, 27, 29, 31, 37a (try to see how the book's answer is not a good synthetic approach)

Also read section 25-8 (Terpenes, 1177-1180), and do problems 11, 12, 13, 15d (circle the isoprenes), and 27 in chapter 25.

Read section 26-5 (Synthetic rubbers, 1193-1195 (what is wrong about the red arrows on page 1193?), and do problem 11.

Chapter 16: Major concepts: Aromaticity, benzene.

Omit sections 16-3, 16-4, and 16-7 (molecular orbitals). Omit pages 721-2 (UV-VIS of benzene)

2, 7, 8, 12-16, 18bcd, 20, 21, 25be, 26abf, 28, 29, 31-34, 36 (formula for b is C_8H_9Br, IR is 3030, 2935, 1605 cm^{-1}), 39, 40, 43 ($C_{10}H_{14}O$ – only ortho coupling is shown in NMR, ignore Mass Spec info)

Chapter 17: Major concepts: electrophilic aromatic substitution, nucleophilic aromatic substitution, oxidation/reduction of phenols.

Omit section 17-13C (Birch reduction, pages 766-767)
Read sections 10-3D and 10-6C, and do problems 9, 10, and 42abf in chapter 10.

3-9, 10ac, 11-25, 29, 30, 33, 35, 37, 38acdef, 40, 42-47, 48 (C_9H_8O – only ortho coupling is shown), 49, 50, 52, 54-59, 63

Chapter 18: Major concepts: Nomenclature of ketones and aldehydes, acetal formation, imine formation, hydrates, dithiane, oxidation/reduction.

Skip sections 18-9 and 18-11 (synthesis of ketones from acids and acid chlorides)

Omit sections 18-5E and 18-5D (mass spec and UV-VIS)

1, 2a, 6, 7, 10abd, 12, 14, 15, 16, 17, 18, 19, 20ab, 21, 23-33, 34 (only 2nd mechanism, book's answer to the 1st mechanism is incorrect), 35, 37, 38, 39, 41, 42, 45 ($\mathbf{C_4H_6O}$), 47, 48, 49bcdefgh, 50, 52, 53, 54abcdefghikl, 55, 56, 58, 59, 60abcdf, 61abcde, 62, 63, 64 (except compound I), 65 ($\mathbf{C_6H_8O}$), 66, 67, 68, 69, 70, 71 (A = $\mathbf{C_6H_{12}O_2}$ B = $\mathbf{C_4H_8O}$), 72, 73ac

additional spectral information for some problems

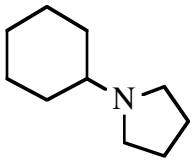
2a (IR: 3050, 2950, 2820, 2720 cm^{-1}; NMR: 9.7 ppm is doublet, J = 3 Hz, 3.6 ppm is doublet of quartets, J = 3, 7 Hz)

72 ($\mathbf{C_4H_6O}$, NMR: 6.9 ppm is a doublet of quartets, J = 6, 16 Hz, 6.2 ppm is a doublet of doublets, J = 4, 16 Hz – structure in the book has a small error)

<u>Chapter 19:</u> Major concepts: Nomenclature and basicity of amines, Hoffmann elimination, aromatic reactions, Sandmeyer reaction, synthesis by Gabriel reaction and reductive amination.

Omit section 19-9D (mass spec) and section 19-25 (Hofmann Rearrangement)
Skip sections 19-13, 19-14, 19-20 (reactions with acid chlorides) – covered later in semester

1, 2abcef, 3, 4abde, 5-8, 11-18, 22-25, 27, 28, 30-34, 39abcfh, 40, 41aef, 42, 44acdefghiklmnop, 45, 47cdef, 48b, 49, 50be, 51abde, 52ab, 53abcd, 54, 56 ($\mathbf{C_6H_{15}N}$), 57 ($\mathbf{C_4H_{11}N}$), 58, 59 ($\mathbf{C_5H_{13}N}$). The structure of the product in 50e is



<u>Chapter 22, part 1:</u> Major concepts: keto/enol tautomers, enolates, α-halogenation and alkylation, aldol reaction

For now, read only 22-1‡22-3 (1008-1017) and 22-5‡22-11 (1018-1031)

Do problems: 1-11, 13-33, 61, 62 (also show mechanism), 65ace, 66cde, 67acde, 70a, 71a, 72abc, 73b, 74ab, 77, 78.

