BIOL-150: GENERAL BIOLOGY I

Also listed as: BIOL-150H

Effective Term
Fall 2024

BOT Approval Date
11/09/2023

Discipline
BIOL - Biology
Course Number
150

Course Title
General Biology I

Short Title
General Biology I

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-150H
C-ID (Admin Only)

C-ID BIOL 190

CB 00

CCC000589924

Course Title

Honors General Biology I

Approved Cal-GETC Area

AREA-5B

Approved Second Cal-GETC Area

AREA-5C

Approved Third Cal-GETC Area

C-ID (Admin Only)
C-ID BIOL 190

Catalog Description
This course, intended for science majors, is an intensive modern study of biology designed to prepare students for upper-division science courses. Topics include the biochemical, molecular, metabolic, genetic, and evolutionary aspects of cells and organisms. Students will apply their understanding of biology concepts in the laboratory to develop an understanding of the philosophy of science, methods of scientific inquiry and experimental design. Field trips may be required.

Requisites

Prerequisite(s)

Prerequisite(s) (must be taken before)
Completion of intermediate algebra or eligibility into college-level math as determined by college assessment or other appropriate methods.

Recommended Preparation

Recommended Preparation (note that students can enroll in the class even if they haven't take the recommended course)
ENGL-C1000.
Additional high school or college Biology and Chemistry courses.

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

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. Evaluate and write about experimental investigations in biology through the application of the scientific method.
2. Relate the chemical properties of the elements and macromolecules of life to their cellular functions and the origin of cells.
3. Consider how prokaryotic and eukaryotic cellular structures relate to their functions and the evolution of diversity.

4. Analyze the enzymatic processes underlying the essential metabolic pathways of cellular respiration, fermentation, and photosynthesis that transform energy and matter to sustain life.
5. Compare the processes of mitosis and meiosis and relate these processes to asexual and sexual modes of reproduction both at the cellular level and in the life cycles of animals and plants.
6. Analyze the inheritance patterns of traits within individuals and populations to solve problems in classical and population genetics.
7. Deduce that DNA sequence codes for protein structure and function through the mechanisms of transcription and translation to solve problems in molecular genetics.
8. Compare the varied and independent evidence for biological evolution.
9. Evaluate the evolutionary mechanisms of mutation, natural selection, genetic drift, and gene flow that effect population genetic changes underlying speciation and the diversity of life.
10. Review some of the contributions women and people of color have made to the biological sciences.

Honors Objectives

1. Reframe thinking about the science of biology by applying rigorous critical analysis, asking questions, reflecting on and discussing the current science of biology, and exploring the scientific literature.
2. Develop a deep set of analytical skills to understand, and evaluate, biological topics beyond what those presented in the regular section.
3. Collaborate closely with the instructor and other honors students.
4. Plan and execute an original research project in consultation with the instructor.
5. 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. The student will discover that evolution is a unifying feature of life causing populations to change over time, and new species to arise, when allele frequencies change due to mutation, natural selection, gene flow, and genetic drift. (Evolution, Vision and Change: A Call to Action - AAAS, 2011)
2. The student will deduce how information flows in biology through the inheritance of genetic and epigenetic information that influences the location, timing, and intensity of gene expression. (Information Flow, Vision and Change: A Call to Action - AAAS, 2011)
3. The student will infer how a structure's physical and chemical characteristics influence its interactions with other structures, and therefore its function in cells and organisms. (Structure and Function, Vision and Change: A Call to Action - AAAS, 2011)
4. The student will evaluate the various transformations of energy and matter used by organisms to capture energy and support maintenance, growth and reproduction. (Transformations of Matter and Energy, Vision and Change: A Call to Action - AAAS, 2011)
5. The student will classify biological systems based on the interactions of biological molecules, genes, cells, tissues, organs, individuals, and ecosystems to form complex networks. (Systems, Vision and Change: A Call to Action - AAAS, 2011)

Program Learning Outcomes

Learning Outcome
Students through persistence will develop problem solving skills in science thinking both critically and abstractly about issues using science as the foundation for understanding.
Students will gain scientific awareness with a flexible approach including a willingness to change perspectives and an ability to weigh alternative options while staying rooted in the understanding of their impact as local, national, and global citizens.
Students will apply past knowledge to new scientific situations, being able to think abstractly regarding science and communicate this newfound knowledge in the language of science and the scientific method.
Students will achieve literacy in the language of science and the scientific method, demonstrating a willingness to respond with wonderment and awe with regards to the physical and biological principles of science, and gather data through all senses.
Students will learn hands-on skills in the laboratory, demonstrate how to measure and collect data from experiments with accuracy and precision, and think critically about the results.

