

**Department of Chemistry
University of Missouri-St. Louis**

Chemistry 2633: Techniques of Organic Chemistry

Spring 2020

Lecture: Monday 2:00-2:50; Room 303 BH
Laboratory: Room 210 , SLB
Instructor: James Chickos: Office: 222 Benton Hall; e-mail: jsc@umsl.edu
Phone: 516-5377 web: www.umsl.edu/~chickosj/
Office hours: Monday 2:50-4:00 PM and during lab hrs

Teaching Assistants:

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|-------------|--|--------------|--|
| Tuesday | 12:30 - 5:00 PM | Giri Gnawali | grgf2b@mail.umsl.edu |
| Wednesday | 12:30 - 5:00 PM | Huy Nguyen | hqnwv3@mail.umsl.edu |
| Thursday | 12:30 - 5:00 PM | Rishi Paudel | rrpq44@mail.umsl.edu |
| Saroj Kafle | skt6n@mail.umsl.edu | | |

Text and Supplies

Laboratory Manual for Chemistry 2633; (M), (available in the book store); Laboratory Notebook: **Bound student notebook with carbonless copies**, available in the University Bookstore and elsewhere (Amazon).

Safety Glasses: Goggles and safety glasses (optional). These are available in the bookstore.

Goggles or safety glasses must be worn in the laboratory at all times. Goggles must be worn while working in the hoods. This is a State requirement.

Course Description

Chemistry 2633 is the first semester in the U.M.-St. Louis Organic Chemistry Laboratory sequence. The formal prerequisite for this course is Structural Organic Chemistry, Chemistry 2612 (or an equivalent lecture course). This course is designed to provide an introduction to the basic experimental techniques and procedures used in the practice of Organic Chemistry. It will be assumed that you are acquainted with general techniques employed in the laboratory, such as weighing, measuring volumes, preparing solutions, measuring temperature, etc. Please inform us if you are not familiar with these techniques. You should also be familiar with the basics of Organic Chemistry including some nomenclature, structural theory and some reactions of common functional groups.

If you have any physical handicaps that may influence your performance in the laboratory, you should inform us so that we can try to accommodate your needs. Most of the materials we will be working with are generally considered to be relatively non-toxic. However, each of us may respond differently to them. Please inform us if you encounter any difficulty or discomfort working with any of these materials. The laboratory is equipped to handle one physically disadvantaged student

Remember: Course material will be available at the following address:

www.umsl.edu/~chickosj/. Any announcements and additional information for the course will

appear on the course site in Canvas so you should also check this site periodically. Cheating on tests, falsification of lab data or notebook entries, or malfeasance of that sort, will result in a grade of zero for the test or lab in question.

Evaluation of Performance

Your final letter grade will be based on your accumulated point total on a 950 point scale in the following areas:

- I. Notebook grades (350 pts.).
- II. Grades on yields and unknowns (200 pts.).
- III. Examinations (400 pts.).

Two examinations will cover material from the lectures, laboratory experiments, and reading assignments. You are responsible for the material covered in the reading assignments, even if not specifically covered in the lectures. Points may be deducted for handing in experiments late. Sample examinations will be made available on the web at the address given above. Each experiment is worth 50 points except expt 10 which is worth 100 pts (combined I and II above).

Grades: Grades in the course are curved. This means that the total number of points earned does not necessarily guarantee a particular grade. Letter grades are generally assigned on relative rankings, not on total points earned. In classes with several sections, laboratory grades may be normalized to a common mean to accommodate any grading differential by instructor; therefore, the final score may differ somewhat from the score posted on Canvas

SCHEDULE

Tentative Lecture Schedule

During the course of this semester, we will be using and discussing infrared and NMR spectroscopy. This material is covered in Appendices 1 and 2 of the laboratory manual. You should familiarize yourself with this material as we discuss it. Additional spectra for both IR and NMR are provided in the appendices of your manual.

Week of

Jan 20: Reading Assignment: pgs 1-10. **You will need to read the file on safety. Send an e-mail that you have done so. E-mail: jsc@umsl.edu.** Your grades will not be available until your e-mail has been received. The material on safety is available on the web at: www.umsl.edu/~chickosj/.

