SCN119 Biological Science (BA 10/20/2016)

High School > 2017-2018 > Mixed-Grade High School > Science > SCN119 Biology (BA)
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Last Updated: Wednesday, September 27, 2017 by Rachel Villanova
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STATEMENT OF PURPOSE

Biological Science is a high school course designed to provide the students with a comprehensive investigative approach to learning that includes all prescribed biological topics and concepts. Students will focus on a variety of topics including molecular structures and functions, energy reactions, roles of DNA and RNA, and movements that occur at the cellular level. Each student will learn about the changes that occur through natural genetic processes and genetic engineering practices, as well as recognize how humans affect the world around them. This course of study utilizes techniques that foster the growth of the visual and kinesthetic learners by emphasizing practical applications and strong laboratory skill development.

This curriculum incorporates strategies that facilitate the learning process by utilizing approaches that help students develop the confidence and knowledge base they need to master the sophisticated concepts encountered, and successfully complete the New Jersey Biology Competency Test (NJBCT). It is important to note that students who are enrolled in this course do so by teacher recommendation. The Biological Science course of study differs from the Biology I curriculum in its approach; however, content areas are designed to be the same in accordance with state requirements. Separately we assess students to gauge progress and inform instruction. For students in grades 9 through 12 are administered in the form of a midterm and final exam for full year courses. *Special Note: Only final exams are administered at the end of quarter courses and semester courses.

RATIONALE

The Biological Science curriculum is being revised to incorporate state prescribed information/topics. It will include a variety of student-centered and technology-based activities. This course seeks to provide students with real world experiences, as well as the content knowledge they need to successfully navigate the newly created state exit exam in Biology.

This course is aligned with the New Jersey Student Learning Standards for Science (NJSLS), also known as the Next Generation Science Standards (NGSS), the New Jersey Student Learning Standards for Technology, the New Jersey Standards for Language Arts Science and Technical Subjects and the 21st Century Life and Careers Ready Practices. Using a variety of materials, resources, and instructional methods, the course reinforces the educational skills of scientific interpretation, investigation, problem-solving, critical analysis and research. District initiatives in assessment and critical reading and writing are also being emphasized.

THE LIVING CURRICULUM

Curriculum guides are designed to be working documents. Teachers are encouraged to make notes in the margins. Written comments can serve as the basis for future revisions. In addition, the teachers and administrators are invited to discuss elements of the guides as implemented in the classroom and to work collaboratively to develop recommendations for curriculum reforms as needed.

AFFIRMATIVE ACTION

During the development of this course of study, particular attention was paid to material, which might discriminate on the basis of sex, race, religion, national origin, or creed. Every effort has been made to uphold both the letter and spirit of affirmative action mandates as applied to the content, the texts and the instruction inherent in this course.

MODIFICATIONS AND ADAPTIONS: For guidelines on how to modify and adapt curricula to best meet the needs of all students, instructional staff should refer to the Curriculum Modifications and Adaptations (http://njcdd.org/wp-content/uploads/2016/08/tools-teacherspart2.pdf). Instructional staff of students with Individualized Education Plans (IEPs) must adhere to the recommended modifications outlined in each individual plan.

GENERAL GOALS

The students will:

1. understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments, and solve problems.

2. recognize the importance of science in everyday living, explore pertinent current scientific issues, and appreciate the interrelationship between science, technology, and society to become scientifically literate and knowledgeable members of society.

3. understand that tables, graphs and equations are alternate ways of representing information or relationships and be able to create, interpret, and understand data presented in this format.

4. understand cell structure and relate it to basic cell functions such as photosynthesis, respiration, transcription, translation, and the cell cycle.

5. understand basic patterns of inheritance and principles of heredity, as well as discover how these relate to probability, meiosis, breeding techniques, and genetic engineering.

6. describe the development of the modern theory of evolution, examine the various types of evidence for evolution and relate evolutionary process to taxonomy, and to the creation of the six-kingdom classification scheme.

7. understand the relationships and interactions that take place between living things with one another and with their environment, including the cycling of nutrients and the flow of energy through the biosphere, the effect of human population growth on the environment, and the consequences of certain activities that alter the environment and exhaust natural resources.

8. Develop problem-solving and critical thinking skills.

GENERAL PERSONAL SAFETY

The science classroom is potentially the most dangerous place in the school. However, this need not constitute a serious threat if the teacher and students have a thorough knowledge of the potential hazards, exercise prudent care and foresight, and use common sense. Accident prevention must be included in the performance of every task, and safety instruction must be an integral part of the overall science program.

1. Precautions should be taken to protect those in the classroom from injury from hot or corrosive materials.
    1. In order to reduce the danger from caustic or hot liquids, students and teachers handling such materials should wear protective aprons (plastic or neoprene), goggles, and should roll sleeves (which can absorb the liquid), tightly to above the elbow.
    2. Students should never be permitted to work with concentrated acids or bases or with boiling water while seated.
    3. Burns from either hot or caustic materials should be flooded immediately and for at least ten minutes with copious amounts of cold water. Following flooding of the bum, the victim should be escorted to the school nurse as quickly possible. Clothing which has absorbed caustic materials should be removed as soon as feasible. The school nurse should be called immediately.

2. High-speed devises such as mechanical rotators, electric drills, fans, etc., should never be operated with protective shields removed or opened. Goggles must be worn.

3.Eating anything in the laboratory should be prohibited since it entails an intolerable hazard from toxic or possible infectious material

1. Cleanliness and order should be maintained.
    1. Extraneous objects should be moved from work surface.
    2. Glassware and other hardware should be maintained in a clean condition. Chemical or biological residues may constitute a reactive hazard.
    3. Students should be required to thoroughly wash their hands with soap and water following a laboratory session.

1. There are several devices for protecting students and instructors against the corrosive or toxic effects of chemical reagents.
    1. Aprons should be worn by all students working in a laboratory, especially when working with corrosive reagents.
    2. Gloves should be worn by students when working with concentrated corrosive reagents. Gloves have a tendency to reduce dexterity, which may be a hazard in itself. Gloves are generally rubber, plastic or vinyl.
    3. Long hair can be a serious hazard in the laboratory and should be covered or contained. Fire and reduced visibility are just two of the hazards that result from long hair.
    4. Loose clothing is another potential hazard in the laboratory. Loose clothing is less controllable than tight-fitting clothing. Glassware can be knocked off benches, clothes can come into contact with open flame, and manual dexterity can be reduced.
2. In a demonstration experiment using any flammable liquid such as alcohol, care must be taken to ensure that any flame in the room is a safe distance from the volatile liquid.

3. Demonstrations involving explosive or potentially explosive substances must be so arranged as to shield everyone from any danger. Use the safety shield to protect observers and the face shield and goggles to protect the demonstrators. Size of apparatus and quantities of reagents used in a demonstration should be consistent with safe practice.

4. Observers should be evacuated from seats directly in front of the demonstration table, even if the possibility is remote that injury to them might occur from splattering of chemicals, inhalation of fumes, etc.

5. All persons performing science activities involving hazards to the eyes must wear approved eye protection devices. All persons in dangerous proximity must likewise be equipped.

6. Chemicals should never be tasted (or placed on the tongue or lips), nor should laboratory glassware be used as drinking vessels.

7. Sandals and open-toe shoes should not be permitted in laboratory areas unless they have a protective covering.

GRADING PROCEDURES

MARKING PERIOD GRADES

Long and Short Term Assessments which may include: 90%

- Tests, quizzes, and/or worksheets
- Authentic assessments
- Technology applications
- Projects, reports, presentations
- Laboratory investigations
- Data Analysis
- Analysis of assigned readings

Daily Assessments which may include: 10%

- Active engagement in class activities
- Demonstration of knowledge and understanding of course material
- Skills and safety practices during lab investigations
- Do Now/Exit Questions
- Homework

Final Grade – Full Year Course

Full Year Course

- Each marking period shall count as 20% of the final grade (80% total).

The midterm assessment will count as 10% of the final grade, and the final assessment will count as 10% of the final grade.

COURSE PROFICIENCIES

In accordance with district policy as mandated by the New Jersey Administrative Code and the New Jersey Core Curriculum Content Standards, the following are proficiencies required for the successful completion of the above named course.

The student will:

1. demonstrate the ability to work in groups to safely solve biological problems and perform laboratory investigations.
2. select and safely use appropriate instrumentation to design and conduct investigations.
3. make measurements of length mass, volume and temperature using the metric system.
4. compare and contrast living and nonliving things while describing the characteristics of living things.
5. 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.
6. develop and use a model to Illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
7. 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.
8. explain how the properties of water impact living things.
9. diagram and explain the pH scale.
10. plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
11. use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
12. construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions
13. 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.
14. describe the historical development of the cell theory.
15. describe cell structure including the functions of the various organelles.
16. compare eukaryote with prokaryotes, plant cells with animal cells and unicellular organisms with multi-cellular organisms.
17. compare and contrast the mechanisms of transport across cell membranes.
18. discuss the experiments and methods leading to the discovery of the structure of DNA and its significance as the molecule of inheritance.
19. describe the structures and functions of DNA and RNA and explain their roles in protein synthesis and replication.
20. describe the structure and importance of chromosomes.
21. describe the events that take place in each phase of the cell cycle.
22. explain how meiosis followed by fertilization maintains chromosome number throughout generations
23. learn how the approach used by Gregor Mendel in his garden pea experiments enabled him to reach his conclusions .

24. learn how to determine the outcome of monohybrid and dihybrid crosses.

25. explain how various types of mutations affect heredity.

26. explain and solve genetic crosses involving various modes of gene expression.

27. describe the role of genetic engineering in our society.

28. discuss uses and ethical implications involved in biotechnology.

29. discuss the development of Darwin’s work and cite evidence that supports the theory of evolution by natural selection.

