

Senior Project Guidelines
for
Chemistry and Biochemistry
Majors

Scheduling and Curriculum Committee
Department of Chemistry and Biochemistry

2006

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Senior Project Guidelines

I. RESPONSIBILITIES OF STUDENT

A. Choosing a senior project advisor – Role of Chemistry 459

A student will normally choose a project advisor either through course work with a faculty member, or by enrolling in Undergraduate Seminar, Chemistry 459. In Chemistry 459 students may consult with several faculty members to investigate potential projects. After selecting a project and a faculty advisor, all students will deliver an oral report over the goals and approaches to be used in their project. A student will also start a literature search related to their project and order necessary chemicals so they will be available when the project starts.

B. Types of senior projects you may experience at Cal Poly.

1. Laboratory research at Cal Poly

A student does laboratory research at Cal Poly under a faculty advisor. The student enrolls in Chemistry 401 during the laboratory phase of the project (C/NC grading), and then enrolls in Chemistry 461 to complete the written report of the project and to receive the final senior project grade.

2. Library literature review at Cal Poly

A student contacts a faculty advisor and completes a library literature review. The student enrolls in Chemistry 461, completes the written report and receives the final senior project grade.

3. Experience outside of Cal Poly

A student completes a laboratory experience external to Cal Poly (internship, summer program etc.). Upon returning to Cal Poly, the student enrolls in 461 to complete a report of their project and submit the report or their final senior project grade. A student must contact and receive approval from a faculty advisor prior to the research experience to receive the final senior project grade.

C. Enroll in the Appropriate Project Class: CHEM 401, 461, 463

Chemistry 401

Every quarter that you work on your project you will need to enroll in Advanced Undergraduate Research, CHEM 401. These courses are graded C/NC. To enroll in these courses go to the Chemistry Department where you will receive a card to be signed by your project advisor. Then, return the signed card to the office where you will receive the ePermit number to enroll by POWER. If you need more than one quarter to complete the work you may enroll in CHEM 401 up to 6 units but only 4U may be applied towards List A advanced Chemistry electives. If your project advisor is from another department (e.g. Biology), enroll in that department's senior project (e.g., Bio 462). A curriculum substitution can then be done between Bio 461/2 and CHEM 401, giving you credit for senior project.

Chemistry 461

Once the laboratory portion of the project is completed you will enroll in Chemistry 461, Senior Project Report. Within this course you will write a report of your project under supervision of your advisor and receive a grade for effective presentation of your research. A passing grade in this course completes the requirement for your senior project.

Chemistry 463

Chemistry 463 is taken when advanced research results in a poster or talk presentation in a public forum (e.g. national, state, or university conference). It is not required to pass your senior project.

Chemistry 200, 400

Chemistry 200 and 400 courses provide additional units you may apply to your chemistry electives, but they will not apply toward your senior project.

D. Literature Competency Requirement

To satisfy the chemical literature competency requirement of your senior project, you need to identify which chemical literature searching techniques you used in researching your project. For this requirement, you should indicate which of the search tools below were used for each of your references. This is normally indicated within the "Reference" section of your written report.

1. Chemical Abstracts Services (CAS): you may have used SciFinder, SciFinder Scholar, or STN (STN on the Web or STN Express) in order to access CAS.
2. Beilstein or Gmelin: these are accessed via Beilstein Commander.
3. Medline: PubMed, accessed from the NIH website, www.nih.lib
4. ACS Journals online: <http://pubs.acs.org>
5. Elsevier Journals online: <http://www.sciencedirect.com/>
6. Wiley Publications online:
<http://www3.interscience.wiley.com/cgi-bin/simplesearch>
7. Chemfinder: www.chemfinder.com
8. MSDS websites: a variety of these exist; the most common is <http://hazard.com/msds/>
9. Spectral Databases: the most common is
<http://www.aist.go.jp/RIODB/SDBS/menu-e.html>
10. Other: specify what other sources you used, including PolyCat and miscellaneous web sources (e.g., Google).

