BIOL-C1000: INTRODUCTION TO BIOLOGY WITH LAB

Also listed as: BIOL-C1000H

Effective Term
Fall 2026

BOT Approval Date
12/11/2025

Discipline
BIOL - Biology
Course Number
C1000

Course Title
Introduction to Biology with Lab

Short Title
Intro Bio w/Lab

Credit Status (CB 04)
D - Credit - Degree applicable

Units

Lecture Units
3.00

Lab Units
1.00

Total Units
4.00

Hours

Lecture Contact Hours
48-54
Out of Class Hours Lecture
96-108

Lab Contact Hours
48-54
Out of Class Hours Lab
0.00

Total Contact Hours
96 - 108

Total Out of Class Hours
96 - 108

Total Student Learning Hours
192 - 216

Is this an existing Extensive Lab?
Yes

Distance Education
Yes

Distance Education

Distance Education Type
Both Fully Online and Hybrid Online

Does the DE also apply to the Honors section?
Yes

Honors component will meet synchronously (face-to-face or moderated through online technology such as Zoom)

Fully Online Delivery Requirements:
a. Students must be notified via the college schedule of classes and the syllabus for the class if proctored tests are required for this course
b. Any planned face-to-face meetings, such as an orientation or study session, must be optional
c. The MSJC curriculum committee requires the use of accessible, asynchronous discussion as a component of every fully online course

Are you using publisher content?
No

Regular Substantive Interaction
Instructor-to-student, student-to-student, and student-to-content contact shall be distributed in a manner that will ensure regular substantive interaction (RSI) is maintained not only weekly but also for the duration of the course. Instructor interactions should be equivalent in time, quality and consistency to the engagement students would receive in a face-to-face course—for example, through announcements, discussion participation, personalized feedback, video messages, or other instructional communications. Instructors are expected to be responsive to student inquiries within a 24-72 hour time frame excluding holidays. RSI will be maintained through a variety of methods: • Orientation - Students must be oriented to the online and face-to-face portions at the start of the course. • Announcements - Announcements using the course management system must be posted at least weekly to keep students current on course events, due dates, materials, etc. • Discussion Forums - Content-related discussion forums within the designated CMS will include appropriate instructor participation and will be initiated and maintained, with timely feedback provided. Instructors are required to monitor the discussions and related activities to provide guidance and direction. Open-ended discussion boards may be used to further learning and interaction. • MSJC Communication – Instructor will use MSJC-administered communication tools (such as email or the designated CMS communication tools) to regularly communicate with and provide ease of access to students. • Timely Feedback - Timely feedback on student work will be provided by the instructor, which may include comments and/or rubrics, within the Grades area of the designated CMS. • Scheduled Meetings – Hybrid and synchronous courses will meet at regularly scheduled times. ADA Compliance - All course interactions and content must be designed with accessibility in mind and meet ADA requirements.

Honors / Non-honors
BIOL-C1000H
C-ID (Admin Only)

CB 00

CCC000040594

Course Title

Introduction to Biology with Lab – Honors

Approved Cal-GETC Area

AREA-5B

Approved Second Cal-GETC Area

AREA-5C

Approved Third Cal-GETC Area

Catalog Description

This combined lecture and laboratory course provides the non-biology major with an introduction to living things and their environment. Students use experimentation and investigation to develop important critical thinking skills. Students learn about the process of science, the building blocks of life, the role and regulation of DNA, how populations change over time, the movement of energy within and between life forms, and how species interact with each other and their surroundings. By the end of the course, students will be able to apply an understanding of biological concepts to current issues and their impacts on society.

Codes

TOP Code (CB 03)

0401.00 - Biology, General

CIP Code

26.0101 - Biology/Biological Sciences, General.

Repeatability Code

No

Grading Option

Letter grade OR P/NP

Minimum Qualifications

Minimum Qualifications	And/Or
Biological Sciences (Masters Required)	Or
Ecology (Masters Required)	End

GE Information

Check GE Types Requested

AA/AS A - Natural and Physical Sciences

Cal-GETC Areas

Approved Cal-GETC Area

AREA-5B

Approved Second Cal-GETC Area

AREA-5C

Learning Objectives

Learning Objectives

Learning Objective
1. Apply the scientific method, including recognizing the elements of experimental design, gathering and analyzing data, and interpreting results.
2. Demonstrate scientific literacy by evaluating social, ethical, and equity issues connected to biological sciences
3. Describe how living things are made of smaller structures that work together to enable the organism to survive.
4. Compare how living things depend on each other and the physical environment as they interact to obtain, change, and exchange matter and energy.
5. Explain how the diversity of living things is the result of evolution of organisms through mechanisms such as heredity, random change, and natural selection.
6. Collaborate on laboratory investigations of the biological content using appropriate, safe methods and equipment.

Honors Objectives

1. Reframe thinking about the science of biology by applying rigorous critical analysis, asking questions, reflecting on and discussing topics in biology, and exploring the scientific literature.

2. Develop and practice the analytical skills to understand, evaluate, and critique the range of biological topics included in the course.

3. Collaborate closely with the instructor and other honors students.
4. Develop appropriate skills in presenting and defending ideas, claims, and conclusions, including through discussion, writing, and formal presentations.

Learning Outcome Information

Course Learning Outcomes

Learning Outcome
1. Students will demonstrate the ability to utilize the scientific method and critically evaluate laboratory data.
2. Students will organize their time and exhibit persistence in completing course work.
3. Students will critically examine the diversity of scientists and career pathways in biology, fostering an inclusive mindset towards various identities and experiences within the scientific community.

