Secaucus Board of Education

PSI Biology

Course Code: 4100, 4210, 4220, 4230, 6440

Science Department

Born on August 2016

Aligned to the NJSLS – Science (2014), Technology (2014), 21st Century Life and Careers (2014), ELA (2016) and Mathematics (2016)

Adopted by the Secaucus Board of Education on August 25, 2016

District Equity Statement

The Board of Education directs that all students enrolled in the schools of this district shall be afforded equal educational opportunities in strict accordance with the law. No students shall be denied access to or benefit from any educational program or activity or from a co-curricular or athletic activity on the basis of the student's race, color, creed, religion, national origin, ancestry, age, marital status, affectional or sexual orientation, gender, gender identity or expression, socioeconomic status, or disability. The Board directs the Superintendent to allocate faculty, administrators, support staff members, curriculum materials, and instructional equipment supplies among and between the schools and classes of this district in a manner that ensures equivalency of educational opportunity throughout this district. The school district's curricula in the following areas will eliminate discrimination, promote mutual acceptance and respect among students, and enable students to interact effectively with others, regardless of race, color, creed, religion, national origin, ancestry, age, marital status, affectional or sexual orientation, gender, gender identity or expression, socioeconomic status, or disability:

1. School climate/learning environment
2. Courses of study, including Physical Education
3. Instructional materials and strategies
4. Library materials
5. Software and audio-visual materials
6. Guidance and counseling
7. Extra-curricular programs and activities
8. Testing and other assessments.

Excerpt from Secaucus Board of Education, Policy 5750, Edited September 2016

Course Description

Biology is a course required by both the State of New Jersey and the Secaucus Board of Education (SBOE). Progressive Science Initiative (PSI) Biology is a course based on documents created by the New Jersey Center for Teaching and Learning (NJCTL). Students are welcome to continue their study of Biology by taking the AP Biology course offered to seniors in high school. The goal of this course is to help students build an understanding of modern biology on the foundation of their prior learning in PSI Physics and PSI Chemistry. All the course topics are either taken directly from Biology, or are designed to prepare students to understand Biology topics. In addition to building a strong biological foundation of knowledge to take the AP Biology course, this course also serves as a foundation for both Human Anatomy/Physiology and Comparative Anatomy courses.

This course strives to give students an integrated insight into the modern scientific view of the world. The separation of the sciences into the discrete disciplines of physics, chemistry and biology is becoming less useful as science is not as easily divided up that way anymore. At the end of this course students should have a broad perspective on the world and how it works. This will empower them to follow their interests in any direction after high school, whether it is to continue their education at a college or university, to join the armed forces, or join the workforce.

Course Outline

Molecular Biology – Units 1 through 5

- Origin of Life
- Large Biological Molecules
- Membranes & Enzymes
- Genes
- Energy Processing

Cellular Biology – Units 6 through 8

- Prokaryotes and Viruses
- Eukaryotes & Gene Expression
- Mitosis and Meiosis

Organismic Biology – Units 9 through 13

- Mendelian Genetics & Inheritance Patterns
- Evolution & Population Genetics
- Classification (optional if time permits)
- Ecology
- Anatomy & Physiology (optional if time permits)

Requirements and Expectations

Students are expected to arrive in class promptly with their class materials (binder, pencils, etc.). During class students are expected to positively participate in class, respecting their teacher and their peers. Students are also expected to follow any and all Secaucus High School rules of behavior found on the school's website.

Students are able to determine how they want to take notes and store class documents. A designated three ring binder will be suggested but students can make use of individual folders or any system they have found to work for them and keep them organized. The class's documents could be numerous. They may include notes (in the Essentials of Biology classroom), handouts, lab procedures, lab reports, homework assignments, and vocabulary. An organized system will help prepare the students for both the midterm and final exams.

The frequency at which students are given homework will be determined by the teacher. These assignments need to be completed by the designated time in order that the student is prepared for class. Homework answers are posted on the NJCTL's website and students should consider a homework assignment complete when they understand any differences between their answers and those posted. This "work on-your-own" style of learning is critical since, while homework may not graded, frequent quizzes will assess student understanding of each homework assignment.

All course materials are posted at www.njctl.org and Biology teachers may provide electronic files on their school website. Students can download and print any lost SMART Notebooks (NJCTL program similar to PowerPoint), homework assignments or labs from that site. In addition, if students are absent, they should review the SMART Notebook/teacher provided notes and homework from that day so as not to fall behind. Biology teachers are required to post homework assignments to their school website.
The pacing, topics, and teaching methodology presented in this curriculum may be modified at the teacher's discretion on the basis of, but not limited to, academic level of the course, student performance, student needs, and school schedule.

Coursework and Assessment

Each Biology teacher will determine how their classroom will be assessed. Teachers will use a mix of test, quiz, homework, laboratory, and participation grades to calculate the student's final grade. Teachers can either use a point or percentage calculation for the grade.

Tests will occur at the end of each unit. Quizzes will be given throughout the unit. Homework will be assigned when determined to be helpful in solidifying concepts taught in the classroom. Lab reports will be assigned after lab is conducted in class. Students will always be given advanced notice of tests; however, quizzes will be given at any time by the teacher (not necessarily announced).

Midterms and Finals

In addition to four quarterly grades, students will also earn a separate grade on their transcript for their midterm and final exams. Each quarterly grade carries a weight of 20% of the full year grade while these two exams each have a weight of 10%, giving them the same weight as a single quarter's result.

The midterm exam will be on the work covered through the first two quarters (September through January). The final exam will be on the work through the second two quarters (February through June). The final is not cumulative.

Teacher Availability

Biology teachers will have a scheduled tutoring time as agreed to in their contract with SBOE. They can also be available by appointment should a student request a different time. All similar level biology classes are using the same course materials, so

students can get assistance from any Biology teacher. Students are encouraged to work together to build better understanding while at the same time understanding that plagiarism and cheating are unacceptable.

Biology teachers are also available to both students and parents via school email address, which are located on the SBOE website.

