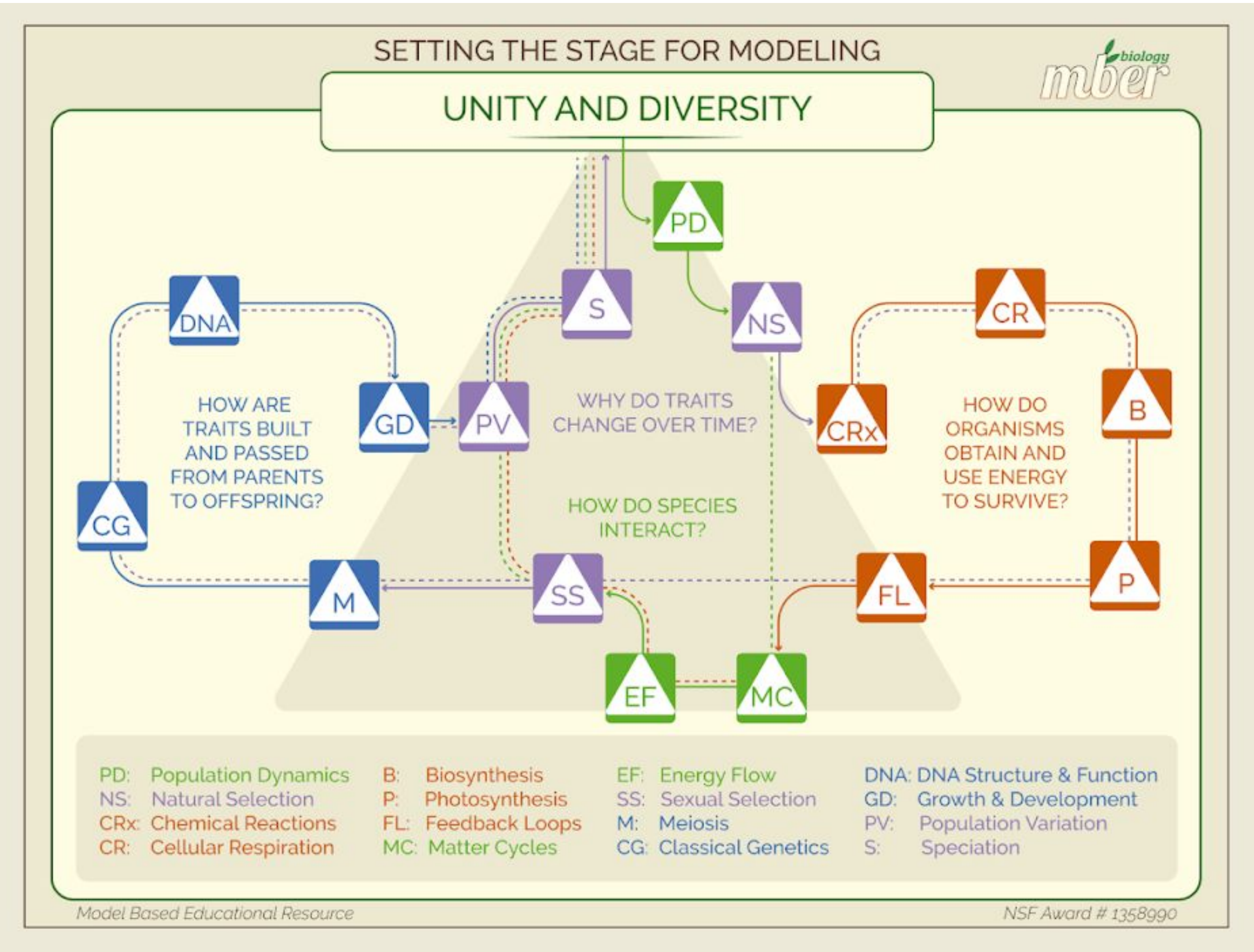
Year at a Glance - BCPS Biology 19-20

Semester 1 Options									
MBERS Unity & Diversity Unit	Carbon Time Units	Systems & Scale		Animals		Plants	Ecosystems		
	MBERS Units	Population Dynamics PD	Chemical Reactions CRx	Cellular Respiration CR	Biosynthesis B	Photosynthesis P	Feedback Loops FL	Matter Cycles MC	Energy Flow EF
Semester 2 Options									
Carbon Time Units	Genetics				Evolution				Human Energy Systems Carbon Time Unit
MBERS Units	Natural Selection NS	Sexual Selection SS	Meiosis M	Classical Genetics CG	DNA Structure & Function DNA	Growth & Development GD	Population Variation PV	Speciation S	