Content

Course Lecture Content

1. The scientific method and the process of science
2. Cellular chemistry and biochemistry
    a. Atoms and bonding
    b. Properties of water
    c. Structure and function of biological molecules
3. Cell structure and function
    a. Cells, membranes, and organelles
    b. Prokaryotes versus eukaryotes
    c. Transport across the cell membrane
4. Cellular metabolism
    a. Enzyme structure and function
    b. Photosynthesis
    c. Cellular respiration
    d. Fermentation
5. Cellular division
    a. Prokaryotic binary fission
    b. Eukaryotic cell cycle
    c. Eukaryotic asexual reproduction (mitosis)
    d. Eukaryotic sexual reproduction (meiosis)
6. DNA structure and function
    a. DNA replication
    b. Transcription and translation
    c. Regulation of gene expression
    d. The impact of mutations
    e. The impact of biotechnology
7. Principles of heredity
    a. Mendelian genetics
    b. Non-Mendelian genetics
    c. Application to human genetics
8. Principles of evolution
    a. Evolutionary mechanisms
    b. Evolutionary evidence
    c. Speciation and classification
    d. The effect of extinction
    e. Survey of biodiversity across Domains
9. Principles of ecology
    a. Biosphere and biomes
    b. Population growth and regulation
    c. Community interactions
    d. Flow of energy and matter in ecosystems
    e. Human interactions with the biosphere
    f. Conservation biology and sustainability

Course Lab Content

1. Process of science and experimental design
2. Personal protective equipment, care and safe use of laboratory equipment
3. Utilization of microscopy to visualize and identify cell structures
4. Cellular transport mechanisms
5. Energy cycling and metabolism
6. Cell division
7. Genetics and inheritance
8. Diversity of life
9. Evolution
10. Ecology

Honors Content

The honors section of this class has the same content as the regular section and, in addition, honors students are encouraged to work above the survey level, with greater depth and complexity. Honors section students are introduced to research design, implementation, and analysis and will engage in rigorous discussions, collaborate with the instructor, and design and conduct original research. Students are encouraged to reflect on and discuss historic and current issues in biological science including, but not limited to, extraterrestrial life, the genetics of race, global climate crisis, nutritional evidence and advice, the evolution of primates, genetic engineering, and conservation of endangered species.

Methods of Instruction

Method

Activity

Integration

Collaborative learning activities in-class and out of class that encourage a deeper understanding of the relationships between the structure, function, evolution, and ecology of life. These can include lecture/discussions, small group activities, or whole class activities.

DE Adaptations for MOI

Activities that encourage a deeper understanding of the relationships between the structure, function, evolution, and ecology of life will be accomplished in the CMS using the assignment, peer review, discussion, and quiz/survey functions.

Method

Discussion

Integration

Discussions may include content topics, concept-mapping exercises, graph interpretation, societal views, controversies, and ethics. Discussion topics could include the biology of race, why organisms reproduce sexually rather than asexually, the unappreciated role of women in the discovery of DNA#s structure and importance, and the ethics of biotechnology applied to humans.

DE Adaptations for MOI

The instructor will use the CMS to create threaded discussions to allow students to respond to a prompt and to one another. The topics require students to analyze, critique, and discuss a variety of biology topics including concept mapping exercises, graph interpretation, societal views of science, controversies, and ethics. The instructor monitors the discussions to assess student participation and understanding.

Method

Field Experience

Integration

Field experiences can involve the study of evolutionary and ecological processes such as transect sampling of plant diversity, observation of vegetation types and animals, and investigations of community structure.

DE Adaptations for MOI

Field experiences can be undertaken virtually using simulations, online museum exhibits, or interactive videos. All resources will meet accessibility requirements.

Method

Lab Activities

Integration

Hypothesis driven experimental laboratory study of lab content wil be undertaken in class, either in groups or individually. The instructor will provide guidance and instruction on successfully completing lab activities. Lab activities include transforming bacteria with Green Fluorescent Protein genes, measuring the absorbance of chlorophyll with a spectrophotometer, and measuring allele frequencies for the ability to taste PTC in the class.

DE Adaptations for MOI

Hypothesis driven experimental laboratory study of lab content through hands-on and virtual experiences will be undertaken within the CMS or using third-party sites linked in the CMS. Virtual lab activities can employ videos, text, simulations, models, databases and other available online resources. All resources used will meet accessibility requirements.

Method

Lecture

Integration

Lecture presentations on biological concepts, ranging from molecules to ecosystem, will introduce key concepts and interpretive approaches to understanding the what biology means in the modern world. Lectures will expand upon information provided in the assigned reading and visual materials, and provide the students with framework with which to analyze biological controversies, pseudoscience, and cutting-edge science, as well as scientific institutions and practitioners. The scientific perspectives of underrepresented groups can be presented. Supporting visual materials may include slide presentations and other digitally-generated images such as charts, diagrams, photos, or film clips.

DE Adaptations for MOI

Lecture presentations can be presented as written lectures, slides, and audio-visual media, and will be presented in the CMS. All lecture material will be accessible. Accessible publisher content and other accessible internet resources may also be provided.

Method

Observation and Demonstration

Integration

Observation and identification of specimens of various organisms including examples of bacteria, "protists", fungi, animals, and plants will be accomplished using various methods such as dichotomous keys, polyclave keys or comparison with images in books or guides.