Course Levels

General PSI Biology – Course Code 6440

This course is a core science program covering a wide-range of biological concepts at a general level, as required by the student's IEP. This adaptive course will focus on basic and complex biological concepts, including, but not limited to: matter, energy, organization in living systems, diversity, biological evolution, reproduction and heredity, natural systems and interactions, and human interactions and impact. This course is intended to effectively prepare students for the required New Jersey Biology Competency Test, given in May of each school year. Laboratory activities will reinforce course concepts.

PSI Biology Concepts – Course Code 4230

The material in the class is presented at a slower pace compared to the other courses offered in order to accommodate those students who have difficulty keeping up with the rate of a regular class. Concepts are covered not only at a slower pace, but also with more teacher support during hands-on activities and discussions. This class has an inclusion setting for those students who have an IEP, which may state that he or she requires in-class support of a special education teacher. As such, there is a special education teacher who will team-teach the class each day. Students who are placed in this course based on ESL placement will also receive accommodations based upon their ESL level. Upon completion of this course, students will continue to be enrolled in Essentials level courses or can be enrolled in Regular level courses.

PSI Biology – Course Code 4220

The material is presented at a moderate pace. Lessons are based on student- driven activities and discussions, which require the student to be a somewhat independent learner. Hands-on activities are meant to show connection to real-life science applications, and to promote critical thinking and problem solving skills. Students who are placed in this course based on ESL placement will also receive accommodations based upon their ESL level. Upon completion of this course students will continue in their high school science program and enroll in Essentials, Regular, or Honors level classes.

PSI Biology Honors/Academy – Course Code 4210/4100

This course is designed for those students who are more independent learners, and who have the ability to master concepts at a faster pace than that of the average student. Students in this class are challenged with additional activities, readings, and discussions beyond that of the regular class in order to further promote and enhance higher-order thinking skills, and scientific processes. Students who are placed in this course based on ESL placement will also receive accommodations based upon their ESL level. Academy students enrolled in this course are required to participate in the Secaucus High School Science Fair.

Course Modifications (ELLs, Special Education, Gifted and Talented)

The course instructor will determine, with the assistance of guidance counselors, teacher assistant/aides, and/or special education teachers, what modifications will be made for his/her students. Such examples of modifications can include, but not be limited to:

- Extended time as needed
- Modification of tests and quizzes
- Preferential seating
- Alternative/Formative assessment (projects)
- Effective teacher questioning (ranging from simple recall to higher order critical thinking questions)
- Supplemental materials
- Cooperative learning

- Teacher tutoring
- Peer tutoring
- Differentiated Instruction

Interdisciplinary Connections

The following Common Core Standards for ELA and Mathematics and the NJSLS for College and Career Readiness and Technology depict what standards align to the science standards taught in this PSI Biology Course.

NJSLS - ELA/Literacy:

- RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-LS1-1),(HS-LS1-6)
- WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-LS1- 1),(HS-LS1-6)
- WHST.9-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (HS-LS1-6)
- WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (HSLS1-3)
- WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-LS1-3)
- WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS-1-1),(HS-LS1-6)
- SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. (HS-LS1-2),(HS-LS1-4),(HS-LS1-5),(HS-LS1-7)
- RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. (HS-LS2-6),(HS-LS2-7),(HS-LS2-8)

- RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-LS2-1),(HS-LS2-2),(HS-LS2-3),(HS-LS2-6),(HS-LS2-8)
- RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. (HS-LS2-6),(HS-LS2-7),(HS-LS2-8)
- RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. (HS-LS2-6),(HS-LS2-7),(HS-LS2-8)
- WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-LS2-1),(HSLS2-2),(HS-LS2-3)
- WHST.9-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (HS-LS2-3)
- WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (HS-LS2-7)
- RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-LS3-1),(HS-LS3-2)
- RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. (HS-LS3-1)
- WHST.9-12.1 Write arguments focused on discipline-specific content. (HS-LS3-2)
- RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-LS4-1),(HS-LS4-2),(HS-LS4-3),(HS-LS4-4)
- RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. (HS-LS4-5)
- WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-LS4-1),(HS-LS4- 2),(HS-LS4-3),(HS-LS4-4)
- WHST.9-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (HS-LS4-6)
- WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (HS-LS4-6)

- WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS4-1),(HS-LS4-2),(HS-LS4-3),(HS-LS4-4),(HS-LS4-5)
- SL.11-12.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. (HS-LS4-1),(HS-LS4-2)

NJSLS - Mathematics:

- MP.4 Model with mathematics. (HS-LS1-4)
- HSF-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. (HS-LS1-4)
- HSF-BF.A.1 Write a function that describes a relationship between two quantities. (HS-LS1-4)
- MP.2 Reason abstractly and quantitatively. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4),(HS-LS2-6),(HS-LS2-7)
- MP.4 Model with mathematics. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4)
- HSN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4),(HS-LS2-7)
- HSN-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4),(HS-LS2-7)
- HSN-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4),(HS-LS2-7)
- HSS-ID.A.1 Represent data with plots on the real number line. (HS-LS2-6)
- HSS-IC.A.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population. (HS-LS2-6)
- HSS-IC.B.6 Evaluate reports based on data. (HS-LS2-6)
- MP.2 Reason abstractly and quantitatively. (HS-LS3-2),(HS-LS3-3)
- MP.2 Reason abstractly and quantitatively. (HS-LS4-1),(HS-LS4-2),(HS-LS4-3),(HS-LS4-4),(HS-LS4-5)
- MP.4 Model with mathematics. (HS-LS4-2)
- MP.2 Reason abstractly and quantitatively. (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-6)
- MP.4 Model with mathematics. (HS-ESS2-1),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-6)
- HSN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-6)

- HSN-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. (HS-ESS2-1),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-6)
- HSN-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-4),(HSESS2-5),(HS-ESS2-6)

NJSLS – Technology:

- 8.1.12.A.1 Create a personal digital portfolio which reflects personal and academic interests, achievements, and career aspirations by using a variety of digital tools and resources.
- 8.1.12.A.2 Produce and edit a multi-page digital document for a commercial or professional audience and present it to peers and/or professionals in that related area for review.
- 8.1.12.A.3 Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue.
- 8.1.12.A.4 Construct a spreadsheet workbook with multiple worksheets, rename tabs to reflect the data on the worksheet, and use mathematical or logical functions, charts and data from all worksheets to convey the results.
- 8.1.12.A.5 Create a report from a relational database consisting of at least two tables and describe the process, and explain the report results.

