

CARLSTADT-EAST RUTHERFORD REGIONAL HIGH SCHOOL DISTRICT
SCIENCE DEPARTMENT
AP BIOLOGY

AP Biology Curriculum Guide

<p>Pacing Guide</p> <p>AP Biology is a full year course that meets on a rotating basis for three (3) 55-minute blocks and one (1) 40-minute block for every five (5) day cycle, as well as an additional 40-minute lab block.</p>	<p>Based on <i>Campbell Biology 2011</i>, Prentice Hall</p> <p>Chapter 1-3 – Week 1</p> <p>Chapter 4-5 – Weeks 2-3</p> <p>Chapter 6-7 – Weeks 4-5</p> <p>Chapter 11 – Week 6</p> <p>Chapter 12 – Week 7</p> <p>Chapter 8 – Weeks 8-9</p> <p>Chapter 9 – Week 10</p> <p>Chapter 10 – Weeks 11-12</p> <p>Chapter 13-15 – Weeks 13-14</p>	<p>Chapter 16-18 – Weeks 15-17</p> <p>Chapter 19-21 – Week 18-20</p> <p>Chapter 22-26 – Weeks 21-24</p> <p>Chapter 27 – Week 25</p> <p>Chapter 40-51 – Weeks 26-28</p> <p>Chapter 38-39 – Week 29</p> <p>Chapter 52-56 – Weeks 30-32</p> <p>AP BIOLOGY REVIEW AND EXAM – Weeks 33-34</p> <p>Chapter 28-37 – Weeks 35-37</p> <p>Case Studies – Weeks 38-40</p>
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<p>21st Century Life and Careers Standards: 9.2 Career Awareness</p>	<p>9.2.12.C.1 – Review career goals and determine steps necessary for attainment. 9.2.12.C.3 – Identify transferable career skills and design alternate career plans. 9.2.12.C.4 – Analyze how economic conditions and societal changes influence employment trends and future education.</p>
<p>Technology Standards</p>	<p>8.1.12.A.2 - Produce and edit a multi-page digital document for a commercial or professional audience and present it to peers and/or professionals in that related area for review. 8.1.12.A.3 - Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue. 8.1.12.F.1 - Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs. 8.2.12.B.1 - Research and analyze the impact of the design constraints (specifications and limits) for a product or technology driven by a cultural, social, economic or political need and publish for review. 8.2.12.B.2 - Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation and maintenance of a chosen product. 8.2.12.B.5 - Research the historical tensions between environmental and economic considerations as driven by human needs and wants in the development of a technological product, and present the competing viewpoints to peers for review. 8.2.12.C.4 - Explain and identify interdependent systems and their functions.</p>
<p>Interdisciplinary Connections</p>	<p>Interdisciplinary connections are built into the New Jersey Student Learning Standards, especially in the sciences. Here are some examples:</p> <p>Mathematics: Using mathematical models, using graphs to present data, interpreting data to reach conclusions, estimating and determining accuracy and precision.</p> <p>English/Language Arts: citing textual evidence to support explanations, integrating and evaluating multiple sources of information, writing explanatory information.</p>

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Differentiation/Accommodations/Modifications

Gifted and Talented	English Language Learners	Students with Disabilities	Students at Risk of School Failure
<p><i>(content, process, product and learning environment)</i></p> <p>Extension Activities:</p> <ul style="list-style-type: none"> • Conduct research and provide presentation of mathematical topics. • Design surveys to generate and analyze data to be used in discussion. • Use of higher level questioning techniques. • Provide assessments at a higher level of thinking. 	<p>Modifications for Homework/Assignments</p> <ul style="list-style-type: none"> • Modified assignments. • Extended time for assignment completion as needed. • Use graphing calculator. • Highlight formulas. 	<p><i>(appropriate accommodations, instructional adaptations, and/or modifications as determined by the IEP or 504 team)</i></p> <p>Modifications for Classroom:</p> <ul style="list-style-type: none"> • Ask students to restate information, directions, and assignments. • Repetition and practice. • Model skills / techniques to be mastered. • Extended time to complete class work. • Provide copy of classnotes. • Preferential seating to be mutually determined by the student and teacher. • Students may request books online, on tape/CD, as available and appropriate. • Assign peer helper in the class setting. • Provide regular parent / school communication • Provide oral reminders and check student work during independent work time. • Assist student with long and short term planning of assignments 	<p>Modifications for Classroom:</p> <ul style="list-style-type: none"> • Ask students to restate information, directions, and assignments. • Repetition and practice. • Model skills / techniques to be mastered. • Extended time to complete class work. • Provide copy of classnotes. • Preferential seating to be mutually determined by the student and teacher. • Students may request books online, on tape/CD, as available and appropriate. • Assign peer helper in the class setting. • Provide oral reminders and check student work during independent work time. • Assist student with long and short term planning of assignments • Provide regular parent / school communication. • Assign peer helper in the class setting. • Provide oral reminders and check student work during independent

