BIOL 103 7382 Introduction to Biology (2168)

BIOL-103

Fall 2016  Section 7382  4 Credits  10/03/2016 to 11/27/2016

Faculty Contact

Kim Largen KLargen@faculty.umuc.edu

Course Description

(Not open to students who have completed BIOL 101 or BIOL 102. For students not majoring in a science. Fulfills the laboratory science requirement.) An introduction to the structure and function of living organisms. The aim is to apply the scientific method and use scientific and quantitative reasoning to make informed decisions about experimental results in the biological sciences. Topics include the chemical foundations of life, cell biology, genetics, evolution, ecosystems, and interdependence of living organisms. Discussion also covers the importance of the scientific method to biological inquiry and the impact of biological knowledge and technology on human societies. Laboratory activities emphasize the scientific method. Students may receive credit for only one of the following: BIOL 101-102, BIOL 103, BIOL 105, or BSCI 105.

Course Introduction

This course is an introductory course in biology, the study of life, in which we will explore unifying themes and concepts, including biodiversity, the principles of evolution that underlie biodiversity, and the criteria that serve to characterize life and living systems. We will also study concepts underlying the organization and interrelationships of living organisms through experiments based on the scientific method. Further discussion will also include how the scientific method and technological advances have led to the significant body of knowledge that now exists in biology as well as in all other scientific disciplines.

Living organisms are built from a very specific set of building blocks—atoms, molecules, and cells. We will begin with a study of these building blocks and their importance to living things. Next, we will examine the ways in which these building blocks interact to provide the energy living things need to develop, grow, move, work, and respond. The power and elegance of DNA and genes will be discussed, as well as their role in inheritance, human diseases, biodiversity, and evolution.

We will look at plants and animals to understand how atoms, molecules, and cells work together in balanced, interrelated systems that are critical to the health and well-being of living organisms. We will also look at the way in which living things interact with one another and with the nonliving parts of their environment. These interactions play a major role in the overall health of populations, ecosystems, and planet Earth.

In the laboratory portion of the course, we will apply the scientific method to scientific experiments, as well as to everyday questions and problems. Upon this foundation, the molecular and cellular processes common to all living organisms will be studied. We will then investigate scientific classification in the context of the importance of DNA to individual living organisms and to species of organisms as a whole. Finally, we will examine the interdependence of living organisms with each other and the environment, especially with respect to the impact of human populations on the environment and other organisms.

Course Outcomes

After completing this course, you should be able to

- recognize and explain how the scientific method is used to solve problems
- make observations and discriminate between scientific and pseudoscientific explanations
- weigh evidence and make decisions based on strengths and limitations of scientific knowledge and the scientific method
- use knowledge of biological principles, the scientific method, and appropriate technologies to ask relevant questions, develop hypotheses, design and conduct experiments, interpret results, and draw conclusions

Course Materials

Click to access your course materials information (http://webapps.umuc.edu/UqcmBook/BPage.cfm?C=BIOL%20103&S=7382&Sem=2168)

Grading Information

This course consists of the following graded items:

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<tr>
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<tr>
<td>Academic Integrity Tutorial (Quiz)</td>
<td>0.5%</td>
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<tr>
<td>Discussion Participation (7 @ 2% each)</td>
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<tr>
<td>Laboratory Assignments (7 @ 3.5% each)</td>
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<tr>
<td>OLI Quizzes (7 weekly average @ 3% each)</td>
<td>21%</td>
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<tr>
<td>Written assignment: Biology and Technology in the Real World</td>
<td>10%</td>
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<tr>
<td>Outline Final Applied Lab Project</td>
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<tr>
<td>Final Applied Lab Project</td>
<td>9%</td>
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<tr>
<td>Final Examination</td>
<td>20%</td>
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The grading scale, based on 100%, is as follows:

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<td>A</td>
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<td>C</td>
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<td>D</td>
<td>60-69%</td>
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Laboratory Assignment Grading:

- To obtain full credit you need to answer all questions in your own words and in full sentences, and demonstrate that you have completed and understood the laboratory exercise(s)/experiment(s) and the underlying biological concepts. Most lab assignments have several exercises/experiments, unless otherwise stated, you need to complete all parts of each lab assignment. If you get unexpected results, discuss and provide a possible explanation.
- The lab answer form also functions as a grading rubric. The value of each question/part of a question is indicated in red after each question. If you skip or incorrectly answer a question/part of a question, you know in advance what the impact will be on the grade for that lab exercise by looking at the point value for that question/part of a question.
- Points will also be subtracted for poor English, including more than a few spelling and grammatical errors.
- When applicable, points will be subtracted for missing references.

Late Submission Policy:

Illness, death, family emergency situations, and TDYs (for military members) are part of our lives, and if they occur during the course, I do not intend to penalize you for them. It is your responsibility, when you think things are in danger of getting out of hand, to keep me informed about what is going on, what the problem is, and how long it will interfere with your ability to concentrate on and participate in the course. I am certain that in most cases, some sort of accommodation can be reached that will allow you to continue and complete the course, but I must know what is going on. I have to hear about such difficulties before any deadlines are reached, let alone exceeded. You can always contact me by e-mail and provide appropriate documentation that confirms an emergency, and we can work something out.

All late submissions that have not been pre-announced will receive be penalized at the rate of 5% per calendar day for the first three days past the due date, no pro-rating, and 10% per calendar day beginning on the 4th day past the due date, no pro-rating. For example, if you submit on 9/20 an assignment that was due on 9/16, it is 4 days late and will be penalized 30% (5% for day 1, 5% for day 2, 10% for day 3 and 10% for day 4). If your assignment would have received a grade of 92% based on your on the accuracy and completeness of your answers, it will end up with a grade of 62% due to the late penalty (92% minus the 30% late penalty).

Extra Credit and Make-up Work Policy

- There will be no extra credit work assigned.
- There will be no make-up work assigned.

Academic Integrity Tutorial

Please visit UMUC’s Academic Integrity Tutorial

After completing the tutorial, take the quiz (at the end of tutorial) and submit the certificate in the assignment folder. You can either do a screenshot of the certificate (submit as a jpg file), or you can follow the instructions for “how to email your certificate”, use your own email address and then submit the received pdf document in the assignment folder. You will only receive a certificate when you score 90% or more, but you will be able to retake the quiz as many times as needed to get that score.

OLI Course Materials

In this course we will be using resources from Carnegie-Mellon University’s Open Learning Initiative (OLI). A link to the OLI Course Materials that we will be using is located under Content.

Each week you need to complete the OLI materials that are assigned. This means that you need to read all expository text, complete all learning activities (Learn By Doing, My Response, Did I Get This), take the assigned module quizzes, and complete the My Response questions at the end of each Unit as they are assigned.

OLI Quizzes
Each week you will receive a grade for the assigned quizzes in the OLI modules for that week. The OLI quiz grade for each week will count 3% towards your course grade. Note that "Unit level" quizzes are for your practice only and are not graded. You have two attempts to take each OLI quiz, and your highest score on each quiz will count towards your course grade.

Final Examination

The final examination will be a timed, unproctored final exam. You will have five hours to complete the final exam. Your Final Exam **will not be accepted** if submitted after the submission deadline of 11:59pm on Sunday, 11/27/16. The final exam may consist of multiple choice, fill-in-the-blank, matching, short answer, and essay questions.

Final Applied Lab Project

Demonstration of your knowledge of basic laboratory skills, experimental design, and/or data evaluation will be assessed by the submission of an applied final lab project. See Project Descriptions below for more details on this final project. Note the earlier deadline for the outline. The final applied project report is due by 11:59pm on Wednesday, 11/23/16.

Discussion Participation

By registering for a Web-based course, you have made a commitment to participate in your online course discussions as well as other online activities. Please plan to participate regularly. Participation for this course is defined as proactive involvement in weekly discussion conferences and/or answering discussion questions. This may require you to actively reflect on weekly reading assignments and to develop original ideas in your responses. You are expected to demonstrate critical thinking and your understanding of the content in the assigned readings as they relate to the issues identified in the discussion. You are expected to make your own contribution in a main topic as well as respond with value-added comments to at least two of your classmates. You are encouraged to respond to other students as well as to your instructor. You will note in the grading policy that your online discussion participation counts significantly toward your final grade.

