

214 / 217 Spencer Chemistry Building, Wed 6:45-9:35 pm

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| Instructor | Prof. Ekaterina N. Kadnikova. |
| E-mail (preferred contact) | KadnikovaE@umkc.edu (you have to start your subject with "Chem 322L") |
| Phone | 816-235-5937 |
| Office | Spencer Chemistry Building 109B |
| Office hours | Mon 4-5 pm and 6:30-7 pm, Wed 4-5 pm, and by appointment |
| Website and Blackboard | The latest version of this syllabus will be posted at http://k.web.umkc.edu/kadnikovae . All other course information, including all announcements and your grades will be posted on the Blackboard (blackboard.umkc.edu). Your Blackboard username and password are the same as those in your UMKC e-mail account (<i>username@umkc.edu</i> e-mail address). |
| Course announcements | All announcements will be posted only on the Blackboard (blackboard.umkc.edu). |
| Teaching assistants and their office hours | Ching-En Chou (cecc3c@umkc.edu) (start your subject with "Chem 322L") Office hours Mon 10 am-12 pm in FH 5 th floor study area Lincoln Maina (lwmfh3@umkc.edu) (start your subject with "Chem 322L") Office hours Tue 5-7 pm in FH 5 th floor study area |

GENERAL

Pre-requisites

Chemistry 321 Lecture (Chem 321) and Laboratory (Chem 321L) courses

NOTE: Prior to beginning Chem 322 Laboratory course, you should be familiar with the following laboratory techniques:

- Recrystallization (incl. use of decolorizing agents, two-solvent systems etc.)
- Extraction (incl. acid-base extraction)
- TLC (thin-layer chromatography)
- Column chromatography
- Melting point measurement
- Distillation (simple and fractional)

To review these techniques, please refer to the Zubrick book (or equivalent - see below)

Co-requisite

Chemistry 322 Lecture (Chem 322)

Course objectives

The objective of this course is to provide the students with advanced organic laboratory experiences, i.e., performing various organic syntheses and writing scientific reports.

Pre-lab quizzes, lectures and announcements

All classes will convene in room C214 in the Spencer Chemistry Building before entering the lab for class announcements, pre-lab quizzes and lectures, and to submit lab reports.

Required materials

- Zubrick, J.W. *The Organic Chem Lab Survival Manual*, 6th ed.; 2002. Substitutions possible – please see the instructor with your proposed substitution.
- A lab notebook capable of making carbon copies. The copies are submitted as you leave the lab each session and become part of your report; you retain the originals.
- Padlock, safety glasses, black felt-tip pen with permanent ink (Sharpie or equivalent).
- Appropriate clothing (see safety rules).

Grading

You are going to turn in *twelve* lab reports, each worth 20 points (including pre-lab quizzes). Your lowest lab report score will be dropped, bringing the total of reports to 220 points. Experimental part write-up for the final paper (based on expts 4+5+6) is worth 30 pts. Full final paper on aromatic substitution is worth 50 points. If you miss a lab, this would be your drop lab. *However, keep in mind that missing experiments 4, 5, or 6 would result in serious deficiencies in your final paper.* Lab exam on Dec 9 is worth 60 pts. Class total is 360 points. Grades will be assigned as follows (plus and minus grades will be used sparingly):

90-100 % = A; 80-89 % = B; 70-79 % = C; 60-69 % = D; 0-59 % = F.

NOTE: In each lab report (or in each section of the paper), you will lose 1 point for each of the following: spelling errors, grammatical errors, partial sentences. Spell-check and proof-read your typed work.

POLICIES**Enrollment and attendance**

You must be enrolled in the section you are attending. If you are not formally enrolled by the end of the second week of classes (Sept 4), you will be asked to leave the lab.