MBER Pacing



Carbon Time Pacing

*Genetics & Evolution under development

Biology 1st Semester Expectations 2019-2020 *(Common Resources: Carbon Time & MBERS)*

<table>
<tr><th>Carbon Time Unit</th><th>MBERS Unit</th><th colspan="3">Standards addressed in that Unit</th><th>Learning Objectives</th><th>Pacing</th></tr>
<tr><td colspan="2">Welcome</td><td colspan="3">Back to School, Welcome, Culture Building, Procedures, etc.</td><td></td><td>1 Week</td></tr>
<tr><td colspan="2">Unity & Diversity
MBERS Unit
Login:
connielynn77
Zachgolds31</td><td colspan="3">Life is diverse, yet there are some commonalities across organisms.
We can see patterns of "nested similarity" where some kinds of life are more similar than others.
Among much of the diversity we see, there is a striking pattern where organisms are fairly well matched to their environments. With all the diversity of life on our planet there are several characteristics that every living organism has in common and this list is now posted in our class. We learned that people have wondered about the similarities and differences of organisms and have worked to classify them in to categories. We also figured out that the environment plays a role in how even very similar organisms can appear very different.</td><td>Our planet is full of wonderful and diverse organisms, and as different as they all are, they also have some similarities. In the next learning segment we will discuss these similarities and differences.</td><td>MBERS Unity & Diversity Resources

Odd One Out Activity</td></tr>
<tr><td rowspan="2">Systems & Scale</td><td rowspan="2">Chemical Reactions</td><td colspan="3">HS-PS1-4. Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.</td><td rowspan="2">Measure mass changes in materials undergoing chemical change.

Detect changes in carbon dioxide concentration in air samples.

Use evidence about changes in mass of fuels and carbon dioxide concentration to defend claims about movements of atoms during chemical changes.

Find patterns in data collected by multiple groups about changes in mass and carbon dioxide concentration.

Describe systems and processes in a hierarchy of scales, including atomic-molecular, macroscopic, and large scale.

Draw and explain movements of materials during a chemical change.

Classify materials as organic or inorganic based on observable characteristics (organic materials include foods, fuels, and tissues of organisms) or molecular bonds (organic materials have C-C and/or C-H bonds).

Explain chemical changes as atoms being rearranged into new molecules.

Explain energy transformations during combustion: Chemical energy stored in C-C and C-H bonds of fuel molecules is transformed into heat and light.</td><td rowspan="2">CT Systems and Scale Unit
Unit at a Glance

Lesson 1 –
Pretest and Expressing Ideas (60 min)
2 Activities

Lesson 2 – Foundations: Powers of Ten and Investigation Tools (2hr 30 min)
5 Activities

(Optional)
Lesson 3 – Investigating and Explaining Soda Water Fizzing (3hr)
4 Activities

Lesson 4 – Investigating and Explaining Ethanol Burning (3hr 20 min)
5 Activities

Lesson 5 –
Other Examples of Combustion (3 hr 10 min)
5 Activities

4 Weeks</td></tr>
<tr><td><u>Developing and Using Models</u>
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.
*Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS -LS1-4)
(HS-LS1-7)</td><td><u>LS1.B: Growth and Development of Organisms</u>
*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 complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (HS-LS1-4)

<u>LS1.C: Organization for Matter and Energy Flow in Organisms</u>
* As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. (HS-LS1- 7)
* As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another. Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment. (HS-LS1-7)</td><td><u>Systems and System Models</u>
*Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows— within and between systems at different scales. (HS-LS1-4)

<u>Energy and Matter</u>
* Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems. (HS-LS1-7)</td></tr>
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<table>
<tr><th rowspan="1">Carbon Time Unit</th><th>MBERS Unit</th><th colspan="3">Standards addressed in that Unit</th><th>Learning Objectives</th><th>Pacing</th></tr>
<tr>
<td rowspan="2">Animals</td>
<td rowspan="2">Cellular Respiration

Biosynthesis

Matter Cycles

Energy Flows

Feedback Loop</td>
<td colspan="3">*HS-PS1-4 & HS-PS1-7*
HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

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-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-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

* Standard Repeated</td>
<td rowspan="2">Measure mass changes in animals and food.

