Descriptors and *NGSS* Connections for *Carbon TIME* Assessment Items

The table below classifies each assessment item with respect to scale and student practice. It also has specific descriptors, including whether it focuses on matter and energy, the kind of system it focuses on, and the carbon-transforming process(es) that it focuses on.

The table also lists a performance expectation from the *Next Generation Science Standards* for each item. We note that (a) no single assessment item can "cover" a performance expectation in its entirety, and (b) some items are useful for assessing more than one performance expectations. For a deeper explanation of how *Carbon TIME* assessments and curricula are connected to the three dimensions of *NGSS*, see Three-dimensional Learning in *Carbon TIME*.

Item Name (with tests the item is on)	***Scale***	***Student Practice***	***NGSS***	***Specific descriptors***
Macroscopic Scale Explanation Items				
BODYHEAT2 (Full Test Form C, Animals)	Macroscopic	Explanation	**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.	• Energy • Animal growth & movement • Cellular respiration
BREADMOLD2 (Full Test Form A, Decomposers)	Macroscopic	Explanation	**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.	• Matter • Decay • Cellular respiration (and digestion)

Item Name (with tests the item is on)	***Scale***	***Student Practice***	***NGSS***	***Specific descriptors***
BRNLOGEN (Full Test Form B, Systems and Scale	Macroscopic	Explanation	**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.	• Energy • Burning • Combustion
BRNLOGMAT (Full Test Form B, Systems and Scale)	Macroscopic	Explanation	**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.	• Matter • Burning • Combustion
CARBON.SS (Systems and Scale)	Macroscopic	Explanation	**MS-PS1-1.** Develop models to describe the atomic composition of simple molecules and extended structures.	• Matter
COMPOSTB (Full Test Form A, Decomposers)	Macroscopic	Explanation	**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	• Energy • Decay • Cellular respiration (and digestion)
ENERGRASS2 (Full Test Form A and B, Plants)	Macroscopic	Explanation	**HS-LS1-5.** Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.	• Energy • Plant growth & movement • Photosynthesis

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ENERMUSHROOM2 (Decomposers)	Macroscopic	Explanation	**S-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.	• Energy • Mushroom growth
FATLOSS (Full Test Form B and C, Animals)	Macroscopic	Explanation	**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 formed resulting in a net transfer of energy.	• Matter • Animal growth & movement • Cellular respiration
GIRLBREATHE (Animals)	Macroscopic	Explanation	**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 formed resulting in a net transfer of energy.	• Matter • Animal growth & movement • Cellular respiration
GIRLGROWPARTS2 (Full Test Form C, Animals)	Macroscopic	Explanation	**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 • Animal growth and movement • Digestion and Biosynthesis

Item Name (with tests the item is on)	***Scale***	***Student Practice***	***NGSS***	***Specific descriptors***
MATERIALS3 (Full Test Form C, Systems and Scale)	Macroscopic	Explanation	**MS-PS1-1.** Develop models to describe the atomic composition of simple molecules and extended structures	• Matter & energy • Organic & inorganic materials (non-LP items)
MOUSEDIE2 (Full Test Form C, Animals)	Macroscopic	Explanation	**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 & energy • Animal growth & movement • Organic & inorganic materials (non-LP items)
OAKTREEPARTS2 (Full Test Form A and C, Plants)	Macroscopic	Explanation	**MS-LS1-3.** Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.	• Matter • Plant growth & movement • Photosynthesis (and biosynthesis)
OCTAMOLE (Full Test Form B and C)	Macroscopic	Explanation	**HS-PS1-7.** Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.	• Matter • Burning • Combustion
PLANTDARK (Full Test Form A and C, Plants)	Macroscopic	Explanation	**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 • Plant growth & movement • Photosynthesis (and cellular respiration)
PLANTDIE (Plants)	Macroscopic	Explanation	**HS-LS1-5.** Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.	• Matter & energy • Organic & inorganic materials (non-LP items)

Item Name (with tests the item is on)	*Scale*	*Student Practice*	*NGSS*	*Specific descriptors*
POTATO (Full Test Form A, B, C, Decomposers)	Macroscopic	Explanation	**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 • Decay • Cellular respiration (and digestion)
Large Scale Items				
BIOMASSPYRAMID (Full Test Form A, Ecosystems)	Ecosystem	Explanation	**HS-LS2-1.** Use mathematical and or computational representations to support explanations of factors that affect carrying capacity of ecosystems and different scales.	• Explaining biomass pyramid
DEERWOLF2 (Ecosystems)	Ecosystem	Explanation	**MS-LS2-4.** Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.	• Explaining biomass pyramid
CO2 SUMMER (Ecosystems)	Ecosystem	Explanation	**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.	• Predicting/explaining effects on pools of changing fluxes (seasonal patterns & responses to disturbances)

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CO2 WINTER (Ecosystems)	Ecosystem	Explanation	**HS-LS2-4.** Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.	• Predicting/explaining effects on pools of changing fluxes (seasonal patterns & responses to disturbances)
FOODCHAIN4 (Full Test Form A and C, Ecosystems)	Ecosystem	Explanation	**MS-LS2-3.** Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.	• Carbon pools & fluxes (carbon cycling and energy flow)
POSSIBLEFOREST (Ecosystems)	Ecosystem	Explanation	**MS-LS2-3.** Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.	• Carbon pools & fluxes (carbon cycling and energy flow)
FLBULBS2 (Full Test Form A, Ecosystems)	Global Scale	Explanation	**ESS3-3.** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.	• Explaining effects of human energy use on CO_2 pools & fluxes
HALFFFINITIAL (Full Test Form C, HES)	Global Scale	Data Interpretation	**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	• Identifying data trends • Carbon pools & fluxes
HALFFFMODEL (Full Test Form C, HES)	Global Scale	Data Interpretation	**HS-ESS2-6.** Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.	• Identifying data trends • Carbon pools & fluxes

Item Name (with tests the item is on)	*Scale*	*Student Practice*	*NGSS*	*Specific descriptors*
KLGLOCAL2 (Full Test Form B and C, HES)	Global Scale	Data Interpretation	**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.	• Generalizability of data
KLGFIVE (Full Test Form B, HES)	Global Scale	Data Interpretation	**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.	• Identifying data trends • Carbon pools & fluxes
KLGONE (Full Test Form B)	Global Scale	Data Interpretation	**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.	• Identifying data trends • Carbon pools & fluxes
Macroscopic Scale Inquiry Items				
ANIMALCLAIM2 (Full Test Form C, Animals)	Inquiry	Data Interpretation	**HS-LS1-2.** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.	• Arguments from evidence • Logic of warrants
DECOMPCLAIM2 (Full Test Form B, Decomposers)	Inquiry	Data Interpretation	**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.	• Arguments from evidence • Logic of warrants

Item Name (with tests the item is on)	***Scale***	***Student Practice***	***NGSS***	***Specific descriptors***
GLUBEXCLAIM (Full Test Form A, Systems and Scale)	Inquiry	Data Interpretation	**HS-LS1-2.** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms	• Arguments from evidence • Logic of warrants
PLANTCLAIM2 (Full Test Form A, Plants)	Inquiry	Data Interpretation	**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.	• Arguments from evidence • Logic of warrants • Identifying uncertainty