San Jose State University, Chemistry Department

CHEM 9

Organic Chemistry Laboratory

Spring 2017

Instructor: Rose Wang

Office: DH 516 (I will hold my Friday office hour in Sci. 154)

Office Hours: F: 11:50 – 12:30 and 3:20 to 3:50 in Sci. 154
T: 2:00 – 2:30 in DH 516

Email: xiao.wang@sjsu.edu and wang932@yahoo.com

Phone: 408-924-4955 (please use email instead of using the phone, I check email almost every day)

Class time: Section 1: 9:00 – 11:50
Section 2: 12:30 – 15:20

Classroom: SCI 154

Prerequisite: Chem. 8 (If you drop Chem. 8 you must also drop Chem. 9)

General Course Description: This course is intended to acquaint the student with the most commonly used procedures for preparation, purification and analysis of organic compounds. Although results - yield, purity, accuracy of data, etc. - shall be considered as part of the report grade as appropriate, the primary emphasis is on understanding the theory and application of these techniques.

Learning Objectives:

♦ To understand and apply basic techniques used in the organic laboratory for preparation, purification and identification of organic compounds.
♦ To learn the major techniques used in organic chemistry laboratory include melting point determination, extraction, chromatography, infrared spectroscopy, distillation and chemical characterization tests.
♦ At least one organic compound will be synthesized.
♦ Calculation of reaction yield for relevant lab experiments will be practiced.
♦ To develop the ability to analyze the given procedures of an experiment and suggest or recommend improvements.
♦ To conduct the practices of laboratory investigations safely by following the safety rules learned.
♦ To develop a better understanding the organic chemistry behind everyday observations such as the action of soap, or application of color dyes on variety of fabrics.

Required:

♦ Chem. 9 Lab Manual. Available at DH 20 sold by Chemistry Student Club (you must buy this!)
♦ Hart, Craine, Hart and Vinod, Organic Chemistry Lab Manual - A Short Course (Suggested to use either 12th Edition or 13th edition.) You can buy a used book for 12th ed. or share the books within students. If you like to use a new edition (13th ed.) you could rent in Amazon and Barnes and Noble for saving money.

Other Equipment/Material Requirements:

♦ From Instructor: Greensheet and Lab Schedule; Locker Inventory Card; Department Safety Sheet
From the Service Center (SCI 150): Equipment Pad; Service Center Procedure Sheet; Price List (available upon request)

Organization:

A Tentative Schedule of Experiments is on last page, listing the tentative scheduling of experiments from the 12th and 13th text (HCHV), along with assigned reading materials in the text, the pre-lab due date and report due dates (both Pre-Lab Sheets and Report Sheets are in the Chem. 9 SJSU Lab Manual, so you must buy the lab manual!) The tentative schedule is subject to change. The theory behind a particular experiment will normally be covered briefly the week before the allotted lab period in order to lay groundwork for the assigned reading. The student is expected to read and understand the assigned sections prior to the allotted lab period for that experiment. At the beginning of the period students should turn the completed pre-lab questions (tear from the lab manual) to me. There will be a question and answer period and perhaps more detailed instructions regarding the experiment shall be given. Reports shall be submitted as scheduled also at beginning of the lab unless otherwise instructed (see the schedule on last page). The overall grade shall depend primarily on all lab reports, a midterm exam and a final exam (see details in grading policy part.)

Modification of Procedures: Sometimes, the instructor will modify procedures from HCHV - these will be announced in class and/or handouts (means lab manual.) Be sure to follow the modified procedures - and to alter your report accordingly.

Reports:

Lab reports shall be due at the beginning (means first 10 minutes) of the lab period of the due date (see Tentative Schedule of Experiments on the last page. Lab reports consist of the following:

1) Pre-lab Exercises – They are in your SJSU Chem. 9 lab manual. Please answer all questions, tear out pages from the lab manual, and submit it to me in person at the beginning (first 10 minutes) of the lab period. The pre-lab exercises will account for about 50% of the report grade. You may not begin the experiment unless these are turned in with all questions answered. Prelab also includes one or two pages lab procedures and hazardous information in your notebook (you need also tear it down to submit it to me at beginning of the lab. Without this part, you will lose 5 pts for prelab score, and you have to make it up, then you are allowed to do experiment.

