

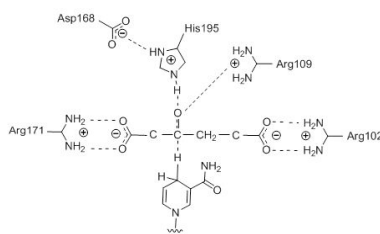
Chem 335

Biochemistry Lab

Spring 2014 Syllabus

Mon / Wed Dr. Joseph J. Provost
SCST 485 Phone 260-7564

Tues / Thur Dr. Margaret Daley
SCST 440 Phone 260-4781



Active site of and structure of MDH

Course Description and Concept: The course is an advanced laboratory course that focuses on techniques for the preparation and quantitative analysis of proteins and other biomolecules presenting students with a broad spectrum of techniques, approaches and concepts of contemporary biochemistry. The topics covered include DNA purification and analysis, protein quantification, enzyme purification, enzymatic characterization, chromatography, electrophoresis, immunological techniques, and spectroscopic analysis. This semester focuses on using a single protein in the context of a semester-long research project to drive student learning. The ability to think critically and independently in both the design and execution of an experiment is crucial for scientists. The best way that this can be learned is through hands-on research. This semester is designed to give students this experience all while learning crucial biochemical skills. The key principle for the student learning is that the project is to be research oriented; meaning that students will not replicate known experiments but instead create new knowledge and work toward a publication quality set of results. Students will be exposed to critical skills in the beginning of the semester and gradually released to work independently where the instructor acts more as a mentor or research advisor (PI) than instructor. Students will be given a choice of MDH and LDH clones, broadly suggested possible avenues of research to encourage and foster new and critical thinking. This will help ensure that the students explore and discover concepts through inquiry rather than simply achieve expected outcomes. Students will analyze their results using SDS-PAGE, western blotting techniques and an enzymatic analysis of the final purified protein.

Grades: Progress on Research Project 500 pts (50% of total grade)

For the project you will form groups of two or three and work as a team to learn the structure, function and important characteristics of malate dehydrogenase (MDH). You will research MDH, choose a clone of MDH, create a hypothesis on the structure or function of MDH, design an amino acid mutation to test your hypothesis, express and purify your protein then test your hypothesis. Depending on the project and progression of the project you could even publish your work! Although it may take a few semesters for that to happen. (See research project guidelines for detailed information.)

Laboratory Notebook 150 pts (15% of total grade)

Your laboratory notebook should be an accurate record of what you do in the lab, and should contain notes and calculations as well as appropriate comments to the lab you're working on. A major function of a lab notebook is to allow another competent scientist to reproduce exactly your experiment. (See lab notebook format document for detailed information.)

Homework and Assignments 350 pts (35% of total grade)

Homework assignments and lab report write-ups will be turned in throughout the semester and must be completed on time to be adequately prepared for the next lab period. See the detailed grade breakdown below and refer to the schedule of due dates provided. Late homework and assignments will not be accepted for a grade.

Grade Cut-Offs will be 90% (A), 80% (B), 70% (C), 60% (D), 50%(F)
(+ and – grades will be awarded within each range)
NOT TURNING IN A LAB BOOK WILL RESULT IN AN AUTOMATIC F.

Grade Breakdown:

<u>Progress on Research Project</u>	<u>Due Date (Mon-Wed/ Tue-Thr)</u>	<u>Points</u>
- Hypothesis and Literature Review/Search	Feb 10 / 11	25 pts
- Experimental Design I	Feb 24 / 25	25 pts
- Experimental Design II	Mar 5 / 6	25 pts
- Proposal Presentation	Mar 19 / 20	50 pts
- Progress Report with Instructor	Apr 14 / 15	25 pts
- Poster Presentation	During Finals	150 pts
- Completion of Research Goals		<u>200 pts</u>
	Total	500 pts
<u>Laboratory Notebook</u>		
- Notebook Check I	Feb 19 / 20	25 pts
- Notebook Check II	Mar 26 / 27	50 pts
- Notebook Check III	Turn in w/Poster	75 pts
	Total	150 pts
<u>Homework and Assignments</u>		
- Lab Math and Pipetting Expt	Jan 29 / 30	25 pts
- Buffer/pH Expt & Problem Set	Feb 3 / 4	20 pts
- Protein Assay Expt	Feb 5 / 6	20 pts
- Informatics and Pymol Assignment	Feb 17 / 18	35 pts
- MDH Enzyme Assay Expt	Feb 19 / 20	25 pts
- Figures and Figure Legends I	TBA	25 pts
- Figures and Figure Legends II	TBA	25 pts
- Expression and Purification Expt	Mar 5 / 6	50 pts
- Expression and Purification Problem Set	Mar 26 / 27	50 pts
- SDS Page & Western blot	Apr 7 / 8	25 pts
- Statistical Analysis Homework	Apr 28 / 29	<u>50 pts</u>
	Total	350 pts

