Organic chemistry I laboratory – CHEM341 – summer 2019

Dates: June 3, 2019 – June 28. 2019

Room	Days	Time	Lead TA	Email	Support TA
OCH3001	T, W, R	12:30 – 5:00 pm	Jonathan Markham	jonathan.markham472@topper.wku.edu	Joel Omage

Instructor information:
Dr. Lawrence Hill
Office: KTH 4058
Phone: 270-745-2136
Email: lawrence.hill@wku.edu (I generally respond by close of the following business day)
Office hours: 11:30am-12:30pm MWF

Course materials:
Goggles, closed toe shoes, and appropriate clothing for laboratory work (no skin showing from the hips to the floor, including feet). No textbook is required.

Prerequisites: CHEM 222-223 (C or better); **Corequisite:** CHEM 340 (or prior credit for CHEM340)

Course description:
This course covers techniques used to separate, purify, and characterize organic compounds. Students will gain hands-on laboratory experience while learning the chemical principles underlying each technique they use.

Course learning objectives:
By the end of this course, students will learn to:
1. Separate and purify organic compounds using extraction, filtration, and distillation.
2. Characterize a compound using melting point, chromatography, and spectroscopy.
3. Identify an unknown compound as one of many possible known compounds using characterization techniques.

Grading:
Your grade will be determined based on the percentage of points earned out of 500 possible points in the course.

- **Prelab quizzes:** 10 x 10 points each = **100 points**
- **Spectroscopy packets and data assignments :** 4 x 15 points each = **60 points**
- **Written assignments:** 6 x 40 points each = **240 points**
- **Summative assessments:** 4 x 25 points each = **100 points**

Total = 500 possible points

Letter grade scale:
You should plan on the following assignment of letter grades for CHEM 341. I reserve the right to change the grading scale, but I will never make the grading scale more difficult than shown below.

A = (100 – 90%), B = (80 – 89%), C = (70 – 79%), D = (60 – 69%), F = (0 – 59%)

Grades will not be discussed by email or by phone. Please speak to your TA or Dr. Hill in person about your grade.

Some tips for succeeding in this course:

- ***Come prepared for lab.*** Critically read all materials and outline your experiment in your lab notebook before coming to class. Prepare your table of physical constants before class. Wear appropriate shoes and clothing on lab day. Come prepared for the prelab quiz.
- ***Be safe!*** Keep your goggles on and move slowly. Think about how best to protect yourself and your neighbor when handling reagents or glassware. Speak up promptly if an accident happens in lab.
- ***Understand why*** you are performing each step in lab.
- ***Ask questions*** and speak up if you are confused. Your peers will thank you for helping them understand.
- ***Come to office hours*** with questions. Email me for an appointment if you can't make it to regularly scheduled office hours.

Students with disabilities:

In compliance with University policy, students with disabilities who require academic and/or auxiliary accommodations for this course must contact the Student Accessibility Resource Center located in Downing Student Union, 1074. SARC can be reached by phone number at 270-745-5004 [270-745-3030 TTY] or via email at sarc.connect@wku.edu . Please do not request accommodations directly from the professor or instructor without a faculty notification letter (FNL) from The Student Accessibility Resource Center.

Title IX Discrimination and Harassment

Western Kentucky University (WKU) is committed to supporting faculty, staff and students by upholding WKU's Title IX Sexual Misconduct/Assault Policy (#0.2070) at https://wku.edu/eoo/documents/titleix/wkutitleixpolicyandgrievanceprocedure.pdf and Discrimination and Harassment Policy (#0.2040) at https://wku.edu/policies/hr_policies/2040_discrimination_harassment_policy.pdf.
Under these policies, discrimination, harassment and/or sexual misconduct based on sex/gender are prohibited. If you experience an incident of sex/gender-based discrimination, harassment and/or sexual misconduct, you are encouraged to report it to the Title IX Coordinator, Andrea Anderson, 270-745-5398 or Title IX Investigators, Michael Crowe, 270-745-5429 or Joshua Hayes, 270-745-5121.Please note that while you may report an incident of sex/gender based discrimination, harassment and/or sexual misconduct to a faculty member, WKU faculty are "Responsible Employees" of the University and MUST report what you share to WKU's Title IX Coordinator or Title IX Investigator. If you would like to speak with someone who may be able to afford you confidentiality, you may contact WKU's Counseling and Testing Center at 270-745-3159.

