

## **208B Assigned Homework Problems – 7<sup>th</sup> Edition**

### **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 (In the first reaction in this problem, A is produced as the major product. However, there is another minor product from this first reaction. Try to determine the structure of this minor product, and explain why A is the major product.)

Also read section 25-8 (Terpenes, 1214-1217), and do problems 11, 12, 13, 15d (circle the isoprenes), and 27 in chapter 25.

Read section 26-5 (Synthetic rubbers, 1230-1232), and do problems 11 and 27 in chapter 26.

### **Chapter 16: Major concepts: Aromaticity, benzene.**

Omit sections 16-3, 16-4, and 16-7 (molecular orbitals). Omit the sections from the middle of page 738–739 (MS and UV-VIS of benzene)

2, 7, 8, 12-19, 21, 22, 24, 27be, 28abf, 30, 32-34, 35 [only part (1)], 36, 37, 38 (formula for b is  $C_8H_9Br$ , IR is 3030, 2935,  $1605\text{ cm}^{-1}$ ), 41, 42, 43a, 45 ( $C_{10}H_{14}O$  – only ortho coupling is shown in NMR, peak at 3.4ppm is a septet, ignore Mass Spec info), 48-50

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

Read sections 10-3D and 10-6C, and do problems 9, 10, and 42abc in chapter 10.

2, 4-9, 11ac, 12-26, 29, 30, 31ab, 34-36, 38, 40, 42, 44-49, 50 ( $C_9H_8O$  – only ortho coupling is shown), 51-54, 56-61, 65, 69

### **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 18-5D and 18-5E (mass spec and UV-VIS)

1, 2a, 6, 7, 10ab, 12, 15-20, 21a, 22, 24-35, 36 (only 2<sup>nd</sup> mechanism, book's answer to the 1<sup>st</sup> mechanism is incorrect), 37, 39, 40, 41, 43, 44, 46, 47 (C<sub>4</sub>H<sub>6</sub>O), 48, 49, 50, 51bcdefgh, 52, 54, 55, 56a-k, 57, 58-61, 62abcdfg, 63abcde, 64, 65, 66 (except compound I), 67 (C<sub>6</sub>H<sub>8</sub>O), 68-72, 73 (A = C<sub>6</sub>H<sub>12</sub>O<sub>2</sub> B = C<sub>4</sub>H<sub>8</sub>O), 74.

additional spectral information for some problems

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

74: (C<sub>4</sub>H<sub>6</sub>O, 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)

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

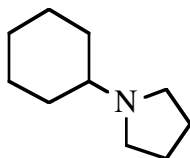
For now, read only 22-1 through 22-5 (1043-1056) and 22-7 through 22-11 (1057-1067)

Do problems: 1-8, 9ab, 10-16, 18, 19ab, 20-33, 63, 64, 66 (just the part that relates to problem 64), 67ace, 68abc, 69acde, 72a, 73a, 74ac, 75b, 76ab, 79, 80.

### **Chapter 19: 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 the Hofmann Rearrangement (section 19-21D, page 919-921). Skip sections 19-13, 19-14, 19-19B, 19-20 (reactions with acid chlorides) – covered later in semester

1, 2abcef, 3, 4abde, 5-7, 11-16, 20-26, 28-31, 36abcfh, 37, 38aef, 39, 41abcdefghijklmnop, 42, 44cdef, 45b, 46, 47bd, 48abde, 49ab, 50, 51, 52, 53 (C<sub>6</sub>H<sub>15</sub>N), 54, 55, 56 (C<sub>4</sub>H<sub>11</sub>N), 57, 58 (C<sub>5</sub>H<sub>13</sub>N), 60, 62. The structure of the product in 47d is



**Chapter 20: Major concepts: Nomenclature and acidity of carboxylic acids, hydrolysis reactions and mechanisms, Fischer esterification.**

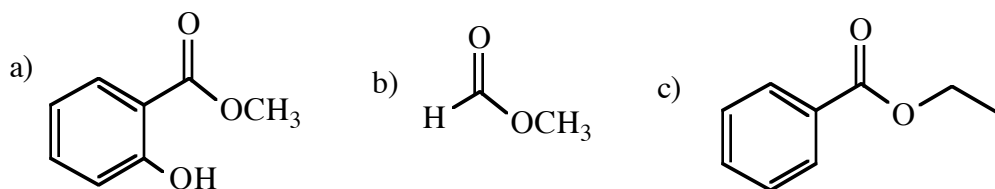
Omit section 20-7C and 20-7D (UV-VIS and mass spec)

Also read section 18-9 and do problems 8, 10c, 21bc, 51a, 62e in chapter 18.  
Also read 22-6 (1057) and do problems 17ab and 69b in chapter 22.

Problems from chapter 20:

1abcdegjkl, 2, 3, 5, 7, 8, 11, 12, 14, 15, 16ab, 17-24, 26 (IUPAC only), 27, 28acdehi, 29-33, 35-39, 40, 41, 42, 43, 44, 45, 46a, 47, 48, 50 ( $C_8H_8O_3$ ).

**Structures of the target molecules for problem 15:**



**Spectral information for problem 40:**

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

**Chapter 21: 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.

1abcdefghijklmnop, 2-15, 16ab, 17-37, 38c, 39-41, 44abcdefghijklmnop, 45-49, 50(omit k), 51, 52, 53 (hint, use  $SO_5H$ ), 54 (omit h), 55, 57, 61, 62 ( $C_4H_6O_3$ ), 63, 64 ( $C_5H_7NO_2$ ), 65 ( $C_6H_{10}O_2$  – some long range coupling [across the double bond – similar to meta coupling in benzene] is shown in the peaks at 1.9 and 5.95 ppm)

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

Also read section 18-11, and do problems 11, 63f in chapter 18.

Also read sections 19-13, 19-14, and 19-20, and do problems 17, 18, 19, 27, 41ij, 44ab, 45a, and 47ae in chapter 19.

**Chapter 22, part 2: Major concepts: enolates of carboxylic acid derivatives, 1,4 (Michael attack), Claisen condensation,  $\alpha$ -decarboxylation, Malonic ester synthesis.**

Read sections 22-12 through 22-19 (1067-end of the chapter).

Do problems: 34-59, 61-66, 67bcdf, 68defg, 69f, 70, 71, 72b, 73bcd, 74bd, 75, 76cd, 77, 78, 81.

**Diels-Alder Reaction: Chapter 15, section 15-11**

All problems are from chapter 15.

14-16, 17b, 18, 25hi, 29, 30, 33, 34.

Also problems from some other chapters: 16-4, 16-39, 17-27, 17-41, 17-62, 17-66

**Chapter 23: Major concepts: Classification of carbohydrates, di- and polysaccharides, 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, 8, 10 (chair only), 11, 14abc, 15-20, 21-22 (no names), 23, 24, 26, 27, 28, 30-36, 38, 39, 40ab, 41c, 42-46, 48-51, 53ab, 54-57, 62, 63, 65, 67.

**Chapter 24: 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.

3-9, 11bcd, 12, 13, 14, 16, 17, 18, 23, 25-31, 34bcdefgh, 35-39, 43-45, 48.

**Chapter 26: Major concepts: Anionic and condensation polymers.**

Read sections 26-2C (anionic polymers, pg. 1228-1229) and section 26-7 (condensation polymers, pg. 1232-1236)

Problems: 7, 8, 9, 13-20.