

Organic Chemistry 2 (CHEM 212)

Spring 2012

Prof. W. P. Malachowski

Office: Park 270

Phone: Ext. 5016

e-mail: wmalacho@brynmawr.edu

web page: <http://www.brynmawr.edu/chemistry/malachowski>

course web page: <http://www.brynmawr.edu/chemistry/malachowski/OChem2/OChem2.html>

Educational Goals:

- develop fundamental critical thinking skills, including pattern recognition and analogous reasoning
- develop a knowledge base of synthetic organic chemistry reactions and apply them to higher order thinking practices
- develop an understanding of structure-reactivity principles in a variety of chemical structures, including complex biologically relevant molecules

Class Meetings:

Section 1 (Undergraduates Only): Mon., Wed., Fri. 10:10-11:00 AM; recitation: Fri. 2:10-3:00 PM

Section 2: Mon., Wed., Fri. 11:10-Noon; recitation: Fri. 9:10-10:00 AM

All class meetings will be held in Park 180. Class cancellations, i.e. for inclement weather, will be posted on the course website and/or communicated via e-mail.

Office Hours: Wed. 2:00-3:00 PM, Thurs. 4:00-5:00 PM, and by appointment

Lecture Textbook: Organic Chemistry, Fifth Edition, by G. M. Loudon

Class Schedule:

Date (Lecture No.)	Lecture Title	Corresponding Text Sections	Associated Questions
Jan. 18 (1)	Introduction and Dienes: Stability and UV/vis Spectroscopy	15.1, 15.2, 27.1	15.1, 3, 4, 46ad, 48; 27.2-27.5
Jan. 20 (2)	Resonance	15.6	15.27-30, 38, 55a, 65, 66, 73a, 74a
Jan. 20 (3)	<i>recitation:</i> Diels-Alder Reaction	15.3, 27.3 (p. 1349-1351)	15.11-20, 51-54, 58, 69b-f, 70-72, 73cd; 27.10, 27.11, 33c
Jan. 23 (4)	"Kinetic and Thermodynamic Control of Reactions"	15.4	15.21-24, 39, 55, 56
Jan. 25 (5)	Aromaticity	15.7	15.31-37, 42b-d, 43, 44, 45ac, 62-64, 67, 68
Jan. 27 (6)	Heteroaromatics	25.1, 25.2, 25.5 C	25.3, 6-8, 23
Jan. 27	Quiz #1 and recitation		
Jan. 30 (7)	Electrophilic Aromatic Substitution Reactions of Benzene	16.1, 16.4 A-C	16.12

Feb. 1 (8)	Friedel-Crafts Reactions	16.4 EF	16.15-20
Feb. 3 (9)	Electrophilic Aromatic Substitution Reactions of Substituted Benzenes	16.5, 25.3 A, 25.4 A	16.21-27, 28b, 29b,30, 32abd-f, 33, 40, 41abd, 42-45, 51, 52, 59abce-g, 60ab, 61-64; 25.9b, 11, 12
Feb. 3	<i>Quiz #2 and recitation</i>		
Feb. 6 (10)	Allylic and Benzylic Reactivity	17.1,2,3 (not Grignard reagents), 4	17.1-6, 8, 18b, 19b, 22, 23, 24ag, 25-28, 31, 32, 36, 37cdfgh, 38de, 43- 46
Feb. 8 (11)	Phenol Chemistry: Acidity and Oxidation	18.7-9	18.30, 33, 34, 35b, 36, 38*, 39*, 45bce-h, 47b-e, 50abf, 55-57, 60, 62, 63, 64a*b*f*g, 65gjk
Feb. 10 (12)	Nucleophilic Additions to Ketones and Aldehydes: H and C Nucleophiles	10.5-7, 10.8B, 11.5, 19.4-9	10.26, 27, 35c, 36b 11.26, 27 19.12, 14-23, 38b-dhij, 39abd, 45e, 49a-eik, 56, 57, 61, 65b
Feb. 10	<i>Quiz #3 and recitation</i>		
Feb. 13 (13)	Nucleophilic Additions to Ketones and Aldehydes: O Nucleophiles	19.10A	19.24-26, 38ae, 40ac, 42, 43, 44, 45b-d, 50, 60ae, 66
Feb. 15 (14)	Carbohydrates	24.1-4, 6, 8D, 11	24.1-5, 6abef, 7b, 8-10, 11a, 14b, 15, 16, 30a, 31, 35a, 36ab, 38a-e, 39a-fjk, 40bc, 42a-c, 44abf, 59, 60
Feb. 17	EXAM 1		
Feb. 20 (15)	Carbohydrates (continued)		
Feb. 22 (16)	Nucleosides	25.5A	25.20
Feb. 24 (17)	Introduction to Amines and Nucleophilic Additions with Ketones and Aldehydes	19.11	19.28-31, 38fg, 39e, 45a, 46b, 53, 60c
Feb. 24	<i>Quiz #4 and recitation</i>		
Feb. 27 (18)	open		
Feb. 29 (19)	Synthesis and Reactions of Carboxylic Acids	20.4, 6-8	20.7-12, 13cd, 14, 25ab, 29-32, 36, 37ab, 43, 46bdf, 49bcf, 51ab
Mar. 2 (20)	Reactions of Carboxylic Acids (cont.)	20.10-11 (ex. 2) 20.9 (ex. 3)	ex. 2: 20.20, 21a, 22ab, 23, 25cdg, 26ab, 38, 46a, 48ab ex. 3: 20.15, 16b, 17, 19, 25eh, 26d, 37de, 45ab, 48c
Mar. 2	<i>Quiz #5 and recitation</i>		