Institutional Learning Outcomes

Critical Thinking: The student will analyze problems, gather and synthesize relevant information, evaluate ideas, information, and evaluate alternative points of view to create, innovate and implement effective solutions.
Scientific Awareness: The student will apply the scientific method of inquiry to assess potential solutions for real-life challenges by employing science-based knowledge and methodologies in daily life.
Social Awareness: The student will recognize and analyze the interconnectedness of global, national, and local concerns, analyzing cultural, political, social, and environmental issues from multiple perspectives and appreciate similarities and differences among cultures.
Civic
Personal

Content

Course Lecture Content

1. Introduction to Biology and the Scientific Method
   a. The properties of life
      i. Requirements for life on earth and possibility of life on other planets
      ii. Discussion of diverse scientists that contributed to this area such as Emmett W. Chappelle
   b. Scientific methods based on observations, hypotheses, experiments
      i. Testing hypotheses about observations using the scientific method
      ii. Scientific theories as comprehensive and predictive
      iii. Bias reduction in scientific practice
2. The Chemical Building Blocks of Living Cells and Organisms
   a. Atoms and elements
   b. Chemical bonding and the formation of molecules
   c. Properties of water and the importance of water to life
   d. Chemistry of carbon-based biological molecules (organic and biochemistry)
   e. Dehydration/condensation and hydrolysis reactions related to biological monomers and polymers
3. The Cellular Level of Organization
   a. Chemical origin of cells on earth and evolution of cellular structures
   b. Structure and function of "prokaryotic" and eukaryotic cells
   c. Structure and function of eukaryotic organelles
   d. Cell membrane structure and function
   e. Molecules and energetics of cellular transport mechanisms
4. Introduction to Cellular Metabolism
   a. Anabolic and Catabolic metabolic pathways
   b. Transformations of energy in cells and the role of ATP
   c. Enzyme catalysis underlying metabolism
   d. Regulation of enzyme function
5. Cellular Respiration and Fermentation
   a. Mitochondrial structure and function
   b. Aerobic and fermentative metabolic pathways
6. Photosynthesis
   a. Chloroplast structure and function
   b. Anabolic photosynthetic pathways
   c. Variations in photosynthetic pathways
7. Cellular Reproduction
   a. Bacterial reproduction via asexual binary fission
   b. Eukaryotic mitosis and the cell cycle
   c. Meiosis as the basis for gametogenesis in animals, genetic recombination, and sexual reproduction in eukaryotic cells
8. Cell Communication
   a. Reception of signals
   b. Signal transduction
   c. Cellular responses
9. Mendelian Genetics
   a. Mendel's concept of the gene and laws of heredity
   b. Monohybrid and Dihybrid Crosses

c. Sex-linkage, Pleiotropy, Epistasis, and Polygenic traits
d. Chromosomal heredity and genetic linkage

10. Molecular Genetics
    a. DNA structure and function
    b. Semiconservative Replication
    c. Mutation and repair
        i. Cancer causing mutations: oncogenes and tumor suppressor genes
        ii. Cancer research discoveries by diverse scientists such as Jewel Plummer Cobb
    d. The history of discoveries
        i. Landmark discoveries (Griffin, Avery, Meselson and Stahl, Hershey and Chase, Watson and Crick)
        ii. Female contributions, including the significance of the research of Rosalind Franklin, Martha Chase, Barbara McClintock)
    e. Gene structure, gene expression and control of gene expression
    f. Transcription and translation in protein synthesis
        i. Role of RNA (mRNA, tRNA, rRNA)
    g. Regulation of transcription in "prokaryotic" and eukaryotic cells
        i. Operons
        ii. Promoters, enhancers, activators, and repressors in transcriptional control
    h. DNA tools and biotechnology
        i. Prospects and perils of applying biotechnology to agriculture organisms and humans
        ii. Social implications of biotechnology and its particular impact underrepresented groups
    i. The evolution and regulation of genomes
11. Evolutionary Theory
    a. Common ancestry and descent with modification
    b. Contributions of Darwin and Wallace
        i. Natural selection
        ii. Artificial Selection
        iii. Adaptation
    c. Independent lines of evidence for biological evolution
    d. Speciation
        i. Biological and alternative species concepts
        ii. Geographical and non-geographical causes of speciation
        iii. Barriers to mating and hybrids
    e. Human evolution and the application of scientific racism
12. Population Genetics
    a. Populations, gene pools, genotype and allele frequencies
    b. Mechanisms of evolution that result in changes in population gene frequencies
        i. Genetic drift, bottleneck effect, founder effect
        ii. Gene Flow
        iii. Mutation
        iv. Modes of selection
        v. Hardy-Weinberg equation
    c. Balancing selection
    d. Social issues and misconceptions about genetics
        i. Human racial differences
        ii. Genetic determinism
        iii. Forensic use of DNA and genes
        iv. Bias in research on humans and medical protocols for POC

Course Lab Content

1. Scientific Process
    a. Basic steps in the scientific method and bias reduction
    b. Scientific hypotheses
    c. Scientific literature
    d. Data analysis via tables and graphs from laboratory experiments
    e. Appropriate statistical analyses
    f. Scientific writing