DE Adaptations for MOI

Observation and identification of specimens of various organisms including examples of bacteria, "protists", fungi, animals, and plants will be accomplished using various methods such as dichotomous keys, polyclave keys or comparison with images provided online. Biodiversity and identification websites or apps will also be used. All resources, images, keys, and websites or apps will meet relevant accessibility requirements.

Method

Reading

Integration

Scientific readings from current periodicals on recent advances in biology, medicine, and related topics pertinent to the course can be required.

DE Adaptations for MOI

The reading material will be provided on the CMS and all work products (discussions, written work) will be submitted on the CMS. Accessibility guidelines will be met.

Additional Methods of Instruction for Honors

Method: Small-Group Discussion
Integration: Guided small group discussions in the honors course will provide a forum for instructors and students to discuss historical trends in and/or the current state of biology as well as analyze and interpret assigned readings or films to gain a deeper understanding of key concepts, people, and events that have shaped modern biology. These discussions can also cover student progress on research projects including research proposals, sources, thesis statements, outlines, and rough drafts as well as peer-reviews of these assignments. Students will meet as a group or individually with the instructor a minimum of once a month for a minimum of four meetings over the course of the semester.

Method: Service Learning Project
Integration: Service learning at biology institutions, museums, or similar locations will help students gain hands-on experience in areas that pertain to the field of biology or medicine. This will be useful to students making decisions about major and career choices and will encourage them to seek out additional volunteer or internship opportunities after the conclusion of the course.

Method: Oral Presentations
Integration: Oral presentations will provide honors students the opportunity of presenting their research projects to their honors colleagues or the regular class to facilitate the development of their presentation and communication skills.

Method: Field Trips
Integration: Students will engage in academic inquiry and discussions of topics in biology by visiting a museum exhibition, going to a film screening, or attending an academic lecture at a nearby university or museum. Museum visits will encourage students to reflect on the impact of science on society while films and lectures provide a means of experiencing biology through a variety of mediums beyond the classroom.

Methods of Evaluation

Method

Class Participation

Integration

Consistent observation of active student participation in lecture activities and laboratory activities. Students will apply their knowledge of the content and concepts of the course to achieve the course objective of exploring the impact humans have on life. Students will discuss the ethical and social considerations with other students and the instructor. Class participation will be assessed based on the quantity and quality of participation and the depth and breadth of contributions. Evaluation considerations include accuracy of contributions, evidence of preparation, organization, and evidence of engagement. Instructors will provide prompt assessment feedback, typically within two weeks, to help students learn how to contribute more in class.

DE Adaptations for MOE

Observation of student participation in online discussions and group activities will be performed by the instructor within the CMS. Students will apply their knowledge of the content and concepts of the course to achieve the course objective of exploring the impact humans have on life. Students will discuss the ethical and social considerations with other students and the instructor. Class participation will be assessed based on the quantity and quality of participation and the depth and breadth of contributions. Instructors will share assessment feedback with students promptly, typically within two weeks, through the CMS to help students learn how to contribute more to online discussions and group activities.

Method

Class Work

Integration

Students will engage in weekly lab work and submit lab assignments to the instructor. Lab activities will allow students to achieve the course objective of designing, performing, and evaluating experimental investigations in biology through the application of the scientific method. Lab assignments will be submitted to the CMS or in person and evaluated for completeness and the students will be assessed on their ability to accurately keep experimental records, analyze lab data, and evaluate their data to create thoughtful conclusions. Prompt lab work feedback will be provided by the instructor, typically within two weeks, to promote continued learning and help students prepare for lab practical exams.

DE Adaptations for MOE

Students engage in weekly lab work and submit lab assignments through the CMS. These lab activities will allow students to achieve the course objective of designing, performing, and evaluating experimental investigations in biology through the application of the scientific method. Lab assignments will be submitted to the CMS and evaluated for completeness and the students will be assessed on their ability to accurately keep experimental records, analyze lab data, and evaluate their data to create thoughtful conclusions. Prompt lab work feedback, typically within two weeks, will be provided by the instructor through the CMS to promote continued learning and help students prepare for lab practical exams. All labs will meet accessibility requirements and guidelines.

Method

Exams/Tests

Integration

Exams and quizzes will consist of multiple choice, fill-in-the-blank, short answer, and essay questions or similar types of questions related to readings, lectures or other material and will require students to demonstrate competence with factual and thematic information covered in the textbook and lectures. For example cell structures, cell division, genetics, DNA, evolution, or ecology concepts will be tested. Exams will encourage students to demonstrate comprehension of basic biology content as well as to think critically. Exams will assess student's ability to identify the most accurate answer, synthesize multiple concepts to derive new insights, describe processes such as transcription and translation accurately, justify proposed explanations, for example related to natural selection, and predict future outcomes such as pandemic vaccine mandates and their impact on mortality rates, by applying scientific methods. Exam feedback will be provided by the instructor to correct misunderstanding and promote continued learning.

Exams/tests will be evaluated based on the demonstration of understanding and application of major topics as described in Course Content in alignment with Learning Objectives.

DE Adaptations for MOE

Exams and/or tests for fully online courses will be administered and evaluated through the CMS. Hybrid course offerings may include exams/tests in a face-to-face setting as outlined in Methods of Instruction or through the CMS as outlined in DE Methods of Instruction. The format may include multiple choice, short answer, essay or similar. Exams/tests will be evaluated based on the demonstration of understanding and application of major topics as described in Course Content in alignment with Learning Objectives. Instructor feedback may be presented through grade book comments, inbox or other confidential means of communication through the course management system. Feedback will be provided in a timely fashion, typically within a two-week period. All exams/tests must meet accessibility guidelines.