You are expected to adhere to the general rules of online etiquette. It’s important to follow the guidelines of proper online etiquette to ensure good communication between you, your classmates and your instructors. Keep the five online etiquette tips below in mind during your online course:

1. Respect. Whether the class is online or on-site, respect is essential. It allows all involved parties to focus on the objective and prevents distracting disagreements. Be sure to use a polite tone, read before responding and be constructive with your criticism.
   It’s important to treat all online interactions the same as face-to-face interactions.
2. Use Proper Formatting, Punctuation and Grammar. The same rules of English apply in the online classroom setting. Capitalize letters when necessary, use appropriate punctuation and avoid using slang and abbreviations. You’ll not only make your posts easier to read; you’ll demonstrate your professionalism and personal value.
3. Be Careful. Because tone is difficult to convey online, sarcasm or humor can easily be misinterpreted. Though you may be tempted to joke around with your classmates, something written for a laugh may offend others. If you are unsure whether your message will be misconstrued, consider using an emoticon to lighten the tone.
4. Go to Your Instructor First. If you have a disagreement or issue with a fellow classmate, go to your instructor before the situation escalates. It’s best to make your instructor aware of the situation before it affects the classroom dynamics or the way you engage with your peers.
5. Stay on Topic, and Keep it Brief. Online classes require a lot of reading, and when responding, it may be difficult to decide where to start. Focus your comments into short topics to keep the conversation flowing. Avoid being too wordy, and instead say what you need to say without veering off topic.

To increase the possibility of you earning full credit for weekly participation, you must:

- Participate individually with meaningful and original comments in the dialogue of the posted discussion questions. (See Academic Policies for information about plagiarism.)
- Make a minimum of 3 posts per week instructor: One post must be your "personal response" to the weekly discussion topic. Then you must post comments on a minimum of two classmates' personal responses to the weekly discussion topic. Responses that
you post to a classmate's posting about YOUR weekly discussion personal response do not count toward your required weekly comments on two classmate's personal responses to the weekly discussion topic.

- Ensure your posted content is written in your own words. Repetitive (redundant) answers, copied articles or portions of articles from Web sites, books, magazines and so on will not count towards participation
- Cite properly and consistently and include all sources used for your responses

The due date for weekly discussion(s) is listed in the course schedule.

Do not put off your class work until the end of the week. The deadline for online classroom discussion participation is 11:59pm ET on the due date unless stated otherwise. You must participate in the classroom discussions before the stated deadline to receive credit.

What is “good” participation?

For discussion participation, what matters here is the quality of your responses, not quantity.

Here are some examples of good responses:

"Mary - you mention in your answer that human cloning is currently being investigated. In your research did you see any companies that were actually doing human cloning? I did not think that human cloning even a possibility in our lifetime. I think the government should regulate cloning practices of all animals to make sure that the science is not being used in a harmful or unethical way."

Another example:

"Joe, I really enjoyed reading your paper. I like the way that you formatted it, using pictures and tables to support your facts. The table you included about the increase in Flu deaths was very interesting - I did not realize that so many people die in other countries from something as simple as the flu!"

Your responses may include an observation, a counterexample, a suggestion, a statement of respectful disagreement, a solution, a question about the material or the process, an insight, an admission, an assent, an example, an idea, a corroboration, or a speculation. Remember to include your sources of information (if applicable)!

Here are some examples of inadequate responses/participation: "Good job, I liked your answers!" or, "Joe - I liked your paper very much!" or, "I agree!"

Any response that is intimidating, disrespectful, belittling and/or demeaning will not be tolerated and may be deleted.

Project Descriptions

Laboratory Assignments

Addresses course outcomes 1-4:

- recognize and explain how the scientific method is used to solve problems
- make observations and discriminate between scientific and pseudoscientific explanations
- weigh evidence and make decisions based on strengths and limitations of scientific knowledge and the scientific method
- use knowledge of biological principles, the scientific method, and appropriate technologies to ask relevant questions, develop hypotheses, design and conduct experiments, interpret results, and draw conclusions

You are required to submit the following 7 lab assignments:

Lab 1: Introduction to Science
Lab 2: Chemistry of Life
Preliminary **required** activities

When you receive your lab kit from Escience Labs, check it to make sure all components are provided and are in good working order. Escience Labs will replace any damaged items at no cost. Find their contact information in the UMUC Biology Lab Manual and at www.esciencelabs.com.

Before you start conducting your labs, please read the Lab Safety section of the UMUC Biology Lab Manual and watch the safety video.

**Photos Required!**

You are required to take pictures of your results in the experiments in labs 2, 3, 4, 5, and 7. Write your name and date on an index card (piece of paper) and include it within the picture. Insert the pictures as directed in the lab answer sheets. If you do not have access to a digital camera/phone please contact the professor to discuss alternatives.

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It is highly recommended that you adopt the following approach for each lab:

1. One or two weeks before the due date for a given lab, check the materials list for the lab and begin to gather the items that you will need. This practice will ensure that you will indeed have all the materials you need when you are ready to start the lab activity. Some labs require access to a stove or refrigerator (this will be indicated in the materials list).

1. Also, one or two weeks before the due date for a given lab, check the time necessary to complete the activity so that you can schedule your time accordingly. For example, some labs may be spread out over a couple of days or require two hours of work—these labs cannot be started an hour before they are due and successfully completed.

1. Before you begin a lab activity, download the lab manual and lab questions documents to your computer or portable device or print the lab activity from the online lab manual. This is important, because you will perform many of the lab activities away from the online environment, and you will want to have the detailed instructions and the lab questions in front of you as you perform the lab activity.

1. Read the assigned portion of the OLI site and the entire lab activity before you begin the activity. It is especially important that you read the directions to the activity before you actually perform the activity. In some cases, you may need to reuse materials in subsequent experiments. It is also a good idea to familiarize yourself with the questions that accompany each activity ahead of time so that you know what to look for and take note of while performing the activity.

1. Perform the lab activity, and while doing so, take thorough notes so that you will be able to answer the questions that accompany each activity. Remember to take a picture of your results. Optimally, you should answer lab experiment questions as you work your way through each component of the experiment.

1. Answer the questions that accompany each lab activity. You will be expected to submit your answers to your instructor as instructed.
IMPORTANT: To conduct your laboratory exercises, use the Laboratory Manual that is available in the LEO classroom.

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Submission Format:

For each lab assignment follow the instructions in the Lab Manual provided in under the Content tab. You will find one answer sheet for each lab (same questions as those in the lab manual). posted in association with the lab submission folder in each week’s conference. Type your answers directly in these documents. Once your lab is completed, save your document as “BIOL103 firstname lastname lab #.doc” (example”BIOL103 John Smith lab1.doc”), and submit your assignment document in the corresponding Assignment Folder.

Your collected data should be presented as specified in the laboratory manual and may be in the form of tables, graphs, diagrams, or narratives. You should be prepared to provide the images of graphs, diagrams, or sketches in the lab documents or as separate files. You can photograph or scan any images and embed them into your lab document. If you have any issues with graphics created within software packages, you can capture screen images. On the Macintosh use Command-Shift-4 to capture a portion of the screen; the image will be saved to the desktop. On IBM-PC clones (the PC), use CTRL-ALT-PrstScrn to capture an image into the memory and then paste it into the lab document.

Each laboratory assignment must be submitted no later than 11.59 PM ET on the due date listed in the Course Schedule.

Addresses course outcomes 1-4:

- recognize and explain how the scientific method is used to solve problems
- make observations and discriminate between scientific and pseudoscientific explanations
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- use knowledge of biological principles, the scientific method, and appropriate technologies to ask relevant questions, develop hypotheses, design and conduct experiments, interpret results, and draw conclusions

Lab 1: Introduction to Science

The scientific method will be introduced using problems that can be related to everyday life. Students will work through laboratory exercises in order to gain an understanding of the process of scientific inquiry. Complete both activities.

Time: 1 hour

Concepts to explore: Testable observations, Hypothesis, Null hypothesis, Experimental approach, Variables, Controls

Experiments: This lab includes several critical thinking exercises that test student knowledge of the scientific method.

Exercise 1: Data Interpretation
Exercise 2: Experimental Variables
Exercise 3: Testable Observations
Exercise 4: Conversion

No lab kit materials are required. You do not have to wait for the lab kit to complete this lab.

Lab 2: Chemistry of Life

Basic properties of the chemistry that underlies biology are explored in this lab. Students will determine the presence of biological macromolecules such as proteins and carbohydrates using reagents that change color in their presence.

Time: 2 1/2 hours

Additional materials needed:

- Experiment 1: egg white, hot water, tap water.
• Experiment 2: fork, knife, potato, onion, hot water bath, tap water.
• Experiment 3: four liquid household products to test (for example: lemon juice, shampoo).
• Cell phone/digital camera - picture required


Experiments:

Experiment 1: Testing for Proteins

• Students use the Biuret reagent to test for the presence of protein in egg white, gelatin, a glucose solution and water. Biuret reagent is normally blue but changes to pink when short peptides are present and to violet when longer polypeptides are present.

