NEW JERSEY CENTER
FOR TEACHING & LEARNING

Progressive Science Initiative® (PSI®)
BIOL6853: Learning and Teaching AP PSI Biology I

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Course Credit: 3.0 NJCTL credits

Dates & Times:
This is a 3-credit, self-paced course, covering 7 modules of content. The exact number of hours that you can expect to spend on each module will vary based upon the module coursework, as well as your study style and preferences. You should plan to spend approximately 15 hours per credit working online, and up to 30 hours per credit working offline.

Graduate Student Handbook: www.njctl.org/graduate-handbook/

COURSE DESCRIPTION:
This is the first in a four-course series which, together, are designed for those who are learning to teach AP Biology. This is a rigorous course that builds upon foundational topics in physics and chemistry, pulling them together to show how these fuel biological processes. Topics include foundations of chemistry, origins and chemistry of life, prokaryotes and eukaryotes, membranes and water potential.

STUDENT LEARNING OUTCOMES:
Upon completion of the course, the student will be able to:

1. Demonstrate an understanding of advanced biology topics, detailed in the module learning outcomes below.
2. Integrate PSI materials (including presentations, labs, practice problems, etc.) to support student learning and deliver effective instruction.
3. Create a social constructivist learning environment through the use of formative assessment questions, interpreting the results of this assessment to effectively facilitate student-led discussions that support deeper understanding of the content.

4. Integrate multiple attempts to demonstrate student mastery of content knowledge, as encouraged/fostered by the PSI pedagogy.
5. Implement learning plans that are aligned to College Board standards that allow for differentiation.

TEXTS, READINGS, INSTRUCTIONAL RESOURCES:
Required Texts:

PSI AP Biology uses a free digital textbook accessible at:
https://njctl.org/materials/courses/ap-biology-update-for-2022/

COURSE REQUIREMENTS:
In order to receive a Passing grade, the participant must complete the following course requirements:

1. Activities: A number of different learning activities will ensure participant engagement and learning in the course. These include:
   - Engage in video module lessons which demonstrate minimized direct instruction followed by frequent formative assessment
   - Completion of formative assessments aligned to learning objectives which include detailed analysis when answered incorrectly.
   - Interaction with module discussion boards that allow conversation with peers and course instructors about the module's content, delivering that content to students. Discussion boards also serve as a place to ask and answer questions related to the module's content.
2. Short Answer Assignment: Each module requires one (1) original response to a given prompt. These prompts are typically based upon course lessons and require teachers to analyze, reflect, and make connections between the module's content and their own classroom practice.
3. Mastery Exercises: For each module, these multiple-choice question quizzes assess the content knowledge gained in a module. Participants have the opportunity to retake; random questions are pulled from a larger question bank on each attempt ensuring varied questions.
4. Virtual Labs: For two modules, a virtual lab write-up will be submitted. Virtual Labs prepare you to teach hands-on labs that promote a deeper understanding of the content knowledge being learned through real-world applications and analysis.
5. Module Exam: One is completed at the end of each (or every other) module. These are culminating exams consisting of multiple choice and free response questions aligned to the standards and objectives of the module.
6. Reflection Paper: At the end of the course, participants are required to reflect on the knowledge taught in the course, make connections, and compare/contrast their current pedagogy with new strategies gained in this assignment.
7. Final Exam: At the end of the course, a comprehensive exam consisting of Multiple Choice and Free Response questions assesses the content knowledge learned throughout the course.

GRADE DISTRIBUTION AND SCALE:
Grade Distribution:

Module Exams	70%

Final Exam	10%
Labs	6%
Short Answer Assignments	6%
Mastery Exercises	6%
Reflection Paper	2%

Grade Scale:

A	93 – 100
A-	90 – 92
B+	86 – 89
B	83 – 86
B-	80 – 82
C+	77 – 79
C	73 – 76
C-	70 – 72
D	60.0 – 69.9
F	59.9 or below

GRADING RUBRIC:
The following rubric is used to score:

- Short Answer Assignment – 6% of grade
- Reflection Paper – 2% of grade

The minimum possible score for this rubric is 4 points, and the score will be converted to the minimum grade available in this module (which is zero unless the scale is used). The maximum score 25 points will be converted to the maximum grade.

Intermediate scores will be converted respectively and rounded to the nearest available grade. If a scale is used instead of a grade, the score will be converted to the scale elements as if they were consecutive integers.

	Meets Expectation	**Approaches Expectation**	**Below Expectation**	**Limited Evidence**
	7 points	***5 points***	***3 points***	***1 point***
Content	• Demonstrates excellent knowledge of concepts, skills, and theories relevant to topic.	• Demonstrates fair knowledge of concepts, skills, and theories.	• Demonstrates incomplete or insubstantial knowledge of concepts, skills, and theories.	• Demonstrates little or no knowledge of concepts, skills, and theories.