Method

Other

Integration

Laboratory practicals will evaluate student achievement of the lab objectives. On the practicals, students will apply the scientific thinking, demonstrate proper use of lab apparatus, interpret lab experimental results, and identify lab procedures and equipment. Laboratory practicals will be evaluated for accuracy of answers, ability to interpret lab results, demonstration of lab skills, and mastery of lab techniques. The questions will assess student's ability to identify the most accurate answer, scrutinize experimental design, use and identify laboratory equipment, evaluate data from laboratory experiments, and apply the scientific method. Laboratory practical feedback will be provided promptly, typically within two weeks, by the instructor to correct misunderstanding and promote continued learning.

DE Adaptations for MOE

Laboratory practicals will evaluate student achievement of the course objective to apply the scientific method. Laboratory practicals will be time limited and given through the CMS. The laboratory practicals will be evaluated for completeness and the questions will assess student's ability to identify the most accurate answer, scrutinize experimental design, use and identify laboratory equipment, evaluate data from laboratory experiments, and apply the scientific method. Lab Practical feedback will be provided promptly, typically within two weeks, by the instructor through the CMS to correct misunderstanding and promote continued learning.

Method

Quizzes

Integration

Periodic quizzes, consisting of multiple choice, fill-in-the-blank, short answer or similar questions types will be given to assess a specific course objective. Each quiz will be evaluated for completeness and accuracy. The questions will assess the student's ability to identify the best answer and eliminate flawed answers. Feedback from the instructor within two weeks will allow students to gauge their learning progress and prepare for the quizzes.

DE Adaptations for MOE

Periodic quizzes, consisting of multiple choice, fill-in-the-blank, short answer or similar questions types will be given to assess a specific course objective. Quizzes will be implements using the CMS quiz function. Each quiz will be evaluated for completeness and accuracy. The questions will assess the student's ability to identify the best answer and eliminate flawed answers. Feedback from the instructor within two weeks will allow students to gauge their learning progress and prepare for the quizzes. All quizzes will meet accessibility requirements.

CCN Methods of Evaluation

Examples of evaluation methods used to observe or measure students' achievement of course outcomes and objectives may include but are not limited to quizzes, exams, laboratory work, field journals, projects, research demonstrations, etc.
Methods of evaluation are at the discretion of local faculty.

Evaluation of Honors assignments

Research papers and multimedia projects will be assessed on clarity of argument and presentation, supporting evidence, the number and types of references consulted, depth of analysis, and scientific accuracy. Oral presentations will be evaluated based on lucidity, organization, critical thinking, and originality of argument. Honors class discussions of supplemental readings will be judged based on student preparedness as well as the ability of students to summarize, critically analyze, and provide their own perspective on the assigned readings. For service learning projects, students will be evaluated on their completion of the agreed upon number of volunteer hours as well as the quality of the reflection paper that integrates academic source material and their service learning experience, the number and types of references consulted, depth of analysis, organizational structure, grammar, and the connection back to themes associated with the course. Journal writings, interviews/surveys, museum field trip assignments, and film discussions will be assessed based on quality, organization, accuracy, and how well they address and further illuminate the subject matter of the course.

Assignments

Assignment Type

Other

In-class and/or outside of class

In-class

Formative or Summative

Formative

Assignment

Investigation of Osmosis Using a Simulation

You will set up and weigh two dialysis bags containing different solute concentrations (high and low). You will submerge the bags in beakers of pure water. Based on your understanding of osmosis, you will state a hypothesis about the weight of the dialysis bags after incubation for 1 hour in the water. As a lab group, you will run the experiment, collect and analyze the data, create a graph and draw a conclusion according to the results.

How assignment will be adapted in online format

The online version of this activity will involve a video of the process of setting up and running the lab and a presentation of sample data for students to collect and analyze, create a graph and draw a conclusion according to the results. The activity will be presented and analyzed on the CMS and all work will be submitted on the CMS. All parts of the activity will meet accessibility requirements and guidelines.

Assignment Type

Writing

In-class and/or outside of class

In-class
Outside of class

Formative or Summative

Summative

Assignment

Design an Alien

You will appropriately apply the basic concepts of organic chemistry, cell biology, homeostasis, and ecology to speculate on life on other worlds.

The planet Stephen Hawking mentions, Gliese 832c, could sustain life. Let's imagine it does. We can assume that chemistry, physics, and all the other rules of nature work the same on this planet as they do on earth.

It is hard to even imagine what life might be like elsewhere in the universe. If we someday find life elsewhere, it will certainly give us an enlarged perspective. Until then, we can try to envision what forms life might take in places beyond earth.

Let's begin with a tour of some interesting places in the universe led by Stephen Hawking. One of his favorite places, as you read, is Gliese 832c .

The first step in imagining extraterrestrial life is to consider the conditions in which life on another planet would exist. The star that Gliese 832c orbits is a red dwarf. Red dwarf stars are the most common type of star in our galaxy. They are smaller and cooler than the sun, and they emit an abundance of infra-red and red light. The planet itself is over 5 times as massive as earth, which results in stronger gravity than on earth. Things would weigh more than they do here.