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		<p>Modifications for Homework</p> <ul style="list-style-type: none"> • Extended time to complete assignments. • Student requires more complex assignments to be broken up and explained in smaller units, with work to be submitted in phases. • Provide the student with clearly stated (written) expectations and grading criteria for assignments. <p>Modification for Assessments</p> <ul style="list-style-type: none"> • Extended time on classroom tests and quizzes. • Student may take / complete tests in an alternate setting as needed. • Restate, reread, and clarify directions/questions. • Distribute study guide for classroom tests. • Establish procedures for accommodations / modifications for assessments. 	<p>work time.</p> <ul style="list-style-type: none"> • Assist student with long and short term planning of assignments <p>Modifications for Homework</p> <ul style="list-style-type: none"> • Extended time to complete assignments. • Student requires more complex assignments to be broken up and explained in smaller units, with work to be submitted in phases. • Provide the student with clearly stated (written) expectations and grading criteria for assignments. <p>Modification for Assessments</p> <ul style="list-style-type: none"> • Extended time on classroom tests and quizzes. • Student may take / complete tests in an alternate setting as needed. • Restate, reread, and clarify directions/questions. • Distribute study guide for classroom tests. • Establish procedures for accommodations / modifications for assessments.
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	CURRICULAR REQUIREMENTS (College Board)	Pages
CR1	Students and teachers use a recently published (within the last 10 years) college-level Biology textbook.	6
CR2	The course is structured around the enduring understandings within the big ideas as described in the AP Biology Curriculum Framework.	6
CR3a	Students connect the enduring understandings within Big Idea 1 (the process of evolution drives the diversity and unity of life) to at least one other big idea.	7-27
CR3b	Students connect the enduring understandings within Big Idea 2 (biological systems utilize free energy and molecular building blocks to grow, to reproduce, and to maintain dynamic homeostasis) to at least one other big idea.	7-27
CR3c	Students connect the enduring understandings within Big Idea 3 (living systems store, retrieve, transmit, and respond to information essential to life processes) to at least one other big idea.	7-27
CR3d	Students connect the enduring understandings within Big Idea 4 (biological systems interact and these systems and their interactions possess complex properties) to at least one other big idea.	7-27
CR4a	The course provides students with opportunities outside of the laboratory investigations to meet the learning objectives within Big Idea 1.	7-27
CR4b	The course provides students with opportunities outside of the laboratory investigations to meet the learning objectives within Big Idea 2.	7-27
CR4c	The course provides students with opportunities outside of the laboratory investigations to meet the learning objectives within Big Idea 3.	7-27
CR4d	The course provides students with opportunities outside of the laboratory investigations to meet the learning objectives within Big Idea 4.	7-27
CR5	The course provides students with opportunities to connect their biological and scientific knowledge to major social issues (e.g., concerns, technological advances, innovations) to help them become scientifically literate citizens.	6
CR6	The student-directed laboratory investigations used throughout the course allow students to apply the seven science practices defined in the AP Biology Curriculum Framework and include at least two lab experiences in each of the four big ideas.	7-27
CR7	Students are provided the opportunity to engage in investigative laboratory work integrated throughout the course for a minimum of 25 percent of instructional time.	7-27
CR8	The course provides opportunities for students to develop and record evidence of their verbal, written and graphic communication skills through laboratory reports, summaries of literature or scientific investigations, and oral, written, or graphic presentations.	7-27

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Textbooks and Other Curricular Resources [CR1]:

-Campbell, Neil and Reece, Jane B. 2008. *AP Edition Biology*, 8th Edition, San Francisco, CA: Pearson Benjamin Cummings.

-The College Board. *AP Biology Investigative Labs: An Inquiry-Based Approach*, 2012.

-Trout, Laura, et al. *POGIL: Activities for High School Chemistry*. Flinn Scientific, 2012.

Course Overview:

This Advanced Placement Biology course will provide students with the equivalent of a general college Biology course. This class meets 3 out of 4 days on a rotating schedule for 55 minutes per block, with a double period once every four days, and an extra 15 minute pull out from lunch once every four days. During this time, students are engaged in hands-on laboratory work, integrated throughout the course that accounts for more than 25% of the class time. **[CR7]**.

The remaining time is used for lectures, group work using POGIL worksheets, and problem solving sessions using *Mastering Biology* with in-class computers, and HHMI Biointeractive activities. The content of the course is structured around the four big ideas listed in the AP Biology curriculum framework (see course outline below) **[CR2]**.

Students will also be given journal articles and news articles throughout the year which have a direct relation to course material. They will be instructed to read the articles and write a brief summary explaining the connections to the Biology content being covered **[CR3a-d]**.

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Laboratory Program:

Most of the laboratory experiments in this course are hands-on activities developed by Carolina Biological Supply Company (AP Advanced Inquiry Labs 1-12) to mirror the recommended labs from the College Board manual. [CR6, CR7]. Students work in groups to collect and graph data, make qualitative and quantitative observations, and provide appropriate conclusions to the activities. Inquiry is emphasized in these experiments, and students will maintain a laboratory notebook in which they will report the purpose, procedure, data, analysis, results, and conclusions in the following lab report format: [CR8].

Title: Name of the Lab

Purpose: Statement of what they will be learning.

Hypothesis: Educated guess including the student's expected results.

Materials: List of materials, chemicals, and safety equipment.

Method: Summary, recorded in a numbered list, of what was done in the activity.

Observations: Statements describing their observations.

Data: Record of all measurements (often in chart form) with labeling of all units required.

Graphs: If data can be used to create a graph, students use Logger Pro.

Calculations and Analysis: Record of all formulas and units (when appropriate).

Conclusion (RERUN FORMAT)

-Restate—the aim.

-Explain—(briefly) what you did.

-Results—state them, including whether or not your hypothesis was proven.

-Uncertainties—determine percent error for calculations and give reasons for other errors.

-New Information—state something learned in this activity, and find connections to major societal issues currently being discussed or historically important events that can be related to the Biology topics being covered [CR4a-d].