NJSLS – 21st Century Life and Careers:

- CRP1. Act as a responsible and contributing citizen and employee.
- CRP2. Apply appropriate academic and technical skills.
- CRP4. Communicate clearly and effectively and with reason.
- CRP5. Consider the environmental, social and economic impacts of decisions.
- CRP6. Demonstrate creativity and innovation.
- CRP7. Employ valid and reliable research strategies.
- CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP11. Use technology to enhance productivity.
- CRP12. Work productively in teams while using cultural global competence.

Unit 1 Lesson Plan – Origin of Life			
Teacher:	**SBOE Faculty**	**Time Frame:**	12 days (depending on class schedule)
Grade:	**10-12**	**School:**	High School
Subject:	**PSI Biology**		
NJSLS-S/DCI HS-LS1 From Molecules to Organisms: Structures and Processes	**Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. (HS-LS1-6)**		

Essential Questions

1. How did our universe form?
2. How did life arise on Earth?
3. What are the characteristics that all living things share?

Knowledge & Skills

By the end of this unit, students will know:	By the end of this unit, students will be able to:
● All Earth's naturally occurring elements were formed in early supernovae. ● Scientists have two hypotheses for the origin of life on Earth. ● All livings things share characteristics and processes that support the hypothesis of a single ancestor.	● Explain the formation of Earth's naturally occurring elements. ● Describe two theories regarding the origin of life on Earth. ● Identify an object as living or nonliving. ● Graph the evolution of living organisms on Earth.

Assessment

During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Classwork and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.

Pacing Guide

Day	Topic	Class Work	Homework
1	Pre Assessment	Vocabulary Concept Mapping	

2	Early Universe, Early Earth	SMART Notebook Slides 5-28; Questions #1-9	#10-17
3	Deep Time	Deep Time Activity	Analysis Questions
4	Water	SMART Notebook Slides 29-44; Questions #18-22	#23-28
5	Organic Monomers	SMART Notebook Slides 45-66; Questions #29-36	#37-43
6	Dehydration Synthesis, Hydrolysis	Quiz 1: Early Universe-Monomers SMART Notebook Slides 67-78; Questions #44-49	#50-54
7	Phospholipids, RNA	SMART Notebook Slides 79-93; Questions #55-62	#63-70
8	LUCA, Characteristics of Life	SMART Notebook Slides 94-118; Questions #71-79	#80-86
9	Characteristics of Life	Characteristics of Life Lab	Analysis Questions
10	Review	Lab Quiz; MC/FR	MC/FR
11	Review	Quiz 2: Dehydration Synthesis-Characteristics of Life Vocabulary Concept Mapping	MC/FR
12	Test	Unit 1 Test	Pre Assessment LBM: Vocabulary Concept Mapping

Unit 2 Lesson Plan – Large Biological Molecules			
Teacher:	**SBOE Faculty**	**Time Frame:**	11 days (depending on class schedule)
Grade:	**10-12**	**School:**	High School
Subject:	**PSI Biology**		
NJSLS-S/DCI HS-LS1 From Molecules to Organisms: Structures and Processes	**Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. (HS-LS1-6)**		

Essential Questions

1. What element is essential to the formation of large biological molecules, and is the basis for organic chemistry?
2. How are the functions of large biological molecules (lipids, proteins, carbohydrates, and nucleic acids) impacted by their structures?
3. What are the building blocks of each of the 4 macromolecules (above)? By what processes are they formed?
4. In what way are large biological molecules used by living organisms?

Knowledge & Skills

By the end of this unit, students will know:	By the end of this unit, students will be able to:
● Macromolecules are large structures built from smaller, building block molecules. ● Polymers, such as carbohydrates, lipids, proteins, and nucleic acids are arranged from smaller monomers. ● Dehydration synthesis involves the linking of a monomer to a polymer and the removal of water	● Describe the importance of carbon in day to day functions of a living organism. ● Identify the 4 main macromolecules by examining their structures. ● Determine whether an unknown lipid is saturated or unsaturated. ● Using different indicators, determine what organic compound is present in a solution

Assessment

During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Classwork and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.

Pacing Guide

Day	Topic	Class Work	Homework
1	Organic Compounds/Hydrocarbons	SMART Notebook Slides 5-27; Questions #1-8	#9-16

2	Carbohydrates, Polysaccharides	SMART Notebook Slides 28-52; Questions #17-24	#25-33
3	Nucleic Acids	Quiz 1 SMART Notebook Slides 53-69	
4	Nucleic Acids	SMART Notebook Slides 70-80; Questions #34-38	#39-43
5	Nucleic Acids	DNA Extraction Activity	Analysis
6	Proteins	SMART Notebook Slides 81-109; Questions #44-53	#54-64
7	Lipids	Quiz 2; SMART Notebook Slides 110-133; Questions #65-69	#70-76
8	Amphiphilic Liquid Lab Organic Compounds Lab	Organic Compounds Lab	Analysis Questions
9	Review	Lab Quiz; Review SMART Notebook Slides 134-138 (Vocabulary Concept Mapping)	MC/FR
10	Review	MC/FR	MC/FR
11	Test	Unit Test	Pre Assessment ME: Vocabulary Concept Mapping

Unit 3 Lesson Plan – Membranes and Enzymes			
Teacher:	**SBOE Faculty**	**Time Frame:**	14 days (depending on class schedule)
Grade:	**10-12**	**School:**	High School
Subject:	**PSI Biology**		
NJSLS-S/DCI HS-LS1 From Molecules to Organisms: Structures and Processes	**Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. (HS-LS1-6**		

Essential Questions

1. How can materials be transported through a cell membrane, specifically in regards to transport proteins?
2. Describe the difference between a hypotonic and a hypertonic solution.
3. When is facilitated diffusion a necessary method to transport molecules across a cell membrane?
4. How to enzymes control reaction rates inside organisms?