Mar. 3-11	<i>Spring Break</i>		
Mar. 12 (21)	Reactions of Carboxylic Acid Derivatives: Nucleophilic Acyl Substitution	21.2, 5-8	21.3, 4, 9b, 10-16, 17b, 18b-d, 31a-ch, 32a-cf-i, 34, 37, 38a, 39a, 42-45, 48, 50, 52a-ekl, 55abgj, 56ace, 60b
Mar. 14 (22)	Reactions of Carboxylic Acid Derivatives: Nucleophilic Acyl Substitution (cont.)		
Mar. 16 (23)	Reduction of Carboxylic Acid Derivatives and Reactions with Organometallic Reagents	21.9-11	21.19, 20bc, 21, 23ac, 24, 26, 27, 31d-f, 33cd, 36, 39b, 40bcf, 52f-hj, 55c-f, 57
Mar. 16	<i>Quiz #6 and recitation</i>		
Mar. 19 (24)	Enolates and Enols	22.1, 2	22.1-3, 5-11, 54, 55a, 56a, 57, 63-67, 68a, 69ab, 75i, 84df, 87, 88
Mar. 21 (25)	The Aldol Reaction	22.4	22.19-23, 70ab, 73ce, 75h, 80abe, 83b, 85a
Mar. 23	EXAM 2		
Mar. 26 (26)	The Aldol Reaction (cont.)		
Mar. 28 (27)	Crossed and Intramolecular Aldol Reactions	22.4	
Mar. 30 (28)	The Claisen Condensation	22.5, 6	22.24-32, 72, 80df, 84a
Mar. 30	<i>Quiz #7 and recitation</i>		
Apr. 2 (29)	Alkylation of Enolates	22.7	22.33, 34, 36, 37, 39, 40, 73ab, 74, 75cdg, 77, 78, 80c, 81ab, 85b
Apr. 4 (30)	Conjugate Addition Reactions	22.8A, B, 9, 10A	22.42abd, 43, 46, 50cdfgh, 51, 75ef, 81i, 82, 83a, 84egh
Apr. 6 (31)	Michael Addition	22.8C, 11	22.44, 49c, 76, 81ef, 89
Apr. 6	<i>Quiz #8 and recitation</i>		
Apr. 9 (32)	Conjugate Addition Reactions (cont.)		
Apr. 11 (33)	Amine Acid/Base Chemistry	23.5	23.7b-d, 8, 38a, 39d, 40abc, 43-46, 48bc, 53acd
Apr. 13 (34)	Synthesis of Amines	23.7	23.13-15, 18, 39dfg, 40dfil, 49acef, 50d, 51, 60bcfo, 70, 72b
Apr. 13	<i>Quiz #9 and recitation</i>		
Apr. 16 (35)	Amino Acids	26.1, 2	26.1-5

Apr. 18 (36)	Acid/Base Equilibria of Amino Acids	26.3AB	26.6-9, 37a-d, 38a-e, 49, 61a-c
Apr. 20	EXAM 3		
Apr. 23 (37)	Peptide Structure	26.8, 9	26.29-32
Apr. 25 (38)	Enzyme Reaction Mechanisms	26.10	26.33-36, 74a
Apr. 27 (39)	Enzyme Inhibition	26.10	
Apr. 27	<i>Quiz #10 and recitation</i>		
May 3	FINAL EXAM Thurs. May 3, 9:30-12:30 PM, PSB 180	<i>cumulative</i>	

