BIOL 103 7381 Introduction to Biology (2172)

BIOL-103

Spring 2017  Section 7381  4 Credits  02/20/2017 to 04/16/2017

Faculty Contact

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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=7381&Sem=2172)

Grading Information

This course consists of the following graded items:

<table>
<thead>
<tr>
<th>Graded Item</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Academic Integrity Tutorial (Quiz)</td>
<td>0.5%</td>
</tr>
<tr>
<td>Syllabus Quiz</td>
<td>1%</td>
</tr>
<tr>
<td>Discussion Participation (7 @ 2% each)</td>
<td>14%</td>
</tr>
<tr>
<td>Laboratory Assignments (7 @ 3.5% each)</td>
<td>24.5%</td>
</tr>
<tr>
<td>Quizzes (7 @ 3% each)</td>
<td>21%</td>
</tr>
<tr>
<td>Written assignment: Biology and Technology in the Real World</td>
<td>10%</td>
</tr>
<tr>
<td>Outline Final Applied Lab Project</td>
<td>2%</td>
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<tr>
<td>Final Applied Lab Project</td>
<td>9%</td>
</tr>
<tr>
<td>Final Examination</td>
<td>18%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

Late Submission Policy

If you are unable to submit an assignment on time contact your professor before the submission deadline to ask for an extension. This does not guarantee that an extension will be granted and/or the professor may require documentation.

For assignments submitted late without a pre-approved extension:

• A penalty of 10% per week will be applied to lab assignments, writing assignments and quizzes
• Late participation in discussion topics will result in zero points
• Late submission of the final applied lab project and the final exam will not be accepted and result in zero points.

Extra Credit and Make-up Work Policy

• No opportunities for extra credit will be offered in this course
• No make-up work will be assigned in this course

Academic Integrity Tutorial

Please visit UMUC's Academic Integrity Tutorial (https://www.umuc.edu/writingcenter/plagiarism/index.cfm) (https://www.umuc.edu/writingcenter/plagiarism/index.cfm)

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.

Quizzes

Each of the 7 weekly quizzes consist of 20 multiple choice or multiple select questions. You will have 2 hours to complete each quiz once you start. Make sure you have 2 hours of uninterrupted time before starting a quiz because you can not save a quiz and come back to finish it later.

Final Examination

The final examination will be a timed, unproctored final exam. You will have three (3) hours to complete the final exam. Your Final Exam **will not be accepted** if submitted after the submission deadline. 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.

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. One Main post and two comments to classmates. All posts should be unique and substantial and include citations in APA format.
- 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 |
| Lab 3: Cells Structure and Function |
| Lab 4: Enzymes |
| Lab 5: Meiosis |
| Lab 6: Taxonomy |
| Lab 7: Ecological Interactions |

**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.*

*Laboratory answer sheets for Labs 2, 3, 4, 5 and 7 that do not include photos will earn 0 (zero) credit. Photos must state your first and last name and include a date within this 8-week session.*

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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).

2. 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.

3. 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.

4. Read the assigned portion of the OpenStax textbook/Course Modules 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.

5. 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.

6. 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). 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
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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.
- 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 (labs 2, 3, 4, 5, 7)

**Late Submission Policy:** 10% will be subtracted for each week a lab assignment is submitted late, unless you have contacted the professor before the submission deadline and received an extension.

**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 three 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](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](https://www.umuc.edu/library/libhow/apa_tutorial.cfm).

4. Post your assignment to the Assignment folder by the due date listed in the course schedule.

**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.

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 stem cells can be used to treat diseases and injury, with special focus on spinal cord injuries. Conclude with your own opinion.

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.
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 3 (three) hours to complete the final exam once started. Failure to submit the timed final exam by the deadline 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 (1 credit Lab Component)

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

This is the culminating lab assessment in BIOL 103. It is designed to assess your ability to apply the principles of the scientific method.