Attendance:

There are no make-up labs or assignments without prior agreement from your instructor.

Ogden College Attendance Statement:

The faculty and staff of Ogden College of Science and Engineering are committed to providing you with learning experiences and opportunities. You must assume ownership of your education and be an active participant in the classroom and laboratory to take advantage of these opportunities. Active participation requires you to attend. Scientific studies have shown that attendance during scheduled classroom and laboratory meetings is directly correlated to your performance on assignments and exams and the potential to earn higher grades. Additionally, if you do not regularly attend class, you are missing important information about course topics, due dates, and assignment details that are crucial to your success in the course. Therefore, as a student enrolled in an Ogden course, you are expected to attend every class meeting.

Technology (e.g., phones, computers, tablets)

Use of technology must be approved by the instructor **prior to the start of class.** For example: if you are expecting a truly urgent phone call, you must approach me in person before class and tell me that you may need to leave to take a call. I will ask you to put your phone on vibrate and sit near the door in case you need to leave. Otherwise, phones must be off before coming to class. Computers and tablets are not allowed in the laboratory, but we will use them for "dry labs" in the classroom. Texting or other distractions are not allowed during class.

Acceptable behavior:

You are expected to prepare for class, exercise safe laboratory practices, interact respectfully with your peers, ask relevant questions, and be a good citizen. Any other behavior is likely to be unacceptable.

Academic dishonesty (https://www.wku.edu/handbook/academic-dishonesty.php/):

"Students who commit any act of academic dishonesty may receive from the instructor a failing grade in that portion of the course work in which the act is detected or ***a failing grade in a course without possibility of withdrawal.****"*

Changes to the syllabus

I reserve the right to change the syllabus as needed during the semester. I will post any changes to Blackboard.

Tentative schedule:

Date	Experiment / activities	Prelab Quiz[1]	Summative assessments[2]	Written assignments[3]	Other assignments[4]
4-Jun	Lab safety, syllabus, and check-in	---	---	---	---
5-Jun	Melting point and TLC	Melting point and TLC	---	TLC only	---
6-Jun	IR spectroscopy packets	IR spectroscopy	---	---	Packets
11-Jun	Acid/base extraction	Acid/base extraction	MP, TLC, IR packets	Acid/base extractions	---
12-Jun	IR wet lab	IR wet lab	---	---	Solve structures
13-Jun	Recrystallization	Recrystallization	---	Recrystallization	---
18-Jun	NMR spectroscopy packets	NMR spectroscopy	Acid/base, IR	---	Packets
19-Jun	SN1/SN2	SN1/SN2	---	SN1/SN2	---
20-Jun	NMR wet lab	NMR wet lab	---	---	Solve structures
25-Jun	GC/MS	GC/MS	SN1/SN2, NMR, Recrystallization	GC/MS	---
26-Jun	Steam distillation	Steam distillation	---	Steam distillation	---
27-Jun	Final summative and check-out	---	NMR, GC/MS, distillation	---	---

1) “Prelab quizzes” take place at the beginning of class and cover basic information from both the procedure and the slides. You should critically read the procedure and slides before coming to lab. See the end of the syllabus for a list of prelab responsibilities and lab report format.

2) “Summative assessments” assess learning of content from previous experiments. These assessments may require understanding concepts from the procedure, slides, the experiment, or your lab report. As a result, the questions on these assessments are at a higher level than the prelab quizzes.

3) “Written assignments” include a table of physical constants (due at beginning of class) and a results/discussion section (due at the beginning of the following class meeting). See the end of the syllabus for a list of prelab responsibilities and lab report format.

4) “Other assignments” include spectroscopy packets (completed in class) or spectroscopic data that you collect and analyze on your own (due at the beginning of the following class meeting).

The following items are evaluated in the prelab quiz, before the prelab lecture:
You are responsible for going through the prelab slides and the procedure before coming to lab. You should review these materials until you have a basic idea of what you will do in each experiment. The prelab quiz will consist of brief, simple questions to probe whether or not you attempted to understand the experiment.

- Review the prelab slides and try to understand what you will learn from the experiment.
- Go through the procedure and try to understand what you will do in each experiment.

