

Lesson 4  
Climate Change



Unit Title: <b>Carbon Cycles through Ecosystems</b>	
Theme: <b>Ecosystems &amp; Cycles</b>	Grade Level: <b>9-10</b>
# of sessions for the unit: <b>class period(s) 2-3 (~45min each)</b>	Session #4: <b>Photosynthesis</b>
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### Unit Description

Provided in a separate document. *Please see High School Curriculum Overview.*

### Standard(s)

**HS-LS1-5.** Use a model to illustrate how photosynthesis uses light energy to transform water and carbon dioxide into oxygen and chemical energy stored in the bonds of sugars and other carbohydrates.

**HS-LS2-5.** Use a model that illustrates the roles of photosynthesis, cellular respiration, decomposition, and combustion to explain the cycling of carbon in its various forms among the biosphere, atmosphere, hydrosphere, and geosphere.

### Unit Goals

Students will understand the causes and effects and possible solutions of climate change with an emphasis on carbon sequestration (capture)

### Lesson Objectives & Essential Vocabulary

1. Students will be able to model photosynthesis
2. Students will be able to understand the reactants and products of photosynthesis
3. Students will understand the relationship of Photosynthesis within the Carbon Cycle

#### Essential vocabulary:

- Carbon Dioxide
- Water
- Sunlight
- Endergonic Reaction
- Products
- Reactants
- Yields
- Glucose
- Carbohydrate
- Molecule

#### NOTE:

If you can predict which students may not be able to achieve the goals, then you need to reduce barriers to maximize learning for all.

## Note any potential barriers to the lesson – consider variability

vocab/reading ability — provide scaffolding, diagrams to clarify text, vocab assignments: word splash, etc.

Writing skills: solution provide writing prompts or sentence frames

### NOTE:

Provide options — refer to the UDL guidelines as a way to ensure that all learners can demonstrate achievement of goals. For ideas: <http://bit.ly/1d5bjtS>

## Evaluation/Assessment

(directly linked to the goals, i.e., Formative/Ongoing Assessment or Summative/End of Lesson Assessment)

Questionnaire to video, “Secret Life of Plants”

Guiding questions/teacher check ins from gum drop activity

Lab Report: Algae Ball Lab if used for further enrichment

NOTE: Consider the [UDL Guidelines](#) in selecting methods and materials to ensure that you provide options for engagement, representation, and action and expression.

## Methods

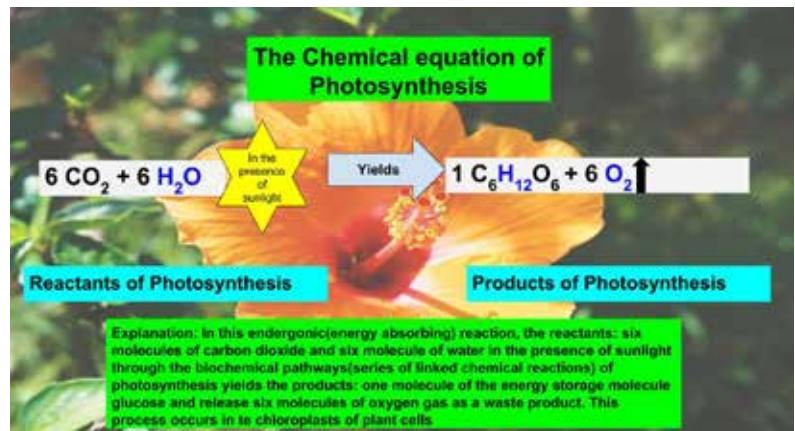
(e.g., Anticipatory Set, Introduce and Model New Knowledge, Provide Guided Practice, Provide Independent Practice)

1. Preteach vocabulary and activate prior knowledge
2. Hook students with showing a piece of wood and asking where the mass comes from \*see video link, ‘Lessons from Thin Air’ <https://www.learner.org/resources/series29.html>
3. Share the chemical equation of photosynthesis with the class on board, on worksheet

4. Have students model photosynthesis with gumdrops/toothpicks. Link to explanation of the chemical equation for photosynthesis: [https://docs.google.com/a/gloucesterschools.com/drawings/d/1jUL8CmDwmmlaIBuHu2ykkYr0vD0SvxsUP7bzpLCr\\_gU/edit?usp=sharing](https://docs.google.com/a/gloucesterschools.com/drawings/d/1jUL8CmDwmmlaIBuHu2ykkYr0vD0SvxsUP7bzpLCr_gU/edit?usp=sharing).

When constructing the model of photosynthesis, be sure to instruct students to use one color gum drop to represent Carbon, another color to represent Hydrogen and yet another to represent oxygen. Assist students as they create models for the reactants and products of photosynthesis using the correct number and color gum drops. Students can work in co-operative lab groups as they assemble gumdrop/toothpick models of the reactants: carbon dioxide, and water and the yielded product models of: glucose and oxygen gas.

5. For enrichment have students view Video, “The Secret Life of Plants” and answer guiding questions while watching the video
6. Algae Ball Lab from MassBioTeach can be done for further enrichment see link in Materials



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## Materials

1. Text materials *Miller & Levine Biology chapter 4: Climate* but any Biology or environmental science text would suffice
2. access to online research (chromebooks, laptop cart, library/media center).
3. Link to college student interview Lessons from Thin Air: <https://www.learner.org/resources/series29.html>
4. Diagram and explanation of chemical equation of photosynthesis: [https://docs.google.com/a/gloucesterschools.com/drawings/d/1jUL8CmDwmmlaIBuHu2ykkYr0vD0SvxsUP7bzpLCr\\_gU/edit?usp=sharing](https://docs.google.com/a/gloucesterschools.com/drawings/d/1jUL8CmDwmmlaIBuHu2ykkYr0vD0SvxsUP7bzpLCr_gU/edit?usp=sharing)
5. Colored pencils, gumdrops, toothpicks
6. Link to 'Secret Life of Plants' E. Sabo (enrichment opportunity)
7. Algae ball lab (Mass BioTeach) additional enrichment: <https://www.massbioed.org/educators/curriculum/16-investigating-photosynthesis-with-algae-balls>

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## Notes and Comments

1. Pre-teach the vocabulary by methodically talking through the essential vocabulary. Can reinforce vocabulary with a variety of methods like: crossword puzzle, word splash, Kahoot, classroom discussion, word wall, etc.
2. Exercise caution using the sharp toothpick as gumdrop models are generated. Try not to let the class eat the model making materials!
3. The photosynthesis equation diagram shows the balanced equation, be sure the models represent the balanced equation.