

**Chemistry 391: ADVANCED LABORATORY 1**  
**Spring 2024**

**Instructor:**

Dr. Kristen Baker

Office: Caputo Hall 317

Phone: 717-871-7419

Email: [Kristen.Baker@millersville.edu](mailto:Kristen.Baker@millersville.edu) (I generally respond to emails promptly and on the same day. However, I do check my email less frequently after 5 pm and on the weekends, so please take this into consideration when contacting me with any questions you may have!)

**Office Hours:**

*No appointment needed! Arrive with any questions you may have about the course material or come to listen to your classmate's questions!*

Monday 10:00 – 11:00 AM

Tuesday: 1:00 – 3:00 PM

Wednesday: 8:00 – 9:00 AM

Friday 8:00 – 9:00 AM

*If these times do not work for you, please use the calendly link below to schedule a 15-minute block of time to meet with me! You may schedule up to 30 minutes (2 blocks) a day. If you cannot find a time on calendly that works for you, please send me an email and we can work something out!*

Calendly link: <https://calendly.com/bakekr01/15-minute-meeting>

I highly encourage you to visit my office hours for any help you may need in this course! As mentioned earlier, I am also available to meet at additional times either one-on-one or in a small group, just use the calendly link to schedule! (<https://calendly.com/bakekr01/15-minute-meeting>)

**Chemistry Peer Learning Hours:**

*No appointment needed! Simply come to work on chemistry with your peers and get help from experienced tutors. Starts January 23<sup>rd</sup>*

Location: Caputo 211

Tuesday 5:30-7:30 PM

Wednesday 12-2 PM, 5:30-7:30 PM

Thursday 12-2 PM, 5:30-7:30 PM

**Required Class Meetings:**

1. Laboratory

391 (CRN 18836) M 12:30 – 3:20 PM

Location: 327 Caputo Hall

*If you are unable to attend a class meeting, please email me asap.*

**Chemistry Department Seminar:**

M 4:00 – 5:00 PM

Location: 149 Roddy Hall

*Please make it a priority to attend all of the seminars this semester!*

**Required Materials:**

- Bound composition notebook (any notebook will work fine!)
- One (1) set of Safety Goggles or Glasses

**Recommended Materials:**

- A modern organic chemistry textbook

Please see [Millersville University textbook store](#) for more details.

**D2L:**

All important course information will be found on D2L. It is your responsibility to keep up with this material, including any information posted in an announcement.

**Millersville Email:**

Announcements may also be sent via email. Please check your email at least once a day.

**Inclusive Excellence Statement:**

In this class, people of all different ethnicities, gender and gender identities, religions, ages, sexual orientations, disabilities, socioeconomic backgrounds, regions, and nationalities are encouraged to participate and share their perspectives and experiences that make each of us unique. Everyone will be expected to always treat each other with the utmost respect and consideration and without judgement. This classroom community will be a safe learning environment that encourages deep discussions based on everyone's individual perspective on the concepts learned. Any suggestions you may have on how to improve the effectiveness of the course are always encouraged and appreciated. Please do not hesitate to talk to me about any concerns you have about your success in this class.

**Course Description:**

Chemistry 391 (Advanced Laboratory 1) builds on some of the prior knowledge obtained during your Chemistry 231 and 232 lecture and in-person laboratory courses. Selected skills and techniques relevant to the modern organic and organometallic synthesis research laboratory will be introduced and developed during the semester; these include: searching the chemical literature, reaction planning, exploring reaction methods scope and limitations, reaction set-up, reaction monitoring by thin-layer-chromatography, chemical isolation, chemical purification, NMR spectroscopic analysis of reaction products and mixtures, employing mechanistic proposals utilizing electron-pushing formalism (EPF, a.k.a. curved-arrow notation) to describe elementary reaction steps, teamwork to compile meaningful data sets, and formal communication of experimental results via semi-formal report writing (utilizing an undergraduate research journal style). Please do not hesitate to reach out with any problems or concerns you may have throughout the semester!

**Course Learning Objectives:**

As your learning progresses, you should be able to confidently demonstrate your ability to...

1. Perform SciFinder chemical literature searches of a target organic molecule.
2. Plan reactions based on chemical literature experimental procedures.
3. Adapt experimental procedures to different substrates, reaction size (scale), and available supplies.
4. Set up chemical reactions safely and efficiently.