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Unit:	Introduction to Biology	NJ Student Learning Standards:	DCI: LS1.C, LS2.B, PS3.D, ESS2.C PE: LS1-6, LS2-5, ESS2-5	Essential Questions:	-Why is life an essential topic of study? -How can we use data to improve our understanding of natural phenomena?
Time Frame:	Summer, 1 Week	AP Biology Essential Knowledge:	2.A.3	Materials:	Textbook, Notes, Lab Equipment, Worksheets, Computers
Content:	Chap. 1 – Themes in the Study of Life Chap. 2 – The Chemical Context of Life Chap. 3 – Water and Fitness in the Environment			Student Learning Objectives:	-Students will learn about the major concepts related to the study of life. -Students will apply their knowledge of chemistry to biological molecules. -Students will learn about the importance of water to life.
Engagement Anticipatory Set	Bozeman Science - http://www.bozemanscience.com/water-a-polar-molecule -				
Exploration Student Inquiry	Mastering Biology - www.masteringbiology.com – Chapters 1-3				
Explanation Concepts and Practices	Gregerson Prezi - https://prezi.com/r9w3s5iqf814/ap-bio-introductory-presentation/ - Introduction Knuffke Prezi - http://prezi.com/4hefv2hk2bhq/ap-bio-matter-1-atoms-water-carbon/ -				
Elaboration Extension Activity	Properties of Water and pH Lab				
Evaluation Assessments	Formative Diagnostic assessment using released AP questions.			Summative Chapter 1-3 Test Lab report	

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Unit:	Organic Molecules and Biochemistry	NJ Student Learning Standards:	DCI: LS1.A, LS3.A, LS3.B, LS1.C, LS2.B, PS2.B, PS3.D, ESS2.C PE: LS1-1, LS3-1, LS3-2, LS1-6, LS2-5, ESS2-5, PS2-6	Essential Questions:	Why is carbon necessary for life? What molecules are necessary to sustain living things?
Time Frame:	2 weeks	AP Biology Essential Knowledge:	2.A.3, 3.A.1, 4.A.1, 4.B.1, 4.C.1	Materials:	Textbook, Notes, Lab Equipment, Worksheets, Computers
Content:	Chap. 4 – Carbon and the Molecular Diversity of Life Chap. 5 – Structure and Function of Large Biological Molecules			Student Learning Objectives:	-Students will learn how atomic structure relates to the structure and function of macromolecules. -Students will differentiate between the four classes of biomolecules and understand their roles in living things.
Engagement Anticipatory Set	Bozeman Science - http://www.bozemanscience.com/042-biologocal-molecules - BioCoach Activity - http://www.phschool.com/science/biology_place/biocoach/biokit/intro.html -				
Exploration Student Inquiry	Flinn POGIL – Biochemistry Basics Flinn POGIL – Protein Structure Mastering Biology – www.masteringbiology.com – Chapters 4-5				
Explanation Concepts and Practices	Knuffke Prezi - https://prezi.com/-r8c-fscmffx/ap-bio-matter-2-macromolecules/ -				
Elaboration Extension Activity	Molecular Modeling Lab Murder Mystery Meal Activity BioCoach Activity – http://www.phschool.com/science/biology_place/biocoach/bioprop/intro.html -				
Evaluation Assessments	Formative Mastering Biology results POGIL results			Summative Chapter 4-5 Assessment Lab report	

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Unit:	Cells and Cell Membranes	NJ Student Learning Standards:	DCI: LS1.A, LS1.C, LS2.B, PS1.A, PS3.B, PS3.D, ESS2.C PE: LS1-1, LS1-2, LS1-5, LS1-6, LS2-5, PS3-4, ESS2-5	Essential Questions:	How can we define the most fundamental unit of life? How do the cells that make up living things vary?
Time Frame:	2 weeks	AP Biology Essential Knowledge:	2.A.3, 2.B.1, 2.B.2, 2.B.3, 4.A.2, 4.B.2	Materials:	Textbook, Notes, Lab Equipment, Worksheets, Computers
Content:	Chapter 6 – A Tour of the Cell Chapter 7 – Membrane Structure and Function			Student Learning Objectives:	-Students will learn the structure and function of specialized organelles in plant and animal cells. -Students will learn how cell size and shape can affect rates of nutrient intake and waste removal.
Engagement Anticipatory Set	Bozeman Science – http://www.bozemanscience.com/015-cell-membrane Bozeman Science – http://www.bozemanscience.com/016-transport-across-cell-membranes Bozeman Science – http://www.bozemanscience.com/043-cellular-organelles Bozeman Science – http://www.bozemanscience.com/044-cellular-specialization				
Exploration Student Inquiry	Flinn POGIL – Membrane Structure Flinn POGIL – Membrane Function Mastering Biology – www.masteringbiology.com – Chapters 6-7				
Explanation Concepts and Practices	Knuffke Prezi – https://prezi.com/m2mplsjawtsg/ap-bio-matter-4-transport/ Knuffke Prezi – https://prezi.com/jmuhrot7ycwm/ap-bio-matter-6-cytology-endomembrane-system/ -				
Elaboration Extension Activity	Diffusion and Osmosis Lab –Potatoes in Sucrose BioCoach Activity – http://www.phschool.com/science/biology_place/biocoach/biomembrane1/intro.html - BioCoach Activity – http://www.phschool.com/science/biology_place/biocoach/biomembrane2/intro.html - BioCoach Activity – http://www.phschool.com/science/biology_place/biocoach/cells/intro.html - LabBench Activity – http://www.phschool.com/science/biology_place/labbench/lab1/intro.html -				
Evaluation Assessments	Formative Mastering Biology results POGIL results			Summative Chapter 6-7 Assessment Lab report	

