Unit 4: Matter and Energy in Organisms and Ecosystems

Content Area: Science
Course(s): Biology/Lab
Time Period: 2nd Marking Period

Length: **6 Weeks** Status: **Published**

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Students will be able to independently use their learning to...

- -Relate the roles of photosynthesis and cellular respiration.
- -Explain the flow of energy through an ecosystem.

For more information, read the following article by Grant Wiggins.

http://www.authenticeducation.org/ae bigideas/article.lasso?artid=60

Meaning

Understandings

Students will understand that				
-Biological molecules are recycled within ecosystems.				
-Energy flows through trophic levels in an ecosystem.				
Essential Questions				
Students will keep considering				
-How do organisms obtain and use energy they need to live and grow?				
-How do matter and energy move through ecosystems?				
Application of Knowledge and Skill				
Students will know				
Students will know				
-Photosynthesis produces carbohydrates and releases oxygen into the atmosphere.				
-Carbohydrates are broken down into their atoms to recombine to form other carbon molecules.				

-Cellular respiration is the breakdown of glucose for energy.

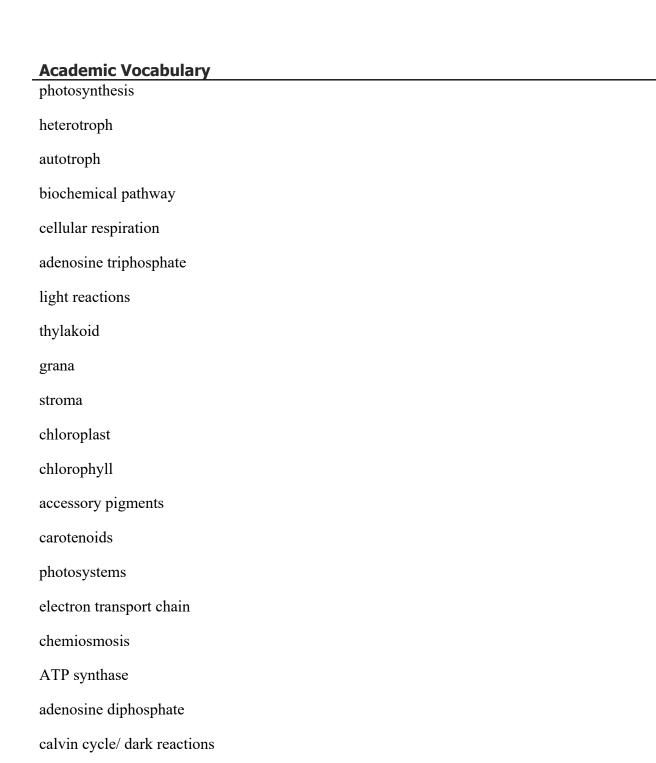
-Biogeochemical cycles are essential to the wellbeing of the ecosystem.

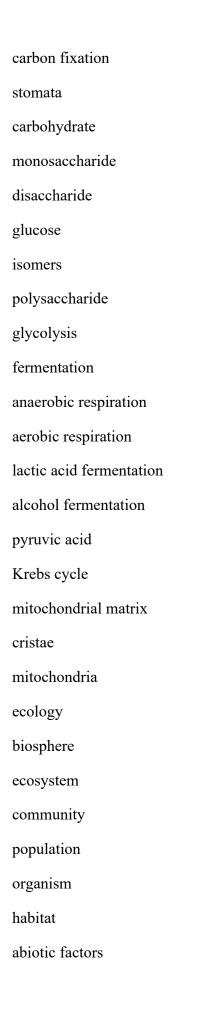
-Energy transfer among organisms is not 100% efficient.

Students will be skilled at...

Students will be skilled at...

- -Describing the relationship between photosynthesis and cellular respiration.
- -Explaining the loss of energy among trophic levels.
- -Illustrating the cycle of essential organic molecules within an ecosystem.





biotic factors
tolerance curve
acclimation
conformers
regulators
dormancy
migration
resources
niche
chemosynthesis
biomass
gross primary productivity
net primary productivity
herbivores
carnivores
omnivores
detritivores
decomposers
trophic level
food chain/web
biogeochemical cycle
evaporation
transpiration
precipitation
nitrogen fixation

Learning Goal 1

Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

Proficiency Scale

• Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

SCI.HS-LS1-5

Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

Target 1

SWBAT:

- -Describe the structure of a chloroplast.
- -Identify the steps of the light reaction.
- -Identify the steps of the dark reaction.
- -Identify the products and reactants of photosynthesis.
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- -Identify the products and reactants of photosynthesis.
- -Identify the steps of the dark reaction.
- · Identify the steps of the light reaction.

