

**CHE 332-C: Organic Chemistry II**

**Summer 2025**

**Professor: Dr. THUY LE
Office Address: C-214 A
Email Address:** **let@tcnj.edu**

**Office Hours: Monday, Tuesday and Thursday 2:50-3:50 pm (after lab or make appointment)**

**In Person class Meetings: Monday, Tuesday, and Thursday 9:00 – 11:50 AM, C-121**

**Lab Meeting: Monday, Tuesday, and Thursday 12:00 – 2:50 PM, C-133**

**Course Description**

Organic Chemistry 332 is the second of a two-semester sequence at the sophomore-junior level for chemistry, biology, and pre-healing arts students. In this course, you will study the reactions of conjugated systems, aromatic compounds, alcohols and ethers, carbonyl compounds, carboxylic acids and their derivatives, the chemistry of amines, and special topics including polymers, organometallics and biological compounds in the context of organic chemistry.

*Prerequisite for CHE 332: C- or better in CHE 331 (Organic Chemistry I); failure to follow this rule is a breach of the academic integrity policy at TCNJ*

**Course Materials**

**Lecture:**

* Smith, 7th edition: Organic Chemistry e-book, ALEKS bundle
* Molecular Model Set (Required (any brand), HGS Alpha Organic Chemistry Basic Set 1003 strongly recommended)
* ACS Study Guide (recommended)
* CamScanner app (recommended) or any comparable app to scan and upload assignments in pdf format.

**Course Structure**

This course will be delivered in person. We will use a semi flipped-classroom format. The instructor will use class time to emphasize important concepts, introduce new materials and engage students through interactive class activities and group work. This fast-paced course will require a serious time commitment. Attendance and participation are expected to succeed in the course. If a student misses a class, it is the responsibility of the student to obtain lecture notes, supplemental materials, assignments and other important information.

**Technical Support**

If you need assistance with technical issues or need to report a problem during the course, you can visit:

* Canvas Help for technical difficulties with Canvas
* **ALEKS student support:**<https://mhedu.force.com/aleks/s/>

**Course Purpose and Learning Outcomes**

In general, upon the completion of this course, students are expected to:

* Possess a solid understanding of the nomenclature, properties, reactions, synthesis and structural determination methods of organic compounds
* Realize the importance and application of organic chemistry to other areas of chemistry and other scientific disciplines
* Further understand the mechanistic nature of organic chemistry by studying several classes of compounds.
* Develop a broader view of synthetic and retrosynthetic approaches in organic chemistry.

More specifically, by the end of the course, students should be able to:

* Use spectroscopy (IR, NMR, UV-Vis and mass spectrometry) for structure elucidation and to identify the presence / absence of functional groups.
* Identify conjugated systems and understand their reactivity (1,2- v. 1,4-addition).
* Rank a set of molecules according to properties such as acidity/basicity, and explain their choices using factors like induction, resonance, and conjugation.
* Determine whether a compound is aromatic, non-aromatic or anti-aromatic using the criteria of aromaticity.
* Utilize resonance structures to explain the directing effects of electron-withdrawing and -donating substituents in electrophilic aromatic substitution reactions.
* Understand the nature of phenols and aryl halides, and why they are able to undergo nucleophilic aromatic substitution reactions.
* Use organometallic reagents and reducing agents to prepare alcohols from carbonyl compounds.
* Convert aldehydes and ketones into a range of products using nucleophilic addition reactions.
* Identify acidic -hydrogens in carbonyl compounds and use p*K*a values to explain the formation of enolates in -dicarbonyl compounds.
* Use enolates as nucleophiles to add to a series of carbonyl compounds and other electrophiles.
* Identify carboxylic acids, their derivatives and their relative reactivity.
* Interconvert between carboxylic acid derivatives considering their comparative reactivities in nucleophilic addition-elimination reactions.
* Determine the relative basicity of a series of amines and identify their roles as bases or nucleophiles in their reactions.
* Apply the reactions of carbonyl, amine and carboxylic acid chemistry to the synthesis of biological molecules including carbohydrates, amino acids and proteins.
* Identify the types of synthetic polymers based on the repeating unit(s) and determine the precursor monomeric unit(s).
* Use the arrow-pushing formalism to show electron movement in a reaction mechanism.
* Predict the starting material, product, or reagents used in a given chemical reaction where two out of three of those variables are presented.
* Design a multistep synthesis from simple organic starting materials to make a specified target molecule by
	+ planning a retrosynthetic analysis scheme (working backwards, step-by-step from product to starting material).
	+ creating an actual synthetic scheme (providing all reaction conditions and intermediates formed going in the forward direction from starting material to final target compound).
* Predict relative reaction rates and the conditions necessary to yield the desired product as a major one.
* Determine the major products from chemical reactions.
* Identify chemical reagents necessary to perform a chemical transformation on a particular functional group.
* Plan a reasonable synthetic scheme to a target compound by correctly combining multiple reactions.