30. describe the fossil, embryological, anatomical, and biochemical evidence for evolution.

    1. relate evolutionary theory to genetics in terms of speciation.
    2. list the taxonomic hierarchy and explain how they relate to one another.

33. recognize that the evolution of life on Earth has changed the composition of the Earth’s atmosphere through time.

34. describe what symbiosis is and identify the three types of symbiotic relationships.

35. describe the cycling of nutrients and the flow of energy through ecosystems.

36. assess the environmental risks and benefits associated with human activity and its role on populations.

37. distinguish between naturally occurring extinctions and those caused by human activity.

SCN119 Biological Science					
Unit	**Essential Questions**	**Enduring Understanding**	**Suggested Activities**	**Evaluation / Assessment**	**Resources**
Scientific Investigation and Safety *(Week 1, 2 Weeks)*	a) How do Biologists conduct scientific investigations safely?	a) Understanding and respect for the safety rules in a laboratory are vital to a successful Science experience. b) Safety guidelines are designed to prevent accidents from occurring, and yield quality results.	• Thoroughly review and discuss safety guidelines in a Science classroom. Carefully read and sign a safety contract, keep a copy in their work folder for easy reference. • Have students participate in a teacher prepared Lab Safety Scavenger Hunt in the classroom/laboratory. • Work in groups to design an experiment that investigates factors that affects solubility of a material or weathering rate on Earth's materials. Prepare a written lab report including a detailed conclusion statement. • Perform a lab activity to learn to properly handle and use a microscope correctly. They will also prepare wet mount slides, stain slides, and correctly make scientific drawings. conduct lab.	**Performance: Authentic Task** Signed Safety contract Experimental design, group work, and adherence to safety guidelines will be assessed using teacher-designed rubric, and continuously monitored throughout the year. **Performance: Authentic Task** Group work, collaboration and safety awareness will be assessed during these activities, and consistently through the school year. **Other: Teacher Observation** Microscope diagrams will be assessed using a teacher designed rubric; skills will be assessed using teacher-designed practical. **Performance: Authentic Task** Accuracy of measurements, ability to cooperatively work with partner will be assessed. Adherence to safety	**BIBLIOGRAPHY** **Textbooks** Miller, Kenneth R. and Joseph Levine. *Biology Foundations.* Upper Saddle River, New Jersey: Pearson Education Inc., 2010 **Resources:** Johnson, George B. Holt Biology – Visualizing Life. Austin, TX. Holt, Rinehart and Winston, 1998. Miller, Kenneth R. and Joseph Levine. Biology. Englewood Cliffs, NJ. Prentice

				guidelines will be continuously monitored and addressed throughout the year.	Hall, Inc., 1995. *Biotechnology, Holt BioSources Lab Program*. Austin, TX. Holt, Rinehart & Winston, 1998. *Inquiry Skills Development, Holt BioSources Lab Program*. Austin, TX. Holt, Rinehart & Winston, 1998. *Laboratory Biology: Investigating Living Systems*. Charles E. Merrill Publishing Co. Columbus, OH, 1976. *Laboratory Techniques & Experimental Design, Holt BioSources Lab Programs*. Austin, TX.

					Holt, Rinehart & Winston, 1998. *Quick Labs, Holt BioSources Lab Program*. Austin, TX. Holt, Rinehart & Winston, 1998. *Student Review Guide, Holt Biology: Visualizing Life*. Austin, TX. Holt, Rinehart & Winston, 1998. **Websites:** http://www.abdn.ac.uk/~clt011/flash/samples/photosyn.swf http://www.dnai.org/timeline/index.html http://www.pbs.org/wgbh/aso/tryit/dna/# http://www.eduref.org/Virtual/Lessons/Science/Gen

					etics/GET0003.html http://www.sciencespot.net/Media/mitosisbook.pdf http://www.learn.genetics.utah.edu/units/biotech/get/ http://www.pbs.org/wgbh/harvest/ http://www.amnh.org/exhibitions/darwin/ http://www.biologycorner.coom/worksheets/pepperedmoth.html http://www.sciencenetlinks.com/lessons/cfm?DocID=178 http://www.zoology.ube.ca/~bio336/Bio336/Lectures/Lecture5/pentadactyl.jpg http://www.pbs.org/wgbh/evolution/educators/lessons/lesson3/act2.html http://www.biologycorner.

					com/worksheets/fossilrecord.html http://www.streaming.discoveryeducation.com/index.cfm http://www.staff.4j.land.edu/~whitley/ecology/units/unit01/lesson02/12a3/12a3.html http://www.enviroliteracy.org./article.php/1191/php **BIBLIOGROPHY continued** http://www.ohea.org/GD/Templates/Pages/OEA/OEADetail.aspx?page=3&TopicRelationID=4&Content=9249 http://www.hhmi.org/biointeractive/Anticiotics_Attack/opening.html http://www.actionbioscience.org/newfr

					ontiers/eldredge2.html http://www.eco-defense-society.org/vanishing-Sp-Animals.html http://learn.genetics.utah.edu/units/biotech/gel/ http://learn.genetics.utah.edu/units/cloning/ http://www.amnh.org/exhibitions/darwin/ http://www.aboutdarwin.com/ http://www.biologycorner.com/worksheets/pepperedmoth.html http://www.biologycorner.com/worksheets/fossilrecord.html http://www.pbs.org/wgbh/nova/orchid/

					classifying.html http://www.unitedstreaming.com http://www.biologycorner.com/worksheets/HIV_coloring.html http://www.hhmi.org/biointeractive/Antibiotics_Attack/frameset.html http://www.enviroliteracy.org/article.php/1191.php

NJ: 2016 SLS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12
NJ: Grades 11-12
Reading: Science & Technical Subjects
Craft and Structure
NJSLSA.R4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
RST.11-12.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
NJSLSA.R6 Assess how point of view or purpose shapes the content and style of a text.
RST.11-12.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
Integration of Knowledge and Ideas
NJSLSA.R7 Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.
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.
NGSS: Science and Engineering Practices
NGSS: 9-12

Practice 1. Asking questions (for science) and defining problems (for engineering)
Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.
Ask questions that arise from careful observation of phenomena, or unexpected results, to clarify and/or seek additional information.
Practice 2. Developing and using models
Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.
Evaluate merits and limitations of two different models of the same proposed tool, process, mechanism or system in order to select or revise a model that best fits the evidence or design criteria.
Practice 3. Planning and carrying out investigations
Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.
Plan an investigation or test a design individually and collaboratively to produce data to serve as the basis for evidence as part of building and revising models, supporting explanations for phenomena, or testing solutions to problems. Consider possible confounding variables or effects and evaluate the investigation's design to ensure variables are controlled.
Practice 4. Analyzing and interpreting data
Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.
Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.
Practice 5. Using mathematics and computational thinking
Mathematical and computational thinking in 9-12 builds on K-8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.
Create and/or revise a computational model or simulation of a phenomenon, designed device, process, or system.
Practice 6. Constructing explanations (for science) and designing solutions (for engineering)
Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.
Make a quantitative and/or qualitative claim regarding the relationship between dependent and independent variables.
Practice 7. Engaging in argument from evidence
Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.
Compare and evaluate competing arguments or design solutions in light of currently accepted explanations, new evidence, limitations (e.g., trade-offs), constraints, and ethical issues.
Practice 8. Obtaining, evaluating, and communicating information
Obtaining, evaluating, and communicating information in 9–12 builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs.
Critically read scientific literature adapted for classroom use to determine the central ideas or conclusions and/or to obtain scientific and/or technical information to summarize complex evidence, concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
NGSS: Disciplinary Core Ideas
NGSS: 9-12
ESS2: Earth's Systems

ESS2.C: The Roles of Water in Earth's SurfaceProcesses The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy,transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks. (HSESS2-5) Copyright © State of New Jersey, 1996 - 2016.					
NJ: 2014 SLS: 21st Century Life and Careers **NJ: All Grades** **Career Ready Practices** **Career Ready Practices** CRP1. Act as a responsible and contributing citizen and employee. CRP2. Apply appropriate academic and technical skills. CRP3. Attend to personal health and financial well-being. CRP4. Communicate clearly and effectively and with reason. CRP7. Employ valid and reliable research strategies. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP12. Work productively in teams while using cultural global competence. Copyright © State of New Jersey, 1996 - 2016.					
The Structural and Chemical Basis of Life *(Week 3, 6 Weeks)*	a) How do organisms live and grow?	a) All living organisms are made of cells. While a simple definition of life can be difficult to capture, all living organisms can be characterized by common aspects of their structure and functioning.	• Work in groups to analyze a collection of teacher-provided objects and generate a list of characteristics/criteria that demonstrate whether the objects are living or nonliving. Contribute to a large group discussion to determine the best criteria choices. • Perform lab exercise in which they will make observations and collect evidence of the characteristics living things exhibit. Then complete a written conclusion statement. • Utilize iPads to explore the campus and photograph the 5 main characteristics of life. Students will create a poster project showing these characteristics and explaining their definition.	**Oral: Discussion** Participation in class discussion, generated characteristic list, and ultimate application in identifying living samples will be assessed for understanding **Performance: Lab Assignment** Lab reports will be assessed using lab report format **Performance: Authentic Task** Contributions to class discussion, notes will be	