- Monitor reactions using thin-layer-chromatography (TLC) analytical techniques.
- Isolate, purify, and characterize reaction products using chemical, physical, and spectroscopic techniques.
- Obtain, formally analyze, and utilize NMR data to determine the composition of reaction mixtures.
- Work as a team to compile, share, analyze, and interpret raw experimental data.
- Begin to explore a reaction method's scope and limitations, as part of a team.
- Communicate experimental results via detailed laboratory reports using the *Journal of Undergraduate Chemical Research (JUCR)*; <https://bit.ly/3iWl8Wj> & <https://bit.ly/3BORbA9> style format with additional guidelines & criteria discussed during laboratory meetings.
- Propose plausible reaction mechanisms using curved-arrow notation electron-pushing formalism (EPF) to demonstrate and reinforce your understanding of plausible elementary reaction steps from CHEM 231 & 232.

### Course Organization:

This is a blended laboratory course in which new topics and assignments are first presented online via the D2L course website, or in laboratory, or via handouts. Required readings, preparation for laboratory, literature searches, data analysis, and laboratory report writing will all require some time spent outside of laboratory to successfully complete this advanced laboratory course. The scheduled class laboratory periods will be used primarily for wet chemistry and chemical analysis. This course is also organized around the following ideas related to synthesis...

- Green chemistry techniques and reaction modifications
- Small scale test reactions as a green research and reaction development technique
- Reactions that form C–C, C–N, and C–O bonds using modern synthetic methods including catalysis
- Reactions used in the pharmaceutical and materials industries
- Understanding mechanisms of organic and organometallic reactions
- Exploring the scope, limitations, and applications of reaction methods by using chemical literature precedent
- Creating small libraries of organic molecules utilizing known reactions

### Grades:

Final grades will be based on your notebooks and your laboratory reports.

Notebooks	20%
Typed Laboratory Reports	80%

Final grades will be based on the scale below. The minimum requirements for a particular grade may be lowered at my discretion.

A	>93%	B+	>87	C+	>77	D+	>67
A-	>90	B	>83	C	>73	D	>63
		B-	>80	C-	>70	D-	>60
						F	<59

## Laboratory Safety

You are expected to have read all assigned reading thoroughly, to have prepared a detailed notebook entry, and to have considered safety concerns prior to each laboratory experiment. Please be prepared to complete focused and efficient work during laboratory time. Being prepared for laboratory is the best way to stay safe. Most of the compounds that we (as chemists) work with have some level of toxicity; and many of the chemicals that we will work with in CHEM 391 should always be handled in the fume hood. General safety guidelines will be presented throughout this laboratory course and should be always followed. Specific safety precautions for each experiment will be covered before each lab. Additional laboratory guidelines including notebook guidelines and report instructions are covered in the weekly handouts.

## Chemistry 391 Laboratory Attendance Statement

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, 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.

## University Approved Class Attendance Policy:

- 1. Students are expected to attend all classes.** It is the student's responsibility to complete all course requirements even if a class is missed. If a student misses class for an officially excused reason, then he/she is 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.
- 2. 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
- 3. 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.
- 4. 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.

## Potentially Useful Resources:

- Evans' pK<sub>a</sub> Table: <http://goo.gl/f6D15q>
- Structural Database of Organic Compounds (SDBS), a database of compounds and their physical and spectroscopic properties: <http://goo.gl/5AoXa>
- Virtual Textbook of Organic Chemistry: <http://goo.gl/kgMGM>

**Important Dates:**

- January 23<sup>rd</sup>, 2024 – last day to DROP/ ADD classes online; last day to request PASS/FAIL or AUDIT
- March 29<sup>th</sup>, 2024 – last day to DROP classes (with a ‘W’ grade)

**Academic Conduct Code:**

Academic dishonesty will not be tolerated. Not only is cheating unethical and disrespectful to your faculty and fellow students, it is also self-destructive to your own academic integrity. All students are expected to maintain high standards of academic integrity; you are responsible for understanding and abiding by the Millersville University Academic Honesty Policy outlined below. *If you break this policy, you will be assigned a failing grade and may be prosecuted by the Academic Review Board.* While you may work together on some assignments, all work turned in must be your own work and answers must be written in your own words. Forms of academic dishonesty include (but are not limited to) the use of cheat sheets during exams, copying answers from other students, plagiarizing material, knowingly allowing others to represent your work as their own, and use of online databases that provide “expert” answers to posted questions such as Chegg, Slader, CourseHero, and Koofers. Additionally, I own the copyright to all course materials, which may not be duplicated in any form other than for your own learning. This includes uploading these materials to any online sites that will provide “expert” answers or giving/receiving old course materials from other students.