Depth of Reflection	• Content is well supported and addresses all required components of the assignment.	• Content is partially supported; addresses most of the required components of the assignment.	• Content contains major deficiencies; addresses some of the required components of the assignment.	• Content is not supported and/or includes few of the required components of the assignment.
Evidence and Practice	• Response shows strong evidence of synthesis of ideas presented and insights gained throughout the entire course. The implications of these insights for the respondent's overall teaching practice are thoroughly detailed, as applicable.	• Writing is mostly clear, concise, and well organized with good sentence/paragraph construction. Thoughts are expressed in a coherent and logical manner. There are no more than five spelling, grammar, or syntax errors per page of writing.	• Response is missing some components and/or does not fully meet the requirements indicated in the instructions. Some questions or parts of the assignment are not addressed. Some attachments and additional documents, if required, are missing or unsuitable for the purpose of the assignment.	• Response excludes essential components and/or does not address the requirements indicated in the instructions. Many parts of the assignment are addressed minimally, inadequately, and/or not at all.
	4 points	***3 points***	***2 points***	***1 point***
Writing Quality	• Writing is well-organized, clear, concise, and focused; no errors.	• Some minor errors or omissions in writing organization, focus, and clarity.	• Some significant errors or omissions in writing organization, focus, and clarity.	• Numerous errors in writing organization, focus, and/or clarity.

The following rubric is used to score:

- Labs – 6% of grade

The minimum possible score for this rubric is 2 points, and the score will be converted to the minimum grade available in this module (which is zero unless the scale is used). The maximum score 14 points will be converted to the maximum grade.

Intermediate scores will be converted respectively and rounded to the nearest available grade. If a scale is used instead of a grade, the score will be converted to the scale elements as if they were consecutive integers.

	Meets Expectation	**Approaches Expectation**	**Below Expectation**	**Limited Evidence**
	7 points	***5 points***	***3 points***	***1 point***

Completeness	• Lab write-up is complete with no missing fields.	• Lab write-up has 1-2 missing fields.	• Lab write up has 3-5 missing fields.	• There are more than 5 missing fields on the lab write-up.
Calculations	• All answers are calculated correctly.	• Most answers are calculated correctly, but there are 1-2 minor calculation errors.	• Most answers are calculated correctly, but there are multiple minor calculation errors, or 1-2 gross miscalculations.	• There are calculation errors throughout the lab.

The remaining types of assignments are not scored using a rubric. These assignments are scored using percentage correct to assign a letter grade. The assignments in this manner are as follows:

- Mastery Exercises – 6% of grade
- Module Exams – 70% of grade
- Final Exam – 10% of grade

Mastery Exercises can be retaken as many times as desired to ensure a high score. Due to the nature of these assignments, each time they are taken, they will be composed of ten unique questions pulled randomly from a larger question bank.

Module and Final Exams are scored using a curve, which allows us to keep content exams rigorous. Module Exams can be retaken one time. Final Exams cannot be retaken.

ACADEMIC STANDING:
NJCTL has established standards for academic good standing within a student's academic program. Students enrolled in any NJCTL online course must receive an 80 or higher to successfully complete a course and receive credit for that course. An 80 is equivalent to a GPA of 2.7 or B-. Additionally, students in an endorsement program must receive a cumulative GPA of 3.0 for all courses combined in order to successfully complete the program.

ACADEMIC INTEGRITY:
Students must assume responsibility for maintaining honesty in all work submitted for credit and in any other work designated by the instructor of the course. Academic dishonesty includes cheating, fabrication, facilitating academic dishonesty, plagiarism, reusing /repurposing your own work, unauthorized possession of academic materials, and unauthorized collaboration.

CITING SOURCES WITH APA STYLE:
All students are expected to follow proper writing and APA requirements when citing in APA (based on the APA Style Manual, 6th edition) for all assignments.

DISABILITY SERVICES STATEMENT:
We are committed to providing reasonable accommodations for all persons with disabilities. Any student with a documented disability requesting academic accommodations should contact the Dean of Students, Melissa Axelsson, for additional information to coordinate reasonable accommodations for students with documented disabilities (melissa@njctl.org).

NETIQUETTE:
Respect the diversity of opinions among the instructor and classmates and engage with them in a courteous, respectful, and professional manner. All posts and classroom communication must be conducted in accordance with the student code of conduct. Think before you push the Send button. Did you say just what you meant? How will the person on the other end read the words?