The Effect of low pH on Enzyme Activity

Design an experiment in which you will test the effect of an acidic fluid on enzymatic activity. Recall: enzymes are proteins! To complete this project, it may be useful for you to first review the Scientific Method Tutorial, information about pH and enzymes in the text book and course modules, Lab 1 (Introduction to Science) and Lab 4 (Enzymes). As you review Lab 4, you will be reminded that there are several factors that impact enzymatic activity: pH, temperature, and amount of reagent. It is OK to use the same enzyme/substrate/method as you did in lab 4 (but modify the treatment), or you can search on-line to find a different enzyme/substrate/method for measuring enzyme activity for your project (include all references).

As you design your experiment for this project, please remember that you are trying to examine how an acidic fluid will modify the outcome of an enzymatic reaction. To successfully complete this project, you will need to identify the question(s) being asked in your experiment and the hypothesis that you are testing. In your experimental design, you must clearly explain what you are doing. That means that you will need to identify the enzyme, the substrate, the acidic fluid used as treatment, the control treatment and the
method of measuring enzyme activity, as well as explain your experimental protocol. You must also thoroughly explain how the acidic fluid impacted enzyme activity based on the results from your own experiment as well as knowledge of enzymes and pH from the textbook, modules, lab manual and potentially additional information sources.

*Hint:* Keep in mind that the acid will change the environmental conditions of the experiment (for example, a low pH value could change the shape of the active site on the enzyme protein), without directly participating in the reaction.

Lab Materials

You *may* need all or some of the following, depending on your experimental design:

Materials from your lab kit:

- pH paper
- hydrogen peroxide solution (you can purchase this at a pharmacy if you have used up the bottle that came with the lab kit)
- plastic beakers or cups
- vinegar
- yeast (can be purchased at grocery store if more is needed)
- balloons
- plastic bottle
- marker for labeling of beakers
- Cell phone/digital camera - pictures required

You may choose to use additional materials (different acidic fluids and/or different organisms and/or different substrate if you chose an enzyme other than catalase).

Outline:

Include the following in your outline:

- Name of enzyme you will use
- Name of organism (if applicable)
- The substrate and products in the chemical reaction
- Method for measuring enzyme activity
- Treatment: acidic fluid(s), pH, length of exposure, how you will treat your samples
- The control(s) in the experiment
- Hypothesis
- How you will present your data (table and/or type of graph)
- Anything else you would like to get feedback on before you start your experiment

Write a lab report that includes the following:

1. Title page: descriptive title, your name, course name, semester

2. Introduction: general background information about enzymes and specific information about your chosen enzyme, the question(s) that you are asking and a clear hypothesis for your experiment (20 points).

3. Design an experiment. Provide a detailed description of the materials and methods used to conduct the experiment. Identify control and experimental samples, as well as independent and dependent variables. Also include the methods used for data collection and analysis (20 points).

4. Conduct the experiment and record your results. Take picture of results. What did you observe? Present your data in table and/or graph format. Remember to label everything and include the unit of measure with all numbers (20 points).

5. Use your knowledge of enzymes and pH to interpret and discuss your results. It may be necessary for you to refer to the text book and course modules, lab manual and/or use additional information resources. What effect does the acidic treatment have on enzyme activity? Did you get the expected results? Explain. (20 points)
6. State a specific and accurate conclusion. Is your hypothesis supported by the results? Looking back, how could you have improved your experiment? (10 points)

7. Include a list of references to all information sources used in APA format (5 points).

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: https://www.umuc.edu/students/academic-integrity/ai-tutorial/academic-integrity-tutorial.html

Submission

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

Grading

**Your Outline will be graded based on the following criteria (100 points total):**

<table>
<thead>
<tr>
<th>Category</th>
<th>Excellent (90-100%)</th>
<th>Good (70-89%)</th>
<th>Adequate (60-69%)</th>
<th>Unsatisfactory (0-59%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outline 100 points</td>
<td>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</td>
<td>Outline missing one or two of the required components, and/or planned experiment does not meet one of the requirements for the assignment and/or minor issues with clarity and accuracy. 70-89 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. 60-69 points</td>
<td>Outline missing most of the required components and planned experiment does not meet the requirements of the assignment. 0-59 points</td>
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**Your Final Applied Lab Project will be graded based on the following criteria (100 points total):**