2) Lab Report Sheet – They are in your SJSU Chem. 9 lab manual as well. Laboratory reports shall be due at the beginning (first 10 minutes) of the period of the due date (see Schedule of Experiments on last page) unless otherwise instructed. Please answer all questions, tear out pages from the lab manual, and submit it to me in person. Tardiness will have a corresponding deduction up to 50% of the points allotted. More than one week late report will not be accepted nor graded.

3) Any product or material purified in the experiment should be in a clean vial labeled as follows:

Your Name, Date  
Name of the Substance  
Melting Point/Boiling Point (if applicable)  
Weight, in grams, % yield (for a dry substance)  
Tare (weight of the vial, cap, and label)

If your report includes the data of someone else, you must reference the person who supplied the data. Failure to do so will be considered plagiarism and will be handled accordingly.
NOTE that University policy F69-24 at http://www.sjsu.edu/senate/docs/F69-24.pdf states that “Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because participation is frequently essential to insure maximum benefit for all members of the class. Attendance per se shall not be used as a criterion for grading.”

Grading:
The grading scheme consists of the final grade being a weighted average of report, midterm and final exam grades in the proportions:

- **Reports:** 50% (500 pts for Pre-Lab, Lab Reports, and Worksheets, see the table below)
- **Midterm:** 20% (200pts, Friday, March 24 – subject to change with notice)
- **Final Exam:** 30% (300pts, Section 2: Thursday, May 18, 0945-1200; Section 1: Monday, May 22, 0715-0930)

<table>
<thead>
<tr>
<th>Lab Points:</th>
<th>Prelab</th>
<th>Lab Report</th>
<th>Work Sheet</th>
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<tbody>
<tr>
<td>Lab 1A Synthesis of Aspirin</td>
<td>15</td>
<td>15</td>
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<tr>
<td>Lab 1B m.p. Determination</td>
<td>15</td>
<td>15</td>
<td>20</td>
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<td>Lab 2 Recrystallization</td>
<td>20</td>
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<td>Lab 3 Extraction</td>
<td>30</td>
<td>30</td>
<td>20</td>
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<tr>
<td>Lab 4 Isolation of Caffeine</td>
<td>20</td>
<td>20</td>
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<tr>
<td>Lab 5 Distillation</td>
<td>25</td>
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<td>Lab 6 IR</td>
<td>20</td>
<td>20</td>
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<td>Lab 7 TLC</td>
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<td>20</td>
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<tr>
<td>Lab 8 Dyeing Fabrics</td>
<td>20</td>
<td>30</td>
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<tr>
<td>Lab 9 Aldehydes &amp; Ketones</td>
<td>20</td>
<td>20</td>
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<tr>
<td>Lab 10 Preparation of Soap</td>
<td>20</td>
<td>20</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>225</strong></td>
<td><strong>235</strong></td>
<td><strong>40</strong></td>
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</table>

Individual scores shall be translated into letter grades and it is the letter grades which shall be averaged according to the weighting scheme above; this is done so that you will always have a clear idea of where you stand in the course.

A **Letter grades will be assigned according to the following percentage scale:**

- $A^+ \geq 97.0\%$, $A \geq 92.0\%$, $A^- \geq 90.0\%$, $B^+ \geq 86.0\%$, $B \geq 82.0\%$, $B^- \geq 80.0\%$
- $C^+ \geq 75.0\%$, $C \geq 65.0\%$, $C^- \geq 60.0\%$, $D^+ \geq 56.0\%$, $D \geq 52.0\%$, $D^- \geq 50.0\%$, $F < 50.0\%$

Precise cut-offs may differ by $\pm 1.0\%$ of the above listed numbers, and are determined only after all points for have been totaled. Also I reserve the right to raise the grade of any student by 1.0% increase for **consistently** outstanding work (including preparation, lab work, and lab reports.)

You must take the final exam to pass the course.