Book Sections Omitted: 15.5; 16.6, 7; 17.6; 18.1-6, 10, 11; 19.1-3, 10B, 12, 15; 20.1-3, 5; 21.1, 3, 12; 22.3, 10B; 23.1-4, 6, 8-12; 24.5-7, 8A-C, 9, 10; 25.3BC, 4B-D, 6; 26.3C, 4-7; 27.2, 4-6

Associated Questions: Questions are listed for your practice they will not be collected or graded. I list them with an emphasis on including *all potentially relevant* questions. By working through the questions, you will be involved in "active learning", a proven method for success in academic studies. As we progress through the text, questions become more complex and will frequently draw upon multiple concepts to obtain the correct answer. Complex questions with multiple concepts have been placed in a lecture topic that I believe is the most important to obtaining the correct answer or understanding the essence of the problem. The answers to many assigned questions from your "Organic Chemistry" textbook can be found in the "Study Guide and Solutions Manual" that accompanies the textbook. The answers for other assigned questions can be found in the "Instructor Supplemental Solutions to Problems" which is available in electronic format on the course website. Questions designated with an asterick* are considered mostly review questions; that is the concepts required to answer the question were previously introduced at an earlier point in the course.

Quizzes: There will be 10 six point quizzes over the semester during Friday recitation. The quizzes will be held at the end of recitation after a worksheet and a brief question period. They will consist primarily of multiple choice and chemical reaction (fill-in-the-box) questions. The quizzes will last for approximately 10 minutes. Your two lowest quiz scores for the semester will be dropped in calculating your final grade. If you are absent from the quiz, you must make up the quiz on the following Monday. Alternatively, if you are absent for a legitimate reason (illness or family emergency), then the quiz can be dropped from your final grade calculation. Students who miss a quiz without a reasonable cause will receive a zero for the quiz.

Recitation: The recitation time before the quiz will be used to collaboratively work with more challenging organic chemistry problems. These exercises will illustrate a new application of a fundamental concept or a problem that requires the use of multiple concepts to address a single question. Time will also be allotted for student questions.

Exams:

There will be three fifty-minute exams on the dates shown on the lecture schedule. All three exams will count towards your final grade. However, if you achieve a higher grade on your final exam than on one of your semester exams, the final exam percent score will be substituted for your lower semester exam. An exam missed for a legitimate reason (illness or family emergency) can be rescheduled for another time shortly after the original exam date. If the absence is prolonged, then the exam can be dropped from your final grade calculation provided documentation of the reason for the absence is provided. Students who miss exams

without a reasonable cause will receive a zero for the exam.

-Molecular modeling kits may be used during an exam to assist you in answering the questions.

-Exam answers will be posted on the course web page.

-No electronic devices are allowed in exam room.

Final Exam: There will be a three-hour scheduled final exam during the exam period. The exam will be taken without lecture notes, textbook or any other associated course materials.

Laboratory: Prof. Nerz-Stormes (Park 170) is in charge of the laboratory portion of the course.

Course Grading:

Lecture Assignments

Quizzes	6 pts. each (x 8)	48 pts.
Semester Exams	100 pts. each (x 3)	300 pts.
Final Exam	150 pts.	150 pts.
	Total Points:	498 pts.

The Course Grade will be determined by the following formula:

$(\text{Lecture Grade as a Percent of Total Points}) \times 0.70 + (\text{Lab Grade as a Percent of Total Points}) \times 0.30 =$
Course Percent

Approximate Grading Scheme:

93-100%	4.0 (A)	70-73%	2.0 (C)
89-92%	3.7 (A-)	66-69%	1.7 (C-)
85-88%	3.3 (B+)	62-67%	1.3 (D+)
81-84%	3.0 (B)	58-61%	1.0 (D)
77-80%	2.7 (B-)	<57%	0.0 (F)
73-76%	2.3 (C+)		

I reserve the right to make modifications to this scheme when I consider it necessary.

The grading scheme will be established based on the course averages of the undergraduate students only. After the grading scheme has been developed, all students will receive grades based on the undergraduate-only grade scheme.

Students with Disabilities: Students who think they may need accommodations in this course because of the impact of a disability are encouraged to meet with me privately early in the semester. Students should also contact Stephanie Bell, Coordinator of Access Services, at 610-526-7351 or sbell@brynmawr.edu, as soon as possible to verify their eligibility for reasonable accommodations. Early contact will help to avoid unnecessary inconvenience and delays.