Attendance is required and will be taken by GTAs at all laboratory classes. The class starts on time and finishes on time. **There will be quizzes during the pre-lab.** No makeup labs are allowed after the experiment has been completed. Please observe the following:

- Students must attend their assigned laboratory section.
- Only substantial and unavoidable reasons (e.g., serious illness, unavoidable out-of-town professional travel, death in the family, religious observance, etc.) should cause students to miss a regularly scheduled lab. Your instructor must be contacted at least 24 hours in advance of missing lab, and documentation must be provided. *This is especially important if you miss experiments 4, 5, or 6.*
- Failure to notify your instructor at least 24 hours in advance or to provide documentation related to your reason for absence will result in the score of zero on the missed lab.
- There will be no make-up labs!

Laboratory

You must provide a padlock for your glassware drawer. You are responsible for maintaining the glassware clean and in good condition and for keeping your equipment drawer clean. Even though you are expected to take appropriate care with equipment and glassware, it is reasonable to expect a small amount of breakage. Notify the GTA as soon as possible if something is broken; you will be issued a replacement.

Lab reports

The due dates for lab reports are listed in the class schedule accompanying the syllabus. Lab reports must be turned in at the beginning of the pre-lab lecture prior to entering the laboratory. If you miss a lab at which the lab report was due to unforeseeable circumstances (serious illness, death in the family, etc.), you should notify the TAs and the instructor as soon as possible and provide documentation for your report to be accepted. In the absence of such serious reasons and compelling documentation, **late lab reports will never be accepted.** No exceptions will be made.

Experimental Part for the final paper must be turned in at the same time as Report 8 (**November 4, 2009**). Full final paper must be turned in at the same time as Report 11 (**December 2, 2008**). For both assignments, you will be submitting a hard copy to your lab TA, as well as uploading to Blackboard, where it would be checked by Turnitin software.

Safety and honesty

During the first week of classes, safety regulations will be reviewed. You are expected to follow them. When in doubt, ask your TA or lab instructor. Do not, under any circumstances, use fabricated data or data from another student. Fabrication of data is academic misconduct: you

will receive a grade of zero on the tainted work and will be reported to the Chief Academic Officer of your academic unit. Repeat offenders will receive an F grade for the course and face disciplinary action from the University. It is your responsibility to know and uphold the UMKC rules of academic conduct (http://www.umkc.edu/helpline/conduct_standard.cfm). Final paper will be submitted online (in addition to hard copy) and checked by Turnitin software to guard against plagiarism.

During the check-in week of the lab, you will be asked to sign a statement that you understand the safety regulations and academic honesty policy, and agree to adhere to them. A copy of these regulations is provided.

Regrade and grievance policy

Regrade requests for the lab reports should be submitted to the TA as soon as possible, and no later than within one week of receiving the graded lab report. The TA may decide to pass certain regrade requests to the instructor. Any other grievances about the class should be first taken up with the instructor. After contact with the instructor, further comments and complaints may be addressed to the Chemistry Department Chair. If you have a documented disability and desire academic accommodations, please contact the Office of Services for Students with Disabilities as soon as possible (<http://www.umkc.edu/disability/>). This class shall be conducted in a professional and respectful manner and in compliance with UMKC's policies ([http://web2.umkc.edu/catalog/Undergraduate Academic Regulations and Information.html](http://web2.umkc.edu/catalog/Undergraduate_Academic_Regulations_and_Information.html)).

Academic accommodations for students with disabilities

If you have a documented disability and desire academic accommodations, please contact the Office of Services for Students with Disabilities as soon as possible (<http://www.umkc.edu/disability/>).

Sexual harassment and discrimination

University of Missouri-Kansas City has a zero tolerance policy for sexual harassment, intimidation, or discrimination of any kind. If you (or our peers) have a question or experience anything of this kind, please talk with and/or report this conduct to the Departmental Chair, the Dean, and Affirmative Action Office. UMKC policy is online at <http://web2.umkc.edu/chancellor/ode/documents/complaintprocess.pdf>.

