Course Syllabus - Biol 111-02

Introduction to Cell & Molecular Biology
Spring 2022

**Instructor:** Jaap Hillenius, Ph.D.
Office/Lab: RITA 213/293
Email: hilleniusw@cofc.edu (Please type “Biol 111” in subject line)
Office Hrs: TR 10:40 – 11:40

**SI Leader:** Elisabeth Fongheiser
Email: fongheiserea@g.cofc.edu (Please type “Biol 111” in subject line)

**Course Meeting Place & Time:** Biol 111-02 meets in RITA 152, on Tuesdays & Thursdays 09:25 – 10:40 am

**Textbook:** You have a choice of textbooks, which should depend on your academic plans and where Biol 111 fits into those plans:
1. OpenStax: Biology (2nd ed). This open-source text is suggested for students not intending to continue in biology coursework beyond Biol 112. It is available in both an electronic version (free) and in print versions (purchase/rent; see further details below).
2. Freeman: Biological Science (7th ed). This textbook is recommended for students with a strong interest in biology, especially those intending to continue in biology coursework beyond Biol 112; the Freeman text is required for Biol 211/213. Several purchasing options are available (see further details below).

**Course Description:** Introduction to Cell and Molecular Biology is a foundation course for potential science majors emphasizing critical thinking skills, and the concepts of structure (molecular and cellular, and function in biological systems. Topics include the scientific method, biochemistry, molecular biology, cellular structure and function, respiration, photosynthesis, and genetics. Completion of Biol 111 and the associated laboratory (Biol 111L) meets a General Education requirement. **Prerequisites:** None. BIOL 111L is co-requisite unless students already have credit for the laboratory portion of the class.

**Learning Goals & Objectives:** This General Education science course provides a background for understanding and evaluating contemporary topics in biology. Students develop a foundational understanding of core biology concepts to use, and upon which, to expand in upper-level courses. They also develop the critical competencies that form the basis for the practice of science and for the use of scientific knowledge.

**Assessment and Grading:** In Biol 111, lecture section 02, student performance will be assessed by means of 3 in-class exams and a final exam. The point distribution for these exams is listed below, and final grades will be calculated according to the percentage from the total, as shown below. Midterm grades will be calculated similarly, but only on the basis of the grades available by the midterm due date (March 2 for Spring 2022); midterm grades do not necessarily predict final grades, and are provided for advising purposes only.

<table>
<thead>
<tr>
<th>Point Distribution:</th>
<th>Final Grade Distribution:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam 1 100</td>
<td>A  &gt; 93%</td>
</tr>
<tr>
<td>Exam II 100</td>
<td>B  80 – 83</td>
</tr>
<tr>
<td>Exam III 100</td>
<td>A+ 90 – 93</td>
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<tr>
<td>Final Exam 200</td>
<td>C+ 77 – 80</td>
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<tr>
<td>Total 500</td>
<td>B  83 – 87</td>
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<tr>
<td></td>
<td>C  70 – 73</td>
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<td>D  67 - 70</td>
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<tr>
<td></td>
<td>D+ 63 - 67</td>
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<tr>
<td></td>
<td>F  &lt; 60%</td>
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**Contacting Your Instructor:** I welcome questions and queries from students. You are encouraged to ask questions during class and through email; if you email me, please include the phrase “Biol 111” in the subject line. I strive to answer emails within 48 hours, often sooner. I am also available for individual consultations during office hours, and on most other days by appointment.

**CSL and Supplemental Instruction:** The Center for Student Learning is a valuable academic support resource for students, and you are encouraged to take advantage of their services. They offer a variety of tutoring services, supplemental instruction, and study strategy workshops. The SI Leader for this semester’s Biol 111-02 section is listed above.

**Attendance Policy:** It is expected that you attend all lectures and exams. I expect you to inform me in a timely manner every time you miss a class or a test. In the event that you have missed an exam due to illness, medical or family emergency, you must inform your instructor promptly; I may be able to arrange a make-up for you. If you need to quarantine due to COVID19 or other sickness, please inform me as early as possible, in accordance with the pertinent CoF protocols, so I can determine reasonable accommodations for you to continue in the course. Failure to notify me of your absence in a timely manner may result in no accommodations, i.e., zero points earned on the missed assessments. Failure to complete assessments on the (re)scheduled dates/times will result in zero points earned for the assessment(s), similar to an unexcused absence from a missed exam in lecture.