E. Chemical Request and Hazard Form

During Chemistry 459, you may be required to submit a Chemical Hazard Assessment Form (p. 10) to the Stockroom Manager. Prior to ordering chemicals you will need to familiarize yourself with hazards associated with the chemicals by logging onto the Vermont Safety Information Resources, Inc. site (<http://www.hazard.com/>) and click on "SIRI MSDS Index". The Material Safety

Data Sheet (MSDS) is accessible by typing in your chemical name and will display both chemical properties and hazards associated with your compound. Transfer the appropriate information onto the Assessment from prior to ordering the chemicals.

F. Meeting with your Advisor

Meet with your project advisor during the first week of the quarter during which you are enrolled in Senior Project. Generally, you will be required to spend an average of at least six hours a week working on the Senior Project. Do not enroll in Senior Project unless you are able to invest the time necessary to complete work on the project.

Prior to the start of your laboratory senior project, go to the C-wing stockroom to

1. Pick up paperwork explaining the key policy.
2. At this time a charge slip will be filled out and kept on file with the associated fee for a key not returned properly -- \$95.00.
3. Post a safety card, available from the Stockroom, outside your laboratory before you begin lab work.

G. Grading of the senior project – Chemistry 461 Project Report

Laboratory Projects

Laboratory projects often require two or more quarters of work before completion. Generally, students will enroll in Chemistry 201 or 401 while they are performing their lab work. Chemistry 201 and 401 are graded C/NC only and grades are assigned at the completion of each quarter. Once they have completed their lab work they will enroll in Chemistry 461 and write a report on their research (see section IV, below). Students have the 10-week quarter to complete their report and turn it in for grading to their advisor. This report will be graded for effective presentation of the goals, methods, and results of the project and will be given a letter grade.

Literature Research Projects

If a student has done literature research, she or he will enroll in Chemistry 461 and complete a report on the literature review (see H., below). This report will be graded for thoroughness of the literature search and effectiveness of presentation and will constitute the grade for the senior project.

See section IV for report formatting, section V for submission requirements to receive final grades, and pages 7 – 9 for samples of select report pages.

H. Checking out and cleaning up

Once your laboratory research work has been completed

1. Student sets up time for technical staff to check them out of their research space, **no later than Final exam week**. Clean all used areas of your lab. This includes the following:
 - wipe down lab benches
 - wash all glassware, no glassware in sinks or hoods
 - make sure Hazardous Waste jars are labeled
 - empty all associated reagents bottles and media from refrigerators
2. Pull all chemicals checked out from the stockroom and put together on lab bench for pickup by technical staff.
3. When you think you have completed the above, make an appointment with a technical staff member to check you out of lab – **no later than Final exam week**. Keep in mind that regular hours are 7:30-4:30 with an hour lunch usually between 11 a.m. – 12 noon.

Once you have been properly checked out of your project space, the technical staff person will remove your key card and you will be clear of the \$95.00 charge.

4. If student does not properly check out of lab space with technical staff, then fee of \$95.00 is charged to student through student accounts – no exceptions.

II. RESPONSIBILITIES OF THE SENIOR PROJECT ADVISOR

The Senior Project Advisor is expected to provide a meaningful but manageable project for the student and to insure the student understands the scope of the work to be done and their responsibilities. Usually, the advisor and the student will meet at an assigned time each week to monitor, discuss, and plan for continued progress of the project. The advisor will also ensure that proper safety is practiced during experimentation and may interact with staff to facilitate student use of equipment. Finally, the advisor will supervise the writing of the project report and provide editing of draft reports.

III. BUDGET GUIDELINES FOR SENIOR PROJECTS

Operating expenditure for one senior project student is \$150 per year, up to \$ 500 per quarter per faculty member. If necessary, your senior project advisor may consult with the Department Chair for additional funding.

