ORGANIC CHEMISTRY 2 — LECTURE SYLLABUS

Dr. Steven Merwin Kennedy
318 Caputo Hall
717-871-7418
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Office hours: please see D2L for my weekly schedule. Meetings outside of my weekly office hours are available; they should be arranged via email or remind.

Lecture (CRN 7778): MWF 10:00 – 10:50 am, 149 Roddy Hall
Laboratory 01B (CRN 9326): Monday 1:00 pm – 3:50 pm, 331 Caputo Hall
Laboratory 01A (CRN 7779): Tuesday 9:00 am – 11:50 am, 331 Caputo Hall

COURSE DESCRIPTION

This course is designed to strengthen your use of a sophisticated graphic, textual, and verbal *scientific language*; organic chemistry—an active field of study, research, and scholarship—provides molecular level foundational knowledge and skills for deeper comprehension and better problem-solving in biochemistry, green chemistry, environmental chemistry, molecular biology, genetics, pharmaceuticals, medicine, biotechnology, toxicology, and numerous related fields. Organic chemicals are everywhere and make up over 95% of the more than 193 million (and counting) known chemical substances (http://bit.ly/2WZ8mKt).

Chemistry 232 is a non-mathematical, yet extremely logical, *problem-solving course*. It focuses on verbal, written and symbolic representation of molecular structure, functional groups, nomenclature, physical properties, reactivity, mechanisms, and synthesis of organic compounds. The examples presented contain underling principles and concepts that are applied repeatedly—both explicitly and implicitly—throughout this course, in future organic chemistry courses, and in biochemistry, molecular biology, and many other areas of science and applied science courses. Most of the examples have real-world application; yet the primary focus is learning to problem-solve via the application of chemistry fundamentals.

LECTURE COURSE LEARNING OBJECTIVES

Upon your successful completion of Chemistry 232, you should be able to…

1. Recognize, name, and represent (draw) organic compounds and organic functional groups.
2. Explain & estimate the attractive forces within and between molecules.
3. Explain & analyze structural and stereochemical conformations, configurations, and isomers.
4. Compare the stability of organic molecules based on energy considerations.
5. Describe relationships between molecular structure, chemical reactivity, and physical properties.
6. Apply acid and base chemistry concepts and the pKa values of common acids and functional groups to analyze and explain reactions.
7. Understand and explain how and why organic functional groups react the way they do.
8. Propose and explain the mechanisms of reaction electron flow via curved-arrow notation.
9. Apply Frontier-Molecular Orbital (FMO) notation to reaction mechanism analysis and description.
10. Predict products, starting materials, or reagents based on functional groups as sites of reactivity.
11. Design multi-step synthesis of organic products by using the organic reactions that you learn.

REQUIRED LECTURE MATERIALS

1. Daily online access to Remind, EDpuzzle, D2L course site, and your Millersville email account.

2. Klein's Organic Chemistry 4rd Edition (1) textbook & (2) study guide & solutions. Please see Millersville University textbook store site for details: https://bit.ly/3s5Xmh0

LECTURE SCHEDULE

Chapter in 4th Edition Klein	Chapter Topic	Exam Schedule
Chapter 10	**Radicals & Review**	
Chapter 11	**Review & Synthesis**	
Chapter 12	**Alcohols & Phenols**	**EXAM 1 – Wed. 9-Feb**
Chapter 13	**Ethers, Epoxides, & Sulfur**	
Chapter 16	**Conjugation & Pericyclic Reactions**	
Chapter 17 & 18	**Aromatics & Reactions**	**EXAM 2 – Wed. 2-Mar**
Chapter 19	**Aldehydes, Ketones, etc.**	
Chapter 20	**Carboxylic Acid Derivatives**	**EXAM 3 – Wed. 30-Mar**
Chapter 21	**Enols & Enolates**	
Chapter 22	**Amines, Phosphines & Review**	**EXAM 4 – Wed. 27-Apr**
	ACS FINAL EXAM — 8:00 AM – 10:00 AM ON THURSDAY, 5-MAY	

COURSE EVALUATION SCHEME:

Chapter introduction video quizzes (50 points)	5 %
Reading & notes—question, recall, & practice (50 points)	5 %
Required chapter practice problems (100 points)	10 %
Exam 1 (100 points)	10 %
Exam 2 (100 points)	10 %
Exam 3 (100 points)	10 %
Exam 4 (100 points)	10 %
ACS Cumulative Final Exam (200 points)	20 %
Laboratory (200 points)	20 %
	∑ = 100 %

GRADE DISTRIBUTION (in percentage points)

A	100 – 92.0	**B**	87.9 – 82.0	**C**	77.9 – 70.0	**D**	61.9 – 60.0
A-	91.9 – 90.0	**B-**	81.9 – 80.0	**C-**	69.9 – 65.0	**D-**	59.9 – 57.0
B+	89.9 – 88.0	**C+**	79.9 – 78.0	**D+**	64.9 – 62.0	**F**	< 57.0

SEE D2L FOR MORE COURSE POLICIES & INFORMATION

Find more course policies & information on the D2L course site.