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<thead>
<tr>
<th>Category</th>
<th>Excellent (90-100%)</th>
<th>Good (75-89%)</th>
<th>Adequate (50-74%)</th>
<th>Unsatisfactory (0-49%)</th>
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<tr>
<td>Section</td>
<td>Description</td>
<td>Points</td>
<td>Description</td>
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</tr>
<tr>
<td>Introduction, Question and Hypothesis</td>
<td>Background information about enzymes in general and about specific enzyme used in project is clearly and accurately written. Questions and hypothesis are specific, relevant and clearly stated.</td>
<td>20 points</td>
<td>Missing background information about enzymes in general or about specific enzyme used in project or questions and hypothesis.</td>
<td>10-14 points</td>
</tr>
<tr>
<td>Background information about enzymes in general and about specific enzyme used in project is clearly and accurately written. Questions and hypothesis are specific, relevant and clearly stated.</td>
<td>18-20 points</td>
<td>15-17 points</td>
<td></td>
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</tr>
<tr>
<td>Background information about enzymes in general and about specific enzyme is somewhat unclear and/or inaccurate. Questions and hypothesis could be more specific, relevant and clearly stated.</td>
<td>15-17 points</td>
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</tr>
<tr>
<td>Background information about enzymes in general and about specific enzyme is clear and accurate. Questions and hypothesis are specific, relevant and clearly stated.</td>
<td>10-14 points</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Missing background information about enzymes in general and about specific enzyme used in project and questions/hypothesis.</td>
<td>10-14 points</td>
<td></td>
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</tr>
<tr>
<td>Experimental Design, Materials and Methods</td>
<td>Experiment is designed to directly test the hypothesis; description of experiment is detailed and well written and includes all materials and methods used.</td>
<td>20 points</td>
<td>Experiment is barely designed to test the hypothesis and/or description of experiment is somewhat inaccurate and/or some information about materials and methods used is missing and/or minor problems with clarity an organization.</td>
<td>10-14 points</td>
</tr>
<tr>
<td>Experiment is mostly designed to test the hypothesis</td>
<td>18-20 points</td>
<td>15-17 points</td>
<td></td>
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</tr>
<tr>
<td>Experiment is designed to test the hypothesis</td>
<td>15-17 points</td>
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<tr>
<td>Experiment is not designed to test hypothesis and/or description of experiment and materials and methods used are missing.</td>
<td>10-14 points</td>
<td></td>
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</tr>
<tr>
<td>Results</td>
<td>Results are clearly and accurately presented in a table and/or graph and picture(s).</td>
<td>20 points</td>
<td>Results are described, but major problems with clarity and/or accuracy and/or results not presented in table or graph.</td>
<td>10-14 points</td>
</tr>
<tr>
<td>Results are presented, but minor problems with clarity and/or accuracy.</td>
<td>18-20 points</td>
<td>15-17 points</td>
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<tr>
<td>Results are described, but minor problems with clarity and/or accuracy</td>
<td>15-17 points</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Results are not included</td>
<td>10-14 points</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Results are not included</td>
<td>0-9 points</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Discussion of Results</td>
<td>A clear, accurate and well organized discussion of results that demonstrates good knowledge of enzymes.</td>
<td>20 points</td>
<td>Major problems with clarity, accuracy or organization and demonstrates minimal knowledge of enzymes.</td>
<td>10-14 points</td>
</tr>
<tr>
<td>Minor problems with clarity, accuracy or organization and/or demonstrates some gaps in knowledge of enzymes.</td>
<td>18-20 points</td>
<td>15-17 points</td>
<td></td>
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<tr>
<td>Major problems with clarity, accuracy or organization and demonstrates minimal knowledge of enzymes.</td>
<td>15-17 points</td>
<td></td>
<td></td>
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<tr>
<td>Major problems with clarity, accuracy or organization and demonstrates minimal knowledge of enzymes.</td>
<td>10-14 points</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Missing discussion of results, or major problems with clarity, accuracy or organization and missing understanding of enzymes.</td>
<td>10-14 points</td>
<td></td>
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<tr>
<td>Missing discussion of results, or major problems with clarity, accuracy or organization and missing understanding of enzymes.</td>
<td>0-9 points</td>
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### Conclusion