2. Microscopy
    a. Use and care of compound and dissecting microscopes
    b. Key microscopy concepts
        i. Magnification
        ii. Resolution
        iii. Contrast
        iv. Field of view
        v. Depth of field
    c. Successful visualization of specimens of bacteria and eukaryotes
    d. Cell staining methods
3. Cellular Processes and Metabolism
    a. Chemical elements found in living organisms
    b. Biological molecules and organic functional groups
    c. Detection of biological molecules in samples
    d. Diffusion and osmosis
    e. Enzymatic reactions
    f. Measurements of cellular respiration
    g. Measurements of photosynthesis
4. Cell Reproduction and Inheritance
    a. Mitosis and meiosis in plant and animal cells
    b. Phases of cell cycle, mitosis, and meiosis
    c. Model organisms to conduct genetic crosses
    d. Principles of inheritance
        i. Laws of probability
        ii. Classical (Mendelian genetics)
        iii. Non-Mendelian genetics
        iv. Punnett squares
        v. Using models Model organisms to conduct genetic crosses
        vi. Recombination frequency and gene mapping
        vii. Chi-squared and other statistical analyses
5. Molecular Biology and Biotechnology
    a. DNA replication
    b. Transcription and translation
    c. Molecular genetics
    d. Micropippetting
    e. DNA extraction
    f. Gel electrophoresis
    g. Polymerase Chain Reaction
    h. Bacterial transformation
6. Mechanisms of Evolution and Population Genetics
    a. Evidence of evolution
        i. Fossils
        ii. Anatomical homologies
        iii. Molecular homologies
    b. Natural selection
    c. Genetic drift
    d. Gene flow
    e. Mutation
    f. Hardy-Weinberg equilibrium and solving genetics problems using the Hardy-Weinberg equations

Honors Content

1. The topics covered in the honors section will be identical to those covered in the regular section. The honors component of the course encourages students to work beyond the survey level and to explore the concepts included in General Biology I with greater depth and complexity.
2. Honors students will be introduced to research design, implementation, and analysis in biology and will conduct original research.
3. Honors assignments and projects will focus on specific areas of biology, including, but not limited to

a. the application of CRISPR technology;
b. identification of genetically engineered foods using PCR;
c. the assessment of bacterial contamination under various conditions;
d. development of plant cell cultures of particular species of interest;
e. public attitudes towards vaccination, evolution, population growth, genetic engineering.

4. Students will apply scientific research methods in designing, carrying out, and analyzing their original research.

Methods of Instruction

Method

Field Experience

Integration

In order to gain field experience, student's may take a field trips to major museums, zoos, or aquariums and will engage in data gathering and interpretation exercises to strengthen their ability to apply the scientific method. They are able to go in person or use official websites and videos from museums, zoos, or aquariums to gather data and information. These reports will be turned on paper or through the Assignment section of the CMS and instructor feedback will be provided, within two weeks, on paper or through the CMS gradebook.

DE Adaptations for MOI

Students are able to use official websites and videos from museums, zoos, or aquariums to gather data and information. These reports will be turned in through the Assignment section of the CMS and instructor feedback will be provided, within 2 weeks, through the CMS gradebook.

Method

Lab Activities

Integration

Hypothesis driven experimental laboratory study of chemical and physiological processes, such as cellular respiration, enzyme activity, and molecular biology and the study of representative specimens and cells. Laboratory activities will explore the major principles of biology incorporating analysis, critical thinking and the graphic or written presentation of results. Hands on activities include manipulation of equipment, chemicals and/or materials. Lab Activities help contribute to equity by helping Kinesthetic learners grasp concepts with hands on experience. Students may be asked to utilize a computer program that captures images of the microscope to observe and compare different cells or tissue types. The student will then submit screen shot images and answer follow up questions in the quizzes section of the CMS and instructor feedback will be provided through the CMS gradebook. Laboratory write-ups are submitted to the instructor on paper or electronically using CMS tools such as Assignment. Laboratory assessments such as quizzes and essays are also submitted to the instructor on paper or electronically using course management tools such as quizzes. Student will receive feedback from the instructor within 2 weeks of submission.

DE Adaptations for MOI

Students may be asked to utilize an online interactive microscope to observe and compare different cells or tissue types. The student will then submit screen shot images and answer follow up questions in the quizzes section of the CMS and instructor feedback will be provided through the CMS gradebook. Lab demonstrations are posted to the CMS via images, prerecorded video and/or delivered live to a virtual student audience via accessible video conferencing tools. Laboratory study of the major principles of biology will use lab simulations and other accessible computerized data software, along with hands on activities similar to those used in the on campus delivery, using laboratory kits purchased in the bookstore or other mail order outlet. Laboratory write-ups are submitted to the instructor electronically using CMS tools such as Assignment. Laboratory assessments such as quizzes and essays are also submitted to the instructor electronically using course management tools such as quizzes. Student will receive feedback from the instructor within 2 weeks of submission.

Method

Lecture

Integration

Lecture presentation, audio-visual presentations, and demonstrations about fundamental biological concepts ranging from biological molecules to evolution. Lecture may address the relationship between the structure, function, and evolution of life on earth. Lecture presentations will engage students in the application of the scientific method to biological problems and issues, such as racial

biology misconceptions. Lectures may be presented using PowerPoint to provide photographs and accessible video clips of biological principles and processes.

DE Adaptations for MOI

Lecture content will be provided in the CMS, using tools such as course pages or asynchronously/synchronously delivered to a live virtual audience via accessible video conferencing tools.