Classroom Protocol:

Because this is a laboratory class, and one in which we work with hazardous materials, **coming to lab prepared and on time are an essential elements for success and safety in the course.** If you come unprepared and/or are tardy such that you missed the safety discussion, you may be asked to leave.
and given a grade of fail for that particular experiment. Attention to the lab work is essential for safety reasons. **No cell phones or use of ear buds with any devices will be allowed in the laboratory.**

**Laboratory Safety:** Please find Department policies regarding safety in teaching labs on the chemistry website: [http://www.sjsu.edu/chemistry/](http://www.sjsu.edu/chemistry/). Please read it carefully! You must pass the safety quiz with 80% or up to be allowed to do the experiments in the lab! If you fail the safety quiz with less than 80%, you need to study the materials about the lab safety again, and you have chance to re-take the safety quiz one more time. Anyone who seriously or persistently disregards safety shall be withdrawn from the class with a grade of F.

Safety Goggles must be worn all the times as long as an experiment is still going on in the lab room and/or students have not put the wastes away and have not cleaned the glassware. Your instructor will announce when everyone could take off the goggles, and then we will use the time to do discussions for the lab report and next lab after all students are done for the experiment. **No open flame (no Bunsen burner) should be used when we use organic solvents**, such as acetone, dichloromethane, ether, alcohols, etc. In the lab, you should wear the clothes that cover my torso; wear long pants to cover whole legs; wear the shoes that cover all of your feet. **No eating, no drinking in the lab room.** If you spill small amount of chemicals in the hood, in balance pan, or in your bench, you have to clean it up immediately. For the large spill, you have to report to instructor immediately, and let safety person to clean it up. When pouring waste into a hazardous waste disposal container, you should read the label to ensure it is the correct container; check to make sure there is room in the container, if not, you should use the safety bucket to bring the waste bottle to lab service room, and get the empty waste bottle back. Please do not pour the waste to an almost full waste bottle to make it overflow. When you dilute acid, you should add acid to water. After you finish the lab, you have to clean up glassware, clean up your bench, put the glassware away, do the report, and waiting for the discussion session for the report and for the next week’s lab. **For more safety rules, please read the Department Safety Policies. You have to understand all safety rules before you start the lab work.**

**Attendance:** Because most presentations by the instructor will be done at the beginning of the period, you must attend laboratory regularly and on time. **No work is permitted during the presentations (lockers must be kept closed during presentations and discussion session).**

**Attendance is mandatory** in this laboratory course. Absence without a documented medical reason will result in a fail for that experiment. **There are only two sections of chem. 9 (both on Friday), and the lab is set up specifically for each experiment, so there can be almost no make-up work unless you could do make-up lab in another section on the same day.** I may allow for emergencies and other complications in life. Please show me the emergency evidence, such as a doctor’s note, a traffic citation, etc.

There will be adequate time for the well-prepared students to complete the work during scheduled hours. In other words, if you don’t do preparation well, you may not have enough time to finish the experiment. So please do your best to read the materials, finish the pre-lab questions, and to ask questions during the office hours.

**Service Center:** Your instructor does not make Service Center policy. However, the Service Center is essential to the smooth operation of our already overburdened laboratory facilities. Therefore, any student who behaves in an abusive, belligerent, or confrontational manner toward the Service Center personnel
shall be considered to be disrupting the class and will face academic and/or administrative sanctions according to University Policy #41301 (d) and (k).

**General Expectations, Rights and Responsibilities of the Student Policy:**

As members of the academic community, students accept both the rights and responsibilities incumbent upon all members of the institution. Students are encouraged to familiarize themselves with SJSU’s policies and practices pertaining to the procedures to follow if and when questions or concerns about a class arise. Please check University Policy S90-5 for more information. More detailed information on a variety of related topics is available in the SJSU catalog. In general, it is recommended that students begin by seeking clarification or discussing concerns with their instructor. If such conversation is not possible, or if it does not serve to address the issue, it is recommended that the student contact the Department Chair as a next step.

**Safe and Respectful Community:**

We hope that the classroom and laboratory will serve as an environment that will promote learning and the development of new ideas, as well as be a safe and respectful community. Behavior that interferes with the normal academic function in a classroom or lab is unacceptable. Students exhibiting this behavior will be asked to leave the class. Examples of such behavior include

- a) Persistent interruptions or using disrespectful adjectives in response to the comments of others.
- b) The use of obscene or profane language.
- c) Yelling at classmates and/or faculty.
- d) Persistent and disruptive late arrival to or early departure from class without permission.
- e) Physical threats, harassing/bullying behavior, or personal insults (even when stated in a joking manner).
- f) Use of personal electronic devices such as pagers, cell phones, PDAs in class, unless it is part of the instructional activity.

