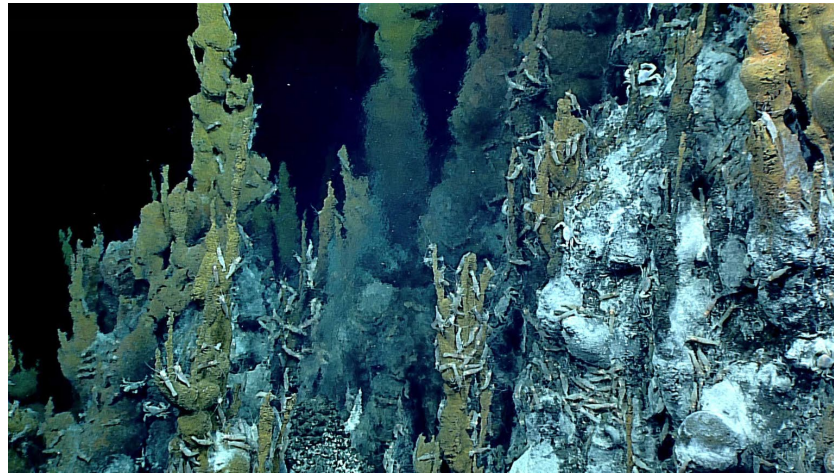




Fueling Life on Earth

Photosynthesis vs Chemosynthesis





Introduction

- Ecosystems depend on some organisms to convert inorganic compounds into food that other organisms can eat.
- The majority of life on Earth is based on a food web which revolves around the Sun, as plants use sunlight to make food.
- What is this process called?
- What does the sunlight provide to most ecosystems?
- What do the plants and algae do with that sunlight? What do they create?





Introduction

- What happens to the environment, i.e. what changes, as the ocean gets deeper?
- Do you think there are animals in the deep sea?
- If there is no light in the deep sea, can photosynthesis occur?
- If there is life in the deep sea but photosynthesis does not occur, then what do organisms rely on for primary production?



Introduction



Deep-Sea Dialogues **HYDROTHERMAL VENTS**





Introduction

- How do animals near vents get their energy?
- What uses the special process to create energy?
- So, what is the base of the food chain down at hydrothermal vent sites?



Introduction

- PHOTO (light) and SYNTHESIS (put things together/build).
 - Uses light energy to make food/sugar.
- CHEMO (chemical) and SYNTHESIS (put things together/build)
 - Uses chemical energy to make food/sugar.