Maintain an environment free of harassment, stalking, threats, abuse, insults or humiliation toward the instructor and classmates. This includes, but is not limited to, demeaning written or oral comments of an ethnic, religious, age, disability, sexist (or sexual orientation), or racist nature; and the unwanted sexual advances or intimidations by email, or on discussion boards and other postings within or connected to the online classroom.

If you have concerns about something that has been said, please let your instructor know.

CLASS SCHEDULE:

Module	Module Learning Outcomes	Assignments
1 – Foundations of Chemistry I	● Describe the structure of an atom. ● Apply the laws of Conservation of Matter and Conservation of Energy to examples in non-living and living systems. ● Analyze models of small molecules and describe them using words. ● Identity examples of kinetic energy, potential energy and changes in entropy, in living systems and in diagrams. ● Differentiate between spontaneous and non-spontaneous events by analyzing changes in energy and stability. ● Describe the role of energy in living systems.	● Short Answer Assignment ● Mastery Exercises
2 – Foundations of Chemistry II	● Predict whether two atoms will form a single, double, or triple covalent bond, or an ionic bond, by analyzing the first three periods of the periodic table. ● Represent the water molecule using different models of the molecule. ● Predict how carbon, nitrogen and oxygen will interact with hydrogen atoms to form molecules. ● Describe three states of matter: gas, liquid, and solid. ● Explain the difference between acids and bases (using the Arrhenius definitions). ● Use the pH equation to calculate relative differences in [H+] (hydrogen ion concentration).	● Short Answer Assignment ● Mastery Exercises ● Module Exam (Covering content of modules 1 & 2)

3 – Origins of Life	• Represent the concept of deep time in a way that illustrates the magnitudes of the ages of the universe, the Earth, and milestones in early evolution. • Evaluate hypotheses that attempt to explain the sources of water on Earth. • Describe the polarity of the water molecule and explain how its polarity relates to each of the emergent properties of liquid water. • Explain how the properties of water that result from its polarity and hydrogen bonding affect its biological function. • Explain the difference between organic and inorganic molecules. • Evaluate hypotheses explaining organic chemical evolution on Earth. • Describe the scientific evidence that provides support for several models of the origin of life on Earth. • The RNA World Hypothesis proposes that RNA could have been the earliest genetic material.	• Short Answer Assignment • Mastery Exercises • Module Exam
4 – Chemistry of Life	• Describe the composition of macromolecules required by living organisms. • Describe the properties of the monomers and the types of bonds that connect the monomers in biological macromolecules. • Analyze structural, skeletal, and other diagrams of macromolecules and use them to identify their macromolecular class. • Explain how a change in the subunits of a polymer may lead to changes in structure or function of the macromolecule. • Describe the structural similarities and differences between DNA and RNA. • Describe the characteristics of DNA that allow it to be used as the hereditary material, (such as complementary bonding of nucleotides).	• Short Answer Assignment • Mastery Exercises • Module Exam

5 – Prokaryotes	• Describe the structure and/or function of sub cellular components and organelles. • Identify the minimal components for a living cell: the plasma membrane, cytoplasm, ribosomes, and a chromosome. • Explain each of the following concepts, using the evolution of antibiotic resistance in bacterial populations as an illustrative example: • Using the human microbiome as an illustrative example, explain how interactions within and among populations influence community structure. • Provide evidence that DNA, and in some cases RNA, is the primary source of heritable information. • Describe the mechanisms by which genetic information is copied for transmission between generations (in prokaryotes). • Prokaryotes and eukaryotes can contain plasmids, small extrachromosomal double-stranded, circular DNA molecules. Describe the structures involved and and the processes by which plasmids and viruses can transmit genetic information between bacterial cells (transformation, conjugation, and transduction).	• Short Answer Assignment • Mastery Exercises
6 – Eukaryotes	• Describe the structure and/or function of sub cellular components and organelles. • Explain the effect of surface area-to-volume ratios on the exchange of materials between cells or organisms and the environment. • Describe the membrane-bound structures of the eukaryotic cell. • Explain how internal membranes and membrane-bound organelles contribute to compartmentalization of eukaryotic cell functions. • Describe structural and functional evidence on cellular and molecular levels that provides evidence for the common ancestry of all eukaryotes. • Describe Endosymbiotic Theory and the evidence that supports it, including the presence and structure of membrane-bound organelles such as mitochondria and chloroplasts.	• Short Answer Assignment • Mastery Exercises • Module Exam (Covering content of modules 5 & 6)
7 - Reflection & Final Exam	• Review topics as desired • Zoom meeting with instructor to review prior to final exam • Discussion Board	• Reflection Paper • Module Exam