Safety: Safety regulations require that all students working in laboratory receive training in the safe handling of any potentially dangerous chemicals or biohazards. The first day in lab will cover refresher training in the safe handling of these materials. For the most part this laboratory poses very little risk, however we will be using several chemicals that are potentially dangerous. A safety-training sheet will be signed at the beginning of the semester.

Attendance Policy: Attendance is mandatory since Chem 335 is a laboratory course. Excused absences can only include: 1. Official University or academically related event approved by your instructor, or 2. Illness, if you provide a doctor's note. For non-illness related absences you must inform the instructors at least 48 hours in advance, and provide supporting documentation. In the event of an unexcused absence from the laboratory, you will not be allowed to make up the session and you will not receive credit for that part of the lab. Continued, unexcused absence from class may result in a failing grade or you will be asked to withdraw from the class.

Academic Integrity: All students are expected to know and abide by USD's Academic Integrity Policy. Academic dishonesty will not be tolerated in any form.

Semester Plan – the schedule is tentative and will change based on the pace of the class.

Be prepared to adjust depending on how projects proceed.

Week	Day	Block	Activity Description	M/W	T/H
1	1	I	Intro, lab book, pipetting, solutions and dilutions	Jan 27	Jan 28
	2	I	Buffers, pH meters, spec & plate reader	Jan 29	Jan 30
2	3	I	Protein assay, intro to project/hypothesis & literature search on MDH	Feb 3	Feb 4
	4	II	Proteomics, PyMol workshop, Informatics	Feb 5	Feb 6
3	5	II	Protein structure exercise	Feb 10	Feb 11
	6	III	MDH continuous and stop time assay	Feb 12	Feb 13
4	7	III	MDH continuous and stop time assay	Feb 17	Feb 18
	8	III	Experimental design & site directed mutagenesis planning (oligo design)	Feb 19	Feb 20
5	9	IV	Protein Expression and Purification Workshop	Feb 24	Feb 25
	10	IV	Expression of watermelon MDH I	Feb 26	Feb 27
6	11	IV	Expression of watermelon MDH II	March 3	March 4
	12	V	Site directed mutagenesis of MDH I	March 5	March 6
<i>Spring Break</i>					
7	13	V	Site directed mutagenesis of MDH II	March 17	March 18
	14	VI a	Independent project – expression and purification	March 19	March 20
8	15	VI a	Independent project – expression and purification	March 24	March 25
	16	VI a	Independent project – expression and purification	March 26	March 27
9	17	Gel	SDS PAGE and Western blot Analysis	March 31	April 1
	18	WB	Continue Western blot –	April 2	April 3
10	19	VI b	Independent project – test hypothesis	April 7	April 8
	20	VI b	Independent project – test hypothesis	April 9	April 10
11	21	VI b	Independent project – test hypothesis	April 14	April 15
	22/X	VI b	Independent project – test hypothesis	April 16	X
12	X/22	VI b	Independent project – test hypothesis	X	April 22
	23	VI b	Independent project – test hypothesis	April 23	April 24
13	24	VI b	Independent project – test hypothesis	April 28	April 29
	25	VI b	Independent project – test hypothesis	April 30	May 1
14	26	VI b	Independent project – test hypothesis	May 5	May 6
	27	VI b	Independent project – test hypothesis	May 7	May 8

- Last day May 12/May 13 clean up day

- Final Project Poster Presentation during assigned finals time for each laboratory section.