Learning Procedure

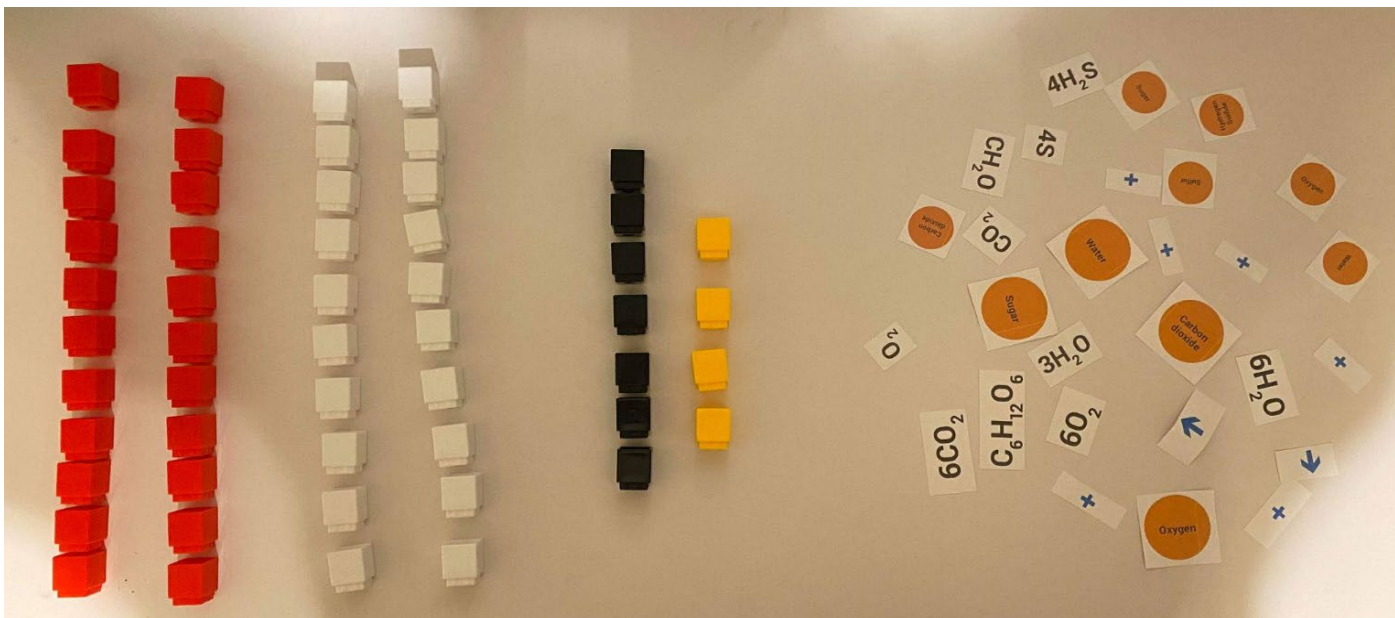
DRIVING QUESTION

How does the process of photosynthesis compare to chemosynthesis in the deep sea?