Experiment 2: Testing for Reducing Sugars

• Students use Benedict’s Reagent to test for reducing sugars such as glucose. When glucose reacts with copper present in the Benedict’s reagent an orange or red colored precipitate is formed.

Experiment 3: What Household Products are Acidic or Basic?

• Students will measure the pH of two provided solutions and four household products of their choice.

Lab 3: Cells Structure and Function

The structure and function of cells will be investigated. The properties of cellular membranes will also be studied, paying special attention to the selective passage of molecules in and out of living cells.

Time: 2 hours

Additional materials needed:

• Scissors, paper towels, tap water.
• Cell phone/digital camera - picture required

Concepts to explore: What is a cell? Prokaryotes, Eukaryotes, Cell structure, Function of cell structures

Experiments

Experiment 1: Identifying Cell Structures

• Students identify and label parts of the cell.

Experiment 2: Direction and Concentration Gradients

• Students use sucrose and dialysis tubing to develop and explore the effect of solute concentration on osmosis.

Lab 4: Enzymes

The properties of the enzymes are investigated in these experiments. Students will explore factors that can affect enzymatic activity.

Time: 90 minutes

Additional materials needed:

• Cutting board, 2 food products, kitchen knife, paper towels, saliva sample, hot water bath, tap water.
• Cell phone/digital camera - picture required

Concepts to explore: Enzymes, Selectivity, Catalysts, Activation energy, Activation site, Reaction sites, Activators, Inhibitors

Experiments

Experiment 1: Enzymes in Food
• Students investigate the presence of amylase in food using potassium iodide, a starch indicator. This indicator turns dark purple or black when starch is present.

Experiment 2: Effect of temperature on Enzyme Activity

• Students study the effect of temperature on the enzyme catalase.

Lab 5: Meiosis

This laboratory exercise explores the events of meiosis. Specifically, students will investigate how chromosomes change as they move through the stages of meiosis.

Time: 2 hours

Additional materials needed:

• Computer and internet access.
• Cell phone/digital camera - pictures required

Concepts to explore: Meiosis, Diploid cells, Haploid cells, Chromosomal crossover

Experiments

Experiment 1: Following Chromosomal DNA Movement

• Students use Pop-It beads to simulate the movement of chromosomes through the stages of meiosis.

Experiment 2: The Importance of Cell Cycle Control

• Differences between normal, controlled cell growth will be compared to abnormal uncontrolled cell growth. Karyotypic differences will be observed.

Lab 6: Taxonomy

The concept of taxonomy will be explored in this lab.

Time: 90 minutes

Additional materials needed: none.

Concepts to explore: Taxonomy, Linnaean system, Binomial nomenclature, Taxonomic vs. phylogenetic classifications

Experiments

Experiment 1: Dichotomous Key Practice

Experiment 2: Classification of Organisms

• Students use a decision tree to determine the kingdom of several organisms.

Lab 7: Ecological Interactions

Many factors contribute to whether an organism can thrive in a given environment. Each species has a range of tolerance that can determine whether the species is commonly observed or only observed rarely and under very specific environmental conditions. In this lab, you will explore one of the factors that impacts survival of living organisms: the acidity or alkalinity of soil and water.

Time: 1 hour plus 7 days for observation.

IMPORTANT: Seven (7) days of plant growth are needed to complete this experiment.

Additional materials needed:

• Paper towels, scissors, sunny location, tap water.
• Cell phone/digital camera - pictures required
Concepts to explore: Environmental impact on a living organism

Experiments

Experiment 1: Effects of pH on radish seed germination

- Students measure acidity and alkalinity of soil to determine the range of pH tolerance for the seed.

Grading:

- To obtain full credit you need to answer all questions in your own words and in full sentences, and demonstrate that you have completed and understood the laboratory exercise(s)/experiment(s) and the underlying biological concepts. Most lab assignments have several exercises/experiments, unless otherwise stated, you need to complete all parts of each lab assignment. If you get unexpected results, discuss and provide a possible explanation.
- The lab answer form also functions as a grading rubric. The value of each question/part of a question is indicated in red after each question. If you skip or incorrectly answer a question/part of a question, you know in advance what the impact will be on the grade for that lab exercise by looking at the point value for that question/part of a question.
- Points will be subtracted for poor English, including more than a few spelling and grammatical errors.
- When applicable, points will be subtracted for missing references.
- To obtain full credit you need must report your own original results, documented with at least one picture for each experiment/exercise (labs 2, 3, 4, 5, 7)

Late Submission Policy:

Illness, death, family emergency situations, and TDYs (for military members) are part of our lives, and if they occur during the course, I do not intend to penalize you for them. It is your responsibility, when you think things are in danger of getting out of hand, to keep me informed about what is going on, what the problem is, and how long it will interfere with your ability to concentrate on and participate in the course. I am certain that in most cases, some sort of accommodation can be reached that will allow you to continue and complete the course, but I must know what is going on. I have to hear about such difficulties before any deadlines are reached, let alone exceeded. You can always contact me by e-mail and provide appropriate documentation that confirms an emergency, and we can work something out.

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Written Assignment: Biology and Technology in the Real World

This assignment addresses course outcomes 1-4:

- recognize and explain how the scientific method is used to solve problems
- make observations and discriminate between scientific and pseudoscientific explanations
- weigh evidence and make decisions based on strengths and limitations of scientific knowledge and the scientific method
- use knowledge of biological principles, the scientific method, and appropriate technologies to ask relevant questions, develop hypotheses, design and conduct experiments, interpret results, and draw conclusions

1. Select one of the topics listed below.
2. Find at least two information sources related to the topic. You can find assistance with searching for articles at the UMUC Library Subject Guides at http://libguides.umuc.edu/science.
3. Write a 750-1500 word paper, excluding references and title page. You must read the information sources that you find and summarize the information in your own words, addressing each of the questions and expectations for your chosen topic. Extensive quotes from the article are discouraged. Use APA style for citing references, see https://www.umuc.edu/library/libhow/apa_tutorial.cfm.
4. Post your assignment to the Assignment folder by 11:59pm on Sunday, 11/13/16.
Topics (select one)

- **a) Genetically modified organisms (GMOs).** What is the purpose genetic engineering of crop plants and domestic animals? Briefly explain how GMOs are created. What foods in your supermarket contain GMOs? Are foods that contain GMOs safe for human consumption? What types of regulations exist for these foods? Clearly explain your reasoning for each answer. The following website from FDA regarding GMO regulation may be helpful: [http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm352067.htm](http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm352067.htm)

- **b) Stem cells.** Your friend had a spinal cord injury after a bad car accident. The medical team has decided that he is a good candidate for a clinical trial using stem cell therapy. Your friend has not had a biology course since high school, so you decide to write him a letter sharing your knowledge of stem cells. Include in your letter a description of the biology of stem cells and how these cells are unique from other cells. Contrast the different types of stem cells, including pros and cons of each. Explain how stems cells are can be used to treat diseases and injury, with special focus on spinal cord injuries. Conclude with your own opinion. The following website from NIH regarding stem cell research will be very helpful: [http://stemcells.nih.gov/info/basics/Pages/Default.aspx](http://stemcells.nih.gov/info/basics/Pages/Default.aspx)

- **c) Fracking (hydraulic fracturing) and tar sands (oil sands).** With society's dependence on nonrenewable fossil fuels, the oil & gas industry is turning to the use of hydraulic fracturing and tar (oil) sands to extract natural gas and oil respectively. A friend asks you "What's all this controversy in the news about fracking and tar sands?" Briefly explain to your friend how hydraulic fracturing and tar (oil) sands are used to obtain these fossil fuels. Then, in more detail, describe the environmental problems that may result from these processes and why they are controversial. Issues that may be addressed involves, but are not limited to, water, air and soil pollution, effects on human health, effects on other species and natural ecosystems. Finally, give your opinions on possible solutions to these environmental problems, with your reasoning backed by the references that you studied. The following websites from EPA may be helpful: [http://www2.epa.gov/hydraulicfracturing](http://www2.epa.gov/hydraulicfracturing)