LAB NOTEBOOKS

- Review Chapter 2 in Zubrick.
- Each experiment should begin on a new page.
- *Put your name, your section, and your TA's name on top of every page in every experiment.*
- Make every entry in your notebook in ink, never in pencil. Don't erase or black out entries. Instead, ~~draw a line through the error~~ and add the new information.
- Record all laboratory observations and data directly in the lab notebook at the time they are observed. Do not use scratch paper. Do not expect to transcribe any information into the notebook at a later time. Carbon copies of your notebook entries are handed in at the end of every laboratory session. Your typed reports must draw on data and observations recorded in your lab notebook.
- Organize your lab notebook using headings such as *Title, Purpose, Procedure, Observations, Apparatus* or *Glassware set-up, Balanced reaction* or *Mechanism, Purification*, etc.

LAB REPORTS

For each experiment you hand in (1) carbon copies of pre-lab pages and data pages from your lab notebook *before leaving the lab*, and (2) a completed lab report *on the scheduled due date*. Your report will consist of these two submissions and a pre-lab quiz. Your lab notes will be hand-written; all other submitted work should be type-written, with the exception of structures and figures, which could be hand-drawn in ink.

The individual lab handouts will be available for download on Blackboard (blackboard.umkc.edu)

Before lab ⇒ Pre-lab

You will need to write in the procedure fully in your lab notebook because the handouts will not be allowed in the lab. You should be thorough enough so that you can perform the experiment from what you have written. Any changes to the lab will be announced in the pre-lab lecture and need to be noted in your lab book. When you arrive in lab, your GTA will sign your notebook pages ensuring that you have completed the required pre-lab. If not, you will not be allowed to start the experiment. You will have to leave the lab, complete the pre-lab, and then return to the lab but all labs will stop by the end of the lab section. No time extensions are allowed.

The pre-lab **at a minimum** should contain the following

- *Title*
Begin each experiment *on a new page* with a title, your name, the date, your GTA's name and your lab section.
- *Purpose*
A brief statement of the experimental objectives
- *Net equation and/or mechanism of reaction*
Include for all important reactions.
- *Procedure*
Provide an outline of the experimental procedure to be carried out. Do not simply copy what is written in the handouts; use your own words and diagrams. It is often useful to construct a flow chart of the procedure.

It is strongly recommended that you also include the following:

- *Table of quantities and physical constants*
Collect in tabular form the name, structure, molecular weight, density, melting or boiling point, solubility, mass or volume used, moles used, of any substance whose mass or volume you must measure. Some of this information can be found in the handouts. That which is not in the handouts can be looked up in *The Aldrich Chemical Company Catalog*, *The Merck Index*, *The CRC Handbook of Chemistry and Physics*, and on-line at <http://chemfinder.camsoft.com> or <http://webbook.nist.gov/chemistry>.
- *Theoretical yield*
Calculate the theoretical yield of all reactions, showing all calculations.

During lab ⇒ Data and observations (hand-written in your lab notebook)

Maintaining good experimental records is an essential part of the laboratory work. For all experiments, record what was done, including amounts (in g or mL, and in mol or mmol) of the compounds used, and your observations (i.e., changes in appearance, color, temperature, precipitation, evolution of gas). Also, where applicable, include work-up, isolation, and purification techniques used, isolated yields (in g or mL and in percents), and appearance of the final product (physical state, color, texture, smell).

Carbon copies of these pages will be stapled together and submitted before leaving the lab. Failure to turn in those pages counts as an absence. If an absence for a lab is recorded, a grade of "0" is unavoidable.

After lab ⇒ Lab Report (typed; CANNOT be hand-written), containing the following:**Experimental Part**

Maintaining good experimental records is an essential part of the laboratory work.

For each experiment, you will write an experimental part, using **passive voice** and coherent sentences. Refer to your *Data and Observations* for the necessary information. Your typed reports will be cross-checked against your lab notes. Spell-check and proof-read your typed work (see GRADING).