**University Policies**

**Dropping and Adding:** Students are responsible for understanding the policies and procedures about add/drop, grade forgiveness (it states in what condition you can repeat the class), etc. Refer to current semester’s Catalog Policies section at [http://info.sjsu.edu/static/catalog/policies.html](http://info.sjsu.edu/static/catalog/policies.html). Add/drop deadlines can be found on the current academic year calendars document on the Academic Calendars webpage at [http://www.sjsu.edu/provost/services/academic_calendars/](http://www.sjsu.edu/provost/services/academic_calendars/). The Late Drop Policy is available at [http://www.sjsu.edu/aars/policies/latedrops/policy/](http://www.sjsu.edu/aars/policies/latedrops/policy/). Students should be aware of the current deadlines and penalties for dropping classes.

Information about the latest changes and news is available at the Advising Hub at [http://www.sjsu.edu/advising/](http://www.sjsu.edu/advising/).

**Consent for Recording of Class and Public Sharing of Instructor Material:**

University Policy S12-7, [http://www.sjsu.edu/senate/docs/S12-7.pdf](http://www.sjsu.edu/senate/docs/S12-7.pdf), requires students to obtain instructor’s permission to record the course.
“Common courtesy and professional behavior dictate that you notify someone when you are recording him/her. You must obtain the instructor’s permission to make audio or video recording in this class. Such permission allows the recordings to be used for your private, study purposes only. The recordings are the intellectual property of the instructor; you have not been given any rights to reproduce or distribute the material.”

- Please inform instructor prior to using the recording device.
- In classes where active participation of students or guests may be on the recording, permission of those students or guests should be obtained as well.

“Course material developed by the instructor is the intellectual property of the instructor and cannot be shared publicly without his/her approval. You may not publicly share or upload instructor generated material for this course such as exam questions, lecture notes, or homework solutions without instructor consent.”

Academic Integrity:

Your commitment, as a student, to learning is evidenced by your enrollment at San Jose State University. The University Academic Integrity Policy S07-2 at http://www.sjsu.edu/senate/docs/S07-2.pdf requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The Student Conduct and Ethical Development website is available at http://www.sjsu.edu/studentconduct/.

Campus Policy in Compliance with the American Disability Act:

If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during the office hours. Presidential Directive 97-03 at http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf requires that students with disabilities requesting accommodations must register with the Accessible Education Center (AEC) at http://www.sjsu.edu/aec to establish a record of their disability.

Accommodation to Student’ Religious Holidays:

San Jose State University shall provide accommodation on any graded class work or activities for students wishing to observe religious holidays when such observances required students to be absent from class. It is the responsibility of the student to inform the instructor, in writing, about such holidays before the add deadline at the start of each semester. If such holidays occur before the add deadline, the student must notify the instructor, in writing, at least three days before the date that he/she will be absent. It is the responsibility of the instructor to make every reasonable effort to honor the student request without penalty, and of the student to make up the work missed. See University Policy S14-7 at http://www.sjsu.edu/senate/docs/S14-7.pdf.

Course Requirements and Assignments:

Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction or preparation/studying or course related activities including but not
limited to labs, completing assignments, etc. More details about student workload can be found in University Policy S12-3 at [http://www.sjsu.edu/senate/docs/S12-3.pdf](http://www.sjsu.edu/senate/docs/S12-3.pdf).