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Unit:	Cell Communication	NJ Student Learning Standards:	DCI: LS1.B, LS1.D PE: LS1-4, LS1-8	Essential Questions:	How do multicellular organisms coordinate various life processes? How do cells use chemicals to send information?
Time Frame:	1 week	AP Biology Essential Knowledge:	2.E.2, 3.B.2, 3.D.1-3.D.4,	Materials:	Textbook, Notes, Lab Equipment, Worksheets, Computers
Content:	Chapter 11 – Cell Communication			Student Learning Objectives:	-Students will learn the three stages of cell communication: reception, transduction, and response. -Students will learn how both positive and negative feedback can affect cellular communication.
Engagement Anticipatory Set	Bozeman Science – http://www.bozemanscience.com/036-evolutinary-significance-of-cell-communication - Bozeman Science – http://www.bozemanscience.com/037-cell-communication - Bozeman Science – http://www.bozemanscience.com/038-signal-transduction-pathways - Bozeman Science – http://www.bozemanscience.com/039-effects-of-changes-in-pathways -				
Exploration Student Inquiry	Flinn POGIL – Cellular Communication Flinn POGIL – Signal Transduction Pathways Mastering Biology – www.masteringbiology.com – Chapter 11				
Explanation Concepts and Practices	Knuffke Prezi – https://prezi.com/okvybidzh1ts/ap-bio-communication-1-cellular-communication/ -				
Elaboration Extension Activity	Cell Communication Lab - Sordaria				
Evaluation Assessments	Formative Mastering Biology results POGIL results			Summative Chapter 11 Assessment Lab report	

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Unit:	The Cell Cycle	NJ Student Learning Standards:	DCI: LS3.B PE: LS3-2	Essential Questions:	How do living things grow and maintain themselves? Why do cells lose control of cell division?
Time Frame:	1 week	AP Biology Essential Knowledge:	3.A.2, 3.C.2	Materials:	Textbook, Notes, Lab Equipment, Worksheets, Computers
Content:	Chapter 12 – The Cell Cycle			Student Learning Objectives:	-Students will learn the events that occur in the cell cycle. -Students will learn how the cell cycle is regulated and how loss of cell cycle control can lead to cancer.
Engagement Anticipatory Set	Bozeman Science – http://www.bozemanscience.com/028-cell-cycle-mitosis-and-meiosis - Bozeman Science – http://www.bozemanscience.com/cell-division - BioCoach Activity – http://www.phschool.com/science/biology_place/biocoach/mitosisig/intro.html -				
Exploration Student Inquiry	Flinn POGIL – Cell Cycle Regulation Mastering Biology – www.masteringbiology.com – Chapter 12				
Explanation Concepts and Practices	Knuffke Prezi – https://prezi.com/mfbf3f0sxiap/ap-bio-information-6-cell-cycle-control/ - Knuffke Prezi – https://prezi.com/mup_tfk8m8zt/ap-bio-information-5-mitosis/ -				
Elaboration Extension Activity	Mitosis Lab – Onion Root LabBench Activity – http://www.phschool.com/science/biology_place/labbench/lab3/intro.html -				
Evaluation Assessments	Formative Mastering Biology results POGIL results			Summative Chapter 12 Assessment plus 1-7, 11 review Lab Report	

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Unit:	Metabolism, Free Energy, and Enzymes	NJ Student Learning Standards:	DCI: LS1.C, LS2.B, PS1.A, PS2.B, PS3.B, PS3.D, PE: LS1-7, LS2-4, PS1-4, PS3-4, PS2-6	Essential Questions:	What is the role of energy in living things? How can life be sustained for long periods of time?
Time Frame:	2 weeks	AP Biology Essential Knowledge:	2.A.1, 4.B.1	Materials:	Textbook, Notes, Lab Equipment, Worksheets, Computers
Content:	Chapter 8 – An Introduction to Metabolism			Student Learning Objectives:	-Students will learn the role of ATP in energy coupling. -Students will learn how enzymes lower activation energy to make chemical process more energetically favorable.
Engagement Anticipatory Set	Bozeman Science – http://www.bozemanscience.com/012-life-requires-free-energy - Bozeman Science – http://www.bozemanscience.com/positive-and-negative-feedback-loops - Bozeman Science – http://www.bozemanscience.com/048-enzymes -				
Exploration Student Inquiry	Flinn POGIL – Free Energy Mastering Biology – www.masteringbiology.com – Chapter 8				
Explanation Concepts and Practices	Knuffke Prezi - https://prezi.com/u5kt8ftfvc3k/ap-bio-energy-1-cellular-energetic-theory/ - Knuffke Prezi - https://prezi.com/eev4gdo5qeeg/ap-bio-energy-3-cellular-energetic-practice/ -				
Elaboration Extension Activity	Enzyme Catalysis Lab – Catalase Floating Disk Assay LabBench Activity – http://www.phschool.com/science/biology_place/labbench/lab2/intro.html -				
Evaluation Assessments	Formative Mastering Biology results POGIL results			Summative Chapter 8 Assessment Lab report	

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Unit:	Respiration and Fermentation	NJ Student Learning Standards:	DCI: LS1.C, LS2.B, PS1.A, PS1.B, PS3.A, PS3.B, PS3.D PE: LS1-5, LS1-6, LS1-7, LS2-3, LS2-4, PS1-4, PS3-2, PS3-4	Essential Questions:	How do living things acquire the energy needed for life? Why do we need to eat to stay alive?
Time Frame:	1 week	AP Biology Essential Knowledge:	2.A.1, 2.A.2	Materials:	Textbook, Notes, Lab Equipment, Worksheets, Computers
Content:	Chapter 9 – Cellular Respiration and Fermentation			Student Learning Objectives:	-Students will learn how fermentation and cellular respiration release energy from organic molecules.
Engagement Anticipatory Set	Bozeman Science – http://www.bozemanscience.com/013-photosynthesis-and-respiration - BioCoach Activity – http://www.phschool.com/science/biology_place/biocoach/cellresp/intro.html -				
Exploration Student Inquiry	Flinn POGIL – Cellular Respiration – An Overview Flinn POGIL – Glycolysis and the Krebs Cycle Flinn POGIL – Oxidative Phosphorylation Mastering Biology – www.masteringbiology.com – Chapter 9				
Explanation Concepts and Practices	Knuffke Prezi - https://prezi.com/m9s0caebmwdu/ap-bio-energy-5-chemoheterotrophic-nutrition/ -				
Elaboration Extension Activity	Respiration Lab – Germination of Peas LabBench Activity – http://www.phschool.com/science/biology_place/labbench/lab5/intro.html -				
Evaluation Assessments	Formative Mastering Biology results POGIL results			Summative Chapter 9 Assessment Lab report	