			• Observe one drop of cement glue in water, discuss whether what they observe is a living organism. Collaboratively construct and argue a list of characteristics that define a living organism. Utilize that finalized list to assess a series of station samples or *Power Point* scenario to determine living status. • Read *Are Viruses Alive?* An Informative Reading Work Sample Assessment. Article and Analysis Questions can be found at https://www.mesd.k12.or.us/cms/lib8/OR01915807/Centricity/Domain/35/Are_Viruses_Alive.pdf Utilize the article to explain why viruses walk the fine line of being living/nonliving and why we ultimately consider them to be nonliving. • Participate in the "Martian Car Debate", https://www.biologycorner.com/worksheets/martian.html, where one set of students need to convince the judge that a car is living and another set debates that the car is not living using scientific evidence and justification. Teacher generated rubric may be used to help students understand clear expectations of the debate. • Construct an explanation on the interdependence of DNA, RNA, and proteins in the overall function of an organism. • Discuss the importance of cells as the basic unit of life. Discuss the organization within internal structures that allow the cell to function. Communicate understanding that human systems are made up of a group of interacting atoms and molecules. • View cell structures and slide collection entitled Cell Structure using a Microslide Viewer. Then draw examples of structures found in plant and animal cells. Complete teacher-generated questions. • Draw a diagram of a typical plant and animal cell then write a brief conclusion statement	assessed for understanding. **Oral: Discussion** **Evaluate and Explain** *Major Lab Investigation* Students will design a lab where they will test a series of unknown foods in the effort to identify the macromolecules found in the food. Utilizing their findings, students will construct explanations on the role the food has on the function of the organism; students will describe the overall end result for the molecules in the food. **Summative: Test: Written** **Summative Assessments** · Biochemistry Unit Test	

			comparing the structures and functions of each. ● Perform an exploration activity entitled "Observing Cells with a Microscope", by role-playing as a biological research team member that is studying life in a polluted pond. ● Observe organisms to determine their size, how to classify them (eukaryotic or prokaryotic), and prepare a diagram along with a written conclusion statement that explains their results. ● Conduct microscope lab, *Comparing Plant and Animal Cells* (Miller/Levine). ● Observe the following indicators: · Benedict & Lugol solutions for carbohydrates · Sudan solution and grease spot test for lipids · Biuret solution for proteins · perform a series of laboratory experiments using specified indicator solutions to test for the presence of carbohydrates, lipids, and proteins. Then compile results in a report. ● Compare and contrast the structures of carbohydrates, lipids and proteins. Discuss how the structure impacts function, and how each relates to the human body and homeostasis. ● Demonstrate a familiarity with the terms "activation energy", "enzyme", and "active site". ● Perform a lab experiment in which they test enzyme activity once the substance has been subjected to different temperatures. Then complete written lab report, including written conclusion statement. ● Contribute to a discussion of what a calorie measures. Analyze a graph that shows different physical activities and the amount of calories they burn. Accurately interpret a nutritional label. ● Log food intake over the course of a series of days. Analyze using online websites such as https://www.choosemyplate.gov/MyPlate.		

			Discuss the importance of diet and how it impacts the function of the human body. ● Cooperatively analyze a series of nutritional labels and communicate findings regarding the nutritional importance of the food.		

NJ: 2016 SLS: English Language Arts
NJ: Grades 9-10
Speaking and Listening
Comprehension and Collaboration
NJSLSA.SL1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
SL.9-10.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
NJSLSA.SL3 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.
SL.9-10.3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any false reasoning or distorted evidence.
NJ: 2016 SLS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12
NJ: Grades 9-10
Reading: Science & Technical Subjects
Craft and Structure
NJSLSA.R4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
RST.9-10.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
Integration of Knowledge and Ideas
NJSLSA.R7 Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.
RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
NJ: 2016 SLS: Science
NJ: HS Life Sciences
HS-LS1 From Molecules to Organisms: Structures and Processes
Performance Expectations

HS-LS1-1. 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-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

HS-LS1-6. 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-LS2 Ecosystems: Interactions, Energy, and Dynamics

Performance Expectations

HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

NJ: 2014 SLS: Technology
NJ: Grades 9-12
8.1 Educational Technology
D. Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.

8.1.12.D.1 Demonstrate appropriate application of copyright, fair use and/or Creative Commons to an original work.
E: Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.

8.1.12.E.1 Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources.
NGSS: Science and Engineering Practices
NGSS: 9-12
Practice 1. Asking questions (for science) and defining problems (for engineering)
Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.
Ask questions that arise from careful observation of phenomena, or unexpected results, to clarify and/or seek additional information.
Practice 2. Developing and using models
Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.
Evaluate merits and limitations of two different models of the same proposed tool, process, mechanism or system in order to select or revise a model that best fits the evidence or design criteria.
Practice 3. Planning and carrying out investigations
Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.
Plan an investigation or test a design individually and collaboratively to produce data to serve as the basis for evidence as part of building and revising models, supporting explanations for phenomena, or testing solutions to problems. Consider possible confounding variables or effects and evaluate the investigation's design to ensure variables are controlled.
Practice 4. Analyzing and interpreting data
Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.
Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.
Practice 6. Constructing explanations (for science) and designing solutions (for engineering)
Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.
Make a quantitative and/or qualitative claim regarding the relationship between dependent and independent variables.
Practice 7. Engaging in argument from evidence

Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.

Compare and evaluate competing arguments or design solutions in light of currently accepted explanations, new evidence, limitations (e.g., trade-offs), constraints, and ethical issues.

Practice 8. Obtaining, evaluating, and communicating information

Obtaining, evaluating, and communicating information in 9–12 builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs.

Critically read scientific literature adapted for classroom use to determine the central ideas or conclusions and/or to obtain scientific and/or technical information to summarize complex evidence, concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

NGSS: Disciplinary Core Ideas

NGSS: 9-12

LS1: From Molecules to Organisms: Structures and Processes

LS1.A: Structure and Function

Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)

LS1.B: Growth and Development ofOrganisms

In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complexorganism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (HS-LS1-4)

LS1.C: Organization for Matter and Energy Flow in Organisms

The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen. (HS-LS1-5)

LS2: Ecosystems: Interactions, Energy, and Dynamics

LS2.A: Interdependent Relationships in Ecosystems

Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and non-living resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it notfor the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (HS-LS2-1),(HSLS2-2)

LS2.B: Cycles of Matter and Energy Transfer inEcosystems

Photosynthesis and cellular respiration (including anaerobic processes)provide most of the energy for life processes. (HS-LS2-3)

NJ: 2014 SLS: 21st Century Life and Careers

NJ: All Grades

Career Ready Practices

Career Ready Practices

CRP2. Apply appropriate academic and technical skills.

CRP3. Attend to personal health and financial well-being.

CRP4. Communicate clearly and effectively and with reason.

CRP5. Consider the environmental, social and economic impacts of decisions. 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. Copyright © State of New Jersey, 1996 - 2016					
Homeostasis and Water Balance *(Week 9, 5 Weeks)*	How does life maintain itself? Why are water's unique properties so important for life as we know it?	Growth, reproduction and dynamic homeostasis require that cells create and maintain internal environments that are different from their external environments. The structures of materials determine their properties. As a result of water's bent shape and polarity, water has unique properties, such as an ability to dissolve most substances. These properties are responsible for many important characteristics of nature.	• Observe a demonstration of celery in water, salt water, distilled water. With a partner, predict expected results. Sketch experimental setup and record hypotheses. • Explain any observed changes using key terms (water, polarity, solution, solvent, etc.). Sketch observations, compose explanation. • Discuss explanations, focusing on water's structure, polarity, and special properties. • With a partner, brainstorm/describe examples of the various properties. • Offer definitions of acids and bases. With lab partner, test various substances with red cabbage juice. Use results to create a color scale that can be used to test pH, compare results to other groups and to standardized pH paper. Explain any differences using understanding of cabbage juice as a solution. • Students will create a pH poster researching everyday substances that are pH 1-14. Students will create a pH scale and accurately describe if substances are basic or acidic. • Execute a lab determining the effect of Acid Rain on Seeds (Can refer to Acid Rains and Seeds Lab in Pearson's Lab Manual B). Have students make environmental connections. Have students research how human activity influences Acid Rain and its environment effects on biodiversity; then research potential	**Formative: Oral: Discussion** Sketches, predictions, and participation in class discussions will be formatively assessed for understanding. **Other: Peer Assessment** Peer analysis of group lists and class presentation **Performance: Lab Assignment** Designed lab activities and resulting pH scales will be assessed for accuracy and understanding **Oral: Oral Report** Lab report conclusions will be assessed for understanding **Performance: Authentic Task** Students can make a photo journal of examples of key terms from the unit (homeostasis, osmosis, etc.). They can take selfies of themselves with	

			technological solutions to reduce impact and carbon footprints. ● Design, implement, and report on transpiration in a plant shoot. Prepare brief proposals for their experiments, protocol for the experiment, and at the end a formal lab report. ● Hypothesize the effects of incubating a chicken egg in vinegar, share predictions, conduct experiment, analyze results. ● Perform a laboratory activity entitled “Cells in Osmotic Balance and Imbalance” by observing the effect of plasmolysis on cells. Then complete a formal lab report. ● Perform a lab activity using dialysis tubing and reagents to determine the permeability of a membrane. Then complete written lab report. ● Perform a lab exercise using three different concentrated solutions to identify which would be hypotonic, hypertonic, or isotonic. Then complete analysis questions. Example could be: Osmosis of the Egg Lab. ● Working in pairs/small groups define the terms solution, solute, and solvent. Discuss. Predict what would happen if a plant were given a solution instead of water. Explain predictions and use evidence from Eggsperiment to justify. ● Using microscopes and various plant cells (potato, elodea, etc.), determine the impact of solutions on cell structures. Document procedures, hypotheses, and observations. ● Discuss how plants exchange materials with their environments and why they would need to do so. Regroup as a class and share ideas. Discuss the term homeostasis, and discuss what plants might have to do to maintain homeostasis. ● Complete the Build-a-membrane activity found here- http://teach.genetics.utah.edu/content/cells/BuildAMembrane.pdf	examples of each and write a short caption to explain. **Performance: Authentic Task** Students can create a comic strip, cartoon, poem or other form of artistic communication to explain homeostasis and water balance **Written: Report** Lab report conclusion will be assessed for level of understanding **Other: Teacher Observation** **Evaluate** Teacher designed summative Assessment for the unit	