Table of Results

Your lab report should also include a table summarizing the results, similar to the tables you used in Chem 321L. This table should not replace the experimental part. It is expected that you will

repeat the values from the experimental part in this table. When applicable, include final mass or volume, theoretical yield, percent yield, melting point, all spectra with assigned peaks etc.. Spell-check and proof-read your typed work (see GRADING).

Post-lab questions

If your handout includes post-lab questions, include the answers to them in your lab report, after your experimental part and the table of results. Spell-check and proof-read your typed work (see GRADING). Figures, structures, reactions and mechanisms are to be hand-drawn in **ink** (not in pencil). Your typed reports will be cross-checked against your lab notes.

Spell-check and proof-read your typed work (see GRADING). Your lab reports will be collected on the date they are due, in the pre-lab room. Do NOT submit your lab reports to Chemistry Office!

WRITING LABS

Two "writing labs" will be conducted:

- Writing Lab A will be during the first week of the classes. Writing Lab A will focus on the correct format of the experimental part, and of the full mid-term paper. You will also be trained to use the ChemDraw program. During this lab, stations 1-16 check-in and wash glassware, and stations 17-32 will go to the SCB computer lab. At a mid-point of the lab time, these two groups will switch.
- Writing Lab B will provide feedback on the Experimental Part write-up and will focus on the format of the full final paper.

FINAL PAPER: EXPERIMENTAL PART AND FULL PAPER

This paper would be similar to what the researchers in the real lab would write upon completing a project. Your papers will be based on a "mini-project" *Aromatic Substitution* (experiments 4, 5, and 6). **The combined Experimental Part is due on Wednesday Nov 4, 2009. The full paper is due on Wednesday Dec 2, 2009.** The full paper should contain the following parts written by you, with proper bibliography, where needed:

- Introduction: what kinds of reactions are you studying; what is the theory behind them (mechanisms *etc.*), what are you hoping to learn.
- Experimental Part: you will combine the experimental narratives for the relevant experiments, correcting and improving the style, as needed. (NOTE: You will also submit this part on Nov 4 and will get it back on Nov 11, to help with your full final version)
- Results and Discussion: what results have you obtained and what reasoning you may have used to deduce what was going on.
- Conclusion: what did you learn?
- Bibliography: list of all sources you used, especially in the introduction and discussion sections.

More details about the format of the full paper would be given during the semester. These assignments will be submitted online and checked by Turnitin software to guard against plagiarism. Remember to spell-check and proof-read your typed work (see GRADING).

NOTE ON GRAPHICS:

Please, note that you may not copy and paste any graphics, including reactions and mechanisms, from the experimental handouts into your papers. Do not attempt to copy the reactions and mechanisms from any websites as well. All chemical reactions and mechanisms must be either hand-drawn in ink or computer-drawn using ChemDraw, in which case an original ChemDraw file should be submitted with each of the papers.

A copy of this statement will be provided for your signature before the first experiment