<table>
<thead>
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<th>Description</th>
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</thead>
<tbody>
<tr>
<td>10</td>
<td>A well stated conclusion that is accurate and specific and directly related to the data collected. Clearly stated whether or not the results support the hypothesis. Relevant suggestion for improvement of experiment.</td>
</tr>
<tr>
<td>9-10</td>
<td>Conclusion stated, but slightly inaccurate, and/or not directly related to data collected and/or suggestion for improvement of experiment not very relevant.</td>
</tr>
<tr>
<td>7-8</td>
<td>Conclusion stated, but inaccurate and/or barely related to data collected and/or missing suggestion for improvement of experiment.</td>
</tr>
<tr>
<td>5-6</td>
<td>Missing conclusion, only suggestion for improvement of experiment.</td>
</tr>
<tr>
<td>0-4</td>
<td>Missing conclusion, only suggestion for improvement of experiment.</td>
</tr>
</tbody>
</table>

### Citations

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<th>Description</th>
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<tbody>
<tr>
<td>5</td>
<td>All references used are included and in correct APA format, in-text references are included.</td>
</tr>
<tr>
<td>4</td>
<td>All references are included, but a few minor mistakes in APA format, and/or missing in-text references.</td>
</tr>
<tr>
<td>2-3</td>
<td>Missing one or several references and/or major mistakes in APA format.</td>
</tr>
<tr>
<td>0-1</td>
<td>No references included or references not in APA format.</td>
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### Grammar and Spelling

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<tr>
<td>4</td>
<td>Between 4 and 7 minor spelling and grammatical errors</td>
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<td>3</td>
<td>Between 8 and 12 spelling and grammatical errors</td>
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<tr>
<td>2-3</td>
<td>More than 13 spelling and grammatical errors</td>
</tr>
</tbody>
</table>

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### 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.
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.

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

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

Degree Completion Requirements for the Graduate School (https://www.umuc.edu/policies/academicpolicies/aa17040.cfm)

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)

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.

Course Withdrawal Policy (https://www.umuc.edu/policies/academicpolicies/aa17072.cfm) - Students must follow drop and withdrawal procedures and deadlines available at https://www.umuc.edu/ under Academic Calendar.

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.

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

* 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](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](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](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.

Class & Assignment Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Readings/Assignments</th>
<th>Due Dates</th>
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<tbody>
<tr>
<td></td>
<td>(Laboratory answer sheets for Labs 2, 3, 4, 5 and 7 that do not include photos will earn 0 (zero) credit. Photos must state your first and last name and include a date within this 8-week session.)</td>
<td>11:59 PM ET</td>
</tr>
</tbody>
</table>
Read and Do:

- Read Syllabus
- Post an introduction in Discussions
- Complete Academic Integrity Tutorial and Quiz. Submit certificate in assignment folder (graded)
- Read Module 1. The Molecular and Cellular Basis of Life:
  - I. Concept Map
  - II. The Branches of Science
  - III. Living vs Nonliving things
  - IV. Structural Organization in Nature
  - V. Basic Principles of Chemistry, sections A, B, C
- Read Open Stax Concepts of Biology:
  - Preface pp. 1 - 4,
  - Ch. 1 Introduction to Biology pp. 5 - 26
  - Ch. 2 Chemistry of Life pp. 27 - 38
- Read the Scientific Method Tutorial (Science Learning Center under Content, Course Resources)
- Read eScience Lab Manual (under Content, Lab Manual)
  - Lab manual appendix- Good Laboratory Techniques
  - Lab 1: Introduction to Science
- Submit Syllabus Quiz (graded)
- Submit Academic Integrity Pledge (graded)
  - Submit certificate in assignment folder
- Submit eScience Lab 1: Introduction to Science(graded)
- Participate in Week 1 Discussion (graded)
- Submit the Week 1 Quiz (graded)