NJ: 2016 SLS: English Language Arts
NJ: Grades 9-10
Speaking and Listening
Comprehension and Collaboration
NJSLSA.SL1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
SL.9-10.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
NJSLSA.SL3 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.
SL.9-10.3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any false reasoning or distorted evidence.
NJ: 2016 SLS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12
NJ: Grades 9-10
Reading: Science & Technical Subjects
Craft and Structure
NJSLSA.R4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
RST.9-10.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
Integration of Knowledge and Ideas
NJSLSA.R7 Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.
RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
NJ: 2016 SLS: Science
NJ: HS Life Sciences
HS-LS1 From Molecules to Organisms: Structures and Processes
Performance Expectations

HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

NGSS: Science and Engineering Practices
NGSS: 9-12
Practice 1. Asking questions (for science) and defining problems (for engineering)
Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.
Ask questions that arise from careful observation of phenomena, or unexpected results, to clarify and/or seek additional information.
Practice 2. Developing and using models
Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.
Evaluate merits and limitations of two different models of the same proposed tool, process, mechanism or system in order to select or revise a model that best fits the evidence or design criteria.
Practice 3. Planning and carrying out investigations

Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models. Plan an investigation or test a design individually and collaboratively to produce data to serve as the basis for evidence as part of building and revising models, supporting explanations for phenomena, or testing solutions to problems. Consider possible confounding variables or effects and evaluate the investigation's design to ensure variables are controlled. **Practice 4. Analyzing and interpreting data** **Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.** Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. **Practice 6. Constructing explanations (for science) and designing solutions (for engineering)** **Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.** Make a quantitative and/or qualitative claim regarding the relationship between dependent and independent variables. **Practice 7. Engaging in argument from evidence** **Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.** Compare and evaluate competing arguments or design solutions in light of currently accepted explanations, new evidence, limitations (e.g., trade-offs), constraints, and ethical issues. **Practice 8. Obtaining, evaluating, and communicating information** **Obtaining, evaluating, and communicating information in 9–12 builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs.** Critically read scientific literature adapted for classroom use to determine the central ideas or conclusions and/or to obtain scientific and/or technical information to summarize complex evidence, concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. **NGSS: Disciplinary Core Ideas** **NGSS: 9-12** **LS1: From Molecules to Organisms: Structures and Processes** **LS1.A: Structure and Function** Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) **ESS3: Earth and Human Activity** **ESS3.C: Human Impacts on Earth Systems** Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. (HS-ESS3-4) Copyright © State of New Jersey, 1996 - 2016.
NJ: 2014 SLS: 21st Century Life and Careers **NJ: All Grades** **Career Ready Practices** **Career Ready Practices** CRP2. Apply appropriate academic and technical skills. CRP4. Communicate clearly and effectively and with reason.

CRP7. Employ valid and reliable research strategies. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. 					
Energy *(Week 14, 7 Weeks)*	a) How do organisms obtain and use the matter and energy they need to live and grow?	a) Sustaining life requires substantial energy and material inputs. As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. The results of these chemical reactions is that energy is transferred from one system of interacting molecules to another.	• Perform iodine (starch indicator) test on plant leaves, both light exposed and non light exposed. Work in pairs/groups and determine possible explanations for results. • Read "Life's Greatest Invention: Photosynthesis" and discuss the following questions or complete the following activities for understanding: o *What is the author's overall attitude towards photosynthesis?* o Create a Venn diagram that compares the types of life that existed on Earth prior to and after photosynthesis. o Write a word equation to describe the early version of photosynthesis. o According to the reading, *How did the evolution of oxygen-using microbes pave the way for the evolution of complex life and its colonization of land?* • Analyze a variety of clues to determine how plants get energy. Arrange the clues to formulate a hypothesis utilizing appropriate vocabulary, then share their explanation with another pair/group. • Design an investigation to explore the effects of differing conditions (sun,shade, light intensity, etc.) on the rate of photosynthesis. • Contribute to a discussion "How Do Biological Organisms Use Energy?" (http://serendip.brynmawr.edu/exchange/bioactivities/energy). • Complete activity "How Do Muscles Get the Energy They Need for Athletic Activity?" to compare aerobic and anaerobic respiration, as well as show how energy and matter are transformed.	**Other: Teacher Observation** Scientific explanations will be assessed for accuracy and understanding **Oral: Discussion** Class discussion/responses will be assessed for level of understanding and need for further instruction. **Other: Teacher Observation** Scientific explanations will be assessed for accuracy and understanding **Performance: Lab Assignment** Designed lab activities will be assessed for understanding. **Performance: Lab Assignment** Participation in lab activity, lab data and conclusion will be assessed for understanding. **Other: Teacher Observation** Scientific explanations will be assessed for accuracy and understanding	

			http://serendip.brynmawr.edu/exchange/bioactivities/energyathlete. • Investigate how sugar concentrations influence the rate of anaerobic respiration in yeast. • Complete a diagram that compares and contrasts the amount of ATP generated by aerobic cell respiration with anaerobic fermentation. • Perform a photosynthesis/cell respiration lab experiment that will use an indicator solution to identify carbon dioxide production exhibited by autotrophs and heterotrophs. Compose a written lab conclusion. • Participate in a "Cellular Respiration in Yeast" inquiry-based lab, developing connection between food and getting energy into cells. Observe the "Big Picture" at www.sumanasinc.com/webcontent/animations/content/cellularrespiration.html. • Contribute to a class discussion of regarding the necessary components and conditions for cellular respiration. In small groups, summarize the findings of the lab, how it relates to cellular respiration, and to open/close their dominant hand as fast as they can for as long as they can. Provide hypotheses for observed phenomena. • Build connections between photosynthesis and cellular respiration and construct an explanation as to how these processes are connected and exhibit the cycling of matter and flow of energy.		

NJ: 2016 SLS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12
NJ: Grades 9-10
Reading: Science & Technical Subjects
NJSLSA.R2 Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
RST.9-10.2. Determine the central ideas, themes, or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
NJSLSA.R3 Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

RST.9-10.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

Craft and Structure

NJSLSA.R4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

RST.9-10.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

Integration of Knowledge and Ideas

NJSLSA.R7 Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.

RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

NJ: 2016 SLS: Science

NJ: HS Life Sciences

HS-LS1 From Molecules to Organisms: Structures and Processes

Performance Expectations

HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

HS-LS1-7. 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-LS2 Ecosystems: Interactions, Energy, and Dynamics

Performance Expectations

HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

NJ: 2014 SLS: Technology

NJ: Grades 9-12

8.1 Educational Technology

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

A. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.

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.

E: Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.

8.1.12.E.1 Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources.

NGSS: Disciplinary Core Ideas

NGSS: 9-12

LS1: From Molecules to Organisms: Structures and Processes

LS1.C: Organization for Matter and Energy Flow in Organisms

The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen. (HS-LS1-5)

LS2: Ecosystems: Interactions, Energy, and Dynamics

LS2.A: Interdependent Relationships in Ecosystems

Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and non-living resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it notfor the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (HS-LS2-1),(HSLS2-2)

LS2.B: Cycles of Matter and Energy Transfer inEcosystems

Photosynthesis and cellular respiration (including anaerobic processes)provide most of the energy for life processes. (HS-LS2-3)

LS2.C: Ecosystem Dynamics,Functioning, and Resilience

A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance toan ecosystem occurs, it may return to its more or less original status (i.e.,the ecosystem is resilient), as opposed to becoming a very differentecosystem. Extreme fluctuations in conditions or the size of anypopulation, however, can challenge the functioning of ecosystems interms of resources and habitat availability. (HS-LS2-2),(HS-LS2-6)

ESS2: Earth's Systems

ESS2.D: Weather and Climate

Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. (HSESS2-6),(HS-ESS2-7)

PS3: Energy

PS3.D: Energy in Chemical Processes and Everyday Life

Although energy cannot be destroyed, it can be converted to less usefulforms—for example, to thermal energy in the surrounding environment.(HS-PS3-3),(HS-PS3-4)

NJ: 2014 SLS: 21st Century Life and Careers

NJ: All Grades

Career Ready Practices

Career Ready Practices

CRP2. Apply appropriate academic and technical skills.

CRP3. Attend to personal health and financial well-being.

CRP4. Communicate clearly and effectively and with reason.

CRP6. Demonstrate creativity and innovation.

CRP11. Use technology to enhance productivity.

CRP12. Work productively in teams while using cultural global competence.