Let's assume these facts about Gliese 832c:

Light on the surface has an abundance of red, but delivers about the same energy per square meter as the sun does on earth.
Gravity is stronger than on earth.
The atmosphere is similar to earth but with more carbon dioxide:
oxygen = 20%
carbon dioxide = 2%
nitrogen = 77%
trace gases = 1%

Due to the higher concentration of carbon dioxide, the climate is warmer than on earth. More like California in the summer during the day. Nights are cool.
There is abundant pure water as well as oceans with salt water.
As on earth, minerals are abundant, such as phosphorus, potassium, calcium, sodium, etc.
A Gliesean day is 113 earth days. There is no seasonal variation, so night is the same length.
There is volcanic and seismic activity, as on earth.

Can you imagine life on this planet?

We have been studying biology intensively, so you have some idea how life works on earth. The key is to decide what aspects of earth life might be universal and which are specific to earth. The basic idea is to apply what you have learned to a new situation. How would life adapt to the conditions on Gliese 832c?

Be creative and invent a life form that lives on this planet.

How assignment will be adapted in online format

The assignment will be presented on the CMS as a quiz or assignment. All work will be submitted by students on the CMS. All parts of the assignment will meet accessibility requirements and guidelines.

Assignment Type

Writing

In-class and/or outside of class
Outside of class

Formative or Summative
Formative

Assignment
What is Causing Thyroid Disease in Cats?

Recently, cats have been experiencing an upsurge of thyroid disease. Attempts to figure out what causes the thyroid problems in cats have found a number of risk factors, but eventually researchers came to suspect a class of flame retardants called polybrominated diphenyl ethers (PBDEs). These flame retardants are put on furniture sold in the United States. Knowing if PBDEs cause thyroid disease in cats could help us prevent this health problem for cats.

The challenge for researchers is how to determine if PBDEs are the cause of thyroid disease in cats?

First propose a hypothesis. A hypothesis is an informed speculation or prediction that can be tested.

Now design an experiment to test your hypothesis. The idea here is to think of a way to test your hypothesis. Do not do any research or go beyond what is given in the prompt for this scenario.

Provide the details of how you would determine if PBDEs are the cause of thyroid disease in cats.

Revise your experiment based on my comments and resubmit, if necessary.

How assignment will be adapted in online format
The assignment will be presented on the CMS as an assignment. All work will be submitted by students on the CMS. All parts of the assignment will meet accessibility requirements and guidelines.

Assignment Type
Reading

In-class and/or outside of class
Outside of class

Formative or Summative
Formative

Assignment
Human Appropriation of the Products of Photosynthesis

How much of what plants produce on earth do humans use? To answer this question, we will read a scientific paper. You may never have read a scientific paper before, so to begin check out the infographic on reading scientific papers

The paper we will read is called Human Appropriation of the Products of Photosynthesis.

Here are some tips specific to the paper we are reading:

As the infographic suggests, do not read the paper from beginning to end in order. Instead, read the introductory section, then skim through each of the three estimates (low, intermediate and high), and then read the discussion.
Notice that the paper has three sections. Each of the sections has a brief intro and then an “Overall” at the end. These contain all the info you need (unless you want the nitty-gritty, you don’t need to read the details of how the estimates were made).
The paper will make more sense if you know what NPP is. The term is defined in the introduction, but you may want to look elsewhere (Google!) to fully understand what this means.
Pg means a Petagram, which is 1015 or a quadrillion grams (which equals a trillion kilograms or 2.2 trillion pounds). Peta- is a metric prefix: Mega- = million; Giga- = billion; Tera- = trillion; Peta- = quadrillion.

A Pg is a big number, so in answering the questions in this case study, report how much of world's NPP humans appropriate as a percentage rather than some number of Pg.
In terms of percentage, the paper uses 224.5 Pg per year as an estimate of global net primary production. This includes 132.1 Pg of terrestrial NPP and 92.4 aquatic NPP. See Tables 2 and 3 for the low and intermediate estimate. Note for the high estimate, a different global NPP is used which includes potential NPP lost to human activities. See Table 4.

After reading the paper, answer these questions:

1. What does the article mean by the products of photosynthesis? List three different examples of products of photosynthesis that people harvest and use and are important economically (you can list things that are not directly mentioned in the paper). Do not use specific chemicals or substances as examples--think about broader categories of products.

2. Which estimate of appropriation do you think is most appropriate to use (low, intermediate, high, terrestrial only or both terrestrial and aquatic)? Explain why you think the estimate you chose is the appropriate estimate to use? Note that the paper contains the percent calculations for some estimates. If you look carefully, you can find and use these.
Write your answer as a percent and explain what you included in the total (terrestrial alone or aquatic as well).

3. If you were writing a paper in a college class, would this article be an appropriate source to cite? What features specifically make this paper an appropriate and reliable source? Are there any features that make this paper less appropriate as a reliable source for college?

How assignment will be adapted in online format

The assignment will be presented on the CMS as an assignment. All work will be submitted by students on the CMS. All parts of the assignment will meet accessibility requirements and guidelines.

Assignment Type

Other

In-class and/or outside of class

In-class

Formative or Summative

Summative

Assignment

Lab Practical

You will be given a lab practical exam in class. This exam will consist of stations at which you will find specimens we looked at, equipment we used, reagent tests we conducted, experimental results from labs we ran, or similar objects or data.

You will have 1.5 minutes at each station with a period of 5 minutes at the end to revisit any station you want.