Method

Activity

Integration

Group collaborative or individual learning activities encourage the identification and observation of cells, tissues, and organisms with focus on comparison and contrast of cellular structures relevant to evolutionary adaptation. Students will be given worksheets or question prompts based on the activity. Student's may also engage in hands-on activities for demonstrations of scientific principles and processes. Hands-on activities help contribute to equity by helping Kinesthetic learners grasp concepts with hands on experience. Students will turn in a written responses on paper or via the CMS assignments. Student will receive feedback from the instructor within 2 weeks of submission, on paper or via the CMS gradebook.

DE Adaptations for MOI

Students will turn in worksheets or written responses to the question prompts in CMS assignments. For hands-on activities, students may be asked to utilize an online interactive programs, such as an online microscope to observe and compare different tissue types. The student may also be asked to screen shot images and answer follow up questions in the quizzes section of the CMS. Instructor feedback will be provided through the CMS gradebook within two weeks.

Method

Observation and Demonstration

Integration

Instructor-guided classroom demonstrations will illustrate biological processes, such as the modeling of molecules and biological processes such as transcription, translation, mitosis, and meiosis. This may be presented using PowerPoint to provide photographs and accessible video clips. Films in digitized format are shown in class and/or posted/linked from within the CMS pages, library accessible video databases or third-party websites. Student will receive feedback from the instructor, within 2 weeks of submission.

DE Adaptations for MOI

Instructor-guided classroom demonstrations may be presented in the CMS, using PowerPoint to provide photographs and accessible video clips. Content may also be provided using CMS tools, such as course pages or asynchronously/synchronously delivered to a live virtual audience via accessible video conferencing tools. Films in digitized format are posted/linked from within the CMS pages, library accessible video databases or third-party websites. Student will receive feedback from the instructor, within 2 weeks of submission, through the CMS gradebook.

Method

Papers and Reports

Integration

Literature research and development of research projects on selected topics related to cell structure, chemical and metabolic processes, genetics and evolution. Reports will explore the major principles of biology incorporating analysis, critical thinking and the graphic or written presentation of results. Laboratory study of these major principles of biology will use lab simulations and other accessible computerized data software, along with hands on activities. Hands on activities include manipulation of equipment, chemicals and/or materials. Laboratory write-ups are submitted to the instructor on paper or electronically using CMS tools such as Assignment. Laboratory assessments such as quizzes and essays are also submitted to the instructor on paper or electronically using course management tools such as quizzes. Lab demonstration are provided by the instructor, or IA, in person and/or posted to the CMS via prerecorded accessible video. Student will receive feedback from the instructor, within 2 weeks of submission.

DE Adaptations for MOI

Laboratory study of the major principles of biology will use lab simulations and other accessible computerized data software, along with hands on activities, and may use laboratory kits purchased in the bookstore or other mail order outlet. Hands on activities

include manipulation of equipment, chemicals and/or materials similar to those used in the on campus delivery. Laboratory write-ups are submitted to the instructor electronically using CMS tools such as Assignment. Laboratory assessments such as quizzes and essays are also submitted to the instructor electronically using course management tools such as quizzes. Lab demonstration are provided by the instructor, or IA, and are posted to the CMS via prerecorded accessible video and/or delivered live to a virtual student audience via accessible video conferencing tools. Student will receive feedback from the instructor, within 2 weeks of submission, through the CMS gradebook.

Method

Discussion

Integration

Class discussions on a variety of issues as they relate to the study of biology. Students will be given prompts for investigation and group discussion. Prompts may include discoveries and contributions made by POC and women to the field of Biology, such as Rosalind Franklin's being the first to take radiograph images of DNA. Students will turn in written responses to the question prompts as a group on paper or through the CMS discussion board. Student will receive feedback from the instructor within 2 weeks of submission.

DE Adaptations for MOI

Discussion will take place through the CMS discussion board or utilizing technology such as, google docs or break out rooms in zoom.. A detailed rubric and instructions will be provided through the CMS. Student responses are submitted through the CMS. Student will receive feedback from the instructor within 2 weeks of submission.

Additional Methods of Instruction for Honors

Method: Small-Group Discussion
Integration: Honors students will meet as a group with the instructor at least three times. These meetings can cover honors biology content, supplemental materials, and student progress on research projects.

For distance education, discussions will utilize technology such as, google docs or break out rooms in zoom, students will turn in written responses in CMS assignments and instructor feedback will be provided through the CMS gradebook within two weeks of completion or submission.

Method: Presentations
Integration: 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. Presentations will include a multimedia component or other visual aids.

For distance education oral presentations will utilize technology such as, studio video or zoom. Instructor feedback will be provided through the CMS gradebook within two weeks of completion or submission.

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.

For distance education, efforts will be made to allow the utilization of technology such as zoom, or by doing at home projects provided by the community institution. Instructor feedback will be provided through the CMS gradebook within two weeks of completion or submission.

Method: Research Project
Integration: Honors students will conduct an original research project using available equipment. Students will design a research project in collaboration with the instructor, conduct the research and analyze the results. The project will be submitted as a paper, multimedia presentation or other format, agreed upon in consultation with the instructor.