Concepts

- scientific method
- experimental design
- dependent and independent variable
- experimental and control groups
- hypothesis
- science vs. pseudoscience
- scientific reasoning
- levels of organization
- characteristics of life
- interdependence of different parts of living systems
- chemistry
  - atoms
  - molecules
  - chemical bonds
- characteristics of water
<table>
<thead>
<tr>
<th>2</th>
<th>Read and Do:</th>
<th>Mar 6</th>
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<tbody>
<tr>
<td></td>
<td>- Read Module 1. The Molecular and Cellular Basis of Life:</td>
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<tr>
<td></td>
<td>- V Basic Principles of Chemistry, section D</td>
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<td></td>
<td>- VI Cells</td>
<td></td>
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<tr>
<td></td>
<td>- VII Summary</td>
<td></td>
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<tr>
<td></td>
<td>- Read Open Stax Concepts of Biology:</td>
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<tr>
<td></td>
<td>- Ch. 2 Chemistry of Life pp. 39 - 54</td>
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<tr>
<td></td>
<td>- Ch. 3 Cell Structure and Function pp. 55 - 89</td>
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<tr>
<td></td>
<td>- Read eScience Lab Manual - Lab 2: The Chemistry of Life</td>
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<td></td>
<td>- Submit eScience Lab 2: The Chemistry of Life(graded)</td>
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<tr>
<td></td>
<td>- Participate in Week 2 Discussion (graded)</td>
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<td>- Submit the Week 2 Quiz (graded)</td>
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<td>Concepts</td>
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<tr>
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<td>- pH, acids and bases</td>
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<td></td>
<td>- macromolecules</td>
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<td></td>
<td>- carbohydrates</td>
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<td>- proteins</td>
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<td>- lipids</td>
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<td>- nucleic acids</td>
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<th>3</th>
<th>Read and Do:</th>
<th>Mar 13</th>
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<tbody>
<tr>
<td></td>
<td>- Read Module 2. Cell Processes:</td>
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<tr>
<td></td>
<td>- I. Concept Map</td>
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<td>- II. Introduction</td>
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<td>- III. Metabolism</td>
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<td></td>
<td>- Read Open Stax Concepts of Biology:</td>
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<td>- Ch. 4 How Cells Obtain Energy pp. 91 - 116</td>
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<td>- Ch. 5 Photosynthesis pp. 117 - 134</td>
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<tr>
<td></td>
<td>- Read eScience Lab Manual - Lab 3: Cell Structure and Function</td>
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<td>- Submit eScience Lab 3: Cell Structure and Functions(graded)</td>
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<td>- Participate in Week 3 Discussion (graded)</td>
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<td>- Submit the Week 3 Quiz (graded)</td>
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<td></td>
<td>Concepts</td>
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<td>- cell biology</td>
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<td></td>
<td>- membrane structure and function</td>
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<td>- energy</td>
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<td>- photosynthesis</td>
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<td>- cellular respiration</td>
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</tbody>
</table>
4 Read and Do:

- Read Module 2: Cell Processes
  - IV Cell Reproduction

- Read Module 3: DNA and Principles of Inheritance
  - I Concept Map
  - II Introduction
  - III Mendelian Genetics

- Read Open Stax Concepts of Biology:
  - Ch. 6 Reproduction at the Cellular Level pp. 135 - 152
  - Ch. 7 The Cellular Basis of Inheritance pp. 153 - 172
  - Ch. 8 Patterns of Inheritance, pp. 173 - 197

- Read eScience Lab Manual - Lab 4: Enzymes
  - Submit eScience Lab 4: Enzymes (graded)
  - Participate in Week 4 Discussion (graded)
  - Submit the Week 4 Quiz (graded)

- Choose topic, start researching and planning Written Assignment:
  Biology and Technology in the Real World due Week 6 (see assignment description in syllabus)