IV. REPORT FORMATTING AND ORGANIZATION

A. Format Information

- Use any standard type font (i.e. Times, Courier, Arial) is acceptable, but unusual fonts (i.e. **Impact**, *Corsiva*) are not acceptable.
- Use only one side of the paper.
- Double space all text in paragraphs. Introduce extra spacing to emphasize headings, to separate quoted excerpts from other material, or to indicate breaks in the discussion.
- Margins should be 1-1/2 inches wide on the left side, 1 inch wide on the right, at the top, and at the bottom.
- Divide words properly - use a dictionary.
- Pagination should be indicated with Arabic numerals (1, 2, 3, 4, . . .) in the upper right hand corner of each page starting with the first manuscript page. Small Roman numerals (i, ii, iii, iv, etc.) are used to number pages preceding the manuscript (but not the title page).
- Tables and Figures should be imbedded within the text, not on separate pages. Each table should have a (i) consecutive number and (ii) a descriptive title above it.
- Structural formulas should be given consecutive Roman numerals.
- Footnotes should be avoided. When absolutely essential, they should be single-spaced, one font size smaller than the text, and separated from the text body by triple-spacing.
- Abbreviations should be identified after the first use of the full-length word(s) and used as little as possible.
- Cite references according to accepted practices. On-line sources for reference format include ACS guidelines (chemistry.library.wisc.edu/instruction/acstyle.html) and Modern Language Assoc guide (www.bedfordstmartins.com/online/cite5.html).

Be consistent in citing your references in the text of your report. To cite a reference, either use a number or the author and year at the end of the sentence (. . . end of sentence.⁸ or . . . end of sentence (Alben, 1968). A list of references (bibliography) should be arranged to conform to the style shown in the following examples.

Authors	- Publication - Title	Year	Volume	Pages
1. Alben, J.O., and Caughey, W.S.	<i>Biochemistry</i>	1965	7	175-183.
2. Antonini, E., and Brunori, M.,	Hemoglobin and Myoglobin in Their Reactions With Ligands; North Holland: New York, N.Y.,	1971.		
3. Jones, D.G. and Brown, R. A.,	<i>J. Amer. Chem. Soc.</i> ,	1974	55	1293-1298.
4. Caughey, W.S., in Hemes and Hemoproteins; Chance, B., Estabrook, R., and Yonetani, T. Ed.,	Academic Press: New York, N.Y.,	1966		pp 276-286.
5. Weisstein, E. W. Molecular Orbital Theory (accessed 12/15/03),	http://scienceworld.wolfram.com/chemistry/MolecularOrbitalTheory.html ,			part of Eric Weisstein's World of Science; http://scienceworld.wolfram.com/ .
6. Borman, S. Sucrose Synthesis Sets A Record.	<i>Chem. Eng. News</i> [Online]	1990		78, 52.

B. Organization of Report

In assembling the manuscript, the following order is an example. Consult your advisor for the preferred order.

Blank sheet of paper

Title page

Approval page

Table of contents

Text of manuscript

The first page of the text should have the project title as main heading, followed by first subheading (listed below).

Introduction

(include goal of project and background of previous work)

Experimental methods

Results

Discussion and Conclusion

Appendices

References

Examples of specific report pages are given on pages 9-11.

V. PROCEDURE FOR SUBMITTING SENIOR PROJECT REPORT

- A. Obtain advisor's approval of final printed copy of report.

If submitting to the library:

- B. If you or your instructor wants the senior project archived in the library, read on. Otherwise, skip to "E", below. Fill out **Senior Project Requirement Form** located on the web at http://lib.calpoly.edu/seniorprojects/seniorproject_reqform.pdf Make a copy, obtain your advisor's signature, and the department chair's signature.
- C. If you or your instructor wants the senior project archived in the library, read on. Otherwise, skip to "E", below. Pay \$12 project fee at the Cashier's Office, Administration Building 131E. Attach a copy of the receipt to the **Senior Project Requirement Form**. Deliver the form with the receipt to the Department of Chemistry and Biochemistry Office
- D. Go to <http://lib.calpoly.edu/seniorprojects/> and follow the directions for "How to Submit Your Senior Project".

If NOT submitting to the library:

- E. Deliver the original (or a good copy) to the department office.
- F. Your senior project package submitted to the department office should include:
1. an original (or good copy) report, unbound, with advisor's signature on the Approval page;
 2. Place in 2-prong cardboard binder (for three-hole punch paper, e.g., Acco) for your advisor.
 3. Type the title of the project, your name, and the year of submission on a label and apply the label to the cover of the folder.
- G. When you deliver your project to the Department of Chemistry and Biochemistry office, please fill out an alumni card. Let us know whenever you change your mailing address so that we can keep in touch via the department newsletter, inform you of reunions, or make you aware of other events of interest.
- H. Remind your advisor to submit a grade or grade change for your project.
- I. Check within 30 days to see if the grade has been recorded.