Genetics and Inheritance *(Week 21, 9 Weeks)*	1. How can probability be used to predict genetic traits? 2. How is the hereditary information in genes inherited and expressed?	1. Genes and chromosomes determine the expressions of inherited traits. 2. All species tend to maintain themselves from generation to generation using the same genetic code. However, there are genetic mechanisms that lead to variation in a population.	• Investigate selected sites, create a time line indicating the major discoveries associated with DNA, its structure, and its functions. Then prepare an oral presentation to be delivered to the class in pairs/groups. • Investigate specified Websites then use a sequence of DNA to produce the corresponding codons, anticodons, and amino acid sequence. • Compare and contrast DNA and RNA utilizing a T-Chart. • Investigate selected Websites in order to manipulate virtual DNA and RNA, then model the processes of replication and protein synthesis. Complete diagrams and questions. • Investigate selected sites to design a chromosome activity in which other students will be able to understand the link between genes and chromosomes, as well as reinforce the concepts of dominant and recessive genes, incompletely dominant genes, and co-dominant genes. Then prepare a presentation to be delivered to the class. • Utilize a specific Website to generate drawings of each state of mitosis using a Micro slide Viewer microscope model to place cells in proper sequence, then create a mitosis flip book. • Investigate the work of Gregor Mendel using the *Ebsco Database*, then compose a letter to the scientific community posing as Mendel and describe his finding, and draw specific conclusions regarding the subject of heredity. • *Perform a lab experiment entitled* What Phenotypic Ratios is Seen in a Dihybrid Cross. *They will compare the ratio results in order to demonstrate the results of a dihybrid cross.* • Perform an exercise that demonstrates rules of probability through coin flipping. Then complete charts and analysis questions.	**Oral: Presentation** Student presentation of designed chromosome activities will be assessed using a teacher-designed rubric **Other: Peer Assessment** Drawings will be assessed for accuracy Peer assessment for accuracy Flip book will be assessed for accuracy **Other: Teacher Observation** Diagrams assessed for accuracy **Other: Peer Assessment** Letter will be assessed using peer-editing practices and student-made rubric **Other: Peer Assessment** Ratios will be assessed for accuracy Charts assessed for completeness Questions assessed for accuracy Self-assessed/peer-assessed for accuracy **Performance: Authentic Task** Teacher anecdotal notes during class discussion Accurate completion of analysis questions	

			● Work in pairs to solve several teacher-generated problems using the Punnett square method. ● Analyze a written paragraph containing numerous errors, identify the types of chromosomes mutation each mistake represents, then share their results with the class. ● Perform a lab exploration entitled *Modeling the Effect of a Mutation* byacting as a genetic counselor that has been hired to evaluate a hands-on activity that models protein synthesis, and the effect of a mutation on protein production. Then prepare an oral presentation that will be shared with the class. ● Work in pairs to solve teacher-generated problems involving co-dominance, sex linkage, and sex influenced inheritance by using the Punnett square method to solve problems. Results will be orally shared with the class. ● Perform a lab exploration entitled ABO Blood-Typing by acting as a medical lab technician hired to complete blood tests for a court case. Then compile results in written form and orally present to the class. ● Investigate selected Websites to obtain information on the history of gene technology to simulate cloning techniques. Then complete analysis questions prepared by the teacher and share results with the class.	Teacher notes during presentation **Other: Teacher Rubric** Cross results assessed for accuracy and completeness Written court testimony will be assessed using teacher-designed rubric **Other: Teacher Rubric** Visual will be assessed using teacher-generated rubric	

NJ: 2016 SLS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12
NJ: Grades 9-10
Reading: Science & Technical Subjects
NJSLSA.R2 Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
RST.9-10.2. Determine the central ideas, themes, or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
NJSLSA.R3 Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

RST.9-10.3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

Craft and Structure

NJSLSA.R4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

RST.9-10.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

NJSLSA.R5 Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

RST.9-10.5. Analyze the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

NJSLSA.R6 Assess how point of view or purpose shapes the content and style of a text.

RST.9-10.6. Determine the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

Integration of Knowledge and Ideas

NJSLSA.R7 Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.

RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

NJSLSA.R9 Analyze and reflect on how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

RST.9-10.9. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

NJSLSA.R10 Read and comprehend complex literary and informational texts independently and proficiently with scaffolding as needed.

RST.9-10.10. By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

Writing

NJSLSA.W2 Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

WHST.9-10.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

Production and Distribution of Writing

NJSLSA.W4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

WHST.9-10.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

NJSLSA.W6 Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

WHST.9-10.6. Use technology, including the Internet, to produce, share, and update writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

Research to Build and Present Knowledge

NJSLSA.W7 Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

WHST.9-10.7. 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.

NJSLSA.W8 Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

WHST.9-10.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

NJSLSA.W9 Draw evidence from literary or informational texts to support analysis, reflection, and research.
WHST.9-10.9. Draw evidence from informational texts to support analysis, reflection, and research.
NJ: 2016 SLS: Science
NJ: HS Life Sciences
HS-LS1 From Molecules to Organisms: Structures and Processes
Performance Expectations

HS-LS1-1. 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-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

HS-LS3 Heredity: Inheritance and Variation of Traits
Performance Expectations

HS-LS3-1. 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-LS3-2. 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-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

NJ: 2014 SLS: Technology
NJ: Grades 9-12
8.1 Educational Technology
F: Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

8.1.12.F.1 Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
NGSS: Disciplinary Core Ideas
NGSS: 9-12
LS1: From Molecules to Organisms: Structures and Processes
LS1.A: Structure and Function
All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS1-1)(secondary to HS-LS3-1)
LS1.B: Growth and Development ofOrganisms
In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complexorganism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (HS-LS1-4)
LS3: Heredity: Inheritance and Variation of Traits
LS3.A: Inheritance of Traits

Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used(expressed) by the cell may be regulated in different ways. Not all DNA codes for a protein; some segments of DNA are involved in regulatory orstructural functions, and some have no as-yet known function. (HS-LS3-1)

LS3.B: Variation of Traits

In sexual reproduction, chromosomes can sometimes swap sectionsduring the process of meiosis (cell division), thereby creating new geneticcombinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmentalfactors can also cause mutations in genes, and viable mutations areinherited. (HS-LS3-2)

NJ: 2014 SLS: 21st Century Life and Careers
NJ: All Grades
Career Ready Practices
Career Ready Practices

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.

Evolution & Classification *(Week 30, 5 Weeks)*	1. How do organisms change over time in response to changes in the environment?" 2. What evidence shows that different species are related?	1. All life on earth evolved from a common ancestor that first appeared billions of years ago. 2. Variation exists in all species and allows some individuals to be better able to survive in a particular environment than others.	• Create a "travel brochure" type document that advertises the route Darwin traveled while on his voyage on the HMS Beagle. It will incorporate page layouts in different formats using desktop publishing and graphics software. • Investigate specified Website in which they will simulate changes in the Peppered Moth population due to pollution and predation. Observe how species can change overtime, graph data using a spreadsheet, and then complete a teacher-prepared survey. • Investigate specified Website, complete coloring plate exercise regarding homologous structures, then prepare a written statement explaining what homologous structures indicate about evolutionary relationships. • Examine specified Website to complete a web quest activity in order to investigate a variety	**Performance: Lab Assignment** Brochure will be assessed using teacher-designed rubric Graph assessed using a teacher-made rubric Survey assessed for understanding **Performance: Lab Assignment** Homologies and essays will be assessed for accuracy and clarity Chart and presentation will be assessed using teacher-generated rubric.	

			of types of evidences by working in teams that will be responsible for learning about fossil evidence, structural evidence, and genetic evidence for evolution, then groups will present this information to the class after creating a presentation chart. ● Investigate specified Websites in order to analyze characteristics of fossils, compare placement of fossils, determine relative ages and develop a model evolutionary tree based on the morphology and age of the fossils. Then complete analysis questions. ● Identify the members of the genus *Norno* using a dichotomous key. https://www.biologycorner.com/worksheets/dichoto.html ● Identify unknown organisms using a dichotomous keys. ● Analyze and read a cladogram. ● Classify a randomly assigned animal into the appropriate taxonomic group. The common names of the different animals will be written on index cards, which will be randomly distributed. ● View video segment on *United Streaming: Elements of Biology, Biological Evolutions* and explain how evolution has changed the earth's atmosphere over time. Then share ideas in peer groups.	**Other: Teacher Observation** Analysis questions will be assessed for accuracy and completeness **Performance: Authentic Task** Students self-assess using teacher provided key **Other: Quiz** Students self-assess using video quiz	

NJ: 2016 SLS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12
NJ: Grades 9-10
Reading: Science & Technical Subjects
NJSLSA.R2 Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
RST.9-10.2. Determine the central ideas, themes, or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
Craft and Structure
NJSLSA.R4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
RST.9-10.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

NJSLSA.R5 Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.
RST.9-10.5. Analyze the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
Integration of Knowledge and Ideas
NJSLSA.R7 Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.
RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
NJSLSA.R9 Analyze and reflect on how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.
RST.9-10.9. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
Writing
NJSLSA.W2 Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
WHST.9-10.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
Production and Distribution of Writing
NJSLSA.W4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.9-10.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
NJ: 2016 SLS: Science
NJ: HS Life Sciences
HS-LS4 Biological Evolution: Unity and Diversity
Performance Expectations

HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

HS-LS4-2. 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-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

HS-LS4-5. 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.

NJ: 2014 SLS: Technology
NJ: Grades 9-12
8.1 Educational Technology
F: Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

8.1.12.F.1 Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
NGSS: Disciplinary Core Ideas
NGSS: 9-12

LS4: Biological Evolution: Unity and Diversity
LS4.A: Evidence of Common Ancestry and Diversity
Genetic information provides evidence of evolution. DNA sequences varyamong species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of descent can be inferred bycomparing the DNA sequences of different organisms. Such information isalso derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence. (HS-LS4-1)
LS4.B: NaturalSelection
Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. (HS-LS4-2),(HS-LS4-3)
LS4.C: Adaptation
Evolution is a consequence of the interaction of four factors: (1) thepotential for a species to increase in number, (2) the genetic variation ofindividuals in a species due to mutation and sexual reproduction, (3)competition for an environment's limited supply of the resources thatindividuals need in order to survive and reproduce, and (4) the ensuing proliferation of those organisms that are better able to survive and reproduce in that environment. (HS-LS4-2)
ESS2: Earth's Systems
ESS2.E:Biogeology
The many dynamic and delicate feedbacks between the biosphereand other Earth systems cause a continual co-evolution of Earth'ssurface and the life that exists on it. (HS-ESS2-7)

NJ: 2014 SLS: 21st Century Life and Careers
NJ: All Grades
Career Ready Practices
Career Ready Practices
CRP2. Apply appropriate academic and technical skills.

CRP4. Communicate clearly and effectively and with reason.