You will meet the outcomes listed above through a combination of the following activities in this course:

**Assignments:** Students will be assigned pre- and post-lecture assignments. The pre-lecture assignments will consist of videos and/or readings along with problems to be completed prior to coming to class. These are intended to prepare the students for successfully doing in-class activities. Post lecture assignments will be assigned and are to be submitted upon the completion of a chapter (due dates will be given by the instructor).

**In-class worksheets/problem sets**: Students will work in small groups during class time to complete a variety of problem sets. Student participation is expected. Worksheets will be submitted and/or graded as determined by the instructor.

**Tests and final exam:** Students will complete three tests during class time on the scheduled dates outlined in the tentative course schedule. The dates of the tests are not subject to change. *Any changes to the test materials will be announced in advance*. Students are responsible for topics covered in class and laboratory, as well as related textbook materials. Questions on each test will emphasize the material as outlined in the tentative schedule; however, due to the cumulative nature of this course, students will be responsible for all earlier material. The Final exam is cumulative and will be given on the last day of class

**Laboratory:** Thelaboratory grade is an integral part of the course. Students will participate in laboratory experiments, complete a number of workshops, maintain a notebook and write final reports. ***Two unexcused absences will result in failure of the lab and a grade of “F” in the course.*** Students who withdraw from the course may not continue in the lab and will not receive a lab grade. More details about lab format and expectations can be found in the lab syllabus.

**Grading**

3 tests 40%

Homework and in-class activities 20%

Final exam (cumulative) 20%

Laboratory 20%

Individual class tests and laboratory grades are not curved. At the end of the course, the overall course average for the class will be curved to 75%, unless the class average is equal to or greater than this value. Final letter grade assignment will be as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| A | ≥94 | A- | 93-90 |  |  |
| B+ | 89-87 | B | 86-84 | B- | 83-80 |
| C+ | 79-77 | C | 76-74 | C- | 73-70 |
| D+ | 69-65 | D | 64-60 | F | <60 |

**Inclusion and Diversity**

It is my goal to create a learning environment that includes and supports all members of the classroom, one that respects diversity in thought and perspectives and honors all identities (including race, gender, class, sexuality, religion, ability, etc.).  If you prefer a different name and/or set of pronouns than those that are represented in the TCNJ records, please make me aware of this.  If you are uncomfortable about things that are happening in class or about something that was said, please reach out to me so that we can address it.  As we all continue to learn about diverse perspectives and identities, please be sensitive to all members of the class by being respectful and accepting of others.