Learning Goal 2

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.

Proficiency Scale

• 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.

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.

Target 1

SWBAT:

- -Describe the structure of the mitochondria.
- -Identify the steps of glycolysis.
- -Identify the steps of anaerobic respiration.
- -Identify the steps of aerobic respiration.
- -Identify the products and reactants of cellular respiration.

- -Describe the structure of the mitochondria.
- -Identify the products and reactants of cellular respiration.
- Identify the steps of aerobic respiration.
- -Identify the steps of anaerobic respiration.
- -Identify the steps of glycolysis.

Learning Goal 3

Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere and geosphere.

Proficiency Scale

SCI.HS-LS2-5

Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

Target 1

SWBAT:

-Define biosphere, atmosphere, hydrosphere and geosphere.

-Relate the products and reactants of photosynthesis and cellular respiration. • -Define biosphere, atmosphere, hydrosphere and geosphere. • Relate the products and reactants of photosynthesis and cellular respiration. **Learning Goal 4** Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. **Proficiency Scale** SCI.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. Target 1 -Identify conditions necessary for aerobic or anaerobic respiration. -Describe the advantage of aerobic respiration compared to anaerobic respiration. -Describe the advantage of aerobic respiration compared to anaerobic respiration. -Identify conditions necessary for aerobic or anaerobic respiration. **Learning Goal 5** Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. **Proficiency Scale** SCI.HS-LS2-4 Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

Target 1

SWBAT:

- -Identify the energy needs within an ecosystem and the energy transfer among trophic levels.
- -Explain the movement of carbon, nitrogen and phosphorus within their cycles.
- -Explain the interdependence of organisms within food webs.
- -Explain the interdependence of organisms within food webs.
- -Explain the movement of carbon, nitrogen and phosphorus within their cycles.
- -Identify the energy needs within an ecosystem and the energy transfer among trophic levels.

Formative Assessment and Performance Opportunities

- -Science notebook
- -Homework assignments
- -Classwork assignments
- -Lab activities/explorations
- -Quizzes, Tests, Projects

Summative Assessment

Common unit assessment aligned to the NJSLS and differentiated for varied learners.

Accommodations/Modifications

- -504 accomodations
- -IEP modifications
- -Science notebook entries
- -Videos, models, posters

Ex:

- provide students access to formulas for photosynthesis and cellular respiration
- demonstrate the products of each biochemical process
- demonstrate how to build a food web

Unit Resources

- -Holt Modern Biology 2009
- -Supplemental textbook materials
- -Online resources
- -Laptops
- -Student Response Systems
- -Lab materials

21st Century Life and Careers

CRP.K-12.CRP1.1	Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater
	beyond the minimum expectation and in participating in activities that serve the greater

good.

CRP.K-12.CRP2.1 Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when

it is appropriate to apply the use of an academic skill in a workplace situation.

Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.

Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to

CRP.K-12.CRP4.1

CRP.K-12.CRP5.1

CRP.K-12.CRP6.1

issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

CRP.K-12.CRP7.1 Career-ready individuals are discerning in accepting and using new information to make

decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.

CRP.K-12.CRP8.1 Career-ready individuals readily recognize problems in the workplace, understand the

nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the

actions of others.

CRP.K-12.CRP9.1 Career-ready individuals consistently act in ways that align personal and community-held

ideals and principles while employing strategies to positively influence others in the workplace. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the directions and actions of a team or organization, and they apply insights into human behavior to change others' action, attitudes and/or beliefs. They recognize the near-term and long-term effects that management's actions and attitudes can have on productivity, morals and organizational

culture.

CRP.K-12.CRP12.1 Career-ready individuals positively contribute to every team, whether formal or informal.

They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team

members. They plan and facilitate effective team meetings.

Interdisciplinary Connections

MA.K-12.2 Reason abstractly and quantitatively.

MA.K-12.4 Model with mathematics.

MA.N-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step

problems; choose and interpret units consistently in formulas; choose and interpret the

scale and the origin in graphs and data displays.

MA.N-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.

MA.N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting

quantities.

LA.RST.11-12.1 Accurately cite strong and thorough evidence from the text to support analysis of science

and technical texts, attending to precise details for explanations or descriptions.

LA.WHST.11-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or

trying a new approach, focusing on addressing what is most significant for a specific

purpose and audience.

LA.SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive

elements) in presentations to enhance understanding of findings, reasoning, and evidence

and to add interest.