Ecosystems & the Environmen t *(Week 35, 6 Weeks)*	1. How do matter and energy link organisms to each other and their environments? 2. How do humans have an impact on the diversity and stability of ecosystems?	1. Matter needed to sustain life is continually recycled among and between organisms and the environment. 2. Organisms and their environments are interconnected. Changes in one part of the system will affect other parts of the system.	• Examine a series of photographs from a specific Website in which each photo shows a different type of symbiotic relationship. Then identify the types of symbiotic relationship each photo illustrates and explain the reason for each selection. • Construct a food chain and a food web, draw and label the organisms in each as a producer, primary consumer, secondary consumer, or tertiary consumer. Then compare both in a food web and a food chain in a written summary.	**Performance: Authentic Task** Relationships assessed for accuracy and understanding. **Written: Report** Drawings will be assessed for accuracy Written comparison for understanding and completeness **Other: Teacher Observation**	

			• Draw an energy pyramid and explain in writing why less energy is available to each succeeding level for each organism. • Complete the Oh Deer! lab activity which simulates carrying capacity, limiting factors and changes in deer populations. • Investigate a specified Website and participate in the Carbon Cycle Game. They will then write a short description of how this activity depicts the movement of carbon atoms through the ecosystem. • Analyze graphs showing various types of population growth. Identify carrying capacity based on graphs. • Engage in a lab exploration entitled Modeling an Ecosystem by role-playing as an ecologist that has been hired to perform tests that will identify the risks associated with building a factory adjacent to a wilderness park. Then complete analysis questions and written evaluation. • Investigate a specified Website and view selected clips from *An Inconvenient Truth*, examine their personal activities and estimate their own impact on the environment, then find ways we can reduce the damage to our environment. Complete a teacher –made survey and written analysis. • Investigate specified Websites to learn about naturally occurring extinctions of organisms, as well as those caused by human activities. Then create an information poster (visual), and prepare an oral presentation to be delivered to the class.	Analysis questions and evaluation assessed for understanding and accuracy Survey and analysis questions assessed for accuracy, understanding, and completeness **Oral: Presentation** Poster and presentation will be assessed using teacher-generated rubric	

NJ: 2016 SLS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12
NJ: Grades 9-10
Reading: Science & Technical Subjects
NJSLSA.R2 Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
RST.9-10.2. Determine the central ideas, themes, or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

Craft and Structure
NJSLSA.R4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
RST.9-10.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
NJSLSA.R5 Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.
RST.9-10.5. Analyze the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
NJSLSA.R6 Assess how point of view or purpose shapes the content and style of a text.
RST.9-10.6. Determine the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.
Integration of Knowledge and Ideas
NJSLSA.R7 Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.
RST.9-10.7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
NJSLSA.R9 Analyze and reflect on how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.
RST.9-10.9. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
NJSLSA.R10 Read and comprehend complex literary and informational texts independently and proficiently with scaffolding as needed.
RST.9-10.10. By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.
Writing
NJSLSA.W2 Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
WHST.9-10.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
Production and Distribution of Writing
NJSLSA.W4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.9-10.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
NJ: 2016 SLS: Science
NJ: HS Life Sciences
HS-LS2 Ecosystems: Interactions, Energy, and Dynamics
Performance Expectations

HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.*

HS-LS2-6. 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.

NJ: 2014 SLS: Technology
NJ: Grades 9-12
8.1 Educational Technology

F: Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

8.1.12.F.1 Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
NGSS: Disciplinary Core Ideas
NGSS: 9-12
LS2: Ecosystems: Interactions, Energy, and Dynamics
LS2.B: Cycles of Matter and Energy Transfer inEcosystems
Photosynthesis and cellular respiration (including anaerobic processes)provide most of the energy for life processes. (HS-LS2-3)
LS2.C: Ecosystem Dynamics,Functioning, and Resilience
A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance toan ecosystem occurs, it may return to its more or less original status (i.e.,the ecosystem is resilient), as opposed to becoming a very differentecosystem. Extreme fluctuations in conditions or the size of anypopulation, however, can challenge the functioning of ecosystems interms of resources and habitat availability. (HS-LS2-2),(HS-LS2-6)
ESS2: Earth's Systems
ESS2.D: Weather and Climate
Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate. (HS-ESS2-6),(HS-ESS2-4)
ESS3: Earth and Human Activity
ESS3.A: Natural Resources
All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulationscan change the balance of these factors. (HS-ESS3-2)
ESS3.B: Natural Hazards
Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations. (HS-ESS3-1)
ESS3.C: Human Impacts on Earth Systems
The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. (HS-ESS3-3)
ESS3.D: Global Climate Change
Through computer simulations and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in responseto human activities. (HS-ESS3-6)

NJ: 2014 SLS: 21st Century Life and Careers
NJ: All Grades
Career Ready Practices
Career Ready Practices
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.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

Appendix A Sample Authentic Assessment

(Week 1, 1 Week)

Performance: Authentic Task
Genetic Screening in the Workplace
Decision-Making Sheet

Name: ________________________________

1. State the ethical question(s) that is (are) raised in this situation.

2. List all of the relevant facts.

3. Identify the values that play a role in this issue.

4. List several possible solutions.

5. Choose the solution you think is best and justify your choice.
SCN119 ASSESSMENT RUBRIC.docx

GRADING PROCEDURES

MARKING PERIOD GRADES

Long and Short Term Assessments which may include: 90%

- Tests, quizzes, and/or worksheets
- Authentic assessments
- Technology applications
- Projects, reports, presentations
- Laboratory investigations
- Data Analysis
- Analysis of assigned readings

Daily Assessments which may include: 10%

- Active engagement in class activities
- Demonstration of knowledge and understanding of course material
- Skills and safety practices during lab investigations
- Do Now/Exit Questions
- Homework

Final Grade – Full Year Course
Full Year Course

- Each marking period shall count as 20% of the final grade (80% total).

The midterm assessment will count as 10% of the final grade, and the final assessment will count as 10% of the final grade.

Appendix B Sample Lab Activity
(Week 1, 1 Week)

Performance: Lab Assignment
TIME SEQUENCE COMPARING NORMAL MITOSIS
TO
ABNORMAL MITOSIS IN CANCER CELLS

OBJECTIVE:

What is the normal time sequence for the stages of mitosis and how is the timing altered in cancer cells?

MATERIALS:

Prepared slide of onion root tip
Compound microscope
Graph paper

PROCEDURE:

PART I

- Obtain a clean onion root tip slide and scan it under low power. Adjust the light for optimum viewing.

- Switch to high power and center your slide so that you have a field of view in which all the cells are in various stages of mitosis (including interphase).

- Start at the top right corner of the field and record the stage of each cell in Data Table 1. Count your cells in a systematic manner. This will be considered Area 1.

- After completing the count in the first area, move the slide to a new area and perform the identification and count a second time. Record this data in the table as well.

- Repeat the procedure a third time, with yet another field of view.

Sample Lab Activity (Procedures/Part I continued)

- On a separate sheet of unlined paper make a drawing of one cell in each of the various stages. Be sure to draw only what you actually see, but include all details that are visible. Your drawings will not necessarily look exactly like the ones in a text book.

- Return to Data Table 1 and record the total numbers of cells in each phase **for all three trial areas**.

- Add the total number of cells viewed in each stage. Write the total count of cells viewed in all three trials in the appropriate place on the data table.

- There is a direct relationship between the number of cells counted in a given stage of mitosis and the time that that stage takes to complete. This may be calculated if the total time for mitosis in onion root tip cells is known. (The total time is measured from interphase to interphase). It is generally acknowledged that this time for onion cells is 720 minutes (12 hours). Set-up a ratio of the number of cells in each phase compared to the total number of cell counted, then multiply this fraction by the total time (720 minutes) needed to complete one mitotic division. Thus, the time for a specific phase is equal to:

- Using your data, calculate the time required for the completion of each stage. **Be sure to use the totals for all three trials**. Enter these results in the appropriate column of Data Table 1.

- Prepare a bar graph to illustrate your results. The vertical axis should be marked in “minutes to complete each stage.” On the horizontal axis, allow equal space for each of the stages beginning with interphase and ending with telophase.

PART II: Mitotic Cell Division In Cancer Cells

- An important characteristic of cancer cells is that they no longer follow their normal timing of mitosis. You may have heard cancer cells called “runaway cells” that have no control on their rate of reproduction. It is this characteristic that allows some cancer cells to grow and spread quite rapidly. In this section, you will analyze data to determine the differences in timing of mitosis between normal and cancerous stomach cells in a chicken.

- Study the data in Table 2. Assume that the total time needed for one normal mitotic division of these cells is 625 minutes. Calculate, in the same manner as before, the total time needed for each normal phase of mitosis. Enter this data in the appropriate column of Data Table 2.
- Repeat this analysis for the data in Table 3. In the case of cancer cells, however, the total time required for one mitotic division is only 448 minutes. Enter the time required for each stage in Data Table 3.

- Prepare another bar graph, similar to your first, using the data from Tables 2 and 3. Put the data for both the normal and cancer cells in each phase directly next to each other.

CONCLUSION QUESTIONS:

Refer to your data and graph from Part 1 to answer the following:

1. Which stage in the mitotic cycle takes the most time? What percentage of the total time is this?

1. Why do you think that this stage (the one in question 1) takes so long? What activities in relation to mitosis are occurring during this phase?

1. Which stage is the second longest? What percentage of the total time does this stage take? Again, what events are occurring during this stage identified in question 3?

1. List the remaining stages in order, from longest to shortest duration.

Referring to your data and graph from Part II answer the following:

1. How does the data for each phase in the normal chicken cell compare with that of the onion root tip cell? Are the percentages of time for the two longest phases similar? Can you make a general conclusion based on this information?

1. In which stages are the most dramatic differences in timing between normal and cancerous chicken cells?

1. What nuclear and cytoplasmic changes would you expect to find in cancer cells, as compared to their normal counterparts? (HINT: What events would be most affected by the alteration in the timing sequence of mitosis?)