CONGRATULATIONS! YOU HAVE COMPLETED YOUR SENIOR PROJECT.

(Sample Title Page)

SYNTHESIS OF TAR

by

Wood B. Chemist

Department of Chemistry and Biochemistry
California Polytechnic State University
San Luis Obispo

2006

(Sample Approval Page)

SYNTHESIS OF TAR

Wood B. Chemist

Date Submitted

Project Advisor's Signature

Department Chair's Signature

Chem 401 Fall 2005, Winter 2006

Chem 461 Spring 2006

(Sample Table of Contents)

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CHEMICAL HAZARD ASSESSMENT FORM

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for Senior Project, Chem 200, 400, etc.
 CHEMISTRY & BIOCHEMISTRY DEPT.
 CALIFORNIA POLYTECHNIC STATE UNIVERSITY

NAME	DATE	COURSE
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List ALL chemicals required for this project, including "common" chemicals, and amounts required.
 Fill in all available safety data in the appropriate spaces.

CHEMICAL NAME					FORMULA	AMOUNT REQUESTED
PHYSICAL DATA					MAJOR HAZARDS	
bp	mp	Flash Point	Vapor	Autoignition Temp		
°C	°C	°F	Pressure	°F		
TOXICITY DATA					PERSONAL PROTECTIVE EQUIPMENT	
Carcinogen		Inhalation	Skin Contact	Ingestion		
IARC	NTP	LC50	LD50	LD50		
		species	species	species	DISPOSAL	

CHEMICAL NAME					FORMULA	AMOUNT REQUESTED
PHYSICAL DATA					MAJOR HAZARDS	
bp	mp	Flash Point	Vapor	Autoignition Temp		
°C	°C	°F	Pressure	°F		
TOXICITY DATA					PERSONAL PROTECTIVE EQUIPMENT	
Carcinogen		Inhalation	Skin Contact	Ingestion		
IARC	NTP	LC50	LD50	LD50		
		species	species	species	DISPOSAL	

Continue on the back of this sheet if necessary.

USE: Outline briefly what you intend to use these chemicals for.

CERTIFICATION :

I agree to follow department safety policies while using the materials listed on this form.

I will use appropriate personal protective equipment for these materials (as detailed for each material).

Student's Signature:	Date
Advisor's Signature:	Date

CHEMICAL NAME					FORMULA	AMOUNT REQUESTED
PHYSICAL DATA					MAJOR HAZARDS	
bp	mp	Flash Point	Vapor	Autoignition Temp		
°C	°C	°F	Pressure	°F		
TOXICITY DATA					PERSONAL PROTECTIVE EQUIPMENT	
Carcinogen		Inhalation	Skin Contact	Ingestion		
IARC	NTP	LC50	LD50	LD50		
		species	species	species		
					DISPOSAL	

CHEMICAL NAME					FORMULA	AMOUNT REQUESTED
PHYSICAL DATA					MAJOR HAZARDS	
bp	mp	Flash Point	Vapor	Autoignition Temp		
°C	°C	°F	Pressure	°F		
TOXICITY DATA					PERSONAL PROTECTIVE EQUIPMENT	
Carcinogen		Inhalation	Skin Contact	Ingestion		
IARC	NTP	LC50	LD50	LD50		
		species	species	species		
					DISPOSAL	

CHEMICAL NAME					FORMULA	AMOUNT REQUESTED
PHYSICAL DATA					MAJOR HAZARDS	
bp	mp	Flash Point	Vapor	Autoignition Temp		
°C	°C	°F	Pressure	°F		
TOXICITY DATA					PERSONAL PROTECTIVE EQUIPMENT	
Carcinogen		Inhalation	Skin Contact	Ingestion		
IARC	NTP	LC50	LD50	LD50		
		species	species	species		
					DISPOSAL	