Knowledge & Skills

By the end of this unit, students will know:	By the end of this unit, students will be able to:
● Cell Membranes are selectively permeable. ● A cell membrane is made of a phospholipid bilayer ● The phospholipid bilayer is described as a "Fluid Mosaic" model because it is composed of different components that move throughout the membrane. ● Transport Proteins lie within the cell membrane's phospholipid bilayer and aid in transport of molecules across the membrane. ● Diffusion, osmosis, facilitated diffusion, and active transport move molecules across a membrane. ● Enzymes lower the activation energy of reactions ● Enzymes are affected by environmental conditions.	● List the reasons a semi-permeable membrane in the cell is essential to cell functions. ● Use dialysis tubes to describe hypotonic and hypertonic solutions. ● Describe the different methods of membrane transport, and which methods require an input energy, and which methods do not require an input of energy. ● Calculate the concentration of solutions and compare the internal and external concentrations. ● Describe the catalytic cycle of an enzyme. ● Use graphs to determine the optimal environmental conditions of an enzyme.

Assessment			
During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Classwork and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.			
Pacing Guide			
Day	Topic	Class Work	Homework
1	Membranes & Diffusion	SMART Notebook Slides 5-30; Questions #1-11	#12-22 Study for Quiz
2	Concentration Activity	Concentration Activity Part 1 Quiz 1	
3	Diffusion Lab or Virtual Diffusion Lab	Diffusion Lab	Analysis Study for Quiz
4	Osmosis	Lab Quiz 1 SMART Notebook Slides 31-46; Questions #23-29	#30-36
5	Concentration Relationships	Concentration Activity Part 2	
6	Osmosis Lab	Osmosis Lab	Analysis Study for Quiz
7	Transport Through Proteins	Lab Quiz 2; SMART Notebook Slides 47-71; Questions #37-47	#48-57 Study for Quiz
8	Enzymes	Quiz 2; SMART Notebook Slides 5-23; Questions #58-66	#67-70
9	Enzymes	Enzymes Activity	Analysis
10	Temperature, pH Inhibition	SMART Notebook Slides 24-50; Questions #71-76	#77-82
11	Allosteric Regulation	SMART Notebook Slides 51-64; Questions #83-85	#85-88 Study for Quiz
12	Review	Quiz 3; MC/FR	MC/FR
13	Review	Vocabulary Concept Mapping MC/FR	MC/FR

14	Test	Unit Test	Pre Assessment Genes: Vocabulary Concept Mapping

Unit 4 Lesson Plan – Genes			
Teacher:	**SBOE Faculty**	**Time Frame:**	12 days (depending on class schedule)
Grade:	**10-12**	**School:**	High School
Subject:	**PSI Biology**		
NJSLS-S/DCI **HS-LS-3 Heredity: Inheritance and Variation of Traits** **HS-LS4 Biological Evolution: Unity and Diversity**	**Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. (HL-LS3-1)** **Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. (HS-LS3-2)** **Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. (HS-LS4-1)**		

Essential Questions

1. What three components is all DNA composed of?
2. How is the structure of RNA different than that of the structure of DNA?
3. What are the steps of protein synthesis, and where in the cell do they occur?

Knowledge & Skills

By the end of this unit, students will know:	By the end of this unit, students will be able to:
● All living things share a common ancestor, as explained by consistency of structure in DNA & RNA. ● DNA bases are adenine, thymine, guanine & cytosine. RNA bases are identical except uracil replaces thymine ● Initiation, elongation, and termination are the three steps of Transcription. ● A gene consists of a sequence of bases on DNA that code for a specific protein.	● Describe the components of nucleic acids. ● List the 4 bases of DNA and the 4 bases of RNA. ● Form a complementary strand of DNA when given the base sequence of its corresponding strand. ● Trace the formation of a protein from a gene including all steps in transcription and translation.

Assessment

During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Classwork and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.

Pacing Guide

Day	Topic	Class Work	Homework
1	DNA Replication	SMART Notebook Slides 5-21; Questions #1-10	#15-22
2	Biotech: PCR	SMART Notebook Slides 22-27; Questions #11-14	#23-25
3	Transcription	Quiz 1 SMART Notebook Slides 28-40	
4	Transcription	SMART Notebook Slides 41-48; Questions 23-30	#31-37
5	Transcription	Replication/Transcription Practice Activity	
6	Gene Expression Overview	Quiz 2 SMART Notebook Slides 49-67; Questions #38-50	#51-61
7	Gene Expression	Gene Expression Activity	
8	Translation	SMART Notebook Slides 68-97; Questions #62-74	#77-88
9	Mutations	SMART Notebook Slides 98-110; Questions 75-76	#89-90
10	Review	Quiz 3 MC/FR	MC/FR
11	Review	Vocabulary Concept Mapping MC/FR	MC/FR
12	Test	Unit Test	Pre Assessment EP – Vocabulary Concept Mapping

Unit 5 Lesson Plan – Energy Processing			
Teacher:	**SBOE Faculty**	**Time Frame:**	13 days (depending on class schedule)
Grade:	**10-12**	**School:**	High School
Subject:	**PSI Biology**		
NJSLS-S/DCI **HS-LS1 From Molecules to Organisms: Structures and Processes** **HS-LS2 Ecosystems: Interactions, Energy, and Dynamics**	**Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. (HS-LS1-5)** **Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. (HS-LS1-7)** **Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic & anaerobic conditions (HS-LS2-3)** **Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem (HS-LS2-4)**		

Essential Questions

1. What are the stages in aerobic cellular respiration and photosynthesis?
2. How are biochemical reactions regulated by enzymes?
3. In anaerobic conditions, how do cells generate ATP?
4. What is the role of chlorophyll in photosynthesis?

Knowledge & Skills

By the end of this unit, students will know:	By the end of this unit, students will be able to:
● Pyruvate, NADH and ATP are produced from glycolysis. ● Glycolysis leads to either fermentation (anaerobic) or aerobic respiration. ● Ethanol and lactic acid are the products of fermentation. ● Photosynthesis is the conversion of CO_2 and H_2O into a 3-carbon sugar and O_2 using light energy.	● Graph the rate of cellular respiration for two different carbohydrates. ● Describe the products of fermentation. ● Determine the relationship between pH and rate of photosynthesis. ● Determine how the rate of photosynthesis is impacted by light intensity.