CHEM 322L Laboratory Safety RegulationsSemester Fall 2009Section VO3

Room and Drawer # _____

GTA (circle one) Ching-En Chou or Lincoln Maina

Station # _____

1. I will prepare for lab by studying the experiment before class and by trying to anticipate potential hazards from the chemicals or procedures to be used.
2. I will wear approved safety goggles AT ALL TIMES in the laboratory unless the instructor gives specific approval to remove them.
3. I will not work in the lab unless an instructor is present.
4. I will not perform any unauthorized experiments.
5. I will notify the instructor of any allergies or other health conditions (i.e., pregnancy or epilepsy) that may affect my ability to work in a chemistry lab. If I am pregnant, I will obtain a release from my doctor and submit it to the instructor before continuing to work in the chemistry lab.
6. I will not eat, drink, or smoke in the lab.
7. I will not use cellular phones or radios in the lab.
8. I will minimize my contact with chemicals by taking care to note odors, never tasting chemicals, using suction bulbs to fill pipettes, and washing any spilled chemicals off my person as soon as possible. I will wash my hands before leaving the lab.
9. I will not wear shorts, sandals, or other clothing in the lab that allows unnecessary exposure to spilled chemicals. I am also aware that certain chemicals can ruin clothing and that wearing a lab coat or apron adds some degree of protection.
10. I will secure long hair to keep it away from open flames and chemicals while I am working in the lab.
11. I will immediately report all cuts, burns, personal injuries, fires, chemical spills, or other accidents to the instructor.
12. I will keep my work area and the common areas of the lab clean.
13. I will NOT return unused chemicals to their original bottles.
14. I will consult with the instructor about the proper disposal of all waste chemicals.
15. I know the location, operation, and appropriate uses of the eye-wash stations, safety showers, fire extinguishers, fire alarms, and fume hoods; and I know the locations of all lab exits.
16. I agree to follow any specific or additional safety instructions that may be given for any experiments.
17. I will conduct myself in a professional and respectful manner. I will leave the lab after I complete my work.

I understand all of these statements and agree to observe them at all times in the lab. I also understand that if I fail to observe them, I will be expelled from the laboratory.

CHEM 322L Academic Honesty Statement

I will perform the work by myself and will adhere to the UMKC Academic Conduct Standards for Students (<http://www.umkc.edu/umkc/catalog/html/append/policy/0020.html>). It is my responsibility to understand the facets of academic honesty and to uphold them. If I am not sure, I will consult with the instructor.

SCHEDULE

| Date | Experiment | Turn in... | Get back... | 322 lecture timeline (tentative chapters) |
|-----------|------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|----------------------------|------------------------------------------------|
| Aug 26 | Introduction; notebook requirements; lab safety and waste disposal; check-in; wash glassware AND Writing Lab A | | | <i>Chem 321 review + 11. Radical rxns</i> |
| Sept 2 | 1. Epoxidation of cholesterol | | | <i>11 + 12</i> |
| Sept 9 | 2. Dimethyl tetraphenylphthalate | | | <i>12. Dienes and allyl system</i> |
| Sept 16 | 3. Hexaphenylbenzene | 1 | | <i>13. Conjugation and aromaticity</i> |
| Sept 23 † | 4. Nitration of methyl benzoate | 2 | 1 | <i>14. S_{Ar} rxns</i> |
| Sept 30 | 5. Alkylation of p-dimethoxybenzene | 3 | 2 | <i>14</i> |
| Oct 7 | 6. Alkylation of biphenyl | 4 | 3 | <i>15. Spectroscopy</i> |
| Oct 14 * | 7. Organic spectroscopy problems | 5 | 4 | <i>15 + 16</i> |
| Oct 21 † | 8. Grignard reaction | 6 | 5 | <i>16. C=O Chem 1: addn rxns</i> |
| Oct 28 | 9. Benzil | 7 | 6 | <i>17. C=O Chem 2: rxns at α-position</i> |
| Nov 4 | 10. Tetraphenylcyclopentadienone Experimental Part for final paper is due (aromatic substitution, expts 4+5+6) | 8 EP for final paper | 7 | <i>17 + 18</i> |
| Nov 11 ** | 11. Wittig reaction AND Writing lab B | 9 | 8 EP for final paper | <i>18. Carboxylic acids</i> |
| Nov 18 † | 12. Synthesis of Banana Oil | 10 | 9 | <i>19. Derivatives of carboxylic acids</i> |
| Nov 25 | Thanksgiving break | | | |
| Dec 2 | Checkout and Review Full final paper is due (aromatic substitution, expts 4+5+6) | 11 final paper | 10 | <i>19 + 20</i> |
| Dec 9 | Laboratory Exam (calculator required) | 12 | 11 | <i>20. Orbital symmetry + review</i> |

† Chem 322 examination is on the same day.

* October 16 (Friday) is the last day to withdraw without assessment.

** November 13 (Friday) is the last day to withdraw. Any student withdrawing by that date would receive W (not WF).