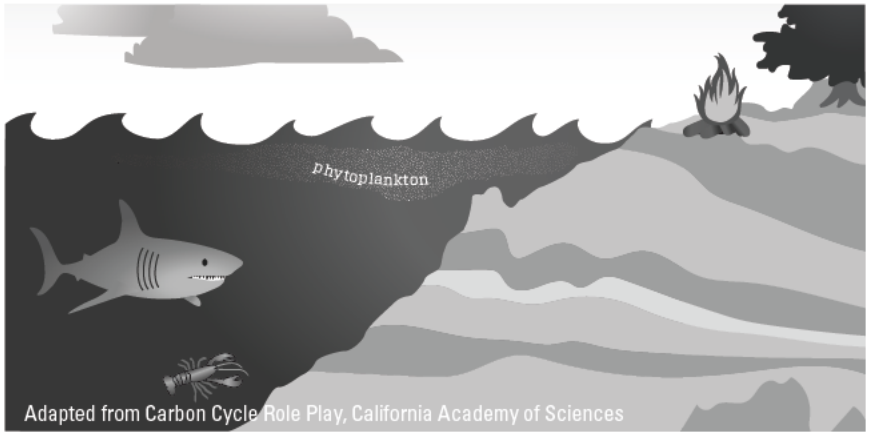
6.1 TRACKING THE CARBON

Is it a carbon source or a sink (reservoir)?

Carbon atoms continually move through the Earth's oceans, atmosphere, ecosystems, and crust. Carbon is the fundamental building block of life and an important component of many other chemical processes. Processes that predominantly produce CO_2 are called sources, and processes that take in or store CO_2 are sinks (reservoirs). In this activity students will trace CO_2 as it moves between these systems and record its movement.



Adapted from Carbon Cycle Role Play, California Academy of Sciences

MATERIALS

- 6.1 Student Worksheet (see next page)
- 21 carbon cards (see pages 87-88)
- 3 colored pencils/markers/crayons
- Pencil or pen
- Tape or glue
- 18" x 24" piece of butcher paper

DIRECTIONS

1. Students can work individually or in groups up to 4 per group.
2. Randomly place the 21 carbon cards on the desk with the Carbon Flow Option side up.
3. Students will work together to perform the following tasks:
    a. Identify each card as a source or sink and record the answer on the back of the card and on the 6.1 Student Worksheet.
    b. Identify the processes taking place to move the carbon atom between its source or sink and record the answer on the 6.1 Student Worksheet.
    c. Create a plausible carbon pathway using at least 15 of the carbon cards.
        i. Tape or glue the cards in the proper path on the butcher paper and draw arrows to connect the cards. Make sure that your source/sink is in the proper location by checking source/sink name on the back of the card.
        ii. Color source cards one color, and sink cards a different color, include a key as a reference.
        iii. Write the process for carbon movement on the coordinating arrow between the carbon cards.
        iv. Review as a team to determine if the pathway is correct. Write a creative story detailing the life of the carbon atom as it moved along the carbon pathway.

REFLECTION

1. Explain the difference between a carbon source and a carbon sink.
2. Draw the pathway that is responsible for the carbon sources of oil and gas below.

6.1 TRACKING THE CARBON: STUDENT WORKSHEET

Source / Sink	Carbon Flow Options	Process for Carbon Movement	Source or Sink?
Atmosphere	Atmospheric CO_2 dissolves into the ocean to become carbonic acid		
	Atmospheric CO_2 is taken up by autotrophic organisms for photosynthesis		
	Rainwater reacts with CO_2 to become carbonic acid		
	Carbonic acid (rain) reacts with sediments to become bicarbonate ions that flow into surface water systems and eventually the ocean		
	CO_2 gas in atmosphere from organisms, combustion, weathering and diffusion		
Ocean	Marine organisms consume bicarbonate ions to build their skeletons and shells		
	CO_2 in water is taken up by heterotrophic marine life for photosynthesis		
	Release CO_2 to the atmosphere		
	Decomposition of organisms release carbon into the environment		
	Sedimentation of carbon in the environment into sediments and fossil fuels		
Sediments	Combustion of fossil fuels releases CO_2 to the atmosphere		
	Weathering of sediments releases CO_2 to the atmosphere		
	Sedimentation of carbon in the environment into sediments and fossil fuels		
Marine Organisms	Release carbon through decomposition		
	Release CO_2 to water through respiration		
	Autotrophic organisms absorb CO_2 in water for photosynthesis		
	Heterotrophic organisms consume carbon for cellular synthesis		
Terrestrial Organisms	Release carbon through decomposition		
	Release CO_2 to atmosphere through respiration		
	Autotrophic organisms absorb CO_2 from atmosphere for photosynthesis		
	Heterotrophic organisms consume carbon for cellular synthesis		

Atmosphere	Atmosphere	Atmosphere
Atmosphere	Atmosphere	Ocean
Ocean	Ocean	Ocean
Ocean	Sediments	Sediments
Sediments	Marine Organisms	Marine Organisms
Marine Organisms	Marine Organisms	Terrestrial Organisms
Terrestrial Organisms	Terrestrial Organisms	Terrestrial Organisms

Rainwater reacts with CO_2 to become carbonic acid	Atmospheric CO_2 is taken up by autotrophic organisms for photosynthesis	Atmospheric CO_2 dissolves into the ocean to become carbonic acid
Marine organisms consume bicarbonate ions to build their skeletons and shells	CO_2 gas in atmosphere from organisms, combustion, weathering and diffusion	Carbonic acid (rain) reacts with sediments to become bicarbonate ions that flow into surface water systems and eventually the ocean
Decomposition of organisms release carbon into the environment	Release CO_2 to the atmosphere	CO_2 in water is taken up by heterotrophic marine life for photosynthesis
Weathering of sediments releases CO_2 to the atmosphere	Combustion of fossil fuels releases CO_2 to the atmosphere	Sedimentation of carbon in the environment into sediments and fossil fuels
Release CO_2 to water through respiration	Release carbon through decomposition	Sedimentation of carbon in the environment into sediments and fossil fuels
Release carbon through decomposition	Heterotrophic organisms consume carbon for cellular synthesis	Autotrophic organisms absorb CO_2 in water for photosynthesis
Heterotrophic organisms consume carbon for cellular synthesis	Autotrophic organisms absorb CO_2 from atmosphere for photosynthesis	Release CO_2 to atmosphere through respiration