• In photosynthesis, one turn of the Calvin cycle produces one 3-carbon simple sugar	

Assessment

During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Classwork and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.

Pacing Guide

Day	Topic	Class Work	Homework
1	Metabolism & ATP	SMART Notebook Slides 6-33; Questions #1-12	#13-22
2	Cellular Respiration - Glycolysis	Quiz 1: Metabolism & ATP SMART Notebook Slides 34-53; Questions #23-28	#41-46
3	Cellular Respiration – Citric Acid Cycle & Oxidative Phosphorylation	SMART Notebook Slides 54-78; Questions #29-40	#47-54
4	Fermentation	Quiz 2: Cellular Respiration SMART Notebook Slides 79-90; Questions #55-61	#62-66
5	Fermentation	Review; Quiz 3: Fermentation	
6	Cellular Respiration Lab	Cellular Respiration Lab	Analysis
7	Photosynthesis	Lab Quiz: Cellular Respiration SMART Notebook Slides 91-115; Questions #67-74	#87-92
8	Photosynthesis	SMART Notebook Slides 116-142; Questions #75-86	#93-101
9	Photosynthesis	Quiz 4: Photosynthesis Review	MC/FR
10	Photosynthesis Lab	Photosynthesis Lab	Analysis
11	Review	Lab Quiz: Photosynthesis; MC/FR	MC/FR

12	Review	Vocabulary Concept Mapping; MC/FR	MC/FR
13	Test	Unit Test	Pre Assessment PV: Vocabulary Concept Mapping

Unit 6 Lesson Plan – Prokaryotes and Viruses			
Teacher:	**SBOE Faculty**	**Time Frame:**	16 days (depending on class schedule)
Grade:	**10-12**	**School:**	High School
Subject:	**PSI Biology**		
NJSLS-S/DCI **HS-LS2 Ecosystems: Interactions, Energy, and Dynamics** **HS-ESS2 Earth's Systems**	**Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic & anaerobic conditions (HS-LS2-3)** **Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth. (HS-EES2-7)**		

Essential Questions

1. What are the two kingdoms of prokaryotes?
2. How is a prokaryotic cell structured?
3. How do prokaryotes replicate and increase genetic variation in their populations?
4. How does a virus use a host cell for replication?

Knowledge & Skills

By the end of this unit, students will know:	By the end of this unit, students will be able to:
● Prokaryotes do not possess an internal membrane and they lack a nucleus. ● Bacteria reproduce by binary fission. ● A gram stain can be used to classify bacteria (gram + and gram -). ● A virus injects its DNA into a host cell for replication. ● Viruses replicate through either the lytic cycle or the lysogenic cycle.	● Use gram stains to distinguish between bacteria types ● Discuss the benefits and implementations of bacteria in our lives. ● Discuss bacterial growth/reproduction and the effect of antimicrobial agents on this growth. ● Describe how bacterial gene expression responds to environmental conditions. ● Describe the differences in the lytic cycle and the lysogenic cycle of a virus.

Assessment

During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Classwork and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.

Pacing Guide			
Day	Topic	Class Work	Homework
1	Types of Prokaryotes	SMART Notebook Slides 6-18; Questions #1-5	#6-9
2	Structure & Function (External)	SMART Notebook Slides 19-29; Naming Bacteria Activity	Complete Activity (if not done in class)
3	Gram Stain Lab	Gram Stain Lab	Analysis
4	Structure & Function (Internal)	Lab Quiz: Gram Stain SMART Notebook Slides 30-39; Questions #10-17	#18-23
5	DNA Review/Reproduction	Quiz 1: Structure & Function SMART Notebook Slides 40-54; Questions #24-27	#38-39
6	Bacterial Growth	Bacterial Growth SMART Notebook Slides 5-40	
7	Bacterial Growth	Bacterial Growth SMART Notebook Slides 41-50 Bacterial Growth Lab Day 1	
8	Bacterial Growth	Bacterial Growth SMART Notebook Slides 52-64 Bacterial Growth Lab Day 2	Analysis
9	Gene Expression - Review	Lab Quiz: Bacterial Growth SMART Notebook Slides 55-64	
10	Gene Expression – Symbiosis	SMART Notebook Slides 65-77; Questions #28-37	#40-47
11	Genetic Variation	Quiz 2: Gene Expression SMART Notebook Slides 78-89; Questions 48-50	#57-58
12	Genetic Variation – Viruses	SMART Notebook Slides 90-112; Questions 51-56	#59-63

13	Biotech: Recombinant DNA Technology	SMART Notebook Slides 113-138; Questions 64-66	#67-69
14	Review	Quiz 3: Genetic Variation MC/FR	MC/FR
15	Review	Vocabulary Concept Mapping MC/FR	MC/FR
16	Test	Unit Test	Pre Assessment Euk: Vocabulary Concept Mapping

Unit 7 Lesson Plan – Eukaryotes and Gene Expression			
Teacher:	**SBOE Faculty**	**Time Frame:**	13 days (depending on class schedule)
Grade:	**10-12**	**School:**	High School
Subject:	**PSI Biology**		
NJSLS-S/DCI **HS-LS1 From Molecules to Organisms: Structures and Processes** **HS-LS-3 Heredity: Inheritance and Variation of Traits**	**Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. (HS-LS1-1)** **Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (HS-LS1-3)** **Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. (HS-LS1-4)** **Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. (HS-LS3-1)**		

Essential Questions

1. How do eukaryotes differ from prokaryotic cells?
2. How do eukaryotes reproduce?
3. What are the 4 Kingdoms eukaryotes compose and how are they alike and different?
4. Where does transcription and translation occur in the eukaryotic cell?
5. What organelles within the cell are essential for gene expression to occur?

Knowledge & Skills

By the end of this unit, students will know:	By the end of this unit, students will be able to:
● Eukaryotic cells contain organelles which perform specialized functions within the cell ● Protists were the 1st eukaryotes to evolve, animals last ● DNA is transcribed into mRNA in the nucleus of a eukaryotic cell	● Observe a cork cell under a microscope and describe what is seen. ● Observe a stained onion cell under a microscope, and locate the organelles in the cell including cell wall, nucleus, cell membrane, and vacuole. ● Separate and extract DNA from a pea-cell layer, and observe the characteristic DNA signatures. Determine the anticodon for a given codon sequence.