On weeks with a written assignment, complete a table of physical constants for all chemicals mentioned in the procedure before coming to class. (You do not need this table for the IR or NMR labs.)
Turn in a copy of this table at the beginning of class, before the prelab quiz. The table may be hand-written or printed or both. Be sure to keep an extra copy for your use in lab. **This table contributes 5 points to your 40 point written assignment grade.** Tabulate information for each chemical that you will handle during the experiment, including:

- Chemical name and structure (for organic compounds) or molecular formula (for inorganic compounds)
- Molar mass (not needed for solvents)
- Density (liquids only)
- Melting point (for solids)
- Boiling point (anything that boils at a temperature possible to reach during the experiment)
    - Obtain BP at atmospheric pressure if available. Otherwise, note the pressure with BP
- Safety hazards / concerns
    - Use reputable sources for information (e.g., SDS from Sigma-Aldrich)

Turn in written assignments at the beginning of the following class meeting using the format below.
Printed document, Times New Roman font (12 pt), 1 inch margins, double spaced.

Title information – required to receive a grade

- Experiment number – experiment name
- Your name
- Section number
- Lab partners' names

Report – 35 points

- **Section 1: Tabulated Data and Observations (20 points)**
    - Data should be presented in **tables**.
    - Present any additional observations as a bulleted list.
- **Section 2: Results and Discussion (15 points)**
    - Analyze your data and observations and combine the information to determine the outcome of the experiment. Explain what your data and/or observations tell you about the materials you worked with in lab. Did the experiment work as planned? Were there any unexpected results? **Address any specific discussion points provided to you at the end of your procedure or by your instructor.** Offer constructive comments on how procedure might be improved (possible bonus points).

The rubric used for grading is on the following page.

CHEM 341 Lab Report Rubric – Results and Discussion
Printed document, Times New Roman (12 pt), 1 inch margins, double spaced.

Table of physical constants (5 points)
Evaluate data organization and completeness. Note any specific guidance from the procedure.
5 points – Chemical name, structure, physical data, and safety information are present for each chemical.
4 points – Missing just one or two small items.
2 points – Missing several items.
0 points – Absent

Data organization (10 points)
Evaluate data organization and completeness. Reward thoughtful efforts to help the reader understand the data. Note any specific guidance from the procedure.
10 points – All results are effectively presented and the calculations are correct.
8 points – Results reasonably presented, but some problems with the completeness of data presented or the accuracy of the calculations.
6 points – Data presented, but significant problems with format, clarity, organization, completeness of data presented or accuracy of calculations.
4 points – Some data, but hard to interpret.
2 points – Incoherent
0 points - Absent

Observations (10 points)
Evaluate recording observations and understanding of related microscopic events. Reward multiple observations and interpretation of these observations. Note any specific guidance from the procedure.
10 points – Multiple observations are described. These observations are then explained in terms of events at the molecular level when possible.
8 points – Limited observations are described. These observations are then explained in terms of events at the molecular level when possible.
6 points – Observations are explained with some errors. Alternatively, specific molecular-level events are suggested without accompanying observation or hypothesis (e.g, writing, "Bubbles were observed at 60 °C. These bubbles are attributed to formation of CO_2 during decarboxylation of the starting material," is much better than just saying, "CO_2 left the reaction mixture at 60 °C")
4 points – Observations are incorrectly explained.
2 points – No observations
0 points – Absent

Data analysis and conclusion (15 points)
Evaluate student's ability to interpret their data. In general, this section should be evaluated on content and clarity of the argument presented. Reward use of data and observations to support all claims made in discussion. Note any specific guidance from the procedure.
15 points – Points are clearly and concisely presented. Data are cited and their relationship to the
conclusion is clear. Sentences are complete and words are spelled properly. Higher thinking skills are evident in the discussion.
12 points – Points are reasonably well presented. Data is not cited or used to support the conclusion. The discussion sticks closely to the facts and does not expand the discussion to a higher level.
9 points – Points are not effectively made. Terms are presented, but not defined or discussed. Writing is intelligible, but there are problems with grammar, spelling, format, and/or punctuation.
6 points – It is impossible to discern what is being discussed; serious format problems are present. No clear thoughts are presented.
0 points – Absent