**Office Hours**

I will be offering office hours after lab and by appointment

**Tentative Course Schedule (M/T/Th)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Week** | **Monday** | **Tuesday** | **Thursday** |
| **1** | IntroductionOrganic I Problem ReviewCh 13-Radical Reaction | Ch 13-Radical ReactionCh 14 – Conjugation, Resonance, Dienes | Ch 14 – Conjugation, Resonance, DienesCh 15 – Benzene and Aromatic Compounds  |
| **2** | Ch 16 – Reaction of Aromatic Compounds | Ch 16 – Reaction of Aromatic Compounds Ch. 17 – Carbonyl Chemistry, Organometallics, Oxidation/Reduction | **Exam 1 (Ch. C–15)**Ch. 17 – Carbonyl Chemistry, Organometallics, Oxidation/Reduction |
| **3** | Ch. 18- Aldehydes and Ketones- Nucleophilic Addition | Ch. 19 – Carboxylic Acids and NitrilesCh. 20 –Nucleophilic Acyl Substitution | **Exam 2 (Ch. 16–18)**Ch. 20 –Nucleophilic Acyl Substitution |
| **4** | Ch. 21 – Reactions at the -Carbon of Carbonyls | Ch. 22 – Carbonyl Condensation Reactions | Ch. 23 – Amines |
| **5** | **Exam 3 (Ch 19-22)** | Final Exam Review | Final Exam (Cumulative) |

*Please note that provisions of this syllabus are subject to change. Any change will be announced in advance in the lecture, when possible. All students are responsible for any information given in class, whether they are present or not.*

**General course policies**

1. **Community Guidelines:**  Your instructor and fellow students wish to foster a safe learning environment. All opinions and experiences, no matter how different or controversial they may be perceived, must be respected in the tolerant spirit of academic discourse. You are encouraged to comment, question, or critique an idea but you are not to attack an individual. Working as a community of learners, we can build a polite and respectful course community. The following tips will enhance the learning experience for everyone in the course:
* Do not dominate any discussion.
* Give other students the opportunity to join in the discussion.
* Do not use offensive language. Present ideas appropriately.
* Be cautious in using Internet language. For example, do not capitalize all letters since this suggests shouting.
* Popular emoticons such as ☺ or / can be helpful to convey your tone but do not overdo or overuse them.
* Avoid using vernacular and/or slang language. This could possibly lead to misinterpretation.
* Never make fun of someone’s ability to read or write.
* Share tips with other students.
* Keep an “open-mind” and be willing to express even your minority opinion. Minority opinions have to be respected.
* Think and edit before you push the “Send” button.
* Do not hesitate to ask for feedback.
* Using humor is acceptable.

Adapted from: Mintu-Wimsatt, A., Kernek, C., & Lozada, H. R. (2010). Netiquette: Make it part of your syllabus. Journal of Online Learning and Teaching, 6(1). Retrieved from <http://jolt.merlot.org/vol6no1/mintu-wimsatt_0310.htm> ;Shea, V. (1994). Netiquette. Albion.com. Retrieved from: <http://www.albion.com/netiquette/book/>

1. **Participation:** Every student is expected to participate in each of his/her/their courses through regular attendance at lecture and laboratory sessions. It is further expected that every student will be present, on time, and prepared to participate when scheduled class sessions begin. While attendance itself is not used as a criterion for academic evaluations, grading is frequently based on participation in class discussion, laboratory work, or other activities, which may take place during class sessions. If these areas for evaluation make class attendance essential, the student may be penalized for failure to perform satisfactorily in the required activities. Students who must miss class will have the responsibility to obtain lecture notes, supplemental materials, assignments and other important information.

*For Absence Due to Religious Observance*

*Students are expected to notify their instructors of anticipated absence for religious observance in advance of the date on which any absence will occur. As with other substantiated reasons for absence, and in consideration of the needs of our diverse campus community, it is recommended that the instructor provide a fair and reasonable opportunity for work to be made up by the student, whenever possible.*