• mRNA and tRNA work together on a cell's ribosome to complete protein synthesis in a process called translation.	

Assessment

During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Classwork and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.

Pacing Guide

Day	Topic	Class Work	Homework
1	Eukaryotic Cell	SMART Notebook Slides 6-19; Questions #1-5	#6-9
2	Nucleus and Gene Expression – thru Transcription Factors	SMART Notebook Slides 20-47; Questions #10-16	#24-28
3	Nucleus and Gene Expression – mRNA Processing	SMART Notebook Slides 48-65; Questions #17-23	#29-33
4	Gene Expression	Gene Expression Basics Activity	
5	Endomembrane System	Quiz 1 SMART Notebook Slides 66-81	
6	Endomembrane System	SMART Notebook Slides 82-106; Questions #36-42	#45-50
7	Energy-Converting Organelles	SMART Notebook Slides 107-120; Questions #51-57	#58-63
8	Other Organelles and Cellular Structures	SMART Notebook Slides 121-143; Questions #64-71	#72-79
9	Review	Quiz 2; MC/FR	
10	Plant vs. Animal Cell Lab	Plant vs. Animal Cell Lab	Analysis
11	Review	Lab Quiz; MC/FR	MC/FR
12	Review	Vocabulary Concept Mapping; MC/FR	MC/FR
13	Test	Unit Test	Midterm Review

Unit 8 Lesson Plan – Mitosis and Meiosis			
Teacher:	**SBOE Faculty**	**Time Frame:**	10 days (depending on class schedule)
Grade:	**10-12**	**School:**	High School
Subject:	**PSI Biology**		
NJSLS-S/DCI **HS-LS1 From Molecules to Organisms: Structures and Processes** **HS-LS-3 Heredity: Inheritance and Variation of Traits**	**Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. (HS-LS1-4)** **Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. (HS-LS3-2)**		

Essential Questions

1. Why do cells undergo Mitosis? Meiosis?
2. What are the five subphases of Mitosis?
3. What are the steps for each of the two divisions undergone in Meiosis?
4. Describe aneuploidy and polyploidy.

Knowledge & Skills

By the end of this unit, students will know:	By the end of this unit, students will be able to:
● The end product of mitosis is an identical cell with the same number of chromosomes and genes. ● Gametes are the product of meiosis. ● The 3 phases of interphase are G1, S, and G_2. ● The nucleus is divided in mitosis, the cytoplasm is divided in cytokinesis. ● Independent Assortment accounts for genetic variation. ● Four haploid daughter cells are the product of meiosis	● Describe the 5 subphases of mitosis, and the ten sub phases of meiosis. ● Observe the different phases of mitosis in the cell of an onion root (plant cell) and whitefish blastula (animal cell and describe the differences. ● Calculate the percentage of cells in each stage in the plant and animal cell. ● Give examples of errors that occur in meiosis including aneuploidy and polyploidy.

Assessment			
During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Classwork and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.			
Pacing Guide			
Day	Topic	Class Work	Homework
1	Pre Assessment	Vocabulary Concept Mapping	
2	Mitosis - Interphase	SMART Notebook Slides 6-18; Questions #1-5	#13-15
3	Mitosis – M Phase	SMART Notebook Slides 19-40; Questions #6-12	#16-25
4	Mitosis Lab	Mitosis Lab	Analysis
5	Cell Cycle Control	Lab Quiz SMART Notebook Slides 41-65; Questions 26-35	#36-43
6	Meiosis	Quiz 1; SMART Notebook Slides 66-87; Questions #44-50	#55-60
7	Accidents in Meiosis	SMART Notebook Slides 88-103; Questions #51-54	#61-65
8	Review	Quiz 2; MC/FR	
9	Review	Vocabulary Concept Mapping MC/FR	MC/FR
10	Test	Unit Test	Pre Assessment Inherit: Vocabulary Concept Mapping

Unit 9 Lesson Plan – Mendelian Genetics & Inheritance Patterns			
Teacher:	**SBOE Faculty**	**Time Frame:**	16 days (depending on class schedule)
Grade:	**10-12**	**School:**	High School
Subject:	**PSI Biology**		
NJSLS-S/DCI **HS-LS-3 Heredity: Inheritance and Variation of Traits**	**Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. (HS-LS3-1)** **Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors (HS-LS3-2)** **Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. (HS-LS3-3)**		

Essential Questions

1. What kind of characteristics should one look for when choosing a model organism?
2. When is an organism homozygous for a gene, and when is an organism heterozygous for a gene?
3. How does a punnett square help us understand a genotype for a particular trait of an organism?
4. Where is incomplete dominance of alleles seen in the natural world?

Knowledge & Skills

By the end of this unit, students will know:	By the end of this unit, students will be able to:
● The allele which determines the appearance of the organism is the dominant allele. The recessive allele is the allele which appears to have no effect. ● A punnett square aids in identifying the genotype of an organism, the genetic makeup of a particular trait. ● The Law of Segregation states that the alleles of one gene segregate into gametes independently of another gene's alleles.	● Study and interpret the pedigree of a family through multiple generations, and identify certain inherited traits. ● Use the principles of probability in conjunction with Mendel's laws and coin tosses to predict inheritance of traits. ● Grow tobacco seeds from parents who are heterozygous for albinism under different environmental conditions. Predict what the offspring's phenotypes should be, and observe what percentage follow this prediction.

• Incomplete Dominance occurs when the phenotype of the offspring is a blend of the phenotypes of the parents.	

Assessment

During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Classwork and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.

