

SYLLABUS for BIOLOGY I LABORATORY (BIOL 1615, 1 cr)
Small World Initiative Authentic Research Experience
 Vernal only / Mondays and Wednesdays / 5:00 – 7:50 pm / Vernal, B120

INSTRUCTOR

Lianna Etchberger, Ph.D.
 Office- B221E in Vernal
 Telephone- (435) 722-1783
 Email- lianna.etchberger@usu.edu

**COURSE DESCRIPTION**

Biology I and Biology II (BIOL 1610 & BIOL 1620) and the associated laboratory courses (BIOL 1615 & BIOL 1625) comprise a year-long course sequence designed to prepare biological sciences majors for advanced studies in biology, including ecology, evolution, biochemistry, cell biology, genetics, and organismal biology. Because evolution is the central unifying concept for understanding biology and its sub-disciplines, its importance is emphasized in both courses as a framework for learning concepts. This course (Biology I & lab) focuses on major concepts in cell biology, energetics, genetics, and natural selection and how they fit into an evolutionary framework. Specific learning outcomes will be provided in class for each topic we discuss.

SMALL WORLD INITIATIVE: AUTHENTIC RESEARCH EXPERIENCE

This course will foster the development of your critical thinking skills including hypothesis testing, experimental design, data analysis and science communication. Students will participate in the *Small World Initiative* in this laboratory course. The Small World Initiative is an innovative undergraduate research collaborative that presents a unique combination of science education, scientific research, and science diplomacy. Using authentic scientific research as a driver, this initiative focuses on addressing a worldwide health threat, the diminishing supply of effective antibiotics. USU students will contribute to discovering new antibiotics from soil bacteria in the Uintah Basin. The research course is based on a course developed at Yale University, and will provide the venue for the investigation of biological and chemical soil diversity. It will also be a platform from which to teach a number of different biological concepts in the context of our introductory biology course. No matter what your future career may be, you will benefit from experiencing the process of scientific discovery this semester. To learn more about The Small World Initiative, go to <http://smallworldinitiative.org>

INSTRUCTOR'S OFFICE HOURS**Wednesdays & Thursdays, 12:00 – 1:00 pm**

These lunchtime office hours may not be accessible for everyone. Therefore, please feel free to call or stop by with questions or comments at any time you find me *in my office*. The best way to contact me is by *email* because I check my email each workday and will respond to you quickly.

MEETING TIMES- VERNAL ONLY**Mondays and Wednesdays, room B120**

Since lecture (BIOL 1610) and lab (BIOL 1615) are closely integrated, with the same student enrollment, and in the same room, we have flexibility with our schedule. Therefore, time scheduling for the courses is combined. Most meetings we will spend some time reviewing lecture material before transitioning to lab activities. Expect to spend a combined average per week of about 2 ½ hours in lecture, and 2 ½ hrs in lab.

COURSE FEE

Registration for this course requires payment of a \$95 lab fee. Because of reduced funding from the Utah state legislature, lab fees have become necessary to maintain a high quality learning experience and to ensure that you are exposed to state-of-the-art biological techniques. The fee is used to buy lab supplies and equipment for this course.

REQUIRED MATERIALS

1. **Small World Initiative Research Guide:** printed as a Course Reader and available from the USU bookstore
2. **Spiral carbonless-copy notebook** for lab: ISBN 9781930882355 or similar item

COURSE GOALS

The broad goals for this course are to help you:

- Begin to think like a biologist by recognizing “Big Ideas” in biology and developing skills used by biologists such as critical thinking and the scientific method
- Develop skills in working with basic laboratory apparatuses and procedures

COURSE OBJECTIVES AND EVALUATION

USU uses the Individual Development and Education Assessment (IDEA) student rating system as one measure of course evaluation. The IDEA Student Ratings system “looks at instruction in terms of its endgame. Rather than emphasizing teaching style or personality, the IDEA system focuses on student learning and the methods used to facilitate it.” (www.theideacenter.org) The IDEA learning objectives emphasized in this course are aligned with more specific course goals in the table below.

After successful completion of this course, students should be able to:

IDEA Center Learning Objectives	Course Learning Objectives Upon successful completion of this course you will be able to
Objective 1. Learn fundamental principles, generalizations, or theories	REMEMBERING, COMPREHENDING <ul style="list-style-type: none"> • Use appropriate terms to describe biological instruments, procedures and protocols
Objective 2. Learn to apply course material (to improve thinking, problem solving and decisions)	APPLYING, ANALYZING, EVALUATING, SYNTHESIZING <ul style="list-style-type: none"> • Apply the process of science <ul style="list-style-type: none"> ○ Design experiments to test hypotheses ○ Maintain an accurate laboratory notebook ○ Generate data ○ Predict experimental outcomes ○ Present data in appropriate format (table, graph, etc.) ○ Analyze and interpret data • Communicate research activities orally and in writing

COURSE STRUCTURE

I hope you are as excited as I am about our research project to discover new antibiotics this semester. Lab activities are meant to reinforce course content and to apply the scientific method. I will help you structure your learning. Learning is your responsibility.