Detect changes in carbon dioxide concentration caused by animal metabolism.

Construct arguments that use evidence about changes in mass of animals and carbon dioxide concentration to defend claims about movements of atoms during 1) growth (digestion and biosynthesis) and 2) function and movement (cellular respiration).

Find patterns in data collected by multiple groups about changes in mass of animals or food and carbon dioxide concentration.

Describe systems and processes in a hierarchy of scales, including atomic-molecular, macroscopic, and large scale.

Draw and explain movements of materials during 1) growth of an animal and 2) function/movement of an organism, including air and food entering the animal, and waste, air enriched in carbon dioxide and water vapor leaving the animal.

Identify the most abundant organic materials in foods—fats, proteins, and carbohydrates—and use food labels to find out how concentrated they are in different foods and animal tissues.

Explain the chemical changes that occur when an animal digests food and creates new biomass.

Explain the chemical changes that occur during cellular respiration, representing the changes with molecular models and chemical equations.

Identify forms of energy involved in growth and movement of animals: chemical energy, movement, and heat energy.

Explain energy transformations during 1) growth: chemical energy stored in food is preserved as polymers are broken down to monomers then reassembled as animal biomass and 2) function/movement of an organism: Chemical energy stored in organic molecules is transformed into motion and heat.</td>
<td rowspan="2">CT Animals Unit
Unit at a Glance

Lesson 1 – Pretest and Expressing Ideas (60 min)
2 Activities

Lesson 2 – Foundations: Zooming into Organisms
(2hr 25 min)
4 Activities

Lesson 3 – Investigating Mealworms Eating
(2hr 40 min)
3 Activities

Lesson 4 –Explaining How Animals Grow, Move, and Function
(1hr 20 min)
2 Activities

Lesson 5 –Explaining How Animals Grow
(2 hr)
4 Activities

Lesson 6 – Explaining Other Examples of Animals Growing, Moving, and Functioning
(2 hr)
3 Activities

3.5 Weeks</td>
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<tr>
<td><u>Developing and Using Models</u>
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.
*Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS -LS1-2) (HS-LS1-7)
* Develop a model based on evidence to illustrate the relationships between systems or components of a system. (HS-LS2-5)

<u>Constructing Explanations and Designing Solutions</u>
*Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students’ own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-6)</td>
<td><u>LS1.A : Structure and Function</u>
*Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)
<u>LS1.C: Organization for Matter and Energy Flow in Organisms</u>
*The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells. (HS-LS1-6)
*As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. (HS-LS1-6),(HS-LS1-7)
* As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another. Cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to muscles.
*Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment.(HS-LS1-7)

<u>LS2.B: Cycles of Matter and Energy Transfer in Ecosystems</u>
*Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical,</td>
<td><u>Systems and System Models</u>
*Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2) (HS-LS2-5)