Pacing Guide

Day	Topic	Class Work	Homework
1	Mendel	SMART Notebook Slides 5-20; Questions #1-9	#18-22
2	Hybridization	SMART Notebook Slides 21-36; Questions #10-17	#23-30
3	Punnett Squares – Monohybrid	SMART Notebook Slides 37-61; Questions 31-40	#49-54
4	Probability	Probability Activity	Analysis
5	Punnett Squares – Dihybrid	Quiz 1;SMART Notebook Slides 62-66; Questions 41-43	#55-57
6	Probability	SMART Notebook Slides 67-78; Questions #44-48	#58-60
7	Non-Mendelian Genetics – Codominance and Incomplete Dominance	Quiz 2 SMART Notebook Slides 79-86; Questions #61-65	#71-74
8	Blood Typing Lab	Blood Typing Lab	Analysis
9	Non-Mendelian Genetics – Pleiotropy and Polygenic	Lab Quiz; SMART Notebook Slides 87-100; Questions 66-70	#75-80
10	Genetic Disorders	SMART Notebook Slides 101-126; Questions 81-89	#92-99
11	Genetic Screening	SMART Notebook Slides 127-136; Questions 90-91	#100-102

12	Pedigrees	SMART Notebook Slides 137-170; Questions 103-108	#109-114
13	Pedigrees	Pedigrees Activity	Analysis
14	Review	Quiz 3; MC/FR	MC/FR
15	Review	Vocabulary Concept Mapping; MC/FR	MC/FR
16	Test	Unit Test	Pre Assessment Evol: Vocabulary Concept Mapping

Unit 10 Lesson Plan – Evolution and Population Genetics			
Teacher:	**SBOE Faculty**	**Time Frame:**	15 days (depending on class schedule)
Grade:	**10-12**	**School:**	High School
Subject:	**PSI Biology**		
NJSLS-S/DCI **HS-LS-3 Heredity: Inheritance and Variation of Traits** **HS-LS4 Biological Evolution: Unity and Diversity**	**Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. (HS-LS3-3)** **Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. (HS-LS4-1)** **Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. (HS-LS4-2)** **Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. (HS-LS4-3)** **Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. (HS-LS4-5)**		

Essential Questions
1. What evidence do we have which supports the theory that all life has a common ancestor? 2. How do populations change over time? 3. How do random events affect the evolution of populations? 4. How can evolution be described quantitatively?

Knowledge & Skills	
By the end of this unit, students will know:	By the end of this unit, students will be able to: ● Discuss the importance of genetic variation in a population

• DNA bases, RNA bases, and amino acids are conserved and the same in all living things. • Some organisms share the same structural plan for a body part which is modified to fit that particular organism's environment (homologous structures) • A population is a group of individuals of the same species which reproduce together. • The Hardy-Weinberg Equation can be used to show whether or not a population is evolving. • The chance changing of allelic frequencies of a population is genetic drift. • Evidence for evolution comes from various fields of science, including genetics, systematics, paleontology, and geography. • Organisms best suited to their environment are more likely to survive and reproduce.	• Support the theory of evolution by natural selection through scientific evidence. • Describe the effect of chance occurrences on a population. • Define species and speciation.

Assessment

During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Classwork and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.

Pacing Guide

Day	Topic	Class Work	Homework
1	Adaptations	SMART Notebook Slides 6-18; Questions #1-4	#5-7
2	Theories of Evolution	SMART Notebook Slides 19-45; Questions #8-13	#18-22
3	Evidence for Evolution	SMART Notebook Slides 46-64; Questions 14-17	#23-27
4	Natural Selection	Who Wants to Live a Million Years Activity	Analysis

5	Natural Selection	Quiz 1 SMART Notebook Slides 65-68; Peppered Moth Activity	Peppered Moth Activity
6	Natural Selection & Speciation	SMART Notebook Slides 69-80; Questions; 28-31	#32-36
7	Hardy-Weinberg Theory	Quiz 2; SMART Notebook Slides 81-93; Questions #37-40	#47-79
8	Hardy-Weinberg Equation	SMART Notebook Slides 94-101; Questions #41-44	#50-52
9	PTC Lab	Population Genetics & Evolution Lab	Analysis
10	Hardy-Weinberg Equilibrium	Lab Quiz; SMART Notebook Slides 102-113; Questions 45-46	#53-54
11	Genetic Drift	SMART Notebook Slides 114-126; Questions 55-61	#66-72
12	Patterns in Macroevolution	SMART Notebook Slides 127-135; Questions 62-65	#73-76
13	Review	Quiz 4; MC/FR	MC/FR
14	Review	Vocabulary Concept Mapping; MC/FR	MC/FR
15	Test	Unit Test	Pre Assessment Classification: Vocabulary Concept Mapping

Unit 11 Lesson Plan – Classification (*time permitting)			
Teacher:	**SBOE Faculty**	**Time Frame:**	9 days (depending on class schedule)
Grade:	**10-12**	**School:**	High School
Subject:	**PSI Biology**		
NJSLS-S/DCI HS-LS4 Biological Evolution: Unity and Diversity	**Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. (HS-LS4-1)** **Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. (HS-LS4-3)** **Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. (HS-LS4-5)**		

Essential Questions

1. What is binomial nomenclature?
2. How does a cladogram show relationships between organisms?
3. How are plants and animals placed into taxa?

Knowledge & Skills

By the end of this unit, students will know:	By the end of this unit, students will be able to:
● *Genus species* is the modern way of classifying individuals ● Domain, Kingdom, Phylum, Class, Order, Family, Genus, and Species are the steps of scientific classification. ● The closer organisms are on a cladogram, the more characteristics they share/the closer they're related ● Plants are classified based on their vascular system, seeds, and flowers. ● Animals are classified based on body plan.	● Observe the characteristics of different plant and animal species, and determine their evolutionary history. ● Construct a cladogram of organisms and identify shared characteristics. ● Be able to trace Homo sapiens lineage from Domain to species.

• Homo sapiens are of the phylum chordate, meaning that they have a backbone.	

Assessment

During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Classwork and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.