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<th>Content Full credit: 40 points</th>
<th>Excellent (90-100%)</th>
<th>Good (75-89%)</th>
<th>Adequate (50-74%)</th>
<th>Unacceptable (0-59%)</th>
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<td>The information obtained from a minimum of three information sources is summarized clearly, accurately and well organized in your own words. All information sources are credible and relevant to the requirement for the chosen topic.</td>
<td>36-40 points</td>
<td>The information obtained from only two information sources is summarized and/or some minor issues with clarity, accuracy, and organization of information and/or one information source is not credible and/or relevant and/or more than a few direct quotes.</td>
<td>20-29 points</td>
<td>No information sources are summarized, and/or none of the sources are credible and relevant, and/or all direct quotes.</td>
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| Contribution 40 points | All questions and requirements for chosen topic are addressed and own ideas are expressed, analyzed and defended based on knowledge learned from literature research. | One of the questions or requirements for chosen topic is not addressed, and/or minimal description and analysis of own ideas, and/or minimal connection between own ideas and what is learned from literature research. | Several of the questions or requirements for chosen topic are not addressed, and/or missing description and analysis of own ideas, and/or no connection between own ideas and what is learned from literature search. | Most of the questions and requirements for chosen topic are not addressed and no description and analysis of own ideas. | 36-40 points | 30-35 points | 20-29 points | 0-19 points |

| Grammar/Spelling 10 points | Less than 3 minor spelling/grammatical errors | 4-7 minor spelling/grammatical errors | 8-12 spelling/grammatical errors | More than 13 spelling/grammatical errors. | 9-10 points | 7-8 points | 5-6 point | 0-4 points |
Final Exam (3 credit Lecture Component)

The Final Exam Addresses Course Outcomes 1-4:

- Recognize and explain how the scientific method is used to solve problems.
- Make observations and discriminate between scientific and pseudoscientific explanations.
- Weigh evidence and make decisions based on strengths and limitations of scientific knowledge and the scientific method.
- use knowledge of biological principles, the scientific method, and appropriate technologies to ask relevant questions, develop hypotheses, design and conduct experiments, interpret results, and draw conclusions

The timed, non-proctored, final examination represents the final assessment for the lecture portion of the class. You will have five hours to complete the final exam once started. Failure to submit the timed final exam by the deadline of 11:59pm on Sunday, 11/27/16 will result in your exam not being accepted. The final exam may consist of multiple choice, fill-in-the-blank, matching, short answer, and essay questions.

Final Applied Lab Project – Guidelines and Grading Rubric

Addresses course outcomes 1-5:

- apply the scientific method to scientific investigations
- state a scientific hypothesis and design a basic experiment
- conduct an experiment, make observations, and collect data
- use knowledge of biological principles to correctly interpret qualitative and quantitative information
- use critical analysis to draw conclusions

This is the culminating assessment for the lab component of BIOL 103. It is designed to assess your ability to apply the principles of the scientific method. For this project, you will complete the activity below. Make sure to address all points (questions) associated with the activity.

Design, conduct, and report on an experiment in which you will test the effect of an acidic fluid on enzymatic activity. (Recall: Enzymes are proteins.) If necessary, it may be useful for you to review the Scientific Method lab.

Please read this carefully: You read about and studied enzymes. Recall the following:

- enzymes are specific, meaning that a given enzyme can only catalyze its substrate
- enzyme function is very much related to its structure
- changes in factors, such as the following, can affect enzyme function (aka – activity)
  - temperature
  - pH
  - salinity

For this assignment, you must:
select an enzyme
know what its substrate is
know what the product(s) of the enzyme catalyzed reaction is
decide how you will determine and measure the activity of your enzyme (i.e. the production of bubbles)
select one or more acidic fluids (if your enzyme-substrate combination is catalase and hydrogen peroxide, then the hydrogen peroxide cannot count as one of your acid fluid fluids)
develop a hypothesis and conduct an experiment to determine whether or not your selected acidic fluid(s) has an effect on the activity of the enzyme you selected
explain the entire process in a report, formatted as explained below

Lab Materials

You may need the following, depending on your experimental design. Please understand that you do NOT have to use these materials. They are listed here because they are the materials that you used for the enzyme lab so they might be useful for this project – depending on how you design your experiment.

Materials in your lab kit:

• excess materials remaining from lab 4 (enzymes)

Additional materials you may need:

• plastic beakers or cups
• hydrogen peroxide solution *(from Lab 4)*
• yeast *(from Lab 4)*
• sample of fresh meat, about 1 cm cubed in size (unprocessed and uncooked, e.g., liver, steak, fish, or poultry—particularly organs)
• sample of fresh vegetable, about 1 cm cubed in size (e.g., potatoes or other root vegetables)
• a pen for labeling the beakers or cups
• a ruler with centimeter markings

Instructions:

1. Develop a testable hypothesis regarding the effect of an acidic fluid on enzyme activity.
2. Design an experiment to test your hypothesis. Make a list of all the materials you will need to conduct your experiment and then procure them. Record in advance all the steps you plan to take when executing the experiment. Design and prepare data tables in which you will record your data and observations while executing the experiment. Decide and make note of how you plan to analyze the data you collect.
3. Conduct the experiment. Record any modifications you had to make to the steps in the experiment as you execute them, including details pertaining to amounts or types of materials used. Record all data you collect and observations you make while executing the experiment.
4. Analyze your results (data and observations). As appropriate, calculate means, prepare summary data tables, refine how you will present your data in your report, prepare graphs of data, etc.
5. Use your knowledge of enzymes to interpret your results. It may be helpful for you to refer to your lab manual, textbook, or other sources.
6. Decide whether or not the data you collected supports your hypothesis. Determine whether or not you will accept or reject your hypothesis.
7. Formulate a conclusion about the effect of an acidic fluid on enzyme activity.
8. Prepare and submit a formal written report of your experiment. This will determine your grade for the final applied lab project. See the "report guidelines" below. A detailed grading rubric is available below.

Graded Products for this Assignment:

1. Outline (worth 1%, due at the end of week 5 by 11:59pm on 11/6/16)

Prepare an outline that includes the information below and submit it in the form of an MS Word document by the due date and time.

• Name of enzyme you will use, and its source (name of source organism if an organism is the source of your enzyme)
• The substrate
• How you will measure enzyme activity (method you will use for measuring enzyme activity)
What type of treatment you will use; type of solution(s), pH of solutions, length of exposure, how you will treat your samples

The control(s) in the experiment

Sample size

How you plan to present your data (table and/or type of graph)

Anything else you would like to get feedback on before you start your experiment.

2. Final Applied Lab Project Written Report (worth 9.5%, due on Wednesday of week 8 by 11:59pm on 11/23/16)

Final Applied Lab Project Report Guidelines:

The report must be typed, double-spaced, in Times Roman 12 point font, in paragraph form (not in bulleted or numbered form). It must contain the following sections, clearly labeled, addressing the content identified below:

Introduction: Include background information on the topic of enzyme activity in general and how it might be affected by an acidic fluid. Also include background on the specific enzyme-substrate combination you have selected and what is known about how it is affected by pH. Cite at least three sources using the APA format. Identify the question you were attempting to answer through the experiment and clearly state your hypothesis.

Methods: Provide, in paragraph form, a detailed account of the materials and methods used to conduct the experiment. IT IS NOT ACCEPTABLE to provide this information in the form of a numbered or bulleted list! This account should provide sufficient detail for someone else to repeat your experiment. Also include the methods for data collection and analysis. How did you collect your data? What data did you collect? How will you analyze the data?

Results: Provide a written summary (in paragraph form) of your results. Include in this section at least one data table containing the data you collected. If appropriate, include in this section and graphs that will help summarize your data. You must reference in this section all data tables and graphs that you include. That means you must say something like, “Table 1 summarizes the amount of gas produced over time for each treatment”. Do not interpret your results in this section, just present/summarize them.

Discussion: Use your knowledge of enzymes to analyze and interpret your results and describe (in paragraph form) that interpretation and analysis in this section. It may be helpful for you to refer to your lab manual, textbook, or other sources. Cite sources as appropriate. Indicate whether or not your hypothesis was supported by the results and whether or not you are accepting your hypothesis or rejecting it. Specifically tie the data you collected to the accepting or rejection of the hypothesis. Briefly state the conclusion about the effect of an acidic fluid on enzyme activity that you arrived at in response to the results of the experiment you conducted.

Avoid Plagiarism

It is very important to write with your own words. If you do copy one or two sentences directly (use sparingly), use quotation marks (“) around the copied text, followed by an in-text reference. All information sources need to be included in the reference list and as in-text references. Plagiarism will be reported to the proper UMUC authority. Guidance on how to avoid plagiarism can be found here: UMUC's How to Avoid Plagiarism

Submission

Submit your final applied lab project in the assignment folder by the due date specified in the course schedule.