Millersville University’s Academic Honesty Policy: Students of the University are expected to be honest and forthright in their academic endeavors. Actions that violate the Academic Honesty Policy include:

- Plagiarism (using someone else’s words, ideas, or data)
- Fabrication (falsifying results in research or other findings)
- Cheating (the act or attempted act of deception by which an individual tries to misrepresent that he/she has mastered subject matter in an academic project or the attempt to gain advantage by the use of illegal or illegitimate means)
- Academic Misconduct: violation of university policies by tampering with grades or participating in the distribution of any part of a test before its administration.

For more information:

<https://www.millersville.edu/cae/teaching-and-learning/academic-integrity.php>

<https://www.millersville.edu/about/administration/policies/pdf/academics/academic-policy-academic-honesty-and-dishonesty.pdf>

<https://www.millersville.edu/studentconduct/files/studentcodeofconduct.pdf>

**Academic Support Services:**

Please see the Office of Learning Services in Lyle Hall as soon as possible if you have special learning needs for this class. If you have a condition that may affect 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 and someone at the Office of Student Support Services. Appropriate accommodations may then be provided.

<http://www.millersville.edu/learningservices/>

**Title IX Statement:**

Millersville and its faculty are committed to maintaining a safe education environment for all students. In order to be in compliance with Title IX of the Education Amendments of 1972 and 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 classroom discussion, in a writing assignment for a class, or as part of a University-approved research project. Faculty members are obligated to report sexual violence or any other abuse of a students who was, or is, a child (under 18 years of age) when the abuse allegedly occurred to the person. <https://www.millersville.edu/titleix/>

**Counseling Reminder:**

Students sometimes face mental health or drug/alcohol challenges in their academic careers that interfere with their academic performance goals. Millersville is a caring community and resources are available to assist students who are dealing with problems.

- Counseling Center (717-871-7821)
- Health Services (717-871-5250)
- Center for Health Education and Promotion (717-871-4141)
- Campus Ministries
- Learning Services (717-871-5554)

**Americans with Disabilities Act:**

Millersville University is committed to equality of opportunity and freedom from discrimination for all students, employees, applicants for admission or employment, and all participants in public University-sponsored activities. In keeping with this commitment, and in accordance with the Americans with Disabilities Act (ADA) the University will make every effort to provide equality of opportunity and freedom from discrimination for all members of the University community and visitors to the University, regardless of any disability an individual may have. Accordingly, the University has taken positive steps to make University facilities accessible to individuals with disabilities to participate in University programs. The University administration and management are obligated to report any allegation of discrimination to the appropriate office as defined in this policy.

***Questions?? Concerns?? Stop by my office hours!***

*Monday 10:00 – 11:00 AM*

*Tuesday: 1:00 – 3:00 PM*

*Wednesday: 8:00 – 9:00 AM*

*Friday 8:00 – 9:00 AM*

## Laboratory Schedule:

WEEK	DATE	ACTIVITY
1	January 15	No lab meeting
2	January 22	Check in, Syllabus, Safety, Introduce Acetal, & Scifinder
3	January 29	Run Acetal reaction, review JUCR guidelines
4	February 5	Isolate, TLC, & run NMR of acetal product
5	February 12	IR, MP, and NMR analysis of acetal product
6	February 19	Introduce Biginelli Rxn, Discuss <b>Acetal report</b> (200 points, due 3/1)
7	February 26	Run Biginelli, isolate crude pdt, TLC, run NMR
8	March 4	Spring Break
9	March 11	IR, MP, and NMR analysis of Biginelli
10	March 18	Introduce Suzuki, Discuss <b>Biginelli report</b> (200 points, due 4/1)
11	March 25	Run 2 Suzuki reactions monitoring by TLC, isolate crude
12	April 1	Purify crude, TLC, NMR
13	April 8	IR, MP, and NMR analysis of Suzuki products
14	April 15	Discuss <b>Suzuki report</b> (400 points, due 4/29)
15	April 22	Finish work, clean-up
16	April 29	<b>Notebooks</b> and <b>Suzuki report</b> due

**Disclaimer:** This syllabus and calendar may change over the course of the semester. All changes will be communicated in class and through a D2L announcement or email.