Pacing Guide

Day	Topic	Class Work	Homework
1	Classification & Naming	SMART Notebook Slides 4-19; Questions #1-4	#5-8
2	Phylogeny	SMART Notebook Slides 20-28; Construct a Cladogram Activity Questions #9-14	#18-22
3	Domains	SMART Notebook Slides 29-45; Questions 14-17	#23-26
4	Kingdom Plantae	Quiz 1 SMART Notebook Slides 46-68; 18-23	#33-37
5	Classification Lab	Lab	Analysis
6	Kingdom Animalia	Lab Quiz; SMART Notebook Slides 69-80; Questions; 38-42	#43-48
7	Review	Quiz 2; MC/FR	MC/FR
8	Review	Vocabulary Concept Mapping MC/FR	MC/FR
9	Test	Unit Test	Pre Assessment Eco: Vocabulary Concept Mapping

Unit 13 Lesson Plan – Ecology			
Teacher:	**SBOE Faculty**	**Time Frame:**	18 days (depending on class schedule)
Grade:	**10-12**	**School:**	High School
Subject:	**PSI Biology**		
NJSLS-S/DCI HS-LS2 Ecosystems: Interactions, Energy, and Dynamics	**Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. (HS-LS2-1)** **Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. (HS-LS2-2)** **Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. (HS-LS2-4)** **Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. (HS-LS2-5)** **Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. (HS-LS2-6)** **Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. (HS-LS2-7)** **Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. (HS-LS2-8)**		
Essential Questions			
1. When considering population growth models, what factors contribute to the carrying capacity of a population? 2. What is a community? 3. What is the primary source of energy on Earth? 4. How does a food web show energy flow in an ecosystem?			
Knowledge & Skills			

By the end of this unit, students will know:	By the end of this unit, students will be able to:
● Disease, predation and limited resources all affect a population's growth, and lead to the carrying capacity of that population being reached. ● The logistic population growth model takes into account predation, disease, limited resources and other factors. ● The collection of all of the species in a given area living together is defined as a community. ● The sun is the primary source of all life on Earth. ● A food web shows the path of energy flow from organism to organism, by showing the feeding habits of community's species.	● Describe the difference between exponential and limited population growth. ● Fit different organisms into their "ecological niche" in a given habitat. ● Describe the three categories of symbiosis. ● List and describe the six categories of terrestrial biomes; Tundra, Taiga, Deciduous Forests, Grasslands, Tropical Rainforests, and deserts. ● Understand how humans have impacted the ecosystem both positively, and negatively.

Assessment

During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Classwork and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.

Pacing Guide

Day	Topic	Class Work	Homework
1	Intro to Ecology	SMART Notebook Slides 6-19	
2	Population Ecology	SMART Notebook Slides 20-43; Questions #1-12	#13-23
3	Population Ecology	Population Growth Activity	
4	Community Ecology - Climate	SMART Notebook Slides 44-59; Questions 24-26	#35-37
5	Community Ecology - Interactions	SMART Notebook Slides 60-73; Questions #27-29	#38-39
6	Community Ecology	Interactions Activity	
7	Community Ecology – Energy Flow	SMART Notebook Slides 74-94; Questions #30-32	#40-42
8	Community Ecology	Build an Ecosystem Lab	

9	Community Ecology - Succession	Collect Lab Data; SMART Notebook Slides 95-105; Questions #33-34	#43-45
10	Nutrient Cycles – Water Cycle	Collect Lab Data; Quiz 1: Population/Community Ecology SMART Notebook Slides 106-114; Questions #46-47	#56-57
11	Nutrient Cycles – Carbon, Nitrogen, Phosphorus	Collect Lab Data; SMART Notebook Slides 115-135; Questions #48-55	#57-65
12	Nutrient Cycles	Lab Discussion Ocean Acidification Activity	
13	Conservation Biology	Lab Quiz; SMART Notebook Slides 136-153; Questions #66-70	#78-81
14	Conservation Biology	SMART Notebook Slides 154-172; Questions #71-74	#82-84
15	Conservation Biology	SMART Notebook Slides 173-192; Questions #75-77	#85-88
16	Review	Quiz 2: Nutrients/Conservation MC/FR Review	MC/FR
17	Review	Vocabulary Concept Mapping MC/FR	MC/FR
18	Test	Unit Test	Pre Assessment Anat: Vocabulary Concept Mapping

Unit 14 Lesson Plan – Anatomy & Physiology (*time permitting)			
Teacher:	**SBOE Faculty**	**Time Frame:**	9 days (depending on class schedule)
Grade:	**10-12**	**School:**	High School
Subject:	**PSI Biology**		
NJSLS-S/DCI HS-LS1 From Molecules to Organisms: Structures and Processes	**Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. (HS-LS1-1)** **Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (HS-LS1-2)**		

Essential Questions

1. What systems exist in the human body?
2. What is the importance of homeostasis in an organism?
3. Compare ectotherms and endotherms.

Knowledge & Skills

By the end of this unit, students will know:	By the end of this unit, students will be able to:
● In order to keep internal operations efficient and operating at optimal levels, homeostatic mechanisms react to changing external factors. ● Endotherms maintain higher internal temperature than their environment using structures like hair, fat & feathers ● Ectotherms mirror their internal temperature to their environment. When temperatures go up, ectotherm activity increases. ● The nervous, excretory, lymphatic, immune, respiratory, circulatory, and endocrine systems are major human body systems that maintain our day to day functions.	● Give examples of both ectotherms and endotherms, and describe how they regulate their body temperatures. ● List the functions of all the major body systems and the way in which they operate. ● Describe the three main types of "eaters" (herbivores, carnivores, and omnivores), and give examples of organisms that fall into these categories.

Assessment

During the lesson designed to introduce concepts, students will be continually questioned on these concepts using a combination of class work and class/homework questions. Classwork and homework questions will be discussed as a class and misconceptions will be addressed by the teacher prior to the formal evaluations which include tests, quizzes, and laboratory reports.

Pacing Guide

Day	Topic	Class Work	Homework
1	Structure & Function – Epithelial Tissue	SMART Notebook Slides 6-21; Questions 1-4	#8-10
2	Connective, Muscle, & Nervous Tissue	SMART Notebook Slides 22-36; Questions 5-7	#11-13
3	Integumentary, Skeletal, & Muscular Systems	SMART Notebook Slides 37-54; Questions 14-18	#35-38
4	Nervous, Endocrine, Lymphatic, Respiratory, & Urinary Systems	SMART Notebook Slides 55-79; Questions 19-26	#39-44
5	Digestive & Circulatory Systems	SMART Notebook Slides 80-104; Questions 27-34	#45-52
6	Homeostasis	Quiz 1: Organ Systems SMART Notebook Slides 105-116; Question 53-55	#56-58
7	Review	MC/FR Review	MC/FR
8	Review	Vocabulary Concept Mapping MC/FR	MC/FR
9	Test	Unit Test	Final Exam Review