Grading Rubrics:

Outline Grading Rubric: The outline will be graded based on the following criteria (100 points total):

To see full grading rubric - scroll to the right

<table>
<thead>
<tr>
<th></th>
<th>Excellent (90-100%)</th>
<th>Good (70-89%)</th>
<th>Adequate (60-69%)</th>
<th>Unsatisfactory (0-59%)</th>
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</tbody>
</table>
### Final Applied Lab Project Report Grading Rubric:

The final applied lab project report will be graded based on the following criteria (100 points total):

**NOTE:** Scroll down and to the right to see the entire grading rubric.

<table>
<thead>
<tr>
<th>% of Total</th>
<th>Section</th>
<th>Title = 1</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>1 = Title is present and all of the following conditions met 1) title is thoroughly descriptive of the experiment (for example, &quot;Effect of Rain Quantity and Frequency on Oak Tree Seedling Growth&quot;), 2) title located on a title page, 3) title page in correct format</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.75 = Title is present and thoroughly descriptive of experiment (for example, &quot;Effect of Rain on Tree Growth&quot;) and at least of the following conditions are present: 1) title not on a title page, 2) title page not in correct format</td>
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<tr>
<td></td>
<td></td>
<td>0.5 = Title is present but not thoroughly descriptive of experiment (for example, &quot;Effect of Rain on Tree Growth&quot;) and at least of the following conditions are present: 1) title not on a title page, 2) title page not in correct format</td>
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<tr>
<td></td>
<td></td>
<td>0.25 = Title is present but not thoroughly descriptive of experiment (for example, &quot;Effect of Rain on Tree Growth&quot;) and both of the following conditions are present: 1) title not on a title page, 2) title page not in correct format</td>
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<tr>
<td></td>
<td></td>
<td>0 = No title present</td>
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<tr>
<td></td>
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<td>0.5 = Summarizes main concepts of every section of the report</td>
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<tr>
<td></td>
<td></td>
<td>0.25 = Summarizes main concepts of some sections of the report</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 = No main concepts summarized, or abstract not present</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5 = Information is presented in the same order as the sections of the report are supposed to be arranged</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.25 = Information is presented in an order that is different from the order in which the report sections are supposed to occur</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 = Information order is irrelevant since abstract not present</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5 = Length of abstract</td>
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<tr>
<td></td>
<td></td>
<td>0.35 = Length of abstract is &lt; 1 page, double-spaced</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.25 = Length of abstract is &gt;1 page, single-spaced, or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 = Length is irrelevant since abstract not present</td>
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<table>
<thead>
<tr>
<th>90-100 points</th>
<th>Outline includes all the required components and planned experiment meets requirements for the assignment and is clearly and accurately described. Submitted on time.</th>
</tr>
</thead>
<tbody>
<tr>
<td>70-89 points</td>
<td>Outline missing one or two of the required components, and/or planned experiment does not meet one of requirements for the assignment and/or minor issues with clarity and accuracy.</td>
</tr>
<tr>
<td>60-69 points</td>
<td>Outline missing several of the required components, and/or planned experiment does not meet several of the requirements for the assignment and/or major issues with clarity and accuracy.</td>
</tr>
<tr>
<td>0-59 points</td>
<td>Outline missing most of the required components and planned experiment does not meet the requirements of the assignment.</td>
</tr>
</tbody>
</table>

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**Final Applied Lab Project Report Grading Rubric:**

- **100 points**
  - Due in week 5
  - Outline includes all the required components and planned experiment meets requirements for the assignment and is clearly and accurately described. Submitted on time.
- **90-100 points**
  - Outline missing one or two of the required components, and/or planned experiment does not meet one of requirements for the assignment and/or minor issues with clarity and accuracy.
- **70-89 points**
  - Outline missing several of the required components, and/or planned experiment does not meet several of the requirements for the assignment and/or major issues with clarity and accuracy.
- **60-69 points**
  - Outline missing most of the required components and planned experiment does not meet the requirements of the assignment.
- **0-59 points**
  - Final Applied Lab Project Report Grading Rubric: The final applied lab project report will be graded based on the following criteria (100 points total):

**NOTE:** Scroll down and to the right to see the entire grading rubric.
<table>
<thead>
<tr>
<th>% of Total</th>
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<tbody>
<tr>
<td>Introduction = 20</td>
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</table>

*Introduction should address the following questions: 1) what is the enzyme and substrate you are using, 2) what does the enzyme do and why is it important, 3) what is known, in general, about the effects of pH on enzyme activity, 4) what is known about the effect of pH specifically on the enzyme you are using, 5) what are the consequences to organisms, ecosystems, the environment of changes in the activity of your selected enzyme due to different pH conditions.*
<table>
<thead>
<tr>
<th>% of Total</th>
<th>Section</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Methods</td>
<td>13</td>
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</table>

| 6 | Concise, easy-to-follow description of materials and procedures provided in enough detail for experiment to be repeated, ALL in paragraph form |
| 4.2 | Concise, easy-to-follow description of materials and procedures provided in enough detail for experiment to be repeated, but all or some was provided in bulleted or numbered format |
| 3.0 | Description of materials and procedures was either not concise and easy to follow OR lacked sufficient detail for experiment to be repeated, in paragraph form |
| 1.8 | Description of materials and procedures was either not concise and easy to follow OR lacked sufficient detail for experiment to be repeated, but all or some was in bulleted or numbered format |
| 0 | No description of materials and procedures provided |

| 2 | Specifically described what data would be collected and when in the experiment it would collected |
| 1 | Did not completely describe the data that would be collected OR did not adequately describe when in the experiment it would be collected |
| 0 | No description of the data that would be collected or when it would be collected was provided |

| 2 | Describes how all data will be analyzed |
| 1 | Describes how some data will be analyzed |
| 0 | No description of how data will be analyzed provided |

| 3.0 | Quality of introduction described as "excellent" |
| 2.25 | Quality of introduction described as "above average" |
| 1.5 | Quality of introduction described as "average" |
| 0.75 | Quality of introduction described as "below average" |
| 0 | Quality absent since introduction not present |

<table>
<thead>
<tr>
<th>% of Total</th>
<th>Section</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Results</td>
<td>19</td>
</tr>
</tbody>
</table>

| 6 | Describes all main findings of experiment and cites all key pieces of data, in paragraph form |
| 5 | Describes at least ½ of main findings of experiment and cites at least ½ of key pieces of data, in paragraph form |
| 4 | Describes all main findings of experiment and cites all key pieces of data, in non-paragraph form |
| 3 | Describes <½ of main findings of experiment and cites <½ of key pieces of data, in paragraph form |
| 2 | Describes <½ of main findings of experiment and cites <½ of the key pieces of data, in non-paragraph form |
| 0 | Main findings of experiment were not described and no key pieces of data were cited |
| 3 | All data summarized in at least one table/figure (T/F), multiples arranged logically and numbered sequentially by type, section does not begin with T/F, all T/F are referenced by their number within paragraph portion of section |
| 2.4 | All data summarized in at least one table or figure (T/F), multiples arranged logically and numbered sequentially by type, section does not begin with T/F, all T/F are referenced in paragraph portion of section but not by their T/F number |
| 1.8 | All data summarized in at least one table or figure (T/F), and no more than two of following conditions present: not arranged logically, not numbered sequentially by type, section does not begin with T/F, all T/F are referenced by their number within paragraph portion of section |
| 1.2 | Part of data summarized in at least one table or figure (T/F), and more than two of following conditions present: not arranged logically, not numbered sequentially by type, section began with T/F, T/F not referenced at all in paragraph portion of section |
| 0.6 | Part of data summarized in at least one table or figure (T/F), and more than two of following conditions present: not arranged logically, not numbered sequentially by type, section began with T/F, T/F not referenced at all in paragraph portion of section |
| 0 | No data summarized in a table or figure |

| 4 | Table/figure format: Each table has above it a descriptive title that begins with “Table” followed by its number; each figure has below it a descriptive title that begins with “Figure” followed by its number; tables contain units in their row/column headings as appropriate; figures have on both axes labels, units and values |
| 3.6 | Table/figure format: No more than one of the following conditions present: title absent; title not descriptive; title in wrong place; title doesn’t begin with “Table…” or “Figure…”; units absent in tables; axis labels missing, axis units missing, axis values missing |
| 2.8 | Table/figure format: More than one but no more than three of the following conditions present: title absent; title not descriptive; title in wrong place; title doesn’t begin with “Table…” or “Figure…”; units absent in tables; axis labels missing, axis units missing, axis values missing |
| 2 | Table/figure format: More than three no more than five of the following conditions present: title absent; title not descriptive; title in wrong place; title doesn’t begin with “Table…” or “Figure…”; units absent in tables; axis labels missing, axis units missing, axis values missing |
| 1.2 | Table/figure format: More than five but not more than seven of the following conditions present: title absent; title not descriptive; title in wrong place; title doesn’t begin with “Table…” or “Figure…”; units absent in tables; axis labels missing, axis units missing, axis values missing |
| 0.5 | Table/figure format: More than seven of following conditions present: title absent; title not descriptive; title in wrong place; title doesn’t begin with “Table…” or “Figure…”; units absent in tables; axis labels missing, axis units missing, axis values missing |
| 0 | Table/figure format: No data summarized in a table or figure |

| 3 | No data interpretation |
| 2 | Less than two sentences devoted to data interpretation |
| 1 | Three to five sentences devoted to data interpretation |
| 0 | More than five sentences devoted to data interpretation |

| 3 | Quality of section described as “excellent” |
| 2.25 | Quality of section described as “above average” |
| 1.5 | Quality of section described as “average” |
| 0.75 | Quality of section described as “below average” |
| 0 | Quality absent since section not present |