Learning Procedure - Modeling Materials

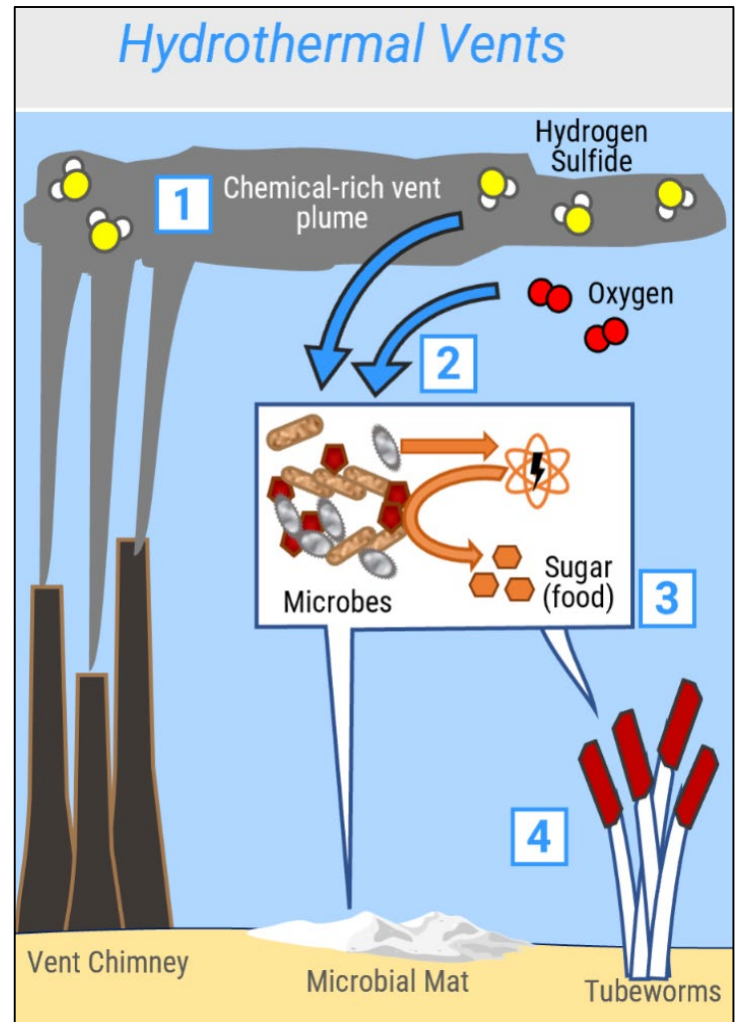
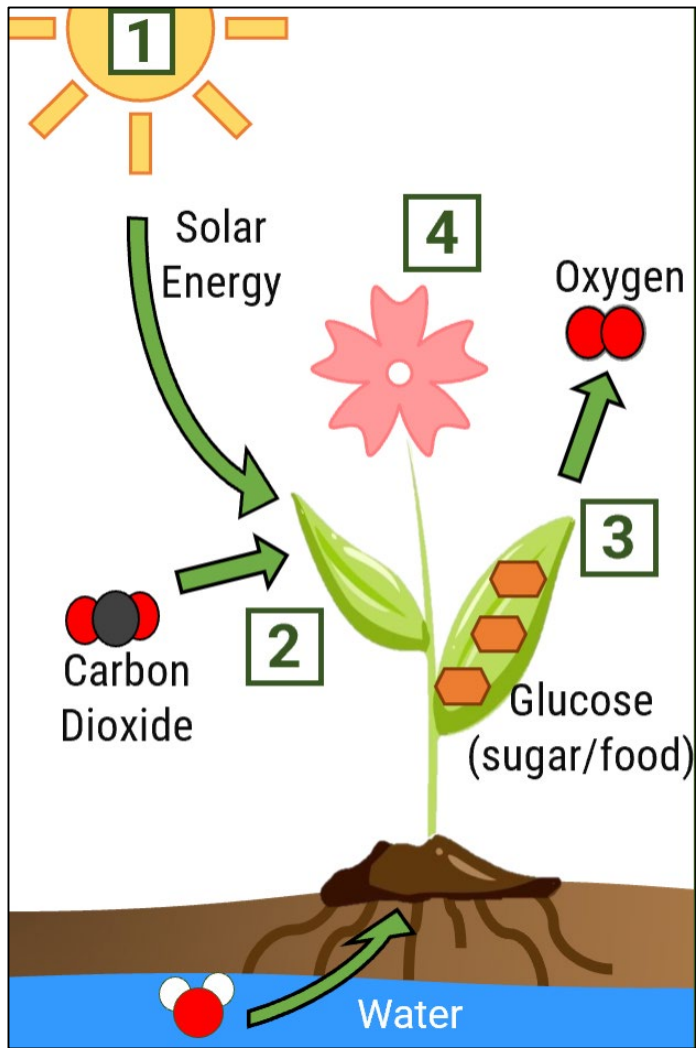
Example: Remember that colors may be different for your kit.
Each color block represents an atom.





Learning Procedure - Modeling Instructions

- Blocks in the bag represent the atoms for only the REACTANTS of each process.
- The cut up equation pieces contain all the components for BOTH **photosynthesis** and one form of hydrothermal vent **chemosynthesis**.
- Your group should start by putting together and labeling the reactants for photosynthesis.
 - *Hint: The remaining blocks should make the reactants for chemosynthesis.*
- Work as a team to try and figure out the correct equations for each process.
Again, start with photosynthesis then go to chemosynthesis.





Learning Procedure: Compare and Contrast Processes

Photosynthesis	BOTH	Chemosynthesis
<i>Write the equation.</i>		<i>Write the equation.</i>