TITLE IX STATEMENT

Millersville University and its faculty are committed to assuring a safe and productive educational environment for all students. In order to meet this commitment, comply with Title IX of the Education Amendments of 1972, 20 U.S.C. §1681, et seq., and act in accordance with guidance from the Office for Civil Rights, the University requires faculty members to report to the University's Title IX Coordinator incidents of sexual violence shared by students. The only exceptions to the faculty member's reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project. Faculty members are obligated to report to the person designated in the University Protection of Minors policy incidents of sexual violence or any other abuse of a student who was, or is, a child (a person under 18 years of age) when the abuse allegedly occurred.

Organic Chemistry 2 — Laboratory Syllabus

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All weekly handouts will be provided in lab and posted on D2L.

At the completion of this laboratory course, you should be able to…

1. Keep a detailed, neat, and organized laboratory notebook.
2. Demonstrate proper laboratory safety when working in the lab.
3. Demonstrate proper methods to categorize and dispose of chemical waste.
4. Set up apparatuses for experimental techniques: reactions, distillations, filtrations, etc.
5. Purify organic products by recrystallization (solids) and distillation (liquids).
6. Characterize organic products by physical, chemical, and spectroscopic properties.
7. Solve unknown organic structures using IR, MS, & 1D NMR spectral data.

Laboratory schedule:

Week	Activity
1	Begin prior knowledge mechanism & reaction review
2	Pre-test, safety, check-in, & complete mechanism & reaction review
3	Gold (III)-catalyzed hydration of phenylacetylene into enol tautomers
4	Oxone oxidation of an aldehyde into a carboxylic acid
5	Diels-Alder reaction & conversion of an anhydride into a lactone
6	Suzuki-Miyaura cross-coupling reaction via palladium catalysis
7	MS, NMR, & IR spectroscopy problem set
8	SPRING BREAK
9	Nitration of methyl benzoate via electrophilic aromatic substitution
10	Acid cat. cyclic acetal formation from benzaldehyde and pentaerythritol
11	Imine Formation from an Aldehyde (Multi-Step Synthesis – Step 1)
12	Imine Reduction & Amide Formation (Multi-Step Synthesis – Steps 2 & 3)
13	Finish reactions & spectroscopy problem set
14	Start reaction review & check-out
15	Post-test & finish reaction review

Required materials:

3. **Laboratory Notebook:** any bound composition notebook will do; here is an example: https://amzn.to/2V0iOpr.

4. **Safety Goggles** or **Glasses -** Over-The-Glass (OTG) means over prescription glasses. *Examples of safety glasses and goggles or OTG safety glasses:* http://bit.ly/2DgoDEm & http://bit.ly/2EJjQZ1.

Learning accommodations:
Please see the Office of Learning Services in Lyle Hall (http://www.millersville.edu/learningservices/) as soon as possible if you have special learning needs for this class. If you have a condition that may impact your ability to perform laboratory exercises, to exit lab safely from the premises in an emergency, or which may cause an emergency during class, or lab, please discuss this in confidence with your instructor, as soon as possible; appropriate accommodations may then be provided.

University approved class attendance policy:
Students are expected to attend all classes [and laboratory meetings]. It is the student's responsibility to complete all course requirements even if a class is missed. If a student misses a class for an officially excused reason, then they are entitled to make up the missed work but only at the convenience of the faculty member. Responsibility for materials presented in, assignments made for, and tests/quizzes given in regularly scheduled classes lies solely with the student.

1. The University policy is that faculty will excuse absences for the following reasons:
    - **a.** personal illness
    - **b.** death or critical illness in the family
    - **c.** participation in a university-sponsored activity
    - **d.** jury duty
    - **e.** military duties
    - **f.** religious holidays

2. Faculty judge the validity of student absences from class within the University's approved guidelines and may require documentation for excused absences. Faculty will evaluate any reason, other than those listed above, for a student missing class and determine whether the absence is justified. In these circumstances, a student may make up missed work at the discretion of the instructor.

3. In the case of foreseeable absences, students are encouraged to notify the faculty member in advance. A student who will miss class due to participation in an official University activity must notify the instructor well in advance of the activity to assure that the absence is excused.

Chemistry 232 laboratory attendance statement & policy:
Make-up labs are not an easy option—due primarily to scheduling and space limitations. If you are planning to miss a lab due to an official Millersville University event, or due to a foreseeable life event absence, or if you miss a lab due to an emergency, please email steven.kennedy@millersville.edu, as soon as possible to begin discussing options; failure to begin discussing options within a timely manner will lead to this course policy: missing the first lab equals a zero for the lab activity, missing two labs equals a zero for the second lab activity, missing three or more labs equals failure of the entire course.

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