Results Section Total
### Discussion = 28 – continued from previous page

<table>
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<th>% of Total</th>
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#### Data Interpretation

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<thead>
<tr>
<th>Score</th>
<th>Description</th>
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<tbody>
<tr>
<td>9</td>
<td>All data interpreted (in same order in which results were presented), by explaining how findings link to basic scientific concepts of the experiment and how they link to findings of other researchers</td>
</tr>
<tr>
<td>7.5</td>
<td>At least (\frac{3}{4}) of data interpreted (in same order in which results were presented), by explaining how findings link to basic scientific concepts of the experiment and how they link to findings of other researchers</td>
</tr>
<tr>
<td>6.5</td>
<td>At least (\frac{1}{2}) of data interpreted and at least one of the following conditions were present: interpretation was not in same order in which results were presented; no explanation of how findings link to basic scientific concepts of the experiment; no explanation of how findings link to those of other researchers</td>
</tr>
<tr>
<td>5.5</td>
<td>At least (\frac{1}{4}) of data interpreted and more than one of the following conditions were present: interpretation was not in same order in which results were presented; no explanation of how findings link to basic scientific concepts of the experiment; no explanation of how findings link to those of other researchers</td>
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<tr>
<td>4.5</td>
<td>(&lt;\frac{1}{4}) of data interpreted and more than one of the following conditions were present: interpretation was not in same order in which results were presented; no explanation of how findings link to basic scientific concepts of the experiment; no explanation of how findings link to those of other researchers</td>
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</tr>
<tr>
<td>1.5</td>
<td>(&lt;\frac{1}{2}) of data interpreted and one or more of the following conditions were present: interpretation was not in same order in which results were presented; no explanation of how findings link to basic scientific concepts of the experiment; no explanation of how findings link to those of other researchers</td>
</tr>
<tr>
<td>0</td>
<td>No data interpreted in context of explaining how findings relate to scientific concepts of the experiment and/or how findings relate to those of other researchers</td>
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<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>3</td>
<td>No new results were introduced here and no incidences of the reiteration of results being presented as interpretation of results</td>
</tr>
<tr>
<td>2.5</td>
<td>Two new results introduced here and/or two incidences of the reiteration of results being presented as interpretation of results</td>
</tr>
<tr>
<td>1.5</td>
<td>One new result (or &gt;1 incidences of the reiteration of results being presented as interpretation of results)</td>
</tr>
<tr>
<td>0.75</td>
<td>One or more hypotheses not re-stated but those re-stated were in incorrect format</td>
</tr>
<tr>
<td>0</td>
<td>No re-stated hypotheses</td>
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</table>

#### Data Presentation

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<tbody>
<tr>
<td>9</td>
<td>All data interpreted (in same order in which results were presented), by explaining how findings link to basic scientific concepts of the experiment and how they link to findings of other researchers</td>
</tr>
<tr>
<td>7.5</td>
<td>At least (\frac{3}{4}) of data interpreted (in same order in which results were presented), by explaining how findings link to basic scientific concepts of the experiment and how they link to findings of other researchers</td>
</tr>
<tr>
<td>6.5</td>
<td>At least (\frac{1}{2}) of data interpreted and at least one of the following conditions were present: interpretation was not in same order in which results were presented; no explanation of how findings link to basic scientific concepts of the experiment; no explanation of how findings link to those of other researchers</td>
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<tr>
<td>5.5</td>
<td>At least (\frac{1}{4}) of data interpreted and more than one of the following conditions were present: interpretation was not in same order in which results were presented; no explanation of how findings link to basic scientific concepts of the experiment; no explanation of how findings link to those of other researchers</td>
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<td>(&lt;\frac{1}{4}) of data interpreted and more than one of the following conditions were present: interpretation was not in same order in which results were presented; no explanation of how findings link to basic scientific concepts of the experiment; no explanation of how findings link to those of other researchers</td>
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<td>(&lt;\frac{1}{2}) of data interpreted and one or more of the following conditions were present: interpretation was not in same order in which results were presented; no explanation of how findings link to basic scientific concepts of the experiment; no explanation of how findings link to those of other researchers</td>
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<td>No data interpreted in context of explaining how findings relate to scientific concepts of the experiment and/or how findings relate to those of other researchers</td>
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#### Data Analysis

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<td>9</td>
<td>All hypotheses re-stated in the proper format</td>
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<tr>
<td>2.25</td>
<td>All hypotheses re-stated but incorrect format used</td>
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<tr>
<td>1.5</td>
<td>One or more hypotheses not re-stated but those re-stated were in proper format</td>
</tr>
<tr>
<td>0.75</td>
<td>One or more hypotheses not re-stated and those re-stated were in incorrect format</td>
</tr>
<tr>
<td>0</td>
<td>No hypotheses re-stated</td>
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#### Data Interpretation

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<th>Description</th>
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<tr>
<td>9</td>
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<tr>
<td>7.5</td>
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<tr>
<td>5.5</td>
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<tr>
<td>4.5</td>
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<tr>
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<td>(&lt;\frac{1}{2}) of data interpreted and one or more of the following conditions were present: interpretation was not in same order in which results were presented; no explanation of how findings link to basic scientific concepts of the experiment; no explanation of how findings link to those of other researchers</td>
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<tr>
<td>0</td>
<td>No data interpreted in context of explaining how findings relate to scientific concepts of the experiment and/or how findings relate to those of other researchers</td>
</tr>
<tr>
<td>General</td>
<td>Literature Cited</td>
</tr>
<tr>
<td>---------</td>
<td>-----------------</td>
</tr>
<tr>
<td>13</td>
<td>3</td>
</tr>
</tbody>
</table>

## Discussion Section Total

<table>
<thead>
<tr>
<th>Subsection</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5 = States whether or not the data supports all hypotheses and why/how</td>
<td>1.0 = States whether or not the data supports some hypotheses and why/how</td>
</tr>
<tr>
<td>1.5 = All conclusions that could be drawn from results were clearly stated</td>
<td>1 = All conclusions that could be drawn from results were stated, but not clearly</td>
</tr>
</tbody>
</table>

### Literature Cited Section Total

<table>
<thead>
<tr>
<th>Subsection</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5 = Lists at least three sources (not including lab manual) in APA format</td>
<td>1.25 = Lists at least three sources (not including lab manual) but not in APA format</td>
</tr>
<tr>
<td>1.5 = All listed sources are cited in body of report in proper format and all in-text citations are listed</td>
<td>1.0 = Only two of listed sources are cited in body of report in proper format and/or one in-text citation not included in list</td>
</tr>
</tbody>
</table>

### % of Total

<table>
<thead>
<tr>
<th>Subsection</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>13%</td>
</tr>
</tbody>
</table>

**Writing style**: All of the following conditions met; written in scientific style; correct tense (past) and person (not 1st) used throughout