For distance education research projects will be mentored via technology such as studio video or zoom. Instructor feedback will be provided through the CMS gradebook within two weeks of completion or submission.

Method: Field Trips
Integration: Field trips to museums, natural areas, waste water treatment plants, biotechnology or crime labs, or other places appropriate to the course can be lead by the instructor, or undertaken individually.

Methods of Evaluation

Method

Class Participation

Integration

Consistent observation of active student participation in lecture activities and laboratory activities that encourage a deeper understanding of the structure, function, and evolution of life on earth. Evaluation tools and criteria to be determined by the instructor. Examples of evaluation tools to consider include one on one discussion of concepts, observation of participation in activities, and observation of lab equipment use. Evaluation criteria to consider include time on task, appropriateness of choice and use of lab equipment, clarity, organization, thoroughness of content, and depth of responses to questions. Participation points may be assessed in a number of different ways including: short written assignments on paper or using text submission assignment tool in the CMS, answering instructor questions orally in person or using text submission assignment tool in the CMS, and in-class discussions or using the discussion board feature in the CMS. Student will receive immediate feedback in person, from the instructor, or within 2 weeks of submission, on paper or through the CMS gradebook.

DE Adaptations for MOE

Participation points may be assessed in a number of different ways including: short written assignments using text submission assignment tool in the CMS, answering instructor questions using text submission assignment tool in the CMS, giving oral presentations using video creating tools such as Youtube or those provided in the CMS, such as Studio, and discussing out-of-class readings using the discussion board feature in the CMS. Student will receive feedback from the instructor, within 2 weeks of submission, through the CMS gradebook.

Method

Exams/Tests

Integration

Tests and quizzes to determine the student's understanding of the study of chemical and physiological processes, such as cellular respiration, enzyme activity and molecular biology; with a demonstration of a deeper understanding of the relationship between structure, function, and evolution of life on earth. At least three tests will be given over the course of the semester. Test and quiz question format may include multiple choice, short answer and/or essay prompts, and oral and/or written identification of models or specimens. Laboratory practicals are given to determine competence in laboratory methods, such as the ability to use a microscope correctly, identify cell structures, knowledge of prokaryotic and eukaryotic specimens, and understanding of the structure and function of animal and plant organ systems. Students will receive feedback with in 2 weeks.

DE Adaptations for MOE

Hands-on oral and/or written identification of models or specimens will be submitted via studio video or zoom. Examinations are presented online using the course management software. There is no requirement for proctored, on campus attendance for examinations. Examination and assignment grades are delivered privately to students via the course management system. Students receive feedback with in 2 weeks via the CMS quiz or gradebook feature.

Method

Oral Presentation

Integration

Oral Presentations to encourage a deeper understanding of the relationship between the structure and function. For example, students may be asked to research one topic, in the study of biology; such as the evolutionary development of chloroplasts with an emphasis on it's structure and function. A detailed rubric and instructions will be provided on paper or through the CMS. Examples of evaluation criteria to consider include clarity, organization, thoroughness of content, depth of analysis, the number and kind of sources, appropriateness of statistics if used for analysis, effectiveness of presentation, grammar and spelling. Presentations are evaluated using the rubric that outlines the expected requirements, such as the level of analysis, depth understanding, and properly referencing relevant sources. In addition, the discussion is reflective, thoughtful and respectful. Presentations are also graded on grammar, to be formatted in a concise and direct language typically found in scientific writing and exercises standard English for punctuation, syntax, spelling, etc. Students receive feedback via the CMS gradebook within 2 weeks.

DE Adaptations for MOE

Oral presentations may be submitted using the assignment tool in conjunction with video creating tools (such as YouTube) or those provided in the CMS (such as Studio). Presentations are evaluated using the online rubric in assignment submission of the CMS. Students receive feedback via the CMS gradebook within 2 weeks.

Method

Papers

Integration

Formal laboratory papers describing selected laboratory investigations, such as the effect of temperature on enzymatic activity, will be written in standard scientific format, the proper application of the scientific method, analysis of data, and presentation of results in scientific format. A detailed rubric and instructions will be provided through the CMS or on paper. These assignments will be graded based on proper application of scientific principles and student's ability to draw valid conclusions from data. Papers are also graded on grammar, to be formatted in a concise and direct language typically found in scientific writing and exercises standard English for punctuation, syntax, spelling, etc. Students receive feedback within 2 weeks.

DE Adaptations for MOE

A detailed rubric and instructions will be provided through the CMS. Written assignments will be submitted through the CMS via document upload, using the assignment tool in the CMS. Students receive feedback via the CMS gradebook within 2 weeks.

Evaluation of Honors assignments

To receive honors credit, students must successfully complete regular course work as well as honors supplemental assignments.

The research project will be assessed according to the appropriateness of the research methods, the accuracy of results, the quality of organization and presentation of results in tables, graphs, and narrative form, the coherence and correspondence of conclusions based on the research outcomes, presentation of appropriate references consulted to contextualize the project.

The oral presentation will be assessed for clarity, accuracy of content, organization, quality and appropriateness of any visual aids, appropriate length, and polished presentation in front of an audience.

Supplemental readings/viewings responses will be evaluated on the basic writing content, originality of response and depth of analysis.