**CofC Covid Protocols:** The pertinent CofC Covid-related protocols are updated regularly; the most up-to-date information can be found [here](#). Although in principle the course are expected to be conducted in-person, in the event of concerning COVID infection incidents on campus or among students in the class, the instructor reserves the right to cancel in-person instruction and move class activities and/or assessments online. This includes, but is not limited to: single incidents of infection exposing multiple unvaccinated students and subsequent quarantine of those students; multiple incidents of infection (either simultaneously or within a short timeframe) exposing multiple vaccinated or unvaccinated students; large-scale incidents of infection on campus (such as associated with large lecture sizes, academic or campus events, dormitories, cafeterias, etc.) that present a reasonable, wide-scale risk of exposure to the CofC student body.

If you are affected by Covid and/or must quarantine, I will make recorded lectures and/or exams available through OAKS. In such cases, you are expected to complete assessments online synchronously if possible, or asynchronously if there is no other option. If any medical complication arises during COVID infection that prevents your synchronous participation, let me know as soon as possible in order to modify accommodations. Failure to complete assessments on the scheduled dates/times will result in zero points earned for that assessment(s), similar to an unexcused absence. Likewise, failure to notify me of your absence and/or medical hardship in a timely manner may result in no accommodations, i.e. zero points earned on those missed assessments.

**Your responsibility:**
- If you have developed ANY of the following: respiratory symptoms, fever, loss of taste/smell or other symptoms associated with COVID; **please do not attend class or lab in-person.** Notify your instructors as soon as possible and seek COVID testing and/or medical consultation.
- If you have had close-contact with an individual who has tested positive for COVID, please follow the CDC/SC DHEC quarantine guidelines as summarized in the CofC “Back-on-the-Bricks” site. If you are unvaccinated and need to quarantine at home, notify your instructors as soon as possible.
- If you have tested positive for COVID, isolate at home for the recommended period. **Do NOT attend lecture and/or lab during this isolation period.** Notify your instructors as soon as possible.
Please consider the following: if you are unvaccinated, the COVID-19 vaccine significantly reduces your chances of COVID infection, and reduces your chances of severe COVID-related symptoms or complications if infected. The current resurgence of COVID infections and hospitalizations due to the COVID delta and omicron variants is occurring in predominantly unvaccinated individuals (>90% of hospitalizations). Furthermore, consider the risk of infection associated with attending indoor events where social distancing cannot be maintained and/or mask-use is not widespread. It is our hope that you remain healthy throughout the semester, and I will attempt to provide reasonable accommodations if quarantine or isolation is necessary. However, if repeated and/or extended accommodations are requested, you may be referred for a medical withdrawal from the course.

**Accommodations for Students with Disabilities:** The College will make reasonable accommodations for individuals with documented disabilities. Students should apply for services at the Center for Disability Services/SNAP (Lightsey Center 104). Students approved for accommodations are responsible for notifying their instructors as soon as possible.

**Academic Integrity:** Academic dishonesty is not tolerated at the College of Charleston. Academic dishonesty includes but is no limited to cheating on an exam, accessing unauthorized materials during exams, stealing exam questions, substituting one person for another at an exam, falsifying data, destroying or tampering with a computer program or file, and plagiarizing. Students are responsible for adhering to all policies and procedures in the College of Charleston Student Handbook.

Guidelines for this course will follow the College of Charleston Undergraduate Catalog policies for Academic Integrity and the Honor Code, Student Code of Conduct, and Classroom Code of Conduct. Students can find the complete Honor Code and all related processes in the Student Handbook at [http://www.cofc.edu/generaldocuments/handbook.pdf](http://www.cofc.edu/generaldocuments/handbook.pdf)

If you are caught cheating, you will be reported to the Dean of Students and the Honor Board, and you will receive a grade of 0 (zero) for the exam on which the dishonesty was observed. Additionally, you may also receive an F for the course and may receive additional disciplinary action from the Dean of Students and the Honor Board. Furthermore, students may receive a XXF for the course to indicate course failure as a result of academic dishonesty. This notation will remain for two years, after which the student may petition to have it expunged. However, the F will remain on the student's record permanently. Individuals may also be subject to disciplinary probation, suspension, or expulsion from College of Charleston by the Honor Board.

**Textbook Details:** As mentioned at the top of this document, you have a choice of textbooks for this Biol 111 section, depending in large part on your subsequent academic plans:

1. **Openstax: Biology (2nd edition).** This free/low-cost text is a viable option, especially for students not intending to continue in Biology past Biol 112. This free Open Educational Resource (OER), which can be accessed online (link in title), downloaded as a PDF, or purchased as a print copy. If you prefer a physical textbook, you can buy/rent a print versions of this textbook from the CofC Bookstore (cost ranges from $21-$45). Note, however, that there are advantages to using an electronic version of the text, including embedded clickable links to online external content.