You will keep careful notebooks, upload your data to an international database server, share results and questions with other students around the world, and present your research findings in poster format at our own research symposium. You are also expected to have excellent lab etiquette and clean up after yourself. If I feel that students are arriving in the lab unprepared, I will institute lab readiness quizzes at the start of lab to ensure that we make the most of our time. There will be times that you may want to check on your isolates, so the lab will be open outside of scheduled class time for this reason (more on this subject later). There will be NO MAKE-UP LABS *per se*, so make every effort to attend. See attendance policy below.

Lab Notebooks (science process)

Observation and organization are critical skills for conducting research. The *Small World Initiative* is a real research project with a worldwide community of undergraduate researchers. To this end, it is important to keep accurate records. This includes the upload of required information to the database, documenting experimental procedures in your lab notebook, and recording data. We will review best practices in recordkeeping at the start of class. The *SWI Student Research Guide* provides concepts, principles and prompts to guide you in your research. You are expected to use the Guide to prepare for each lab period.

Preparing for Lab

Upon arrival in the lab, you should have recorded (at least in draft form) the date, purpose/background and objective of the experiment, hypothesis / expected outcomes, and technique or protocol you will use. You will use a spiral notebook with pages that make carbonless copies allowing you to submit your work while maintaining a consistent record. You are expected to come to lab prepared; upon arrival in lab, I will sign your lab manual to confirm that you have thoughtfully completed the pre-lab sections.

Research Poster (science writing)

You will summarize the major findings of your drug-discovery project in the form of a research poster. As you move through the stages of your research project, you will gradually assemble the components of a scientific report: Background, Methods, Results & Discussion, and Literature Review. Periodically throughout the semester, you will submit drafts of these components as well as the final poster, and will receive feedback for improvement.

Rubrics will be provided to guide the development of your record keeping and data collection (notebook) and scientific communication (research poster and presentation) skills.

Small World Initiative Research Symposium (oral science communication)

Researchers often present preliminary data at research conferences. To simulate this experience at the end of the semester, we will hold our own research symposium for you to present your poster to the public. This will be an exciting event, so be sure to invite friends and family! Final details on schedule and venue will be determined in class with your.

GRADING

The laboratory skills you will be introduced to require many years to develop. Consider this course as a foundational, hands-on introduction to the process of science. I do not expect you to develop expertise in a single semester, but I do expect progress toward proficiency. A scale of proficiency for various criteria of a good notebook, and a good research poster, are provided in the rubrics. The rubrics will guide your development by providing clear performance expectations, as well as a framework for my feedback for improvement. You will be graded on individual effort and improvement over the semester (rather than expertise). I intend to make every effort to make this a fun and safe environment for learning from our mistakes.

	% Course Grade
Preparation, Etiquette, Clean-up	10
ESKAPE Pathogens Group Presentation & Other Assignments	20
Lab Notebooks	30
Research Poster	40
Total:	100

Course grading scale will be no stricter than:

Total Points Possible	Final Grade
93-100%	A
90-92%	A-
87-89%	B+
83-86%	B
80-82%	B-
77-79%	C+
73-76%	C
70-72%	C-
67-69%	D+
60-66%	D
Below 60%	F

Grading Standards.

- A - achievement that is outstanding relative to the level necessary to meet course requirements.
- B - achievement that is significantly above the level necessary to meet course requirements.
- C - achievement that meets the course requirements in every respect.
- D - achievement that is worthy of credit even though it fails to meet fully the course requirements.
- F - represents failure (or no credit) and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit, or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I grade.
- I (Incomplete) - assigned at the discretion of the instructor when, due to extraordinary circumstances (e.g., hospitalization), a student is prevented from completing the work of the course on time.

COURSE POLICIES

Safety

Safety in the laboratory is of utmost importance. We will be trained in safety practices and we will wear provided personal protective equipment (PPE). You may wish to purchase your own eye protection or lab coat, but please check w/ the instructor before purchasing to be sure specific standards are met.