<u>Chapter 20:</u> Major concepts: Nomenclature and acidity of carboxylic acids, hydrolysis reactions and mechanisms, Fischer esterification.

Omit section 20-7C and 20-7D (UV-VIS and mass spec) and section 19-25 (Hofmann Rearrangement)

Also read sections 18-9, and 18-20C. Do problems 8, 10c, 20c, 49a, 60e in chapter 18.

Problems from chapter 20:

1abcdegj, 2, 3, 5, 6, 7, 10, 11, 13, 14, 15, 17, 18, 19, 20, 21, 22, 24, 26acdehi, 27-36, 37 (**$C_8H_9O_3$**), 38, 39, 40ab, 41, 43

Spectral information for problem 43:

IR of A: 3400-3000, 3030, 2945, 1710 cm^{-1}, IR of B and C : 3400-2950, 3050, 2935, 1690 cm^{-1})

NMR of B: the peaks at 5.7 and 6.2 ppm are doublets, J = 1 Hz. NMR of C: 5.7 ppm is doublet, J = 15 Hz. 7.0 ppm is a doublet of triplets, J = 7, 15 Hz

<u>Chapter 21:</u> Major concepts: Nomenclature and acidity of carboxylic acid derivatives, relative stability and reactivity, interconversion of the derivatives, oxidation/reduction chemistry

No nomenclature of lactones or lactams.

1abcdefghijlnop, 2, 4-15, 16ab, 17-41, 44abcdefghij, 45-49, 50(omit k), 51, 52, 53, 54 (omit i), 55, 57, 59, 60ab, 61, 63, 64, 65 (**$C_4H_6O_3$**), 66 (**$C_5H_7NO_2$**), 68 (**$C_6H_{10}O_2$**)

Also read section 10-9D, and do problems 16, 17, 18, 38eg, 39f, 40f, in chapter 10. Also read section 18-11, and do problems 11, 61f in chapter 18.

<u>Chapter 22, part 2:</u> Major concepts: enolates of carboxylic acid derivatives, 1,4 (michael attack), claisen condensation, α-decarboxylation, Malonic ester synthesis.

Read 22-4 (1017-1018) and 22-12‡22-18 (1031-1048).

Do problems: 12, 34- 54, 59, 60, 63, 64, 65bdf, 66abfg, 67b, 68, 69, 70bc, 71b, 73a, 74c, 76, 79.

If there is time, we will also read section 22-19 (Robinson Annulation, 1048-1051). The problems for this topic are: 55, 56, 57, 65c, 71cd, 72d, 73c, 75, 79d.

<u>Diels-Alder Reaction</u>: Chapter 15, section 15-11

All problems are from chapter 15.

14, 15, 16, 18, 25hi, 30, 33, 34.

Also problems 16-4, 17-26, 17-39, 17-60, 17-64

<u>Chapter 23:</u> Major concepts: Classification of carbohydrates, di- and poly-saccharides, chain extension and degradation, Fischer structure proof

The only structures I will expect you to memorize are: glucose, fructose, and glyceraldehyde. There will be no nomenclature of the complex saccharides (although you will need to look them up to do some of the problems), but you should be able to classify the glycoside connections. I will not expect you to memorize any of the DNA/RNA structures.

1, 2, 3, 4, 5, 7, 9 (chair only), 10, 11b, 12, 13abc, 14-19, 20-21 (no names), 22, 23, 25, 26, 27, 29-35, 37-40, 42-46, 48-51, 53ab, 54-57, 62, 63, 64abcd, 65cde, 66, 67, 68, 69

<u>Chapter 24:</u> Major concepts: Isoelectric point calculations, amino acid separation, synthesis of amino acids, synthesis of proteins.

I will not expect you to memorize the amino acid structures, but you will have to look them up to do the problems.

2-9, 10bcd, 11, 12, 13, 15, 16, 17, 21, 22, 24-30, 33bcdefgh, 34, 35, 36, 37, 38, 42, 43, 44, 47.

<u>Chapter 26:</u> Major concepts: Anionic and condensation polymers.

Read sections 26-2C (anionic polymers, pg. 1190-1191) and section 26-7 (condensation polymers, pg. 1195-1199)

<u>Problems</u>: 7, 8, 9, 13-20.