A Service Learning Project will be evaluated on the completion of the agreed upon number of volunteer hours as well as the quality of the reflection paper that integrates academic source material as well as first hand accounts of the service learning experience, the number and types of references consulted, depth of analysis, organizational structure, writing, and the connection back to themes associated with the course.

Field trips, film viewing, interviews, or communications with community members will be evaluated on completion of the assignment, participation in any discussions, and by the writing quality, originality, completeness, and appropriate depth of any response documentation.

Assignments

Assignment Type

Other

In-class and/or outside of class

In-class

Formative or Summative

Summative

Assignment

Follow specific lab instructions to test the impact of environmental conditions such as temperature, salinity, or pH on enzyme activity, followed by development of a formal lab report detailing hypotheses, test methods, results, analysis and conclusions in a standard laboratory/research report format. Reference the article "Purification and Characterization of Polyphenol Oxidase from Hemşin

Apple (Malus communis L.)" https://www.tandfonline.com/doi/full/10.1080/10942912.2015.1012725. Assignments will submitted through the CMS via document upload, using the assignment tool in the CMS. Experimental data will be gathered in lab with materials provided in class.

How assignment will be adapted in online format

Students will use available online simulations to investigate simulated enzyme activity under varying simulated environmental conditions. The data will be used to make tables, graphs, and to produce a formal lab report in standard laboratory/research report format.
Assignments will be submitted through the CMS via document upload or as answers to a Quiz, using the assignment tool in the CMS.

Assignment Type

Reading

In-class and/or outside of class

In-class

Formative or Summative

Formative

Assignment

Read the peer reviewed research article "Going global by adapting local: A review of recent human adaptation" by Fan, S., Hansen, M., Lo Y., and Tishkoff, F. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5154245/

Perform a "Quick-write" using reading apprenticeship evidence chart format. Write down the EVIDENCE {what you saw, heard, or read in the text (include page #s)}. Then write down your INTERPRETATION (I wondered/ I thought/I made a connection). What stuck out to you and what did it mean to you? You will have 30 minutes to read the article and do the quick write. Then, we will come together and discuss your findings. The goal is to demonstrate your understanding and interpretation of the information you read in the article and to engage in bringing awareness to the racial biases, misinformation and the way in which population-specific or region-specific genetic variants influence variable phenotypes.

How assignment will be adapted in online format

Large and Small group collaborative learning activities, utilizing technology such as, google docs or break out rooms in zoom. Students will turn in written responses to the question prompts individually or as a group in CMS assignments.

Assignment Type

Other

In-class and/or outside of class

In-class

Formative or Summative

Summative

Assignment

Analyze hypothetical population genetic questions using the Hardy-Weinberg Theorem to determine if evolution is occurring of if the population is in Hardy-Weinberg equilibrium with respect to the gene of interest. Questions are presented in person by the instructor or online using the course management software. Assignment grades are delivered privately to students via the course management system. Students receive verbal feedback, written feedback on paper or via the CMS quiz or gradebook feature.

How assignment will be adapted in online format

Analyze hypothetical population genetic questions using the Hardy-Weinberg Theorem to determine if evolution is occurring of if the population is in Hardy-Weinberg equilibrium with respect to the gene of interest. Questions are presented online using the course management software. Assignment grades are delivered privately to students via the course management system. Students receive feedback via the CMS quiz or gradebook feature.

Assignment Type
Writing

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

Formative or Summative
Summative

Assignment
Use descriptive scientific writing style to explain the general process of transcription, including the three major steps of initiation, elongation, and termination. Describe how RNA polymerase recognizes where transcription should begin and how mRNA is processed after transcription in eukaryotic cells.

The paper must be a minimum of two paragraphs. Papers will be based on the proper understanding of the scientific principles and written in formal scientific format. A detailed rubric and instructions will be provided in class or through the CMS. Papers will be submitted in class or through the CMS via document upload, using the assignment tool in the CMS. Papers will be evaluated using the rubric that outlines the expected requirements, including writing with concise, direct language typically found in scientific writing and uses standard English for punctuation, syntax, and spelling.

How assignment will be adapted in online format
A detailed rubric and instructions will be provided through the CMS. Papers will be submitted through the CMS via document upload, using the assignment tool in the CMS. Papers will be evaluated using the rubric that outlines the expected requirements, including writing with concise, direct language typically found in scientific writing and uses standard English for punctuation, syntax, and spelling.

Assignment Type
Writing

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

Formative or Summative
Formative

Assignment
Students will read background material (distributed in class or on the historical scientific conceptions of race and critique arguments for and against the notion that race is primarily genetic. In class, a discussion will be held on race as genetic, the impact of racial genetics on medical care for people of color, and the influence of bias on scientific conclusions about race. Students will work in small groups to craft arguments for and against a conception of race as genetic. Each group will submit arguments with sources for their claims. Students will individually submit a reflection on both the societal implications of conceiving of race as genetic and the personal insights investigating this topic has engendered. Grades and feedback will provide on the CMS.