Attendance

Attendance is very important to be successful in this course. There will be NO MAKE-UP LABS. If you should miss a lab activity, then you will be behind in your research project. You are expected to catch up on any missed work on your project, and to talk to your biology-buddy to see what you missed. Excused absences require documentation of an emergency. You are granted two unexcused absences (without documentation). Additional unexcused absences result in loss of lab credit (loss of participation, etiquette and cleanup points).

Late submission of assignments

Without prior arrangement at least 24 hours in advance, I will deduct 10% of the assignment value for each day an assignment is late. For example, if you turn in an assignment two days late, I will deduct 20% prior to grading.

Use of mobile devices in class

Digital images of your data are useful for your lab notebook and research poster. However, there is a very high risk of contaminating personal electronic devices used in lab. Therefore, you may ask me to capture images. Alternatively, you may receive training on how to use your own device in a sealed plastic bag that is decontaminated prior to removal.

UNIVERSITY POLICIES

Policies for Students with Disabilities, Withdrawl and Incomplete Grades, Plagiarism, Academic Integrity and others can be found in the **USU Student Policy Manual** at

<http://catalog.usu.edu/content.php?catoid=12&navoid=3587>

Policies of particular relevance are highlighted in the BIOL 1610 syllabus.

DETAILED Biology I (BIOL 1610 + BIOL 1615) Course Schedule - Subject to Change

L. Etchberger, Fall 2016
M & W, 5:00 – 7:50, B120

Biology: How Life Works by Morris *et al.* 2nd edition (2016), W.H. Freeman Press
Small World Initiative: Student Research Guide & Protocols, 3rd edition (2015)

Wk	Date	Ch [^]	Topic (Tentative)	RQ	Small World Initiative Lab	PreLab	Assessment Due Dates
1	M 8/29		Orientation & Learning Strategies		SWI Introduction & Consent		
	W 8/31	1	Life (Foundations)		Lab Safety / Primary Lit.		Scientific Lit. Discn. (F)
2	M 9/5	<i>Labor Day Holiday- No Class</i>					
	W 9/7	2	The Molecules of Life	2	1- Exploring dirt transfers		Citations Quiz & Primary Lit. (F)
3	M 9/12	3	Nucleic Acids and Biol. Info.	3	2- Soil: choose your sample	2	
	W 9/14	4	Translation and Protein Structure	4	BRING SOIL SAMPLES on Wed 3- Isolate single colonies	3	Exam 1 (Chs 1-4) TC F-Sat
4	M 9/19*	5	Organizing Principles	5	4- Choose your growth conditions	4	Serial Dilutions
	W 9/21	6	Making Life Work (Energy)	6	-		
5	M 9/26	7	Cellular Respiration	7	5- Isolate unique colonies	5	
	W 9/28	"	"		-		
6	M 10/3	8	Photosynthesis	8	6- Meet the ESKAPE Pathogens 7- Screen for antibiotic producers	7	ESKAPE Group Presentations
	W 10/5	"	"		Streak for single colonies		Exam 2 (Chs 5-8) TC F-Sat
7	M 10/10	9	Cell Communication	9	"		
	W 10/12	10	Cell Form and Function	10	(Confirm Isolates/ Pure Culture)		
8	M 10/17	11	Cell Division	11	8- Initial identification of isolates	8	Research Introduction
	W 10/19	"	"		"		
9	M 10/24	12	DNA Replication and Manipulation	12	BLAST & Lit Review		Research Methods
	W 10/26	13	Genomes	13	9- Testing organic extracts	9	Exam 3 (Chs 9-13) TC F-Sat

Continued...

10	M 10/31	14	Mutation and DNA Repair	14	“		
	W 11/2	15	Genetic Variation	15	“		
11	M 11/7	16	Mendelian Inheritance	16	-		Research Results
	W 11/9	17	Beyond Mendel	17	Work on poster		
12	M 11/14	18	Complex Traits- Gen. & Environ.	18	-		Research Concl. & Lit
	W 11/16	TBA	Students’ choice (CH 19 or 20)	TBA	-		Exam 4 (Chs 14-TBA) TC F-Sat
13	M 11/21		No Class- Study & work on poster reviews		Lit Review		Poster draft for review
	W 11/23	<i>Thanksgiving Holiday- No Class</i>					
14	M 11/28	21	Evolution	21	No Lab		Poster Peer Evaluations Due
	W 11/30		“		-		Final Poster for printing
15	M 12/5	---	Gather Qs for Review		-		Poster Symposium
	W 12/7	---	Review Wed.		-		
Final Exam (Ch 21 + Comprehensive)- In Testing Center M-W, 12/14-16							

^ Be sure to read the textbook chapters AND have completed the online Reading Quiz BEFORE coming to class.

* Last day to drop classes without notification on transcript: M 9/19 at 5pm