1. **Communication:** If you have trouble with any aspect of the course or feel like you are falling behind, please reach out to your instructor as early as possible so they can help you find a solution. You can book a time to meet with your instructor during office hours, as outlined above. You can email your instructor with questions. Expect a reply within 24 hours on weekdays (emails are seldom checked on the weekends). Expect hand-written work to be graded and returned within a week of the date taken.
2. **Test** scores will be posted on Canvas in a timely manner. If you have any doubts about the grading of a question or questions, please make an appointment during office hours to discuss it. Review of test questions and answers will not be done during class time, unless the instructor feels it necessary. The answer key to the tests will be made available on Canvas after the test.
3. **Make-Up Tests:Absolutely no tests will be given after they are administered to the class**. If a serious conflict arises, please arrange to take the test before the rest of the class. Advanced notice of a desired alternate arrangement is required and appreciated. Emergencies that prevent you from taking a test, such as sickness or a death in the family, should be reported to your instructor and the appropriate campus office (Department Chair, Dean of Students, respectively) and you must send documentation from that office upon your return to class. A medically excused absence will be granted for significant illness or injury that requires healthcare attention at the time of the illness or injury. In the event of an excused absence, your remaining tests will be weighted more heavily to account for the missed test.
4. **Integrity:** Academic dishonesty is any attempt by the student to gain academic advantage through dishonest means, to submit, as his/her/their own, work which has not been done by him/her/their or to give improper aid to another student in the completion of an assignment. Such dishonesty would include, but is not limited to: submitting as his/her/their own a project, paper, report, test, or speech copied from, partially copied, or paraphrased from the work of another (whether the source is printed, under copyright, or in manuscript form). Credit must be given for words quoted or paraphrased. The rules apply to any academic dishonesty, whether the work is graded or ungraded, group or individual, written or oral.

 In addition, you will be asked to sign an Academic Integrity Pledge before taking each exam. The actual pledge is an abbreviated form of the College policy which reads as follows:

 *I pledge to maintain the integrity of this quiz/exam. I pledge to abide by the quiz/exam instructions and to withhold communication through any means with anyone about the content of the quiz/exam or proposed solutions to the questions until the entire class and I have completed it. I understand that there may be students who have formal accommodations to receive extended time on the quiz/exam. I will not communicate anything about this quiz/exam until after I have received my quiz/exam grade. The work that I submit is my own. Final exams are the property of the College. I understand that breaking this pledge constitutes a violation of the TCNJ Academic Integrity Policy that will be reported to the College’s Academic Integrity Administrator and result in the application of the Academic Integrity Procedural Standards; this can result in a grade of 0 on the exam, receiving a failing grade for the course, and in severe instances expulsion from the College. Additionally, I agree that ​I will not post or share the content of the exam at any time​.*

1. **Accessibility:** Students who experience barriers in this course are encouraged to contact the instructor as early in the semester as possible. The Accessibility Resource Center (ARC) is available to facilitate the removal of barriers and to ensure reasonable accommodations.  For more information about ARC, please visit: <https://arc.tcnj.edu/>.

**Selected TCNJ Policies**

[TCNJ’s final examination policy](https://recreg.tcnj.edu/269-2/)

[TCNJ’s attendance policy](https://policies.tcnj.edu/?p=77)

[TCNJ’s academic integrity policy](https://policies.tcnj.edu/?p=130)

[TCNJ’s Accessibility Resource Center (ARC)](https://arc.tcnj.edu/students/accommodation-process/)

[TCNJ’s Americans with Disabilities Act](https://policies.tcnj.edu/?p=145)



**CHE 332-3A-01: Organic Chemistry II Laboratory**

**Summer 2023**

**Professor: Dr. thuy le**

**Office Address: C-214A (chemistry adjunct office)
Email Address:** **let@tcnj.edu**

**Virtual Office Hours: Monday, Tuesday, and Thursday 2:50-3:50 pm, or by appt.**

**Lab Meeting: Monday, Tuesday, and Thursday, 12:00 – 2:50 PM, C-133**

**Course Description**

This is the second of a 2-semester laboratory experience at the sophomore-junior level. The laboratory component is a required part of the CHE 332 course, and serves as the “4th” hour. The laboratory grade contributes 20% to the overall course grade.

**Course Materials**

* All exercises, laboratory handouts, worksheets and other required materials will be provided online.
* Goggles are required for this course and may be purchased in the college bookstore.
* A lined composition notebook is required to write experimental procedures and collect data in the laboratory.
* It is *strongly recommended* that you have a ruler and calculator to use during the lab.

**Course Structure**

The laboratory portion of the course will consist of in-person instruction (after our first week of remote learning). After the laboratory period, students will be expected to complete the laboratory reports and submit them to Canvas by the due date. Students should expect to have laboratory reports graded within one to two weeks of their submission.