SCN119 Sample Lab Activity.docx

Appendix C Lab Report Rubric *(Week 1, 1 Week)*				SCN119 LAB REPORT RUBRIC.docx	

Appendix D Oral Report Rubric
(Week 1, 1 Week)
SCN119 ORAL PRESENTATION RUBRIC.docx

Appendix E Peer Conference Checklist
(Week 1, 1 Week)
Other: Peer Assessment
SCN119 PEER CONFERENCE CHECKLIST.docx

Appendix F Self Assessment
(Week 1, 1 Week)

Written: Essay
MID-YEAR REFLECTION

After looking over your work folder with all of your assessments from this year, what are your strengths? What are your weaknesses?

How can you continue to use your strengths to be successful? Be specific and explain.

How can you improve your areas of weakness? Give yourself at least one goal in order to help you improve.

Which assessment(s) are you most proud of? Explain why.

Which assessment(s) do you think you could have done better on? Explain why and how.

We are now half-way through the school year. What will you continue to strive for? How do you plan on doing this

WORK FOLDER REFLECTION

Look through the various items in your work folder and take a moment to think about this school year. Answer the following questions in the form of a paragraph to reflect on your progress so far this year.

- What were some of your goals in the beginning of this school year? Have you made progress towards achieving them?

- What are some goals you have for the rest of this school year?

- In what areas did you have the most success? Be specific by indicating the topics in which you feel most confident.

- In what areas did you have difficulty? What are some ways you can improve in those areas?

- What can you do to prepare yourself for the final exam?

- Now that more than half of the year has passed, what are some things that you have learned that will help you next year? (i.e. study skills, putting more effort in homework, etc.)

What are some things that you enjoy about this class? What are some things you don't like? Do you have any suggestions as to what would make the class better
SCN119 SELF ASSESSMENT.docx

Appendix G Teacher Resources for Biochemistry
(Week 1, 1 Week)

Performance: Lab Assignment
Name:____Date:_________Pd: ________

Testing for Organic Molecules Lab

Objective
In this lab you will design and conduct a controlled experiment where you will test for the presence of organic molecules in a series of unknown foods. You will need to have the student research proposal stamped prior to the start of the lab.

Things to include
The following is a list of questions and information that must be included in your lab report. Keep in mind your lab report is not limited to the following criteria. See the lab report rubric for all essential components that are necessary in your laboratory investigation and lab report.

- As you begin testing the unknowns, make predictions on what the unknowns might be.
- For each unknown elaborate on what role the unknowns play in homeostasis.
- Include a molecular structure of the unknowns.
- Make sure you have included qualitative and quantitative data.

Name:____Date:____________Pd: _____

Calculating Food Calories

DATA CALCULATIONS:

- **($q = mC\Delta T$) (1000 cal = 1kcal = 1 nutritional Cal)**
- **Remember that 1 ml of water weighs 1 g**
- **The specific heat of water is 1 calorie/gram ^{0}C**

1. How many kilocalories/gram are in cheerios if in a calorimeter experiment the 7 gram cheerio lost 3 grams when it was burned surrounding a 100 ml water bath. The temperature of the water found to increase from an initial temperature of 21.2°C to a final temperature of 24.4°C.

a) How many Calories/gram are in cheerios?

b) If you were to consume 47 grams of cheerios, how many calories would you be consuming?

2. How many kilocalories/gram is in a taco if in a calorimeter experiment the 53-gram taco after burned measured 52.99 grams surrounding a 100 ml water bath. The temperature of the water found to increase from an initial temperature of 21.0°C to a final temperature of 61.0°C.

a) How many Calories/gram are in a taco?

b) How many calories would you be consuming if you were to have three tacos?

3. Which food source overall is high in calories eating 2Tbsp (32 g) of peanut butter at 190 Calories or 9 pieces (85 g) of potato chips at 150 Calories? Explain.

4. If a candy bar has a total mass of 80.0 grams. In a calorimeter experiment, a 0.5-g sample of this candy bar was burned in a calorimeter surrounded by 500 mL of water. The temperature of the water in contact with the burning candy bar was measured and found to increase from an initial temperature of 21.2°C to a final temperature of 26.4°C.

a) How many Calories/gram are in a candy bar?

b) Calculate the total caloric content of the candy bar in Calories.

Are Viruses Alive?

Although viruses challenge our concept of what "living" means, they are vital members of the web of life

Aug 8, 2008 |By Luis P. Villarreal

Editor's Note: This story was originally published in the December 2004 issue of Scientific American.

In an episode of the classic 1950s television comedy *The Honeymooners*, Brooklyn bus driver Ralph Kramden loudly explains to his wife, Alice, “You know that I know how easy you get the virus.” Half a century ago even regular folks like the Kramdens had some knowledge of viruses—as microscopic bringers of disease. Yet it is almost certain that they did not know exactly what a virus was. They were, and are, not alone.

For about 100 years, the scientific community has repeatedly changed its collective mind over what viruses are. First seen as poisons, then as life-forms, then biological chemicals, viruses today are thought of as being in a gray area between living and nonliving: they cannot replicate on their own but can do so in truly living cells and can also affect the behavior of their hosts profoundly. The categorization of viruses as nonliving during much of the modern era of biological science has had an unintended consequence: it has led most researchers to ignore viruses in the study of evolution. Finally, however, scientists are beginning to appreciate viruses as fundamental players in the history of life.

Coming to Terms

It is easy to see why viruses have been difficult to pigeonhole. They seem to vary with each lens applied to examine them. The initial interest in viruses stemmed from their association with diseases—the word “virus” has its roots in the Latin term for “poison.” In the late 19th century researchers realized that certain diseases, including rabies and foot-and-mouth, were caused by particles that seemed to behave like bacteria but were much smaller. Because they were clearly biological themselves and could be spread from one victim to another with obvious biological effects, viruses were then thought to be the simplest of all living, gene-bearing life forms.

Their demotion to inert chemicals came after 1935, when Wendell M. Stanley and his colleagues, at what is now the Rockefeller University in New York City, crystallized a virus— tobacco mosaic virus—for the first time. They saw that it consisted of a package of complex biochemicals. But it lacked essential systems necessary for metabolic functions, the biochemical activity of life. Stanley shared the 1946 Nobel Prize— in chemistry, not in physiology or medicine—for this work. Further research by Stanley and others established that a virus consists of nucleic acids (DNA or RNA) enclosed in a protein coat that may also shelter viral proteins involved in infection. By that description, a virus seems more like a chemistry set than an organism. But when a virus enters a cell (called a host after

infection), it is far from inactive. It sheds its coat, bares its genes and induces the cell's own replication machinery to reproduce the intruder's DNA or RNA and manufacture more viral protein based on the instructions in the viral nucleic acid. The newly created viral bits assemble and, voilà, more virus arises, which also may infect other cells.

These behaviors are what led many to think of viruses as existing at the border between chemistry and life. More poetically, virologists Marc H. V. van Regenmortel of the University of Strasbourg in France and Brian W. J. Mahy of the Centers for Disease Control and Prevention have recently said that with their dependence on host cells, viruses lead “a kind of borrowed life.” Interestingly, even though biologists long favored the view that viruses were mere boxes of chemicals, they took advantage of viral activity in host cells to determine how nucleic acids code for proteins: indeed, modern molecular biology rests on a foundation of information gained through viruses.

Molecular biologists went on to crystallize most of the essential components of cells and are today accustomed to thinking about cellular constituents—for example, ribosomes, mitochondria, membranes, DNA and proteins—as either chemical machinery or the stuff that the machinery uses or produces. This exposure to multiple complex chemical structures that carry out the processes of life is probably a reason that most molecular biologists do not spend a lot of time puzzling over whether viruses are alive. For them, that exercise might seem equivalent to pondering whether those individual subcellular constituents are alive on their own. This myopic view allows them to see only how viruses co-opt cells or cause disease. The more sweeping question of viral contributions to the history of life on earth, which I will address shortly, remains for the most part unanswered and even unasked.

To Be or Not to Be

The seemingly simple question of whether or not viruses are alive, which my students often ask, has probably defied a simple answer all these years because it raises a fundamental issue: What exactly defines “life?” A precise scientific definition of life is an elusive thing, but most observers would agree that life includes certain qualities in addition to an ability to replicate. For example, a living entity is in a state bounded by birth and death. Living organisms also are thought to require a degree of biochemical autonomy, carrying on the metabolic activities that produce the molecules and energy needed to sustain the organism. This level of autonomy is essential to most definitions.

Viruses, however, parasitize essentially all biomolecular aspects of life. That is, they depend on the host cell for the raw materials and energy necessary for nucleic acid synthesis, protein synthesis, processing and transport, and all other biochemical activities that allow the virus to multiply and spread. One might then conclude that even though these processes come under viral direction, viruses are simply nonliving parasites of living metabolic systems. But a spectrum may exist between what is certainly alive and what is not.

A rock is not alive. A metabolically active sack, devoid of genetic material and the potential for propagation, is also not alive. A bacterium, though, is alive. Although it is a single cell, it can generate energy and the molecules needed to sustain itself, and it can reproduce. But what about a seed? A seed might not be

considered alive. Yet it has a potential for life, and it may be destroyed. In this regard, viruses resemble seeds more than they do live cells. They have a certain potential, which can be snuffed out, but they do not attain the more autonomous state of life.

Another way to think about life is as an emergent property of a collection of certain nonliving things. Both life and consciousness are examples of emergent complex systems. They each require a critical level of complexity or interaction to achieve their respective states. A neuron by itself, or even in a network of nerves, is not conscious—whole brain complexity is needed. Yet even an intact human brain can be biologically alive but incapable of consciousness, or “brain-dead.” Similarly, neither cellular nor viral individual genes or proteins are by themselves alive. The enucleated cell is akin to the state of being braindead, in that it lacks a full critical complexity. A virus, too, fails to reach a critical complexity. So life itself is an emergent, complex state, but it is made from the same fundamental, physical building blocks that constitute a virus. Approached from this perspective, viruses, though not fully alive, may be thought of as being more than inert matter: they verge on life.