**References**: There were 3 references cited in the report. All listed sources were cited in body of report in proper format and all in-text citations were included. However, there were some issues with the quality of section, where it was described as "below average". The discussion section was strong, stating conclusions and providing evidence from results. Further investigations that could/should be done to gather more information were suggested. Uncertainty that may have led to unclear results was mentioned, including sources of uncertainty that may have caused the negative result. Suggestions for improving current experiment were made, such as alternative explanations for positive or negative results. Overall, the quality of writing and documentation was described as "average".
<table>
<thead>
<tr>
<th>Section</th>
<th>Assessment Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 = All required sections are present and each has the appropriate section heading</td>
<td>0.75 = All required sections are present and no more than one appropriate section heading missing</td>
</tr>
<tr>
<td>0.35 = At least one required section is missing, or two or more appropriate section headings missing</td>
<td>0 = Two or more required sections are missing, or three or more appropriate section headings missing</td>
</tr>
<tr>
<td>3 = Sentence structure: Sentences 1) are extremely well developed sentences, 2) express ideas clearly, 3) are concise, and 4) flow well.</td>
<td>2 = Sentence structure: Most sentences 1) are extremely well developed sentences, 2) express ideas clearly, 3) are concise, and 4) flow well.</td>
</tr>
<tr>
<td>1 = Sentence structure: Less than ½ of sentences 1) are extremely well developed sentences, 2) express ideas clearly, 3) are concise, and 4) flow well.</td>
<td>0 = Sentence structure: Sentences don’t express ideas well and are poorly developed; sentence structure is sometimes so poor that it makes reading and understanding difficult; sentences would sound strange if read out loud.</td>
</tr>
<tr>
<td>4 = Grammar, punctuation, spelling: Writing is nearly error free. No more than two insignificant errors (doesn’t interfere with comprehension or distract from message) in entire paper and no significant errors that interfere with comprehension or distracts from message</td>
<td>2.5 = Grammar, punctuation, spelling: Writing contains insignificant errors that don’t interfere with comprehension or distract from message per page, and/or more than two significant errors that interfere with comprehension or distracts from message</td>
</tr>
<tr>
<td>1 = Grammar, punctuation, spelling: Writing contains &gt;3 insignificant errors (doesn’t interfere with comprehension or distract from message) per page, and/or more than two significant errors that interfere with comprehension or distracts from message</td>
<td>0 = Grammar, punctuation, spelling: Writing contains &gt;5 insignificant errors (doesn’t interfere with comprehension or distract from message) in entire paper, and/or more than two significant errors that interfere with comprehension or distracts from message</td>
</tr>
<tr>
<td>2 = Format: All of the following condition met: typed in Times New Roman font with size of 12 point, double-spaced (except abstract)</td>
<td>1.25 = Format: Incorrect font style or point size used, but still double-spaced (except abstract)</td>
</tr>
<tr>
<td>0.5 = Format: typed in Times New Roman font with size of 12 point, but not double-spaced (except abstract)</td>
<td>0 = Format: Incorrect font style and point size used and single-spaced throughout</td>
</tr>
</tbody>
</table>

General Section Total

Total (100 possible)

---

**Academic Policies**

**Academic Policies and Guidelines**

**ACADEMIC INTEGRITY**

As a member of the University of Maryland University College (UMUC) academic community that honors integrity and respect for others you are expected to maintain a high level of personal integrity in your academic work at all times. Your work should be original and must not be reused in other courses.

**CLASSROOM CIVILITY**

Students are expected to work together cooperatively, and treat fellow students and faculty with respect, showing professionalism and courtesy in all interactions. Please review the Code of Civility for more guidance on interacting in UMUC classrooms: [https://www.umuc.edu/students/support/studentlife/conduct/code.cfm](https://www.umuc.edu/students/support/studentlife/conduct/code.cfm).
POLICIES AND PROCEDURES

UMUC is committed to ensuring that all individuals are treated equally according to Policy 040.30 Affirmative Action, Equal Opportunity, and Sexual Harassment (https://www.umuc.edu/policies/adminpolicies/admin04030.cfm).

Students with disabilities who need accommodations in a course are encouraged to contact the Office of Accessibility Services (OAS) at accessibilityservices@umuc.edu, or call 800-888-UMUC (8682) or 240-684-2287.

The following academic policies and procedures apply to this course and your studies at UMUC.

150.25 Academic Dishonesty and Plagiarism (https://www.umuc.edu/policies/academicpolicies/aa15025.cfm) – UMUC defines academic dishonesty as the failure to maintain academic integrity. All charges of academic dishonesty will be brought in accordance with this Policy.

   Note: Your instructor may use Turnitin.com, an educational tool that helps identify and prevent plagiarism from Internet resources, by requiring you to submit assignments electronically. To learn more about the tool and options regarding the storage of your assignment in the Turnitin database go to: https://www.umuc.edu/library/libresources/turnitin.cfm.

151.00 Code of Student Conduct (https://www.umuc.edu/policies/studentpolicies/stud15100.cfm)

170.40 The following policies describe the requirements for the award of each degree:

   170.41 Degree Completion Requirements for the Graduate School (https://www.umuc.edu/policies/academicpolicies/aa17040.cfm)
   170.42 Degree Completion Requirements for a Bachelor’s Degree (https://www.umuc.edu/policies/academicpolicies/aa17041.cfm)
   Degree Completion Requirements for an Associate’s Degree (https://www.umuc.edu/policies/academicpolicies/aa17042.cfm)

170.71 Policy on Grade of Incomplete (https://www.umuc.edu/policies/academicpolicies/aa17071.cfm) - The grade of I is exceptional and only considered for students who have completed 60% of their coursework with a grade of B or better for graduate courses or C or better for undergraduate courses and request an I before the end of the term.


130.80 Procedures for Review of Alleged Arbitrary and Capricious Grading (https://www.umuc.edu/policies/academicpolicies/aa13080.cfm) – appeals may be made on final course grades as described herein.

205.06 Calculation Of Grade-Point Average (GPA) for Inclusion on Transcripts and Transcript Requests (https://www.umuc.edu/policies/academicpolicies/aa20506.cfm) – Note: Undergraduate and Graduate Schools have different Grading Policies (i.e. The Graduate School does not award the grade of D). See Course Syllabus for Grading Policies.

GRADING

According to UMUC's grading policy, the following marks are used:

<table>
<thead>
<tr>
<th>Undergraduate</th>
<th>Graduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90-100</td>
</tr>
<tr>
<td>B</td>
<td>80-89</td>
</tr>
<tr>
<td>C</td>
<td>70-79</td>
</tr>
<tr>
<td></td>
<td>70-79*</td>
</tr>
</tbody>
</table>
D 60-69  N/A**
F 59 or below  69 or below
FN Failure-Non attendance  Failure-Non attendance
G Grade Pending  Grade Pending
P Passing  Passing
S Satisfactory  Satisfactory
U Unsatisfactory  Unsatisfactory
I Incomplete  Incomplete
AU Audit  Audit
W Withdrew  Withdrew

* The grade of "B" represents the benchmark for The Graduate School. Students must maintain a Grade Point Average (GPA) of 3.0 or higher. Classes where final grade of C or F places a student on Academic Probation must be repeated.

** The Graduate School does not award the grade of D.

COURSE EVALUATION SURVEY

UMUC values its students' feedback. You will be asked to complete an online evaluation toward the end of the term. The primary purpose of this evaluation process is to assess the effectiveness of classroom instruction in order to provide the best learning experience possible and make continuous improvements to every class. Responses are kept confidential. Please take full advantage of this opportunity to provide your feedback.

LIBRARY SUPPORT

Extensive library resources and services are available online, 24 hours a day, seven days a week at https://www.umuc.edu/library/index.cfm to support you in your studies. The UMUC Library provides research assistance in creating search strategies, selecting relevant databases, and evaluating and citing resources in a variety of formats via its Ask a Librarian service at https://www.umuc.edu/library/libask/index.cfm.

LEARNING MANAGEMENT SYSTEM SUPPORT

To successfully navigate the online classroom new students are encouraged to view the Classroom Walkthrough under Help in the upper right menu of the LEO classroom. Those requiring technical assistance can access Help@UMUC Support directly in LEO under the Help menu. Additional technical support is available 24 hours a day, seven days a week via self-help and live chat at https://www.umuc.edu/help or by phone toll-free at 888-360-UMUC (8682).

SYLLABUS CHANGES

All items on this syllabus are subject to change at the discretion of the Instructor and the Office of Academic Affairs.