The lab experiments will emphasize experimental techniques, synthesis and characterizations that parallel the course content. Workshops are incorporated to support the learning goals of the course and emphasize problem solving skills. Students will work in pairs to complete each experiment. Each student should submit a prelab assignment and maintain a complete laboratory notebook following the expected format for each experiment. Both students should contribute to the content of the final report of an experiment, but one lab report per team will be submitted, alternating between the partners.

**Academic Integrity:**

As a college student, it is your responsibility to maintain the highest standards of academic integrity. Representing work generated by artificial intelligence as one's own work is considered to be academically dishonest. This includes (a) ensuring that all work submitted for grades is your own original work, and (b) properly citing any sources that you use. (For example, this academic integrity statement comes from the [Brandeis Center for Teaching and Learning](https://www.brandeis.edu/teaching/resources/syllabus/ai-statements.html)).

**Technical Support**

Contact Canvas Help if you need assistance with technical issues or need to report a problem during the course.

**Safety**

Safety is an important part of the Organic Laboratory. Working with chemicals and equipment in the laboratory can be dangerous and requires Personal Protective Equipment (PPE). Students are required to review the “Safety Guidelines for the Organic Chemistry Laboratory” packet posted in Canvas.

**Course Purpose & Learning Goals**

In general, upon the completion of this course, students are expected to:

* Relate laboratory techniques and activities to chemical principles taught in lecture
* Demonstrate the fundamental skills and techniques required for organic synthesis and product analysis
* Identify the hazards associated with handling chemicals, lab equipment, and performing chemical reactions using the RAMP (Recognize, Assess, Minimize, Prepare) method
* Maintain laboratory notebooks that are an accurate reflection of experimental data and results

More specifically, by the end of the course, students should be able to:

* Separate chemical compounds using their chemical and physical properties (polarity, acid/base)
* Perform common calculations used to predict and determine product yields
* Identify safety hazards in a particular experiment and design ways to conduct the experiment so that hazards are minimized and waste is disposed of appropriately
* Explain how to set up a laboratory apparatus and a chemical reaction safely, as well as how to conduct simple purification procedures, such as extractions and recrystallizations, independently
* Select appropriate glassware for a laboratory procedure
* Summarize the objective of a particular laboratory experiment and determine whether it was achieved post-experiment
* Analyze spectroscopic data, such as 1H NMR, MS, or IR data, along with observations and yields, to make conclusions about the identity and purity of a chemical product

**Attendance and Participation**

Because this is a laboratory-based course, attendance for all lab meetings is mandatory. In case of an emergency, reach out to your instructor as soon as possible to discuss the situation. You may not turn in a report for a meeting that you did not attend. According to departmental policy, **two unexcused absences from a laboratory meeting will result in an F for the entire course.** *Please also be aware that if a person is more than* ***5 minutes late*** *to a meeting, it will automatically be* ***marked as an absence****. It is absolutely essential that every student be present for the discussion at the beginning of the laboratory period.*

Participation in all lab activities during the scheduled time is expected. Students are allowed to work in teams during the laboratory and it is expected that there will be equal contributions from each partner. For some of the workshops, students will be allowed to work in larger groups in order to collaborate and learn from one another. Students should be prepared to contribute to all activities; this will make the laboratory an enjoyable experience for all.

**Inclusion and Diversity**

It is my goal to create a learning environment that includes and supports all members of the classroom, one that respects diversity in thought and perspectives and honors all identities (including race, gender, class, sexuality, religion, ability, etc.).  If you prefer a different name and/or set of pronouns than those that are represented in the TCNJ records, please make me aware of this.  If you are uncomfortable about things that are happening in class or about something that was said, please reach out to me so that we can address it.  As we all continue to learn about diverse perspectives and identities, please be sensitive to all members of the class by being respectful and accepting of others.

**General Guidelines**

**LABORATORY NOTEBOOKS:**

 Each student will maintain a Google document as their electronic notebook. If you do not have a laptop, bring a laboratory notebook bound, hard-cover, NO loose-leaf or spiral. It will contain a pre-lab assignment, experimental procedure/observations and data/results sections.