In fact, in October, French researchers announced findings that illustrate afresh just how close some viruses might come. Didier Raoult and his colleagues at the University of the Mediterranean in Marseille announced that they had sequenced the genome of the largest known virus, Mimivirus, which was discovered in 1992. The virus, about the same size as a small bacterium, infects amoebae. Sequence analysis of the virus revealed numerous genes previously thought to exist only in cellular organisms. Some of these genes are involved in making the proteins encoded by the viral DNA and may make it easier for Mimivirus to co-opt host cell replication systems. As the research team noted in its report in the journal *Science*, the enormous complexity of the Mimivirus's genetic complement "challenges the established frontier between viruses and parasitic cellular organisms."

Impact on Evolution

Debates over whether to label viruses as living lead naturally to another question: Is pondering the status of viruses as living or nonliving more than a philosophical exercise, the basis of a lively and heated rhetorical debate but with little real consequence? I think the issue *is* important, because how scientists regard this question influences their thinking about the mechanisms of evolution.

Viruses have their own, ancient evolutionary history, dating to the very origin of cellular life. For example, some viral- repair enzymes—which excise and resynthesize damaged DNA, mend oxygen radical damage, and so on— are unique to certain viruses and have existed almost unchanged probably for billions of years.

Nevertheless, most evolutionary biologists hold that because viruses are not alive, they are unworthy of serious consideration when trying to understand evolution. They also look on viruses as coming from host genes that somehow escaped the host and acquired a protein coat. In this view, viruses are fugitive host genes that have degenerated into parasites. And with viruses thus dismissed from the web of life, important contributions they may have made to the origin of species and the maintenance of life may go unrecognized. (Indeed, only four of the 1,205 pages of the 2002 volume *The Encyclopedia of Evolution* are devoted to viruses.)

Of course, evolutionary biologists do not deny that viruses have had some role in evolution. But by viewing viruses as inanimate, these investigators place them in the same category of influences as, say, climate change. Such external influences select among individuals having varied, genetically controlled traits; those individuals most able to survive and thrive when faced with these challenges go on to reproduce most successfully and hence spread their genes to future generations.

But viruses directly exchange genetic information with living organisms—that is, within the web of life itself. A possible surprise to most physicians, and perhaps to most evolutionary biologists as well, is that most known viruses are persistent and innocuous, not pathogenic. They take up residence in cells, where they may remain dormant for long periods or take advantage of the cells' replication apparatus to reproduce at a slow and steady rate. These viruses have developed many clever ways to avoid detection by the host immune system— essentially every step in the immune process can be altered or controlled by various genes found in one virus or another.

Furthermore, a virus genome (the entire complement of DNA or RNA) can permanently colonize its host, adding viral genes to host lineages and ultimately becoming a critical part of the host species' genome. Viruses therefore surely have effects that are faster and more direct than those of external forces that simply select among more slowly generated, internal genetic variations. The huge population of viruses, combined with their rapid rates of replication and mutation, makes them the world's leading source of genetic innovation: they constantly "invent" new genes. And unique genes of viral origin may travel, finding their way into other organisms and contributing to evolutionary change.

Data published by the International Human Genome Sequencing Consortium indicate that somewhere between 113 and 223 genes present in bacteria and in the human genome are absent in well-studied organisms—such as the yeast *Saccharomyces cerevisiae*, the fruit fly *Drosophila melanogaster* and the nematode *Caenorhabditis elegans*—that lie in between those two evolutionary extremes. Some researchers thought that these organisms, which arose after bacteria but before vertebrates, simply lost the genes in question at some point in their evolutionary history. Others suggested that these genes had been transferred directly to the human lineage by invading bacteria.

My colleague Victor DeFilippis of the Vaccine and Gene Therapy Institute of the Oregon Health and Science University and I suggested a third alternative: viruses may originate genes, then colonize two different lineages—for example, bacteria and vertebrates. A gene apparently bestowed on humanity by bacteria may have been given to both by a virus.

In fact, along with other researchers, Philip Bell of Macquarie University in Sydney, Australia, and I contend that the cell nucleus itself is of viral origin. The advent of the nucleus— which differentiates eukaryotes (organisms whose cells contain a true nucleus), including humans, from prokaryotes, such as bacteria—cannot be satisfactorily explained solely by the gradual adaptation of prokaryotic cells until they became eukaryotic. Rather the nucleus may have evolved from a persisting large DNA virus that made a permanent home within prokaryotes. Some support for this idea comes from sequence data showing that the gene for a DNA polymerase (a DNAcopying enzyme) in the virus called T4, which infects bacteria, is closely related to other DNA polymerase genes in both eukaryotes and

the viruses that infect them. Patrick Forterre of the University of Paris-Sud has also analyzed enzymes responsible for DNA replication and has concluded that the genes for such enzymes in eukaryotes probably have a viral origin.

From single-celled organisms to human populations, viruses affect all life on earth, often determining what will survive. But viruses themselves also evolve. New viruses, such as the AIDS-causing HIV-1, may be the only biological entities that researchers can actually witness come into being, providing a real-time example of evolution in action.

Viruses matter to life. They are the constantly changing boundary between the worlds of biology and biochemistry. As we continue to unravel the genomes of more and more organisms, the contributions from this dynamic and ancient gene pool should become apparent. Nobel laureate Salvador Luria mused about the viral influence on evolution in 1959. “May we not feel,” he wrote, “that in the virus, in their merging with the cellular genome and reemerging from them, we observe the units and process which, in the course of evolution, have created the successful genetic patterns that underlie all living cells?” Regardless of whether or not we consider viruses to be alive, it is time to acknowledge and study them in their natural context—within the web of life.

Protein Puzzles
SCN119 Sample Biochemistry Unit Plan.docx

Appendix H Teacher Resources for Homeostasis

(Week 1, 1 Week)
Introduction to Osmosis.docx

Unit I Teacher Resources for Energy Unit

(Week 1, 1 Week)
SCN119 Teacher Resources for Energy.docx

Using a Scientific Method, Holt, *Biology: Visualizing Life*, pp.756-757

Holt, *Biology: Visualizing Life,* “Using a Compound Light Microscope”, pp. 828-829

Miller/Levine, “Metric Scavenger Hunt”

Explore/Explain/Evaluate
XCC: Scale, Proportion & Quality
Practice: Model, construct explanations, and communication

Classroom supplies to be given may include: paper clips, pipe cleaners, beads, construction paper, cups, wire hangers, string, etc.

Biology Resource binder contains "Is Sammy Alive?" activity

http://www.pbs.org/wgbh/aso/tryit/dna/#

Segue discussion into CHNOPS and the macromolecules

Engage/Explain
XCC: Structure & function
Practice: Ask questions, argue from evidence, analyze data

Engage/Explain
XCC: Structure & function
Practice: Ask questions, argue from evidence, analyze data

Holt, *Lab Program*, "Observing the Effect of Temperature on Enzyme Activity", p. 27

Holt, *Quick Tabs*,#A33, p.65

Explore
XCC: Structure & function, stability & change
Practice: Model, construct explanations, argue from evidence

Explore and Evaluate
XCC: Stability & Change; Cause and effect. Practice: Asking questions; design experiments; analyzing data

Teacher should provide a model transpirometer, plant shoots, various substances for transpiration, light sources, heat sources, etc.

"Eggsperiment" Activity is in Biology Resource binder and Appendix

Explore and Evaluate
XCC: Stability & Change; Cause and effect. Practice: Asking questions; design experiments; analyzing data

Extension (for advanced students) - Have students plot data to find the concentration of the original potato core. Especially advanced students may be able to compare it to a yam or sweet potato.
Explore and Engage
XCC: Structure and Function; Stability & Change; Practice: Asking questions; Design experiments; Analyze data; Construct explanations; communicate

This is a good time to discuss light transmission and using the microscope.

Lamps, fans, etc. and more leaves (including shade versus full sun varieties) can be used as exploration options.

Online: http://www.iit.edu/~smile/bi9104.html

***Engage* | *XCC* cause and effect | *Practice* asking questions, design experiments, construct explanations**
***Explore* | *XCC* energy and matter | *Practice* models, argue from evidence**
***Explore* | *XCC* energy and matter | *Practice* models, analyze data, construct explanations**
***Explore* | *XCC* varies | *Practice* varies |**
Student responses and assessments should inform instruction at this point.
***Explore* | *XCC* energy and matter | *Practice* argue from evidence, construct explanations**
***Explore, Elaborate* | *XCC* scale, proportion, quantity | *Practice* design experiments, models, analyze data, construct explanations, communicate**
***Explore, Explain* | *XCC* energy and matter, patterns, cause and effect | *Practice* asking questions, design experiments, argue from evidence, communicate**

Online resource: http://www.Eduref.org/virtual/Lessons/Science/Genetics/GET0003.html
Flip book masters available at: http://www.sciencespot.net/Media/mitosisbook.pdf
Holt, *Biology: Visualizing Life*, p. 111
Miller/Levine, *Lab Manual*, p. 129
Holt, *Biology: Visualizing Life*, pp. 780-781
Holt, *Biology: Visualizing Life*, pp. 774-775
http://www.learn.genetics.utah.edu/units/biotech/gel/
http://www.learn.genetics.utal.edu/units/cloning/
Online resource: http://www.Pbs.org/wgbh/harvest/

Online resource: http://www.dnai.org/timeline/index.html
Online resource: http://www.Pbs.org/wgbh/aso/tryit/dna/#

Suggested differentiated topics for the 3 levels of Biology as per the June 2017 PD Day.docx