How assignment will be adapted in online format
Background materials will be distributed on the CMS. The discussion will take place using video conferencing platforms and breakout rooms or asynchronous using discussion boards. The written parts of the assignment will be submitted on the CMS using the document upload function. Grades and feedback will provide on the CMS.

Honors Assignments

Assignment
Honors students will complete all the regular course requirements and be graded first according to the requirements and criteria of the rest of the class. In order to receive honors credit, students will also complete the following assignments, 1, 2, and 3:

1. A supplemental reading beyond the readings required for the regular section. An appropriate book or set of articles will be chosen collaboratively by the honors students and the instructor. The reading(s) will be discussed in honors section meetings or used as

a basis for written or multimedia summaries and responses. Examples of books in include The Last Days of the Dinosaurs by Riley Black, The Gene: An Intimate History by Siddhartha Mukherjee, and The Madame Curie Complex: The Hidden History of Women in Science by Julie Des Jardins.

Required or Optional

Required

Honors Core Values

Engagement

Justify how the assignment reflects the Engagement Core Value

The supplemental reading will be focus on a current topic or a topic of current interest to the honors students. This supplemental reading will be discussed by the honors section. This allows engagement with a topic in biology and engagement with peers and faculty in discussing the issues and implications of the text.

Assignment

2. A 10-15 minute presentation of their main project to the honors section or the entire regular section class, at the discretion of the instructor. The presentation will include a summary of research and results, a discussion of the significance of the findings, and a personal reflection on the project. The presentation will be accompanied by a visual presentation, such as slides or a poster.

Required or Optional

Required

Honors Core Values

Academic Rigor and Research
Leadership

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

A presentation provides students the opportunity to distill their work into a concise presentation and to produce easily interpretable graphs, tables and other visual aids.

Justify how the assignment reflects the Leadership Core Value

Giving a presentation requires students to lead the class through a complex topic and to answer questions.

Assignment

3. Honors students will meet regularly with the instructor, either individually or as an honors group to collaborate on the project and to receive instruction on the relevant biology, methods, and techniques. These meetings may be in addition to the regular honors section meetings or may be conducted as part of that course requirement.

Required or Optional

Optional

Honors Core Values

Academic Rigor and Research
Engagement

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

These meetings will challenge students to develop appropriate scientific reasoning and methods.

Justify how the assignment reflects the Engagement Core Value

Interaction with the instructor (and other honors students if there are any) is a key component of an honors section for engagement with academic standards, expertise, as well as promoting collegiality.

Assignment

In addition, honors students will complete either assignment 4 or 5.

4. An original research project consisting of an original contribution to the field. The project will involve choosing a topic in collaboration with the instructor; consulting the literature to find previous research or discussions of the topic; formulating questions that are feasible to answer; creating a proposal for research; designing a set of systematic observations or experiments to address the questions using rigorous scientific principles; conducting the research; producing a summary and discussion of the research and a reflection of the research experience. The format of the work product will be determined in collaboration with the instructor and may consist of
A. A 9-12 page write-up in standard scientific paper format (Introduction, Materials and Methods, Results, Discussion) double-spaced with typical margins and fonts
B. A short film or digital story
C. An academic poster
D. Other, as determined in collaboration with the instructor(s)

Students will also submit a 250-word abstract of their work.

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 if appropriate. A minimum of five academic sources must be referenced in the project. The instructor may organize student peer reviews of their research proposals, and outlines, or rough drafts of their projects. Examples of topics include:
A. An assessment of the whether foods labeled as organic are genetically engineered using PCR to detect evidence of genetic modifications
B. A study of the impact of common lawn care chemicals on soil microbiota
C. An investigation of the antibiotic potential of a various herbs
D. A survey of new mothers who used doulas to investigate if doulas had an impact on the rate of cesarian section
E. A content analysis of high school biology texts to categorize and critique their presentation of a controversial topic such as genetic engineering, evolution, or global warming

Students who complete high quality projects will be encouraged to apply to present their work at the UC Irvine Community College Conference.

Required or Optional

Required

Honors Core Values

Academic Rigor and Research

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

Proposing, designing, conducting, analyzing, and presenting an independent original research project promotes academic rigor and encourages students to improve their scientific thinking.

Assignment

5. A service learning project designed 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 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. The paper should include a academic background or context for the focus of the experience (e.g., museology, informal nature eduction), a summary of activities undertaken during the experience, and a personal reflection on the experience. The paper will include at least 5 academic sources. Students may wish to share the content of their paper 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
Leadership

Justify how the assignment reflects the Engagement Core Value

A service learning project will engage students beyond the honors program and the college community. Students will engage with an institution or agency and in many cases the science-consuming public.

Justify how the assignment reflects the Leadership Core Value

The student will take an active role in creating their experience and then bringing their experience back to the class.

Assignment

At the discretion of the instructor, addition honor assignments may include:

A. Viewing of a film or other video, which can be followed by a class discussion and/or short response paper.
B. A field trip to a relevant local site, such as a waste water treatment plant or a biotechnology production facility. The field trip can be followed by a class discussion and short response paper.
C. Interviews of biologists or other people working in life science or related fields to discover the content of their profession, their motivations for pursuing the work, and their thoughts or opinions on various topical issues. Interviews can be presented to the honors section or followed by a class discussion and/or short response paper.
D. Composing letters or engaging in other communication with public or private parties around an issue of concern to honors students, such as local development projects using microorganisms, bioremediation, the quality of educational programs in biology, or other topics. These communications and any responses can be presented to the honors section or followed by a class discussion and/or short response paper.