Concepts

- pathways and regulation
- chromosomes
- mitosis
- meiosis

Mar 20

5 Read and Do:

- Read Module 3: DNA and Principles of Inheritance
  - IV Human Genetics
  - V Molecular Genetics
  - VI Current Topics in Genetics
  - VII Summary

- Read Open Stax Concepts of Biology:
  - Ch. 9 Molecular Biology pp. 199 - 223
  - Ch. 10 Biotechnology pp. 225 - 247

- Read eScience Lab Manual - Lab 5: Meiosis
  - Submit eScience Lab 5: Meiosis (graded)
  - Participate in Week 5 Discussion (graded)
  - Submit Outline Final Applied Lab Project (graded)
  - Submit the Week 5 Quiz (graded)

- Choose topic, start researching and planning Written Assignment:
  Biology and Technology in the Real World due next week (see assignment description in syllabus)

Concepts

- inheritance
- DNA function
- gene expression

Mar 27
<table>
<thead>
<tr>
<th>6</th>
<th>Read and Do:</th>
<th>Apr 3</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>• Read Module 4: Evolution and Biodiversity</td>
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<tr>
<td></td>
<td>♦ I Concept Map</td>
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<tr>
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<td>♦ II Introduction</td>
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<td>♦ III Microevolution</td>
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<td>♦ IV Macroevolution</td>
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<td>♦ V Biodiversity</td>
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<td>♦ VI Summary</td>
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<td>♦ Ch. 11 Evolution and its Processes pp. 249 - 273</td>
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<td>♦ Ch. 12 Diversity of Life pp. 275 - 290</td>
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<tr>
<td></td>
<td>• Read eScience Lab Manual - Lab 6: Taxonomy</td>
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<td></td>
<td>• Submit eScience Lab 6: Taxonomy (graded)</td>
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<tr>
<td></td>
<td>• Participate in Week 6 Discussion (graded)</td>
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<td></td>
<td>• Submit Written Assignment: Biology and Technology in the Real World (graded)</td>
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<td></td>
<td>• Submit the Week 6 Quiz (graded)</td>
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<td></td>
<td>• Start lab 7 pH/radish seed experiment (7 days required for completion)</td>
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</table>

**Concepts**

- phylogenetic trees
- evolution
- natural selection
- biodiversity
- taxonomy
<table>
<thead>
<tr>
<th>7</th>
<th>Read and Do:</th>
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<tr>
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<td>Read Module 5: Ecology</td>
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<tr>
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<td>- I Concept Map</td>
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<td>- II Introduction</td>
</tr>
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<td></td>
<td>- III Populations and Communities</td>
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<td>- IV Human Impact on the Biosphere</td>
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<td>- V Summary</td>
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<td>Read Open Stax Concepts of Biology:</td>
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<td>- Ch. 19 Population and Community Ecology pp. 499 - 528</td>
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<td>- Ch. 20 Ecosystems and the Biosphere pp. 529 - 566</td>
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<td>- Ch. 21 Conservation and Biodiversity pp. 567- 592</td>
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<tr>
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<td>Read eScience Lab Manual - Lab 7: Ecology of Organisms</td>
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<tr>
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<td>Submit eScience Lab 7(graded)</td>
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<tr>
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<td>Participate in Week 7 Discussion (graded)</td>
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<td>Submit the Week 7 Quiz (graded)</td>
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### Concepts
- ecology
- populations
- community
- ecosystems
- interdependence of parts of living systems
- human impact on the environment

<table>
<thead>
<tr>
<th>8</th>
<th>Do:</th>
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<tbody>
<tr>
<td></td>
<td>Applied Final Lab Project (graded) – due April 16 by 11:59PM</td>
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<tr>
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<td>Final Exam (graded) - due April 16 by 11:59PM</td>
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Exam provided on April 10 at 12:01 AM ET in the Quizzes & Exams area.

Classroom Walkthrough Videos Link (http://www.umuc.edu/students/leo/videos.cfm)

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