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Unit:	Photosynthesis and the Capture of Solar Energy	NJ Student Learning Standards:	DCI: LS1.C, LS2.B, PS1.A, PS1.B, PS3.A, PS3.B, PS3.D PE: LS1-5, LS1-6, LS1-7, LS2-3, LS2-4, PS1-4, PS3-2, PS3-4	Essential Questions:	Where do living things get the energy they need to live? Why is the sun the ultimate source of life?
Time Frame:	2 weeks	AP Biology Essential Knowledge:	2.A.1, 2.A.2	Materials:	Textbook, Notes, Lab Equipment, Worksheets, Computers
Content:	Chapter 10 – Photosynthesis			Student Learning Objectives:	-Students will learn how photosystems convert solar energy into chemical energy. -Students will learn how organisms are related in their creation and use of energy.
Engagement Anticipatory Set	Bozeman Science – http://www.bozemanscience.com/013-photosynthesis-and-respiration - BioCoach Activity – http://www.phschool.com/science/biology_place/biocoach/photosynth/intro.html -				
Exploration Student Inquiry	Flinn POGIL – Photosynthesis Mastering Biology – www.masteringbiology.com – Chapter 10				
Explanation Concepts and Practices	Knuffke Prezi – https://prezi.com/odmifdasxk6e/ap-bio-energy-4-photoautotrophic-nutrition/ -				
Elaboration Extension Activity	Photosynthesis Lab – Floating Disk Assay Plant Pigments and Photosynthesis Lab LabBench Activity – http://www.phschool.com/science/biology_place/labbench/lab4/intro.html -				
Evaluation Assessments	Formative Mastering Biology results POGIL results			Summative Chapter 10 Assessment plus 8-9 review Lab report	

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Unit:	Mendelian Genetics	NJ Student Learning Standards:	DCI: LS1.A, LS2.A, LS2.C, LS3.A, LS3.B, LS4.B, LS4.C PE: LS3-1, LS2-2, LS3-2, LS3-3, LS4-3, LS4-5	Essential Questions:	-Since no organism can live forever, how and why do living things reproduce? -Why do family members look similar?
Time Frame:	2 weeks	AP Biology Essential Knowledge:	3.A.3, 3.A.4, 3.C.1 4.C.2, 4.C.4	Materials:	Textbook, Notes, Lab Equipment, Worksheets, Computers
Content:	Chapter 13 – Meiosis and Sexual Life Cycles Chapter 14 – Mendel and the Gene Idea Chapter 15 – The Chromosomal Basis of Inheritance			Student Learning Objectives:	-Students will learn how meiosis and sexual reproduction can lead to genetic variability. -Students will learn how traits are tracked over time.
Engagement Anticipatory Set	Bozeman Science – http://www.bozemanscience.com/029-mendelian-genetics - Bozeman Science – http://www.bozemanscience.com/033-genotypes-and-phenotypes - Bozeman Science – http://www.bozemanscience.com/030-advanced-genetic -				
Exploration Student Inquiry	Flinn POGIL – The Statistics of Inheritance Flinn POGIL – Chi-Square www.masteringbiology.com – Chapters 13,14-15				
Explanation Concepts and Practices	Knuffke Prezi – https://prezi.com/el-sh-qgrgsj/ap-bio-information-7-meiosis/ - Knuffke Prezi – https://prezi.com/y7-iiu2ny3c/ap-bio-information-8-chromosomal-abnormalities/ - Knuffke Prezi – https://prezi.com/jousblqvrtns/ap-bio-information-9-intro-to-mendelian-genetics/ - Knuffke Prezi – https://prezi.com/zphgne1krrqo/ap-bio-information-10-extensions-to-mendelian-genetics/ - Knuffke Prezi – https://prezi.com/bpqviw0m4jjk/ap-bio-information-11-human-genetic-conditions/ -				
Elaboration Extension Activity	Exploring Mendelian Genetics Lab LabBench Activity – http://www.phschool.com/science/biology_place/labbench/lab3/intro.html - BioCoach Activity – http://www.phschool.com/science/biology_place/biocoach/meiosis/intro.html - BioCoach Activity – http://www.phschool.com/science/biology_place/biocoach/inheritance/intro.html -				
Evaluation Assessments	Formative Mastering Biology results POGIL results			Summative Chapter 13-15 Assessment Lab report	

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Unit:	Molecular Genetics	NJ Student Learning Standards:	DCI: LS1.A, LS1.B, LS3.A, LS3.B, LS4.B, LS4.C PE: LS1-1, LS1-2, LS1-4, LS3-1, LS3-2, LS3-3, LS4-3	Essential Questions:	-How has the discovery of DNA changed our understanding of life? -How is all life on Earth related?
Time Frame:	3 weeks	AP Biology Essential Knowledge:	2.E.1, 3.A.1, 3.B.1, 3.B.2, 3.C.1, 4.A.3	Materials:	Textbook, Notes, Lab Equipment, Worksheets, Computers
Content:	Chapter 16 – The Molecular Basis of Inheritance Chapter 17 – Gene Expression: From Gene to Protein Chapter 18 – Regulation of Gene Expression			Student Learning Objectives:	Students will learn the structure and function of DNA, RNA, and proteins. Students will learn how DNA replicates. Students will learn how genes are regulated.
Engagement Anticipatory Set	Bozeman Science – http://www.bozemanscience.com/027-part-1-dna-rna - Bozeman Science – http://www.bozemanscience.com/027-part-2-dna-rna - Bozeman Science – http://www.bozemanscience.com/031-gene-regulation -				
Exploration Student Inquiry	Flinn POGIL – Gene Expression – Transcription Flinn POGIL – Gene Expression – Translation Flinn POGIL – Genetic Mutations Flinn POGIL – Control of Gene Expression in Prokaryotes Mastering Biology – www.masteringbiology.com – Chapters 16-18				
Explanation Concepts and Practices	Knuffke Prezi – https://prezi.com/zkhjbh03vcri/ap-bio-information-1-dna-introduction/ - Knuffke Prezi – https://prezi.com/rjwxngctmqlp/ap-bio-information-2-the-central-dogma/ - Knuffke Prezi – https://prezi.com/jgpqmkmh7xk5/ap-bio-information-12-regulation-of-gene-expression/ -				
Elaboration Extension Activity	Electrophoresis and Simulated Genetic Screen Lab BioCoach Activity – http://www.phschool.com/science/biology_place/biocoach/dnarep/intro.html - BioCoach Activity – http://www.phschool.com/science/biology_place/biocoach/transcription/intro.html - BioCoach Activity – http://www.phschool.com/science/biology_place/biocoach/translation/intro.html -				
Evaluation Assessments	Formative Mastering Biology results POGIL results			Summative Chapter 16-18 Assessment Lab report	