Required or Optional

Optional

Honors Core Values

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

Justify how the assignment reflects the Engagement Core Value

Any of these activities will further engage honors students with the honors section, and B, C, and D will engage honors students beyond the college community.

Justify how the assignment reflects the Leadership Core Value

Assignments C and D will require students to assume a leadership role in initiating an activity and responding appropriately to any response.

Justify how the assignment reflects the Positive Transgressive Behavior Core Value

Assignments A, C, and D can require students to risk approaching controversial topics, taking a stand, and questioning prevailing narratives.

Course Materials

Textbooks

Urry, L., A., Cain, M., L., Wasserman, S., A., Minorsky, P., V., Orr, R. (2021). Campbell Biology, 12th Edition, Pearson. ISBN: 9780135188743
Raven P., Johnson G., Mason K., Losos J., Duncan T. (2023). Biology, 13th Edition, McGraw-Hill. ISBN: 9781264097852

Other Resources

MSJC Biological Sciences Department. BIOL-150 Lab Manual 7th Edition. Mt. San Jacinto College , 08-01-2022.

Open Educational Resources

Biology 2e by OpenStax https://openstax.org/details/books/biology-2e
LibreTexts Biology Bookshelves https://bio.libretexts.org/Bookshelves

Class Size Information

Class Size

32

Class Size Category

G - Large lab 32

Diversity and Inclusion

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

The course content of BIOL-150 addresses topics fundamental to understanding the scientific basis of social concerns associated with DEI, and thus provides a critical foundation of science on which discussions of DEI can build. Relevant topics include the biological definition of life, production of zygotes and embryos from gametes, the determination of sex and the relationship of sex to gender, the biological process and function of sex, the history of science as including important contributions from people of color and women (groups traditionally not included in the narrative of biology), the social, ethical, and cultural implications of biotechnology and genetic engineering, the history and current thinking on the relationship of genetics to race, the impacts of environment on cell function, including disproportionate incidence of cancer among people with lower socioeconomic status.

The course has been revised to include explicit mention of diversity and inclusion concerns in the lecture content and in assignments. The honors sections includes extensive opportunities to include topics related to DEI in science.

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

To support diverse learners, we have revised the course along three fronts. We have incorporated increased reflection on the process of learning to support students who may be new to academia, especially those from underrepresented groups. We have made adjustments to the course to explicitly highlight contributions to biology, both historical and current, from people other than the European white males typically presented in textbooks so as to inspire students from groups that historically have not felt welcome in science courses to see science as diverse and inclusive. We have adjusted the methods of instruction and evaluation to include a diversity of modes beyond lectures and exams to encourage greater engagement, community, and support for students, and we have provided OER resources for students with financial hardship.

The lecture and lab content, objectives, methods of instruction and evaluation, and assignments allow students to interact with their instructor, and each other, to build critical thinking skills in a community of practice, to learn and practice skills, both in and out of class, to receive feedback both informally in discussions and labs and formally through formative and summative assessments submitted in the CMS.

Interactions

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

Students will engage in a variety of collaborative activities such as in-class whole class and small group discussions related to modern issues in biology like genetically modified organisms, advanced lab experiments that utilize modern techniques such as PCR performed in small groups, and presentations of experimental results to demonstrate an understanding of the scientific process. Since our student body is diverse, students will discuss how scientists from diverse backgrounds with divergent political, social, ethnic, and socioeconomic status can work collaboratively by using the same scientific method to make progress together toward understanding the complexities of life.

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

The instructor will lead lectures, discussion, and labs that engage students in investigations of modern biological discoveries made by diverse scientists during class time and will provide supportive feedback and grades directly to students both in class and the CMS.

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

The course content focused on current biological topics and skills that are career relevant will be presented in lectures, the textbook, and third party (including OER) resources. Students will have opportunities for diverse perspectives on the range of topics in this course including controversial topics that affected people of color like informed consent for medical procedures. Students will be challenged to go beyond comprehension of basic biological concepts to think critically about how the discoveries in biology are used by society and to ask pertinent questions that critique modern science. All course materials will be ADA compliant and free or as low cost as possible. A majority of learning resources will be presented on the CMS.

Course activities include a number of possible assignments beyond procedural labs and lecture note-taking. Many of these are interactive and advanced laboratory activities that develop career relevant skills. Assessments include a number of possibilities beyond exams, including papers, discussions, and presentations.

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

The course emphasizes critical thinking and provides opportunities for students to reflect not only on what they are learning about biology but on the learning experience itself and how it relates to the cumulative and self-correcting process of science. Students will develop their own unique learning methods and have the opportunity to engage in discussions, collaborative lecture and lab activities, and reflective writing that inspires students to consider areas of uncertainty in biology. The course touches on how basic science is crucial to effective citizenship by demonstrating how science can be used to analyze current societal and community concerns.

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