2. Freeman: Biological Science (7th ed). This option is recommended for students intending to continue in Biology beyond Biol 112, or those still deciding. The Freeman text is required for Biol 211/213. A range of purchasing options are available:
   a) **eText 1 semester access with access to Mastering Biology (18 weeks):** Estimated cost: $69.99 purchased directly through Pearson (link below); $86.65 purchased through CofC Bookstore. Students can purchase an additional Loose-leaf version of the book for $44.99 through Mastering Biology, and it is shipped to the student from Pearson. *This may be a good option for students who only need access to Freeman for a single semester (i.e. non-biology majors using Freeman in Biol 112).*
b) **eText with access to Mastering Biology (24-month access).** Estimated cost: $109.99 purchase directly from Pearson (link below); $146.65 purchased through CofC Bookstore. Students can purchase an additional Loose-leaf version of the book for $44.99 through Mastering Biology, and it is shipped to the student from Pearson. *This would be the recommended for BIOL 111/HONS 151 students who are Biology majors and are using Freeman in BIOL 111, as it would give them access to Freeman through their sophomore year when they take BIOL 211/213.*

c) **eText 1 year access without access to Mastering Biology:** Estimated cost: $49.99 purchase directly from Pearson (link below); $80.00 purchased through CofC Bookstore. *This may be a good option for students who only need access to Freeman for 1 year (non-biology majors taking 111/112; or students who used Openstax in Biol 111 but need Freeman for 112 (and perhaps BIOL 211/213).*

d) **Bound print version of the book:** Estimated cost: $204.99 purchased directly from Pearson (link below); From the CofC Bookstore Buy New - $273.30, Rent New - $185.85; Buy Used - $205.00, Rent Used - $128.45. Students who purchase/rent a new textbook should have access to Mastering Biology. However, students who purchase/rent a used textbook will have to pay extra from access to Mastering Biology.

**To register for the Freeman et al text directly with the publisher (Pearson):**
2. Sign in with your Pearson student account or create your account.
3. Select any available access option, if asked.
   a. Enter a prepaid access code that came with your textbook or from the bookstore.
   b. Buy instant access using a credit card or PayPal.
   c. Select Get temporary access without payment for 14 days.
4. Select Go to my course.
5. Select Biological Science from My Courses.

If you contact Pearson Support, give them the course ID: hillenius89772

**To sign in later:**
1. Go to [https://mlm.pearson.com](https://mlm.pearson.com).
2. Sign in with the same Pearson account you used before.
3. Select Biological Science from My Courses.
# Lecture Schedule
(subject to change with notice)