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Unit:	Viruses, Biotechnology, and Genomes	NJ Student Learning Standards:	DCI: LS1.A, LS3.A, LS3.B PE: LS1-1, LS3-1, LS3-2	Essential Questions:	-How can nonliving things affect life? -Why do we get sick and how can we prevent it? -How do diseases spread through populations? -How has biotechnology changed our understanding of life?
Time Frame:	3 weeks	AP Biology Essential Knowledge:	3.A.1, 3.C.3, 4.C.1	Materials:	Textbook, Notes, Lab Equipment, Worksheets, Computers
Content:	Chapter 19 – Viruses Chapter 20 – DNA Tools and Biotechnology Chapter 21 – Genomes and Their Evolution			Student Learning Objectives:	-Students will learn about viral reproduction through the lytic and lysogenic cycles. -Students will learn about the different types of viruses and their structural composition. -Students will learn how the tools of biotechnology are used to study genes and create modifications.
Engagement Anticipatory Set	Bozeman Science – http://www.bozemanscience.com/035-viral-replication - Bozeman Science – http://www.bozemanscience.com/039-information-exchange - Bozeman Science – http://www.bozemanscience.com/comparing-dna-sequences -				
Exploration Student Inquiry	Mastering Biology – www.masteringbiology.com – Chapter 19-21 Biocoach Activity – http://www.phschool.com/science/biology_place/biocoach/lacoperon/intro.html - Biocoach Activity – http://www.phschool.com/science/biology_place/biocoach/red/intro.html -				
Explanation Concepts and Practices	Knuffke Prezi – https://prezi.com/bdrtbhglgy4c/ap-bio-information-4-viruses/ -				
Elaboration Extension Activity	Virus Transmission Simulation Lab BLAST Sequence Analysis – Whale Evolution Virtual Lab – BLAST Bacterial Identification				
Evaluation Assessments	Formative Mastering Biology results POGIL results			Summative Chapter 19-21 Assessment plus 12-18 review Lab report	

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Unit:	Mechanisms of Evolution	NJ Student Learning Standards:	DCI: LS2.A, LS2.C, LS3.B, LS4.A, LS4.B, LS4.C, LS4.D, ESS1.C, ESS2.A, ESS2.B, ESS2.D, ESS3.A, ESS3.B, ESS3.D, PS1.C PE: LS2-2, LS2-6, LS2-7, LS3-2, LS3-3, LS4-1, LS4-2, LS4-3, LS4-4, LS4-5, LS4-6, ESS2-2, ESS3-1, ESS3-6, ESS1-5, ESS1-6	Essential Questions:	How is all life on Earth related? How can we explain the diversity of life on Earth? How do new species form? Why are there so many fossils on Earth?
Time Frame:	4 weeks	AP Biology Essential Knowledge:	1.A.1-1.A.4, 1.B.1-1.B.2 1.C.1-1.C.3, 1.D.1-1.D.2, 2.E.2, 3.C.1, 4.B.4, 4.C.3, 4.C.4	Materials:	Textbook, Notes, Lab Equipment, Worksheets, Computers
Content:	Chapter 22 – Descent with Modification Chapter 23 – The Evolution of Populations Chapter 24 – The Origin of Species Chapter 25 – The History of Life on Earth Chapter 26 – Phylogeny and the Tree of Life			Student Learning Objectives:	-Students will learn how evolution by natural selection is the best explanation for the diversity of life on Earth. -Students will learn how species adapt and evolve to survive and reproduce. -Students will learn how selective pressures can result in new species with new adaptations. -Students will learn about the history of life on Earth. -Students will create phylogenetic trees based on genome data collected from publicly available databases.

(The five E's for this unit are continued on the next page)

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Engagement <i>Anticipatory Set</i>	Bozeman Science - http://www.bozemanscience.com/ap-biology/ - ALL of Big Idea 1 (001-011).	
Exploration <i>Student Inquiry</i>	Mastering Biology - www.masteringbiology.com – Chapters 22-26 Flinn POGIL – Selection and Speciation Flinn POGIL – Phylogenetic Trees Flinn POGIL – The Hardy-Weinberg Equation Flinn POGIL – Mass Extinctions	
Explanation <i>Concepts and Practices</i>	Knuffke Prezi - https://prezi.com/user/knuffke/prezis/ - ALL of Evolution (1-7). www.hhmi.org – Got Lactase? Co-Evolution www.hhmi.org – Rock Pocket Mouse www.hhmi.org – Lizard Phylogeny	
Elaboration <i>Extension Activity</i>	Origin of Life Lab Natural Selection Lab Population Genetics and Evolution Lab LabBench Activity - http://www.phschool.com/science/biology_place/labbench/lab8/intro.html -	
Evaluation <i>Assessments</i>	Formative Mastering Biology results POGIL results	Summative Chapters 22-26 Assessment Lab reports HHMI worksheets