How assignment will be adapted in online format

The assignment will be presented on the CMS as a quiz with images in place of objects used in F2F classes. The exam will be time-limited. All images and lab practical components will meet accessibility requirements and guidelines.

Honors Assignments

Assignment

Honors students will complete all the regular course requirements and will be graded first according to the standards used for the regular section. Honors students must, in addition, complete assignments A) and B), as well as one of C) or D) or E), to be decided in collaboration with the instructor. Assignments F), G), and H) are optional and one or two of these can be completed at the discretion of the instructor.

Assignment

A) Read a book (or comparable alternative) beyond the scope of the regular section. Readings can be chosen collaboratively by the instructor and honors students, and might include popular science or academic books, journal articles, or other appropriate texts. Contradictory readings on the same topic may be analyzed to encourage critical thinking on various perspectives in biological science. Honors students will meet with the instructor to discuss the reading(s) and may optionally also produce a short one to two page reflection/reaction paper. Examples of appropriate readings include: The Gene: An Intimate History by Siddhartha Mukherjee, Frankenstein; or, The Modern Prometheus by Mary Shelley, Adam's Curse: A Story of Sex, Genetics, and the Extinction of Men by Bryan Sykes, Stiff or Bonk by Mary Roach, The Singularity is Near by Ray Kurzweil, Six Degrees: Our Future on a Hotter Planet by Mark Lynas.

Required or Optional

Required

Honors Core Values

Engagement
Positive Transgressive Behavior (as evidenced by creativity, innovation, risk taking, challenging norms and standard narratives)

Justify how the assignment reflects the Engagement Core Value

The supplementary reading can allow students to engage with provocative ideas beyond the regular section content as well as engage with the instructor and their peers in a group discussion.

Justify how the assignment reflects the Positive Transgressive Behavior Core Value

The supplementary reading can explore innovative and challenging ideas that address existing norms and standard narratives. This will allow students to manifest positive transgressive thinking.

Assignment

B) Give a 10-15-minute oral presentation of the major work done in the honors section (i.e. for Assignment C, D, or E). The presentation will be given to the honors section group, the instructor, or to the entire regular section class.

Required or Optional

Required

Honors Core Values

Academic Rigor and Research
Engagement

Justify how the assignment reflects the Academic Rigor and Research Core Value

The presentation allows the student to showcase the academic rigor of their honors project. The honors project carries with it high expectations of academic rigor and the presentation will make these apparent.

Justify how the assignment reflects the Engagement Core Value

A presentation provide the opportunity for the student to engage with their classmates, the instructor, and the content of their topic.

Assignment

C) Produce an in-depth investigation of a topic in biology that the student selects in consultation with the instructor. Background research may be conducted in a university library or the equivalent and should be based on primary and secondary sources from the scientific literature, and academic books. A minimum of ten academic sources must be referenced in the project. For projects that do not include a written component as the main work product, these can be turned in as a references document. The project should have an original thesis or element. The instructor may organize student peer reviews of their research proposals, theses, and outlines, or rough drafts of their projects. Students will also submit a 250-word abstract of their work. Examples of in-depth investigations include: a survey of the scientific debate over GMOs; an investigation of the history and current status of an emerging infection like Nipah virus, Zika virus, or Ebola; co-opting of genetic research to argue for Caucasian superiority and the reaction of scientists; scientific controversies over animal research; the causes and consequence of extinction for particular groups of organisms; the prospects and ethical issues raised by gene therapy or cloning. The investigation can be submitted as:

-a 9-12 page research paper, double-spaced with the usual margins and fonts;
-a short film of 10-15 minutes, with a written synopsis of the film and references submitted separately;
-an academic poster, designed for a 3x5 poster format, but submitted digitally, with a separate references document;

-another project, as determined in collaboration with the instructor.

Required or Optional

Required

Honors Core Values

Academic Rigor and Research
Engagement
Inclusivity
Positive Transgressive Behavior (as evidenced by creativity, innovation, risk taking, challenging norms and standard narratives)

Justify how the assignment reflects the Academic Rigor and Research Core Value

This project allows students to delve into an academic topic in greater depth and with greater intensity than normal afforded by the regular section. Research, source integration, and argumentation can be emphasized in this project.

Justify how the assignment reflects the Engagement Core Value

Some project options can allow students to engage with others (in or out of the honors section or regular class) and to engage with the instructor or other professional biologists. This should make doing science engaging to the student beyond the typical course content.

Justify how the assignment reflects the Inclusivity Core Value

Some options (short film, e.g.) can include others in the project and can allow the student to express their unique perspective in a creative manner. This allows the student to feel more included in the science course and the project of science.

Justify how the assignment reflects the Positive Transgressive Behavior Core Value

Some project options will allow students to challenge norms and standard narratives, inject innovative ideas or push back against lagging areas of biology.

Assignment

D) Produce an original research project appropriate to biology, biology education, or the sociopolitical implications of biology. The research project will involve an original investigation consisting of experiments (using available tools of biological research), clinical interviews, surveys, observations, literature reviews, or other appropriate methods. The product of the investigation will be presented as a six to nine page (typed, double-spaced, typical margins and fonts) report. The report will include background information, methods of the research, results and discussion/conclusions. The project will be designed and implemented by the student in consultation with the instructor. Background research may be conducted in a university library or the equivalent and should be based on the following: primary and secondary sources from the scientific literature or academic books. A minimum of six academic sources must be referenced in the paper. As part of this project, students may peer review one another's work. Examples of original research topics include: attitudes toward science or particular biology topics (e.g., genetic engineering, evolution) among a particular group of people; a comparison of different soaps on bacterial populations of human hands; the impact of herbicides on the soil fauna of lawns; the relative strength of various stimuli in producing learning in isopods; the effect of flame retardants on seed germination; high school teacher's experience of teaching evolution or global climate change.