<table>
<thead>
<tr>
<th>Date</th>
<th>Topics</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/11</td>
<td>1. Introduction: Biology is the Study of Life</td>
<td>OpenStax Ch. 1</td>
</tr>
<tr>
<td>13</td>
<td>2. Evolution as a unifying theme of biology</td>
<td>Freeman Ch. 1</td>
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<tr>
<td>18</td>
<td>3. The molecules of life I: chemical structure, water &amp; carbon</td>
<td>Ch. 18 Ch. 22</td>
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<tr>
<td>20</td>
<td>4. The molecules of life II: carbon &amp; carbohydrates</td>
<td>Ch. 2 Ch. 2</td>
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<tr>
<td>25</td>
<td>5. The molecules of life III: proteins &amp; nucleic acids</td>
<td>Ch. 3 Ch. 3, 4</td>
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<tr>
<td>27</td>
<td>6. The molecules of life IV: membranes &amp; diffusion</td>
<td>Ch. 5 Ch. 6</td>
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<tr>
<td>02/01</td>
<td><strong>Exam 1</strong></td>
<td></td>
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<tr>
<td>03</td>
<td>7. The cell I: cell structure</td>
<td>Ch. 4, 5 Ch. 7</td>
</tr>
<tr>
<td>08</td>
<td>8. The cell II: energetics and enzymes</td>
<td>Ch. 6 Ch. 8</td>
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<tr>
<td>10</td>
<td>9. The cell III: glycolysis &amp; aerobic respiration</td>
<td>Ch. 7 Ch. 9</td>
</tr>
<tr>
<td>15</td>
<td>10. The cell IV: anaerobic respiration</td>
<td>Ch. 7 Ch. 9</td>
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<tr>
<td>17</td>
<td>11. The cell V: photosynthesis</td>
<td>Ch. 8 Ch. 10</td>
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<tr>
<td>22</td>
<td>12. The cell VI: cell-cell interactions</td>
<td>Ch. 9 Ch. 11</td>
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<tr>
<td>24</td>
<td><strong>Exam 2</strong></td>
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<tr>
<td>03/01</td>
<td>13. The cell VII: cell cycle</td>
<td>Ch. 10 Ch. 12</td>
</tr>
<tr>
<td>03</td>
<td>14. The gene I: meiosis</td>
<td>Ch. 11 Ch. 13</td>
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<tr>
<td>08</td>
<td><strong>Spring Break</strong></td>
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<tr>
<td>10</td>
<td><strong>Spring Break</strong></td>
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<tr>
<td>15</td>
<td>15. The gene II: Mendelian genetics</td>
<td>Ch. 12 Ch. 14</td>
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<tr>
<td>17</td>
<td>16. The gene III: Chromosomes, linkage, mutations</td>
<td>Ch. 13 Ch. 14</td>
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<tr>
<td>22</td>
<td>17. The gene IV: DNA</td>
<td>Ch. 14 Ch. 15</td>
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<tr>
<td>24</td>
<td>18. The gene V: the genetic code</td>
<td>Ch. 15 Ch. 16</td>
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<tr>
<td>29</td>
<td><strong>Exam 3</strong></td>
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<tr>
<td>31</td>
<td>19. The gene VI: from DNA to proteins</td>
<td>Ch. 15 Ch. 17</td>
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<tr>
<td>04/05</td>
<td>20. The gene VI prokaryotes</td>
<td>Ch. 15 Ch. 18</td>
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<tr>
<td>07</td>
<td>21. The gene VII: eukaryotes</td>
<td>Ch. 15 Ch. 19</td>
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<tr>
<td>12</td>
<td>22. The gene VIII: biotechnology</td>
<td>Ch. 17 Ch. 20</td>
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<td>14</td>
<td>23. The gene IX: genome mapping, genomics</td>
<td>Ch. 17 Ch. 20</td>
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<tr>
<td>19</td>
<td>24. The gene X: genes, development &amp; evolution</td>
<td>Ch. 17 Ch. 21</td>
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<tr>
<td>21</td>
<td>25. The gene XI: review</td>
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**Final Exam: Saturday 30 April (10:30 am – 12:30 pm)**

**Other important dates:**
- Tuesday, January 18 – Drop/Add
- Monday, April 4 – last day to withdraw with a “W” grade
- Thursday, April 30 – Lecture Final
Biol 111/Biol 111L Introduction to Cell and Molecular Biology

Department of Biology

Learning Goals & Objectives: This General Education science sequence provides a background for understanding and evaluating contemporary topics in biology. Students develop a foundational understanding of core biology concepts to use, and upon which, to expand in upper-level courses. They also develop the critical competencies that form the basis for the practice of science and for the use of scientific knowledge.

Core Concepts: This 2-semester sequence in general biology, which addresses fundamental principles in biology to prepare students for sophomore and upper-level courses in biology:

- EVOLUTION: The diversity of life evolved over time by processes of mutation, selection, and genetic change. The theory of evolution by natural selection allows scientists to understand patterns, processes, and relationships that characterize the diversity of life.
- STRUCTURE AND FUNCTION: Basic units of structure define the function of all living things. Structural complexity, together with the information it provides, is built upon combinations of subunits that drive increasingly diverse and dynamic physiological responses in living organisms. Fundamental structural units and molecular and cellular processes are conserved through evolution and yield the extraordinary diversity of biological systems seen today.
- INFORMATION FLOW, EXCHANGE, AND STORAGE: The growth and behavior of organisms are activated through the expression of genetic information at different levels of biological organization and depend on specific interactions and information transfer.
- PATHWAYS AND TRANSFORMATIONS OF ENERGY AND MATTER: Biological systems grow and change by processes based upon chemical transformation pathways and are governed by the laws of thermodynamic and will be explored to understand how living systems operate, how they maintain orderly structure and function, and how physical and chemical processes underlie processes at the cellular level (i.e. metabolic pathways, membrane dynamics), organismal level (i.e. homeostasis) and ecosystem level (i.e. nutrient cycling).
- SYSTEMS: Living systems are interconnected and interacting and biological phenomena are the result of emergent properties at all levels of organization, from molecules to ecosystems to social systems. The course will explore the dynamic interactions of components at one level of biological organization to the functional properties that emerge at higher organizational levels.