### CHEM 9: TENTATIVE LAB SCHEDULE (SPRING 2017)

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Exp. # in HCHV text</th>
<th>Reading Pages from HCHV text</th>
<th>Prelab Due</th>
<th>Lab Reports Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wk 0: 1/27</td>
<td>Check in Safety Video</td>
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<tr>
<td>Wk 1: 2/3</td>
<td>Safety Quiz Lab 1A: Synthesis of Aspirin</td>
<td>21 (pp319-326) (Macroscale)</td>
<td>Macroscale on vi Intro (viii-x) page 319-326</td>
<td>Prelab 1A</td>
<td></td>
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<tr>
<td>Wk 2: 2/10</td>
<td>Lab 1B: Melting Point</td>
<td>1 (pp 1-10)</td>
<td>Page 1-5</td>
<td>Prelab 1B</td>
<td>Worksheet 1: Stoichiometry</td>
</tr>
<tr>
<td>Wk 3: 2/17</td>
<td>Lab 2: Recrystallization</td>
<td>2 (part. 5, Macroscale)</td>
<td>1,2 &amp; 5-Macroscale Page 11-13, 16</td>
<td>Prelab 2</td>
<td>Lab 1</td>
</tr>
<tr>
<td>Wk 4: 2/24</td>
<td>Lab 3: Extractive Separations (Continued)</td>
<td>4 (part. 4, Macroscale)</td>
<td>1,3 &amp; 5-Macroscale Page 33-38</td>
<td>Prelab 3</td>
<td>Lab 2</td>
</tr>
<tr>
<td>Wk 5: 3/3</td>
<td>Extractive Separations (Continued)</td>
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<td>Worksheet 2: Extraction flow diagram</td>
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<tr>
<td>Wk 6: 3/10</td>
<td>Lab 4: Isolation of Caffeine from Tea</td>
<td>5A, Handout</td>
<td>Part A (pp 47-49); Handout</td>
<td>Prelab 4</td>
<td>Lab 3</td>
</tr>
<tr>
<td>Wk 7: 3/17</td>
<td>Lab 5: Distillation</td>
<td>3, Handout</td>
<td>Page 23-28 Handout</td>
<td>Prelab 5</td>
<td>Lab 4</td>
</tr>
<tr>
<td>Wk 8: 3/24</td>
<td>Mid-Term Exam (to cover everything except Distillation lab)</td>
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<tr>
<td>Wk 9: 3/31</td>
<td>Spring Break</td>
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<tr>
<td>Wk 10: 4/7</td>
<td>Lab 6: Dry lab Infrared Spectroscopy</td>
<td>25A, Handout</td>
<td>Part A (pp 369-372); Handout</td>
<td>Prelab 6</td>
<td>Lab 5</td>
</tr>
<tr>
<td>Wk 11: 4/14</td>
<td>Lab 7: Thin Layer Chromatography (Analgesics)</td>
<td>6B (B3)</td>
<td>Intro, A1 (pp 59-60); B1 (pp 61-63); Handout</td>
<td>Prelab 7</td>
<td>Lab 6</td>
</tr>
<tr>
<td>Wk 12: 4/21</td>
<td>Lab 8: Dyeing Fabrics</td>
<td>24: (3, 5, and 6)</td>
<td>1-6 (pp 351-359); Handout</td>
<td>Prelab 8</td>
<td>Lab 7</td>
</tr>
<tr>
<td>Wk 13: 4/28</td>
<td>Lab 9: Reactions of Aldehydes and Ketones</td>
<td>15</td>
<td>A1,2; B4,5; C1,2; Handout</td>
<td>Prelab 9</td>
<td>Lab 8</td>
</tr>
<tr>
<td>Wk 14: 5/5</td>
<td>Lab 10: Synthesis of Soap</td>
<td>29, Handout</td>
<td>29A (pp 409-413); Handout</td>
<td>Prelab 10</td>
<td>Lab 9</td>
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<tr>
<td>Wk 15: 5/12</td>
<td>Check-Out Day</td>
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<td></td>
<td>Lab 10</td>
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<tr>
<td>Wk 17: 5/18</td>
<td>(THURSDAY) SECTION 2, FINAL – 12:15 – 14:30 PM</td>
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<tr>
<td>Wk 18: 5/22</td>
<td>(MONDAY) SECTION 1, FINAL – 7:15 – 9:30 AM</td>
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Important dates: 1) **Tuesday, February 7** Last day to drop courses without an entry on student's permanent record Last day to drop courses with adjustment of registration fees. 2) **Tuesday, February 14** Last day to add courses for Spring 2017; Last day to submit Instructor Drops. 3) **Wednesday, February 22** Enrollment census date. 4) **Tuesday, May 16** Spring 2017 - Last day of instruction. 5) **Wednesday, May 17** Study/Conference Day (no classes or exams) 5) **Thursday, May 18 - Wednesday, May 24** Spring 2017 final examinations. 6) **Friday, May 26** End of Spring Semester; Spring 2017 grades due from faculty (Preliminary) 7) **Wednesday, May 31** Initial Spring 2017 grades viewable on MySJSU