Required or Optional

Required

Honors Core Values

Academic Rigor and Research
Engagement
Leadership

Justify how the assignment reflects the Academic Rigor and Research Core Value

This project develops scientific reasoning and practice along with the rigor that attends it.

Justify how the assignment reflects the Engagement Core Value

This project allows students to engage with their instructor to design and carry out research, with their classmates to share and receive feedback from, and with the scientific process.

Justify how the assignment reflects the Leadership Core Value

This project allows the student to design and carry out independent research, and to manage all the details and vagaries that go with it.

Assignment

E) Create a service learning project in consultation with the instructor. Service learning can be differentiated from other volunteer experiences by its focus on the integration of academic learning and providing a service to one's community. Students will volunteer at a local life science institution, museum, nature preserve, national park, laboratory, hospital, or similar location for a total of 10 hours over the course of the semester and enrich their volunteer experience by reading three articles related to the biology relevant to the site of service, museology, the politics of the visual representation of science, scientific practice, hospital care, or similar topics. Students will submit a four to seven-page reflection paper that connects their volunteer experience to themes addressed in the course and assigned readings along with a log of their hours signed by an employee of the institution where they are volunteering. Students may wish to share the content of their reflection with the institution where they volunteered in the form of a lecture, presentation, or suggested action plan that the instructor and other honors students in the course are invited to attend.

Required or Optional

Required

Honors Core Values

Engagement
Holistic Well-being
Leadership

Justify how the assignment reflects the Engagement Core Value

This project allows students to engage with institutions or organizations beyond the college and to also engage with classmates and other parts of the college when they bring their experience back.

Justify how the assignment reflects the Holistic Well-Being Core Value

This project allows students to do meaningful work in the community and allows them the opportunity to work in an area of personal or professional meaning to the students. This can help build a bridge between well-being and career.

Justify how the assignment reflects the Leadership Core Value

This project allows students to represent the college in the community and to represent the community organization at which they complete their service project to the college. Both of these roles involve leadership.

Assignment

F) Interview a biologist or medical professional about the purpose, methodology, and significance of their work and how it relates to topics and themes addressed in Biology 115H. Students will collaborate with their instructor to select an appropriate person to interview, develop a set of interview questions, review interview protocols, decide on the best way to preserve and present their findings to the instructor or the class (i.e., a brief write-up of their interview or a short oral presentation), and consider how the individual's research contributes to or challenges current scientific perspectives.

Required or Optional

Optional

Honors Core Values

Engagement

Justify how the assignment reflects the Engagement Core Value

This project allows the student to engage with the professional community they someday intend to join.

Assignment

G) Keep a journal on assigned readings and writing assignments. Journal writing will assist students in understanding and reflecting on important subjects of the course and will help students organize their own questions and comments that can be used in class discussions.

Required or Optional

Optional

Honors Core Values

Holistic Well-being

Justify how the assignment reflects the Holistic Well-Being Core Value

This option allows reflection and meta-cognition, which can foster a sense of greater meaning for the student#s educational activities. This can serve to encourage the student to seek out career paths and academic opportunities that further serve to enhance well-being.

Assignment

H) A project outside regular class time designed by the instructor. For example, instructors will lead a field trip to a science museum and complete a project associated with an exhibition or permanent collection at the museum. The instructor may wish to collaborate with the education department or one of the curators of the museum to design a guided tour that is tailored to the specific curriculum of Biology 115H. Students will complete a one to two-page analysis of the exhibition and consider how the artwork on display represents and/or challenges themes addressed in the course. Science museums such as the California Science Center and the Natural History Museum of Los Angeles as well as art museums that showcase exhibitions on science such as "African Cosmos" at the Los Angeles County Museum of Art or "Beautiful Science: Ideas That Changed the World" at the Huntington Library are all examples of locations in Southern California that might be considered for this assignment. Other activities could include a film viewing such as The Imitation Game, The Martian, Interstellar, Contact, Inherit the Wind, Ex Machina, or episodes from the Mars mini-series. Documentary options could include Chasing Coral, Chasing Ice, Homo Sapiens 1900, and What Plants Talk About. Students could also attend an academic lecture at a local university or museum.

Required or Optional

Optional

Honors Core Values

Academic Rigor and Research

Justify how the assignment reflects the Academic Rigor and Research Core Value

The option allows students to investigate and learn about topics that might be completely beyond the normal course content. As such, it will enhance their appreciation and expertise in biology.

Course Materials

Textbooks

OER Example:
• Fowler, S., Wise, J., & Roush, R. (2024). Concepts of Biology. OER: OpenStax.
https://openstax.org/books/concepts-biology/pages/1-introduction

• Traditional Examples:
• Hoefnagels, M. (2021). Biology: The Essentials. 4th ed.: McGraw Hill.
• Taylor, M., Simon, E., Dickey, J., & Reece J. (2020). Campbell Essential Biology. 7th ed.: Pearson.