<table>
<thead>
<tr>
<th>Week</th>
<th>Readings/Assignments</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Week 0</td>
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<td></td>
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<tr>
<td>= 9/26-10/2</td>
<td></td>
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<tr>
<td>Pre-Course Week</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Order Lab Kit from eScience Labs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Verify OLI Access and do System Check (ungraded)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Read Syllabus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10/2/16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>by</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:59pm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 1</td>
<td>Read:</td>
<td>10/9/16</td>
</tr>
<tr>
<td>--------</td>
<td>----------------------------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>10/3-10/9</td>
<td>· Syllabus</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· OLI Unit 1: Modules 1 - 5 (and complete activities)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· OLI Unit 2: Modules 6 - 9 (and complete activities)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· Scientific Method Tutorial in Science Learning Center</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· eScience Lab Manual</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Lab manual appendix- Good Laboratory Techniques</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Lab 1: Introduction to Science</td>
<td></td>
</tr>
<tr>
<td>Do:</td>
<td>· Complete the Academic Integrity Tutorial, take the quiz, and</td>
<td></td>
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<tr>
<td></td>
<td>submit certificate (graded)</td>
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</tr>
<tr>
<td></td>
<td>· Scientific Method Tutorial (ungraded)</td>
<td></td>
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<tr>
<td></td>
<td>· VERIFY ACCESS to OLI - MANDATORY! (by 11:59pm Sunday, 10/2/16)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· OLI Quizzes for Modules 2, 3, 4, 7, 8, and 9 (graded)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· eScience Lab 1: Introduction to Science (graded)</td>
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<tr>
<td></td>
<td>· Participate in the Week 1 Discussion - &quot;The Scientific Method in</td>
<td></td>
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<tr>
<td></td>
<td>Everyday Life&quot; (graded)</td>
<td></td>
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<tr>
<td></td>
<td>· Participate in the &quot;Meet Each Other&quot; Introductions Discussion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(ungraded)</td>
<td></td>
</tr>
<tr>
<td>Concepts</td>
<td>· scientific method</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· experimental design</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· dependent and independent variable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· experimental and control groups</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· hypothesis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· science vs. pseudoscience</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· scientific reasoning</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· levels of organization</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· characteristics of life</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· interdependence of different parts of living systems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· chemistry</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o atoms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o molecules</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o chemical bonds</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· characteristics of water</td>
<td></td>
</tr>
<tr>
<td>Week 2 = 10/10-10/16</td>
<td>Read:</td>
<td>10/16/16</td>
</tr>
<tr>
<td>----------------------</td>
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</tr>
<tr>
<td></td>
<td>• OLI Unit 2: Modules 10 - 11 (and complete activities)</td>
<td>by 11:59pm</td>
</tr>
<tr>
<td></td>
<td>• OLI Unit 3: Modules 12 - 18 (and complete activities)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• eScience Lab Manual</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Lab 2: The Chemistry of Life</td>
<td></td>
</tr>
</tbody>
</table>

Do:

- OLI Quizzes for Modules 10, 13, 14, 15, 16, and 17 (graded)
- eScience Lab 2: The Chemistry of Life (graded)
- Participate in the Week 2 Discussion - "The Role/Importance of pH in the Function of a Household Substance" (graded)

Concepts

- pH, acids and bases
- Macromolecules
  - Carbohydrates
  - Proteins
  - Lipids
  - Nucleic acids
<table>
<thead>
<tr>
<th>Week 3</th>
<th>Read:</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/17-10/23</td>
<td>· OLI Unit 4: Modules 19 -23 (and complete activities)</td>
<td>10/23/16</td>
</tr>
<tr>
<td></td>
<td>· OLI Unit 5: Modules 24 - 26 (and complete activities)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· eScience Lab Manual</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Lab 3: Cell Structure and Function</td>
<td></td>
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<tr>
<td></td>
<td>Do:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· OLI Quizzes for Modules 20, 21, 22, 25, and 26 (graded)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· eScience Lab 3: Cell Structure and Function (graded)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· Participate in the Week 3 Discussion - &quot;Summarize and Explain Importance to Life of One of Nature's Metabolic Pathways&quot; (graded)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· Read through the Written Project &quot;Biology and Technology in the Real World&quot; Description and Grading Rubrics, select a topic, and begin your research (found in the syllabus or in Course Content) (this preliminary process is ungraded)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Concepts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· cell biology</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· membrane structure and function</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· energy</td>
<td></td>
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<tr>
<td></td>
<td>· photosynthesis</td>
<td></td>
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<tr>
<td></td>
<td>· cellular respiration</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Week 4</th>
<th>Read:</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/23-10/30</td>
<td>· OLI Unit 5: Modules 27 - 28 (and complete activities)</td>
<td>10/30/16</td>
</tr>
<tr>
<td></td>
<td>· OLI Unit 6: Modules 29 - 33 (and complete activities)</td>
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</tr>
<tr>
<td></td>
<td>· eScience Lab Manual</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Lab 4: Enzymes</td>
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<tr>
<td></td>
<td>Do:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· OLI Quizzes for Modules 27, 30, 31, and 32 (graded)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· eScience Lab 4: Enzymes (graded)</td>
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<tr>
<td></td>
<td>· Participate in the Week 4 Discussion - &quot;Benefit/Harm Based on the Presence, Absence or Quantity of an Enzyme&quot; (graded)</td>
<td></td>
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<tr>
<td></td>
<td>Concepts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· pathways and regulation</td>
<td></td>
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<tr>
<td></td>
<td>· chromosomes</td>
<td></td>
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<tr>
<td></td>
<td>· mitosis</td>
<td></td>
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<tr>
<td></td>
<td>· meiosis</td>
<td></td>
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<tr>
<td>Week 5</td>
<td>Read:</td>
<td>Deadline</td>
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<tr>
<td>----------------</td>
<td>----------------------------------------------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>10/31-11/6</td>
<td>· OLI Unit 7: Modules 34 - 37 (and complete activities)</td>
<td>by 11/6/16</td>
</tr>
<tr>
<td></td>
<td>· OLI Unit 8: Modules 39 - 41, 44 (and complete activities)</td>
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<tr>
<td></td>
<td>· OLI Unit 8: Modules 42 - 43 (optional)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· eScience Lab Manual</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· Lab 5: Meiosis</td>
<td></td>
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</tbody>
</table>

|                  | Do:                                                                  |                   |
|                  | · OLI Quizzes for Modules 35, 36, 37, 40 and 41 (graded)            |                   |
|                  | · eScience Lab 5: Meiosis (graded)                                   |                   |
|                  | · Participate in the Week 5 Discussion - "Chromosomal-based Disease/disorder" (graded) |                   |
|                  |   · Submit outline for Final Applied Lab Project (graded)           |                   |
|                  |   · Make sure you have picked your topic and are working on researching and writing the written assignment due at the end of week 6 (this part of the assignment is ungraded) |                   |

<p>|                  | Concepts                                                             |                   |
|                  | · inheritance                                                        |                   |
|                  | · DNA function                                                        |                   |
|                  | · gene expression                                                     |                   |</p>
<table>
<thead>
<tr>
<th>Week 6</th>
<th>Read:</th>
<th>11/13/16</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/7-11/13</td>
<td>- OLI Unit 9: Modules 45 - 48 (and complete activities) by 11:59pm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- eScience Lab Manual</td>
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<tr>
<td></td>
<td>- Lab 6: Taxonomy</td>
<td></td>
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<tr>
<td>Do:</td>
<td>- OLI Quizzes for Modules 45, 46, and 47 (graded)</td>
<td></td>
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<tr>
<td></td>
<td>- eScience Lab 6: Taxonomy (graded)</td>
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<tr>
<td></td>
<td>- Participate in the Week 6 Discussion - &quot;Classification in Everyday Life&quot; (graded)</td>
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<tr>
<td></td>
<td>- Written Assignment: Biology and Technology in the Real World (graded)</td>
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<td>- (instructions and structuring questions can be found in the Project Descriptions section of the syllabus and in the Course Content)</td>
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<tr>
<td></td>
<td>- Start eScience Lab 7: Ecology of Organisms towards the end of this week because this lab takes a full 7 days to complete - NO extensions will be given due to poor planning on your part! (this process of starting the lab is ungraded)</td>
<td></td>
</tr>
<tr>
<td>Concepts</td>
<td>- phylogenetic trees</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- evolution</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- natural selection</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- biodiversity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- taxonomy</td>
<td></td>
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<tr>
<td>Week 7</td>
<td>Read:</td>
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<tr>
<td>--------</td>
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<td></td>
</tr>
</tbody>
</table>
| 11/14- 11/20 | - OLI Unit 10: Modules 49 - 54 (and complete activities)  
- eScience Lab Manual  
  Lab 7: Ecology of Organisms |
| 11/20/16 | 11:59pm |

**Do:**
- OLI Quizzes for Modules 50, 51, 52, and 53 (graded)
- eScience Lab 7: Ecology of Organisms (graded)
- Participate in the Week 7 Discussion - "The Effect on a Lifeform of a Human Impact on the Environment" (graded)
- Start working on Applied Final Lab Project (see Project Descriptions section of the syllabus for details) (this preliminary work on the project is ungraded)

**Concepts**
- ecology
- populations
- community
- ecosystems
- interdependence of parts of living systems
- human impact on the environment

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<th>Week 8</th>
<th>Do:</th>
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| 11/21- 11/27 | - Applied Lab Final Project - DUE 11:59pm Wednesday, 11/23/16 (see Project Descriptions section of the syllabus for details) (graded)  
- Final Examination - DUE 11:59pm Sunday, 11/27/16 (graded)  
  - see Grading Criteria and Project Descriptions sections of the syllabus for information of the availability and due date of the final exam  
  - Final exam will become available in the Week 8 conference at 12:01am on 11/24/16 |
| 11/23/16 | 11:59pm |

**Classroom Walkthrough Videos Link**

Students also have access to a calendar tool on the course homepage within the classroom.