<u>Energy and Matter</u>
* Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-LS1-6)
*Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems.(HS-LS1-7)</td>
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			geological, and biological processes. (HS-LS2-5)			
Carbon Time Unit	**MBERS Unit**	**Standards addressed in that Unit**			**Learning Objectives**	**Pacing**
Plants	**Matter Cycles** **Energy Flows** **Photosynthesis**	*HS-PS1-4 & HS-PS1-7* HS-PS3-1. Create a computational model to calculate change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. *HS-LS1-2, HS-LS1-6, HS-LS1-7, HS-LS2-5*			Measure changes in dry mass of plants and soil. Detect changes in carbon dioxide concentration caused by plants in the light and in the dark. Construct arguments that use evidence about mass gain in plants, and carbon dioxide concentration in air to defend claims about movements of atoms and chemical changes during plant growth and functioning. Find patterns in data collected by multiple groups about changes in mass or gas exchange in plants. Describe plant systems and processes in a hierarchy of scales, including atomic-molecular, macroscopic, and large scale. Draw and explain movements of materials in a growing plant, including: · carbon dioxide, oxygen, water, and minerals entering a plant · Sugar, water, and minerals moving within a plant, and · carbon dioxide, oxygen, and water exiting the plant. Describe molecules of key materials in plant processes, including atmospheric gases, soil minerals, water, and organic materials. Explain how atoms are rearranged into new molecules in photosynthesis, biosynthesis, and cellular respiration in plants. Identify forms of energy at different stages of plant growth and life processes. Explain transformation and conservation of energy during photosynthesis, biosynthesis, and cellular respiration in plants.	**CT Plants Unit** Unit at a Glance Pre-Lesson – Investigation Set Up (3hr) 2 Activities Lesson 1 – Pretest and Expressing Ideas (50 min) 2 Activities Lesson 2 – Foundations: Zooming into Organisms (2hr 5 min) 4 Activities Lesson 3 – Investigating Plants (3hr 10 min) 5 Activities Lesson 4 – Explaining How Plants Move, Function, and Make Food (3hr) 4 Activities Lesson 5 – Explaining How Plants Grow (2hr 55 min) 3 Activities Lesson 6 – Explaining Other Examples of Plants Growing, Moving, and Functioning (2 hr) 3 Activities **3.5 Weeks**
		Using Mathematics and Computational Thinking Mathematical and computational thinking at the 9–12 level builds on K–8 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 a computational model or simulation of a phenomenon, designed device, process, or system. (HS-PS3-1) **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. *Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS -LS1-5)	**PS3.A: Definitions of Energy** *Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. (HS-PS3-1) **PS3.B: Conservation of Energy and Energy Transfer** *Conservation of energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system. (HS-PS3-1) *Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. (HS-PS3-1) *Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g. relative positions of charged particles, compression of a spring) and how kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior. (HS-PS3-1) *The availability of energy limits what can occur in any system. (HS-PS3-1) **LS1.C: Organization for Matter and Energy Flow in Organisms** *The process of photosynthesis converts light energy to stored chemical energy by converting carbon	**Systems and System Models** *Models can be used to predict the behavior of a system, but these predictions have limited precision and reliability due to the assumptions and approximations inherent in models. (HS-PS3-1) **Energy and Matter** *Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-LS1-5)		

			dioxide plus water into sugars plus released oxygen. (HS-LS1-5)			
Carbon Time Unit	**MBERS Unit**	**Standards addressed in that Unit**			**Learning Objectives**	**Pacing**
Decomposers (in CT) ***Optional**		*HS-PS1-4 & HS-PS1-7* * HS-LS1-6 & HS-LS1-7*			Measure mass changes in molding bread and other materials. Detect changes in CO2 concentration in chambers with decaying materials. Construct arguments that use evidence about changes in mass of decaying materials and carbon dioxide concentration to defend claims about movements of atoms and chemical changes during decay. Find patterns in data collected by multiple groups about changes in mass of decaying materials and carbon dioxide concentration. Describe systems and processes in fungi in a hierarchy of scales, including atomic-molecular and macroscopic scales. Draw and explain movements of materials during 1) growth of fungi and 2) function/ movement of an organism, including oxygen and food entering fungal cells, and carbon dioxide and water vapor leaving fungus. Identify the most abundant organic materials in decaying matter, including proteins and carbohydrates, and use food labels to find out how concentrated they are in different foods and animal tissues. Explain the chemical changes that occur when a fungus digests food and creates new biomass. Explain the chemical changes that occur during cellular respiration, representing the changes with molecular models and chemical equations. Identify forms of energy involved in decay: chemical energy, movement, and heat energy. Explain energy transformations during decay processes. In particular, chemical energy stored in C-C and C-H bonds of organic molecules is used to support life processes in decomposers and is ultimately converted to heat.	**CT Decomposers Unit** Unit at a Glance Pre Lesson 1 – Bread Mold Investigation Set Up (30 min) 1 Activity Lesson 1 – Pretest and Expressing Ideas (50 min) 2 Activities Lesson 2 – Foundations: Zooming into Organisms (2hr 5 min) 4 Activities Lesson 3 –Investigating Bread Molding (2hr 40 min) 3 Activities Lesson 4 – Explaining How Decomposers Move and Function (1hr 20 min) 2 Activities Lesson 5 – Explaining How Decomposers Grow (1hr 20 min) 4 Activities Lesson 6 – Explaining How Decomposers Growing, Moving, and Functioning (time varies) 4 Activities **1 Week**

