Mapping *Carbon TIME* onto Next Generation Science Standards (NGSS)

	PS1 MATTER AND ITS INTERACTIONS	LS1 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES	LS2 ECOSYSTEMS: INTERACTIONS, ENERGY AND DYNAMICS	ESS2: EARTH'S SYSTEMS ESS3 EARTH AND HUMAN ACTIVITY
Systems and Scale	**MS-PS1-1.** Develop models to describe the atomic composition of simple molecules and extended structures. **MS-PS1-2.** Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. **MS-PS1-5.** Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. **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.			
Animals	**MS-PS1-1.** Develop models to describe the atomic composition of simple molecules and extended structures. **MS-PS1-2.** Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. **MS-PS1-5.** Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. **HS-PS1-4.** Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the	**MS-LS1-7.** Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. **HS-LS1-2.** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. **HS-LS1-7.** 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	**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.	

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	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.	formed resulting in a net transfer of energy. **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		
Plants	**MS-PS1-1.** Develop models to describe the atomic composition of simple molecules and extended structures. **MS-PS1-2.** Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. **MS-PS1-5.** Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. **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. **Energy. 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.	**MS-LS1-6.** Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. **Matter and Energy in Organism and Ecosystems. MS-LS1-7.** Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. **HS-LS1-2.** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. **HS-LS1-5.** Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. **MS-LS1-3.** Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. **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	**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. **Matter and Energy in Organism and Ecosystems. MS-LS2-3.** Develop a model to describe the cycling of matter and flow of energy among living and non-living parts of an ecosystem.	

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		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.		
Decom-posers	**MS-PS1-1.** Develop models to describe the atomic composition of simple molecules and extended structures. **MS-PS1-2.** Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. **MS-PS1-5.** Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. **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.	**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-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. **Matter and Energy in Organisms and Ecosystems. MS-LS1-7.** Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.	**Matter and Energy in Organisms and Ecosystems.** **MS-LS2-3.** Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.	
Human Energy Systems	**HS-PS1-7.** Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.		**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	**HS-ESS2-6.** Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

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			geosphere. **HS-LS2-7.** Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.	**Earth and Human Activity. MS-ESS3-3.** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. **MS-ESS3-4.** Construct an argument supported by evidence for how increases in human population and per-capital consumption of natural resources impact Earth's systems. **MS-ESS3-5.** Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. **HS-ESS3-5.** Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. **HS-ESS3-6.** Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
Eco-systems	**HS-PS1-7.** Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.	**Matter and Energy in Organisms and Ecosystems. MS-LS1-6.** Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy in and out of organisms.	**MS-LS2-1.** Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. **MS-LS2-2.** Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. **MS-LS2-3.** Develop a model to	**Earth's Systems. MS-ESS2-1.** Develop a model to describe the cycling of earth's materials and the flow of energy that drives this process. **Human Impacts. MS-ESS3-4.** Construct an argument supported by evidence for how increases in human population and per-capita

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			describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. **MS-LS2-4.** Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. **Interdependent Relationships in Ecosystems. HS-LS2-1.** Use mathematical and or computational representations to support explanations of factors that affect carrying capacity of ecosystems and different scales. **Interdependent Relationships in Ecosystems. HS-LS2-2.** Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems at 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. **Matter and Energy in Organisms and Ecosystems. 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.	consumption of natural resources impact Earth's systems. **HS-ESS2-6.** Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.