Jan 27: Reading Assignment Expt. 1. Preparation of Aspirin, **M** pp. 19-21;

Feb 3: Reading Assignment: Expt. 2. Preparation of Acetaminophen: **M** pp. 22-23. Appendix 1 pp. 59-69

Feb 10: Reading Assignment: Extraction **M** pp. 15-16; Expt. 3. Caffeine Experiment **M** pp. 24.

Feb 17: Reading Assignment: Expt. 4. Thin Layer Chromatography: **M** pp. 26-29. Appendix 1 pp. 69-79

Feb 24: Reading Assignment: Expt. 5. Synthesis of Banana Oil: **M** pp. 30-31. Simple Distillation; 32-40

Mar 2: Reading Assignment: Expt. 6. Fractional Distillation, Gas Chromatography, **M** pp. 40-46.

Mar 9: Reading Assignment: Expt. 7. Steam Distillation: **M** pp. 47-49. Appendix 1 pp. 79-87.

Mar 16: Exam 1 covering experiments 1-5. Reading Assignment: Expt 8. Preparation of Methyl Salicylate. Vacuum Distillation; p 50.

Mar 21: Spring Break

Mar 30: Reading Assignment: Expt 9. Identification of Organic Unknowns, **M** pp. 51-54; Appendix 2; NMR Spectroscopy, pp 88- 97. Appendix 2 pp. 88-97.

Apr 6: Reading Assignment: Expt 10. Multistep Synthesis; **M** Synthesis of Benzoin. pp. 55-6.

Apr 13: Reading Assignment: Expt 10. Multistep Synthesis; Oxidation of Benzoin to Benzil; **M** pp. 56-7.

Apr 20: Reading Assignment: Expt 10. Multistep Synthesis; Preparation of Tetraphenylcyclopentadienone.

Apr 27: Reading Assignment: Expt 10. Reduction of Benzil with Sodium Borohydride; **M** pp. 58.

May 4: Exam 2 covering experiments 7-10, IR and NMR.

Laboratory Schedule

Week of

Jan 20: Laboratory Assignment: Laboratory Check-in; Introduction to the Organic Laboratory; **M** pp. 1-18; Laboratory Safety; Laboratory Check-in;.

Jan 27: Laboratory Assignment: Expt. 1. Preparation of Aspirin, **M** pp. 19-21

Feb 3: Laboratory Assignment: Expt. 2. Preparation of Acetaminophen, **M** pp. 22-23.

Feb 10: Laboratory Assignment: Expt. 3. Isolation of Caffeine from Tea; **M** pp. 24.

Feb 17: Laboratory Assignment: Expt. 4. Thin Layer Chromatography: **M** pp. 26-29. **Expts 1 and 2 are due.**

- Feb 24: Laboratory Assignment:** Expt. 5. Synthesis of Banana Oil: **M** pp. 30-31.
- Mar 2: Laboratory Assignment:** Expt. 6. Fractional and Simple Distillation of a Binary Mixture: **M** pp. 40-6; Complete experiments 1-5; Gas chromatographic analysis of the distillations may be continued the following week. Be sure to save your samples in a capped vial. **Expt. 3, and 4 are due at the end of the period.**
- Mar 9: Laboratory Assignment:** Expt. 7. Isolation of a Natural Product by Steam Distillation: **M** pp. 47-9.
- Mar 16: Laboratory Assignment:** Expt. 8. Preparation of Methyl Salicylate-Vacuum Distillation: **M**. p. 50.
- Mar 21: Spring Break**
- Mar 30: Laboratory Assignment:** Expt. 9. Identification of Unknowns; **M** 51-4.
- Apr 6: Laboratory Assignment:** Expt. 10. Multistep Synthesis; Synthesis of Benzoin. p 55-6. **Expts 5 and 6 are due at the end of the period.**
- Apr 13: Laboratory Assignment:** Expt. 10. Multistep Synthesis: Oxidation of Benzoin to Benzil; **M**. pp. 55-6, (ongoing); Identification of Unknowns (ongoing).
- Apr 20: Laboratory Assignment:** Expt. 10. Multistep Synthesis, Preparation of Tetraphenylcyclopentadienone; Reduction of Benzil with Sodium Borohydride. **M** pp. 58
- Apr 27: Laboratory Assignment:** Multistep Synthesis, (continued), unknowns (continued).
- May 4: Completion of all remaining experiments. All remaining experiments are due: Check out.**