Learning Procedure



Deep-Sea Dialogues
HYDROTHERMAL VENTS





+



+



Carbon dioxide

+

Water



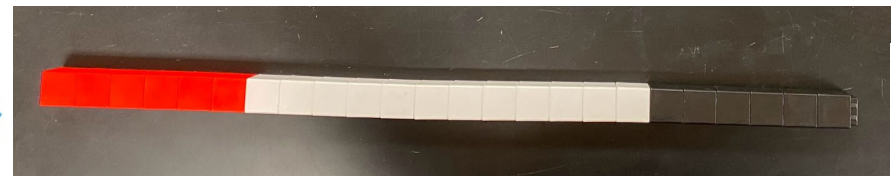
Sugar

+

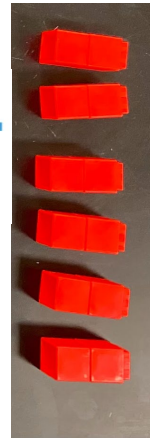
Oxygen

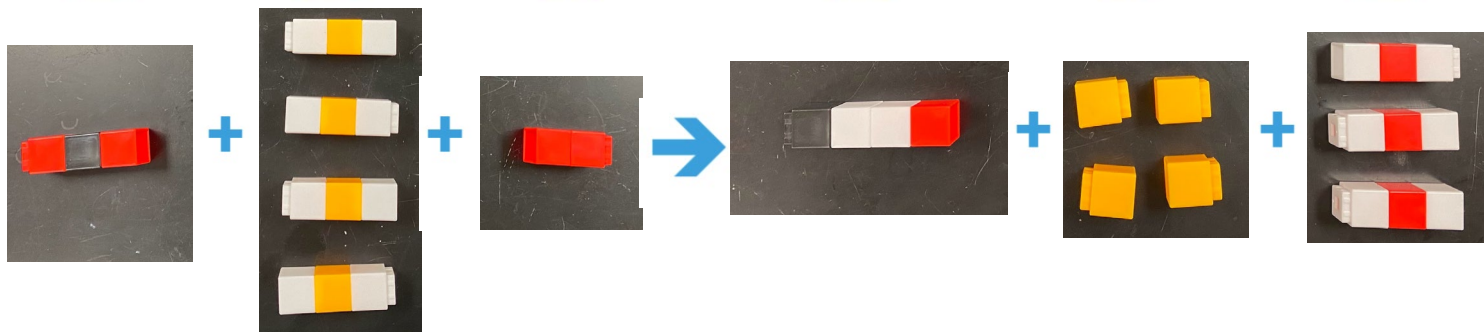
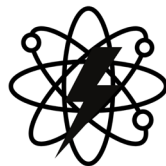


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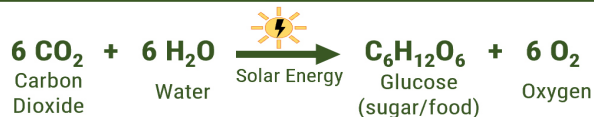
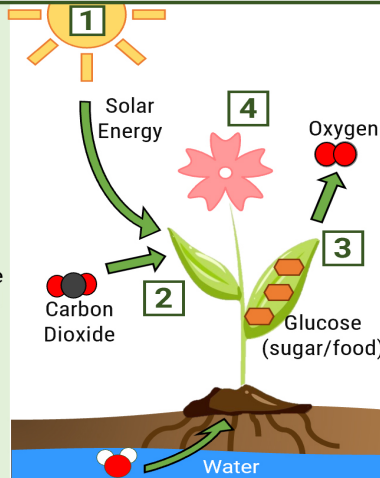


Putting the Pieces Together

PHOTOSYNTHESIS

The process plants use to convert carbon dioxide and water into sugars (food), using energy from the sun.

- 1 The sun gives off energy in the form of light.
- 2 Plants absorb sunlight and take up water from the soil and carbon dioxide from the air.
- 3 The plants use energy from the sun to combine carbon dioxide and water to make food (glucose/sugar).
- 4 The plants grow and reproduce and are eaten or hosted as internal symbionts in animals, like corals.



CHEMOSYNTHESIS

The process by which microbes create sugars (food) using energy released from chemical reactions

- 1 Chemical-rich waters emerge from beneath the seafloor at hydrothermal vents and cold seeps.
- 2 Some chemical reactions release chemical energy. Chemosynthetic microbes harness the chemical energy released during reactions with vent or seep chemicals.
- 3 The microbes use the chemical energy to convert inorganic carbon to organic molecules, or food, through the carbon fixation process.
- 4 The microbes grow and reproduce, and are eaten, or hosted as internal symbionts by other animals like tubeworms and mussels.

Hydrothermal Vents