Lab manuals
An example of a publisher lab manual is:
• Bres, M., & Weisshaar, A. (2018). Thinking About Biology: An Introductory Lab Manual
(What's New in Biology). 6th ed.: Pearson.
• Locally developed lab manual

Other Resources

Various "Scientific American Current Issues in Biology." Scientific American for Pearson Volume 6 07-04-1905. M.A. Palladino "Special Topics in Biology Series." current issue Volume various 07-03-1905.

Open Educational Resources

Fowler, S., Wise, J., & Roush, R. (2024). Concepts of Biology. OER: OpenStax.
https://openstax.org/books/concepts-biology/

Class Size Information

Class Size

32

Class Size Category

G - Large lab 32

Diversity and Inclusion

Course Design and Materials: Course will incorporate diverse perspectives, authors, and examples that reflect a variety of cultures, identities, and lived experiences. Instructional materials will be reviewed regularly to ensure representation, inclusivity, and alignment with equity-minded practices across disciplines.

Inclusive Learning Environment: Instructors will establish classroom norms and policies that promote respect, civil discourse, and belonging in both online and face-to-face classes. Clear expectations for communication and engagement will support a learning space where all students feel valued and heard.

Accessible Instruction: Course content will be delivered using accessible design. Materials will follow accessibility guidelines within the CMS, including captioned media, readable document formats, and multiple means of engagement to support diverse learning.

Equitable Teaching Practices: Instructors will use transparent and grading criteria, varied assessment methods, and timely feedback to promote fairness and student success. Opportunities for revision, reflection, and multiple demonstrations of learning may be incorporated when appropriate to the discipline.

Culturally Responsive Pedagogies: Instructional strategies will encourage critical thinking about diverse perspectives and systems of power relevant to the course content. Faculty will foster opportunities for students to connect course material to real-world contexts.

Ongoing Reflection and Improvement: Faculty will engage in continuous professional development related to IDEAA principles and reflect on course practices using metacognition to identify opportunities for increased equity, inclusion, and accessibility.

Explain how diversity and inclusion(e.g., gender, culture/race, sexuality, etc.) is infused into the course.

This course affords students the opportunity to learn the science underlying race, sex, gender, biodiversity, human physiology, vaccination, biotechnology, evolution (including Social Darwinism and eugenics), human impacts on the environment, the climate crisis (and its disproportionate impact on underprivileged peoples), and other topics that frequently engender dissension in society. Students are encouraged to not only learn the science, but to consider their own impacts and their ethical commitments.

A concerted effort has been made to include elements of diversity in the course content and course assignments, where students are invited to study, research, communicate, and present on various vital topics. Specifically, the course content was enhanced to highlight the role and impact of women in biology as well as historically marginalized or underrepresented groups. The diverse participation of people in biology today is also highlighted.

Describe how assignments, instruction, evaluation, course content, and interactions are contextualized for diverse learners promoting an equitable course.

The instructor will present course content and assess students in a variety of ways to accommodate for various learning preferences. With diverse learners in mind, a variety of accessible reading materials, films, and assignments are incorporated into this class. Assignments are written to challenge students to think critically about a variety of controversial topics related to biology. This allows students to develop as scholars and to pursue topics of particular relevance to them.

Formative assignments are present in the COR to accommodate student diversity of opinion or background. The course includes small group activities, discussions, and assignments that emphasize a variety of ways to learn.

Interactions

Explain how the course will incorporate student-to-student interaction.

This course will incorporate student-to-student interaction through in-class or online discussions. Students will be able to engage in small group and whole class discussions with each other when completing collaborative learning exercises. They allow in-depth discussions on the role of genes, race, sex and gender, other species, the environment, and the climate crisis. These discussions will be among students themselves, enabling students to exchange ideas and to prepare for course assignments and class activities. Students also work together on lab activities in small groups online or in-class, and respond to announcements and emails.

Explain how the course will incorporate instructor-to-student interaction.

Faculty will deliver lecture/discussions and facilitate group discussions or activities. In lecture, faculty will have the opportunity to model a scholarly approach to analyzing and interpreting scientific evidence, and show how evidence is used to support interpretations related to biology. The instructor(s) will encourage and emphasize critical thinking, the value of asking questions, research skills, and science (biology) literacy at all levels. Faculty will offer feedback on student assignments through accessible video conferencing software, CMS grading functionality, or individual meetings with students. Faculty will provide office hours and appointment meetings with students. Faculty will also be available by email or CMS message function.

Explain how the course will incorporate student-to-content interaction.

Students will interact with the content through reading (the textbook and a diverse array of sources provided in the course), watching accessible biology relevant multimedia or video content, listening to live or recorded lectures, participating in in in-class activities, by studying for and taking tests and the final, and through lab activities that illustrate key concepts in biology through hands-on interaction with cells, organisms, biochemical pathways, and advanced apparatus used in modern biology.

Explain how the course will incorporate student-to-self interaction (metacognitive).

This course will encourage students to reflect on how key events in the ongoing development of biology and biotechnology have had and continue to have a major impact on today's society and on their personal lives. Students will be encouraged during in-class and out-of-class activities to reflect on current concerns in society related to biology and biotechnology and to connect these concerns to the broad societal concerns explored in the course as well as to themselves. Students will be given the opportunity to reflect on how critical thinking practiced and honed in this course can serve as transferable skills in other academic disciplines and further a student's career goals. The course also provides opportunities to confront critical issues in biology involving ethical commitments, genocide, genetic engineering, biology education, environment concerns, racism, discrimination in the name of science, the climate crisis, and similar issues. The course encourages students to see these as current, crucial concerns and to consider their own personal responses.

Key: 459