

# Educational Resources from *Phenomenon Science Education*

## Student Proficiency Goals for **NGSS MS-LS1-6**



### Information about MS-LS1-6

#### **NGSS Performance Expectation 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.

#### **Clarification Statement.**

*Emphasis is on tracing movement of matter and flow of energy.*

#### **Assessment Limits.**

*Assessment does not include the biochemical mechanisms of photosynthesis.*

#### **Science and Engineering Practice (Constructing Explanations and Designing Solutions)**

- Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) 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.

#### **Disciplinary Core Idea (LS1.C: Organization for Matter and Energy Flow in Organisms)**

- Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use.

#### **Disciplinary Core Idea (PS3.D: Energy in Chemical Processes and Everyday Life)**

- The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. (secondary).

#### **Crosscutting Concept (Energy and Matter)**

- Within a natural system, the transfer of energy drives the motion and/or cycling of matter.

Student Proficiency Goals for **NGSS MS-LS1-6**



**Student Proficiency Goals**

**SEP (Constructing Explanations and Designing Solutions):**

- Students identify and describe evidence that supports the idea that plants use light, carbon dioxide, and water to make sugars and release oxygen, resulting in the transformation of electromagnetic energy into chemical energy, and in the cycling of matter in a process known as photosynthesis.
- Students assume that aspects of the natural world described and explained by current laws and theories operate today as they did in the past and as they will in the future.
- Students collect evidence from their own experiments or grade appropriate media.
- Students identify strengths and weaknesses in their evidence, including the type of source the evidence came from and the relevance, validity, and reliability of the evidence.
- Students identify strengths and weaknesses in the ability of their evidence to support a scientific explanation for the idea that plants use light, carbon dioxide, and water to make sugars and release oxygen, resulting in the transformation of electromagnetic energy into chemical energy, and in the cycling of matter in a process known as photosynthesis.
- Students construct an explanation based on their strong evidence that supports the idea that plants use light, carbon dioxide, and water to make sugars and release oxygen, resulting in the transformation of electromagnetic energy into chemical energy, and in the cycling of matter in a process known as photosynthesis.

**DCI (LS1.C Organization for Matter and Energy Flow in Organisms):**

- Students know that plants, algae, and other microorganisms use light, carbon dioxide, and water to make sugars and to release oxygen through the process of photosynthesis.
- Students know that the process of photosynthesis supports the cycling of matter and energy.
- Students know that sugars made through photosynthesis can be used immediately or stored for growth.

**CCC (Energy and Matter):**

- Students consider the ways that energy is transferred in a natural system through photosynthesis.
- Students consider the ways that matter is cycled in a natural system through photosynthesis.
- Students consider how photosynthesis supports the transfer of energy and cycling of matter.

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- Students know that organisms which feed on plants, algae, and other microorganisms use the molecules produced through photosynthesis as food and that this represents a movement of matter from one organism to another organism.

**DCI (PS3.D Energy in Chemical Processes and Everyday Life):**

- Students know that the chemical reactions used by plants during photosynthesis to produce complex molecules require an input of energy from the sun.
- Students know that the chemical reactions used by plants during photosynthesis combine carbon dioxide and water to produce carbon-based organic molecules and release oxygen.
- Students know that plants use carbon-based organic molecules such as sugar for food and other life processes.

- Students consider how matter is transferred through a natural system as other organisms feed on photosynthetic organisms.