## General

1. Number all pages in the notebook.
2. The first page should be a “Table of Contents”. Each experimental entry should have a title, page number, and date the experiment/exercise was conducted.
3. Begin every new experiment on a new page.

***Importance of the Laboratory Notebook***

The laboratory notebook is an important record of work that has been completed in the laboratory. It will serve as a valuable resource for someone who may try to reproduce your work at a later time, so it should be clear and legible. It is also considered to be a legal document in both academic and industrial settings.

## Notebook Format

## 1) Pre-lab assignment (5 points, done before coming to the laboratory meeting)

 See the document entitled *Pre-laboratory Assignment Template* for details. The pre-lab should be submitted to Canvas before lab by the due date indicated by your instructor.

**2) Procedure / Observations** (done during lab)

 It is sufficient to reference the lab handout that was provided if it includes an experimental procedure – there is no need to rewrite this information.

 If no written procedure is provided, write a step-by-step summary of exactly how you performed the virtual experiment or technique. This information may need to be obtained from an assigned video. This may be done in a bullet form or a paragraph form. Pictures for any special experimental set-ups should be included. Be sure to write in the third person passive voice (example - “The flask was heated for 30 min” is correct, not “I heated the flask for 30 min”).

 Observations are an important part of your laboratory notebook. You should note any color changes, formation of precipitates, the evolution of heat or gas, the formation of a new layer, etc., that you observe in the video.

 As you take your notes, keep in mind that your written procedures, references and observations should be sufficient for a person to reproduce the experiment.

**3) Data/Results** (done during lab)

 Think carefully about how best to present your data. Tables, graphs and charts are helpful ways of showing your results. All data must have descriptive labels, titles and units. Yields of products should be reported with both weights and percentages (include all calculations). Measured physical properties, such as melting and boiling points are reported here as well as the corresponding literature values.

##  The Laboratory Report (15 points, done during and after the laboratory meeting)

 See the document entitled *Writing the Laboratory Report* for details. The Procedure/Observations and Data/Results sections can be copied from your laboratory notebook into the final report.

Specific expectations for each lab report will be given in the corresponding assignment.

**Grading**

 Your laboratory report grade will be based on the total number of points that you accumulate for the semester.

|  |  |
| --- | --- |
| Reports (6 x 20 points each) | 120 pts. |
| Assignments (4 x 20 points) |  80 pts. |
| **Total Points**  | **200 pts.** |

**Selected TCNJ Policies**

See the policies listed on the lecture syllabus.

**Tentative Schedule of lab experiments**

|  |  |  |
| --- | --- | --- |
| Date | Experiment | Assignment  |
| 7/21 | Introduction and Orientation*; Spectroscopy Workshop* | **-----** |
| 7/22 | **Experiment 1** - The Diels-Alder Reaction, Part 1*Spectroscopy Workshop Continued (due at end of lab)* | **Assignment (20)** |
|  7/24 | **Experiment 1** - The Diels-Alder Reaction, Part 2*Aromaticity Workshop*   | **Report (20)****Assignment (20)** |
| 7/28 | **Experiment 2** – The Bromination of Vanillin, Part I(Synthesis) | **-----** |
| 7/29 | **Experiment 2** – The Bromination of Vanillin, Part II(WebMO and Analysis) | **Report (20)** |
| 7/31 | **Experiment 3** - Grignard Reaction | **Report (20)** |
| 8/04 | **Experiment 4 –** Synthesis of Lidocaine  | **Report (20)** |
| 8/05 | **Experiment 5** – A Green Wittig Reaction, Part 1 | ***---------*** |
| 8/7 | **Experiment 5** – A Green Wittig Reaction, Part 1I | **Report (20)** |
| 8/11 | *Mechanism/Synthesis Workshop*   | **Assignment (20)** |
| 8/12 | **Experiment 6**– The Aldol Reaction | **Report (20)** |
| 8/14 | *Problem Sets (Review)* | **Assignment (20)*****Lab checks out (Mandatory for All Students)*** |  |