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Unit:	Bacteria and Archaea	NJ Student Learning Standards:	DCI: LS1.A, LS3.A, LS3.B PE: LS1-1, LS3-1, LS3-2	Essential Questions:	Why do we get sick and how can we prevent it? Why are bacteria such successful organisms?
Time Frame:	1 week	AP Biology Essential Knowledge:	3.A.1, 3.C.2	Materials:	Textbook, Notes, Lab Equipment, Worksheets, Computers
Content:	Chapters 27 – Bacteria and Archaea			Student Learning Objectives:	-Students will learn how bacteria are classified -Students will learn the difference between beneficial and pathogenic bacteria. -Students will grow bacteria and study how antibiotics help prevent their growth.
Engagement <i>Anticipatory Set</i>	Bozeman Science – http://www.bozemanscience.com/three-domains-of-life - Bozeman Science – http://www.bozemanscience.com/archaea - Bozeman Science – http://www.bozemanscience.com/bacteria -				
Exploration <i>Student Inquiry</i>	www.masteringbiology.com – Chapter 27				
Explanation <i>Concepts and Practices</i>	Chapter 27 - http://wps.aw.com/bc_campbell_biology_9_mir_ap/174/44584/11413622.cw/index.html -				
Elaboration <i>Extension Activity</i>	Bacterial Transformation Lab				
Evaluation <i>Assessments</i>	Formative Mastering Biology results POGIL results			Summative Chapter 27 Assessment Lab Report	

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Unit:	Animal Form and Function	NJ Student Learning Standards:	DCI: LS1.A, LS1.C, LS1.D, LS2.B, LS2.C, LS2.D, LS4.B, LS4.C, LS4.D, PS1.A, PS1.B, PS3.B, PS3.C, PS3.D PE: LS1-1, LS1-2, LS1-3, LS1-7, LS1-8, LS2-4, LS2-6, LS2-7, LS2-8, LS4-3, LS4-5, LS4-6, PS1-4, PS3-4, PS3-5	Essential Questions:	What adaptations are useful for survival? What special organs and systems do animals have? What special behaviors are animals born with and how do animal behaviors develop?
Time Frame:	3 weeks	AP Biology Essential Knowledge:	2.A.1, 2.C.1, 2.C.2, 2.D.2, 2.D.3, 2.D.4, 2.E.3, 3.E.1, 3.E.2, 4.A.4, 4.B.2	Materials:	Textbook, Notes, Lab Equipment, Worksheets, Computers
Content:	Chapter 40 – Animal Form and Function Chapter 43 – The Immune System Chapter 45 – Hormones and the Endocrine System Chapter 47 – Animal Development Chapter 48 – Neurons, Synapses and Signaling Chapter 49 – Nervous Systems Chapter 51 – Animal Behavior			Student Learning Objectives:	-Students will learn how positive and negative feedback systems control homeostasis. -Students will learn how the immune system protects organisms from infection. -Students will learn how hormones regulate behaviors and developmental patterns. -Students will learn how the nervous system is connected and how information processing occurs. -Students will learn how behaviors help organisms to survive and reproduce.

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Engagement <i>Anticipatory Set</i>	Bozeman Science – http://www.bozemanscience.com/024-development-timing-and-coordination - Bozeman Science – http://www.bozemanscience.com/positive-and-negative-feedback-loops - Bozeman Science – http://www.bozemanscience.com/023-plant-and-animal-defense - Bozeman Science – http://www.bozemanscience.com/nervous-system - Bozeman Science – http://www.bozemanscience.com/ap-bio-lab-11-animal-behavior -	
Exploration <i>Student Inquiry</i>	Flinn POGIL – Feedback Mechanisms Flinn POGIL – Control of Blood Sugar Levels Flinn POGIL – Neuron Structure Flinn POGIL – Neuron Function Flinn POGIL – Immunity www.masteringbiology.com – Ch.40,43,45,47,48,49,51	
Explanation <i>Concepts and Practices</i>	Knuffke Prezi – https://prezi.com/wt0jgzaklumd/ap-bio-communication-3-behavior/ - Knuffke Prezi – https://prezi.com/af51835nwjsb/ap-bio-communication-4-neurons/ - Knuffke Prezi – https://prezi.com/6gsnzuday57z/ap-bio-communication-5-sensation-integration-response/ - LabBench Activity – http://www.phschool.com/science/biology_place/labbench/lab10/intro.html -	
Elaboration <i>Extension Activity</i>	Making Sensory Comparisons Lab Animal Behavior Lab	
Evaluation <i>Assessments</i>	Formative Mastering Biology results POGIL results	Summative Chapters 40-51 Assessment Lab Report

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Unit:	Plant Form and Function	NJ Student Learning Standards:	DCI: LS1.A, LS1.B, LS2.D, LS3.A, LS3.B, LS4.C PE: LS1-4, LS2-8, LS3-1, LS3-2, LS4-5	Essential Questions:	How do plants differ from other organisms? What adaptations are useful for survival?
Time Frame:	1 week	AP Biology Essential Knowledge:	2.D.4, 2.E.1, 2.E.2, 2.E.3	Materials:	Textbook, Notes, Lab Equipment, Worksheets, Computers
Content:	Chapter 38 – Angiosperm Reproduction Chapter 39 – Plant Responses			Student Learning Objectives:	-Students will learn about special anatomical structures that give plants an adaptive advantage. -Students will compare and contrast the vascular systems of different types of plants. -Students will learn how plants respond to various signals.
Engagement Anticipatory Set	Bozeman Science – http://www.bozemanscience.com/023-plant-and-animal-defense -				
Exploration Student Inquiry	www.masteringbiology.com – Chapters 38,39 Flinn POGIL – Plant Hormones				
Explanation Concepts and Practices	BioCoach Activity – http://www.phschool.com/science/biology_place/biocoach/plants/intro.html - Knuffke Prezi – https://prezi.com/mmlx8kd3xx2b/ap-bio-regulation-5-transport-gas-exchange/ -				
Elaboration Extension Activity	Transpiration Lab Bozeman Science – http://www.bozemanscience.com/ap-bio-lab-9-transpiration -				
Evaluation Assessments	Formative Mastering Biology results POGIL results			Summative Chapter 38-39 Assessment plus 27, 40-51 review Lab report	