The specific topics covered in each course include:

**Biology 111 & Biology 111L**
- Chemical and physical properties of life
- Cell form & function
- Energetics, metabolism, and photosynthesis
- The cell cycle:
  - Mitosis and cell reproduction
  - Meiosis and sexual reproduction
- Mendelian genetics / Patterns of inheritance
- Human Inheritance
- The molecular basis of inheritance
- DNA and protein production
- Regulation of gene expression
- Some aspects of biotechnology

**Biology 112 & Biol 112L**
- The development of evolutionary thinking
- Basic evolutionary processes
- Comparative plant form & function
- Comparative animal form & function
Core Competencies

- **Nature of Scientific Knowledge**
  - Understand the intellectual standards used by scientists to establish the validity of knowledge, evidence, and decisions about hypothesis & theory acceptance. These standards include: 1) science relies on external and naturalistic observations, and not internal convictions; 2) scientific knowledge is based on the testing of hypotheses and theories, which are under constant scrutiny and subject to revision based on new observations; 3) the validity of scientifically generated knowledge is established by the community of scientists through peer review and open publication of work.
  - Understand that new ideas in science are limited by the context in which they are conceived; are often rejected by the scientific establishment; sometimes spring from unexpected findings; and usually grow slowly, through contributions from many investigators.
  - Understand that science operates in a world defined by the laws of chemistry and physics.
  - Understand the differences and relationships among scientific theories, hypotheses, facts, laws, & opinions.
  - Understand the differences between science and technology, but also their interrelations.
  - Understand the dynamic (tentative) nature of science.

- **Scientific Methods of Discovery**
  - Understand the methods scientists use to learn about the natural world (observing; questioning; formulating testable deductive hypotheses; controlled experimentation when possible; observing a wide range of natural occurrences and discerning (inducing) patterns).
  - Apply physical/natural principles to analyze and solve problems.

- **Develop a Scientific Attitude**
  - Develop habits of mind that foster interdisciplinary and integrative thinking (within biology; between biology and other sciences; between science and other disciplines).
  - Develop an appreciation for the scientific attitude - a basic curiosity about nature and how it works.

- **Develop scientific analysis and communication skills**
  - Develop quantitative reasoning skills (quantitatively expressing the results of scientific investigations, or patterns in nature and using knowledge of biological concepts to explain quantitatively-expressed data or patterns).
  - Understand the probabilistic nature of science and the use/application of inferential statistics to test hypotheses.
  - Develop scientific information literacy (library, internet, databases etc...); find and evaluate the validity of science-related information.
  - Communicate scientific knowledge, arguments, and ideas in a variety of different contexts (scientific, social, cultural), utilizing a variety of different media (scientific articles, policy statements, editorials, oral presentations etc.).
  - Develop cooperative problem-solving skills (working effectively in teams), but also habits of mind and skills that foster autonomous learning.

- **Develop an appreciation for the impact of science on society.**
  - Develop an appreciation of humans as a part of the biosphere and the impact of biological science on contemporary societal/environmental concerns.
  - Knowledge of the history of the biological sciences and the influences of politics, culture, religion, race, and gender on the scientific endeavor.

**Signature assignments for measuring learning outcomes**

**Learning Outcome 1: Students apply physical/natural principles to analyze and solve problems.**

This learning outcome is assessed using the poster (or scientific article) generated in Biology 112 lab as part of the multi-week student-directed independent research project. In this project students use data they collect (or has been collected in actual research investigations) to test an hypothesis of their choosing. These projects may be themed, with all student groups addressing different aspects of a larger question, emphasizing the interdependence of various research groups needed to address complicated problems. This multi-week project begins the class identifying what questions need to be addresses in the larger problem. Individual student groups then become experts in these areas of the larger problem. The smaller research teams develop an hypothesis, and write a research proposal to test their hypothesis. Students collect (or use already collected data), summarize and statistically analyze the data, and draw conclusions.
Learning Outcome #2 - Students demonstrate an understanding of the impact that science has on society.
Biology 112 lab Students produce a written document based on one of the case-based labs (examples - policy statement, article, stake-holder professional letter or poster) that requires them to research and apply biological knowledge or evidence to defend or critique a proposed solution to a biology-related societal issue. Although the choice of the specific issue or proposed solution is course-section specific, some examples of potential issues include
  - exploring environmental/health impacts of genetically modified organisms
  - the use of performance enhancing drugs in sports
  - the development of antibiotic resistance in disease organisms

1This learning goal will be measured as part of the general education assessment. The specific learning outcome to be measured is: Students can apply physical/natural principles to analyze and solve problems.

2This learning goal will be measured as part of the general education assessment. The specific learning outcome to be measured is: Students can demonstrate an understanding of the impact that science has on society.