<table>
<tr><th>Carbon Time Unit</th><th>MBERS Unit</th><th colspan="3">Standards addressed in that Unit</th><th>Learning Objectives</th><th>Pacing</th></tr>
<tr><td rowspan="2">Ecosystems</td><td rowspan="2">Population Dynamics</td><td colspan="3">*HS-PS1-7*
HS-LS2-1. Use mathematical and or computational representations to support explanations of factors that affect carrying capacity of ecosystems and different scales.
HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
HS-LS2-2 *HS-LS2-5*
HS-ESS2-6</td><td rowspan="2">Locate organic and inorganic carbon pools in natural ecosystems (e.g., meadow) and human-managed ecosystems (e.g., farm):
· CO_2 in the atmosphere
· Organic carbon pools: producers, herbivores, carnivores, soil carbon

Describe the “biomass pyramid” (producers > herbivores > carnivores) as a consistent pattern in terrestrial ecosystems

Describe pools as changing in size over time

Describe carbon cycling within ecosystems as movement of carbon atoms among carbon pools associated with:
· Movement of materials: Eating, defecation, death
· Carbon-transforming processes: combustion, photosynthesis, digestion, biosynthesis, cellular respiration

Explain why the biomass pyramid is a consistent pattern in terrestrial ecosystems.

Explain changes in size of carbon pools in terms of fluxes into and out of carbon pools

Identify energy transformations involved in carbon fluxes

Describe energy as flowing through ecosystems, from sunlight to chemical energy to heat that is radiated into space

Explain the implications for resource use of humans eating meat or plant products: The same producers can support more humans as herbivores than as carnivores</td><td rowspan="2">CT Ecosystems Unit
Unit at a Glance

Lesson 1 –Pretest and Key Features of Ecosystems
(1hr 5 min)
3 Activities

Lesson 2 – Patterns in Biomass in Ecosystems
(2 hr)
3 Activities

Lesson 3 – Matter Cycles and Energy Flows in Ecosystems
(2hr 50 min)
5 Activities

Lesson 4 – Ecosystem Services and Changes in Ecosystems
(2hr 50 min)
3 Activities

Lesson 5 – Ecosystems Application and Posttest
(1hr 65 min)
4 Activities

3 Weeks</td></tr>
<tr><td><u>Using Mathematics and Computational Thinking</u>
* Use mathematical and/or computational representations of phenomena or design solutions to support explanations. (HS-LS2-1)
*Use mathematical representations of phenomena or design solutions to support claims. (HS-LS2-4)</td><td><u>LS2.A: Interdependent Relationships in Ecosystems</u>
* 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 nonliving resources and from such challenges such as predation, competition, and
disease. Organisms would have the capacity to produce populations of great size were it not for 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)

<u>LS2.B: Cycles of Matter and Energy Transfer in Ecosystems</u>
* Plants or algae form the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher level. Given this inefficiency, there are generally fewer organisms at higher levels of a food web. Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. At each link in an ecosystem, matter and energy are conserved. (HS-LS2-4)</td><td><u>Scale, Proportion, and Quantity</u>
* The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs. (HS-LS2-1)

<u>Energy and Matter</u>
* Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems. (HS-LS2-4)</td></tr>
<tr><td colspan="2">Semester 1 Exams
(0.5 Weeks)</td><td></td><td></td><td></td><td></td><td>Total ~
18 Weeks</td></tr>
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