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Unit:	Ecology	NJ Student Learning Standards:	DCI: LS1.C, LS2.A, LS2.B, LS2.C, LS2.D, LS4.C, LS4.D, PS1.A, PS1.B, PS3.B, PS3.D, ESS2.A, ESS2.D, ESS3.A, ESS3.B, ESS3.D PE: LS1-7, LS2-1, LS2-2, LS2-4, LS2-5, LS2-6, LS2-7, LS2-8, LS4-5, LS4-6, PS1-4, PS3-4, ESS2-2, ESS3-1, ESS3-5, ESS3-6	Essential Questions:	How are all living things on Earth related? Why do populations explode or crash, and how can we learn how to maintain their stability? How do organisms depend on each other for survival?
Time Frame:	3 weeks	AP Biology Essential Knowledge:	2.A.1, 2.D.1, 2.D.2, 2.E.3, 4.A.5, 4.A.6, 4.B.3, 4.B.4, 4.C.4	Materials:	Textbook, Notes, Lab Equipment, Worksheets, Computers
Content:	Chapter 52 – An Introduction to Ecology and the Biosphere Chapter 53 – Population Ecology Chapter 54 – Community Ecology Chapter 55 – Ecosystems and Energy Chapter 56 – Conservation Biology and Global Change			Student Learning Objectives:	-Students will learn about the biotic and abiotic factors that play a role in the survival of species. -Students will model exponential and logistic population growth, and learn how to estimate carrying capacity. -Students will model food webs to estimate energy flows. -Students will model primary and secondary succession. -Students will learn about nutrient cycling throughout the ecosystem.

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Engagement <i>Anticipatory Set</i>	Bozeman Science – http://www.bozemanscience.com/054-population-variation - Bozeman Science – http://www.bozemanscience.com/051-ecosystem-change - Bozeman Science – http://www.bozemanscience.com/050-populations - Bozeman Science – http://www.bozemanscience.com/049-cooperative-interactions - Bozeman Science – http://www.bozemanscience.com/046-communities - Bozeman Science – http://www.bozemanscience.com/047-ecosystems - Bozeman Science – http://www.bozemanscience.com/055-biodiversity -	
Exploration <i>Student Inquiry</i>	Flinn POGIL – Global Climate Change Flinn POGIL – Eutrophication Mastering Biology – www.masteringbiology.com – Chapters 52-56 HHMI Biodiversity Activity - http://www.hhmi.org/biointeractive/ecology -	
Explanation <i>Concepts and Practices</i>	Knuffke Prezi – https://prezi.com/unqers6ftwgx/ap-bio-interactions-1-organism-organization/ - Knuffke Prezi – https://prezi.com/zjlaouh7jxup/ap-bio-interactions-2-reproduction/ - Knuffke Prezi – https://prezi.com/emdcmgiwz8lh/ap-bio-interactions-3-community-interactions/ - Knuffke Prezi – https://prezi.com/mzsdx130t8i4/ap-bio-interactions-4-population-dynamics/ - Knuffke Prezi – https://prezi.com/zpb19ugz1mks/ap-bio-interactions-5-ecosystem-structure/ - Knuffke Prezi – https://prezi.com/m8hki5xp0emb/ap-bio-interactions-6-conservation-biology/ -	
Elaboration <i>Extension Activity</i>	Predator-Prey Simulation Lab Floristic Relay	
Evaluation <i>Assessments</i>	Formative Mastering Biology results POGIL results	Summative Chapter 52-56 Assessment

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Unit:	Review and Preparation for the AP Biology Exam	NJ Student Learning Standards:	All Standards	Essential Questions:	Why is it important to be prepared?
Time Frame:	2 weeks	AP Biology Essential Knowledge:	All Standards	Materials:	Textbook, Notes, Lab Equipment, Worksheets, Computers
Content:	AP Test Prep Books AP Practice Exams			Student Learning Objectives:	Students will prepare for the AP exam.

Unit:	Final Project – AFTER THE EXAM	NJ Student Learning Standards:	All Standards	Essential Questions:	Why is there so much variation among living things?
Time Frame:	2 weeks	AP Biology Essential Knowledge:	All Standards	Materials:	Textbook, Notes, Lab Equipment, Worksheets, Computers
Content:	Chapter 28 – Protists Chapters 29-30 – Plant Diversity Chapter 31 – Fungi Chapters 32-34 – Animal Diversity Chapters 35-37 – Plant Structure and Function			Student Learning Objectives:	Students will choose an organism to study and create a presentation for the class.

Unit:	Case Studies – AFTER THE EXAM	NJ Student Learning Standards:	All Standards	Essential Questions:	How can we apply what we learned to “real world” scenarios?
Time Frame:	2 weeks	AP Biology Essential Knowledge:	All Standards	Materials:	Textbook, Case Studies
Content:	Case Studies – http://sciencecases.lib.buffalo.edu/cs/collection/ - Magazine Articles – New Scientist, Science News, etc. Presentations – based upon chosen case study			Student Learning Objectives:	Students will choose a case study or magazine article related to biology and present it.