Clark-Pohlod
Earth Science

Name _____
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Biogeochemical Cycles – Cycles in Nature

A. Earth's biosphere contains a fixed amount of water, carbon, nitrogen, oxygen, and other materials that _____ through the environment and are reused by different organisms.

B. _____ - the transfer of nitrogen from the atmosphere to the soil, to living organisms, and back to the atmosphere
   1. Nitrogen fixation - a process in which some types of soil _____ can form the nitrogen compounds that plants need
   2. Farmers replace nitrogen in the soil by growing nitrogen-fixing crops or using _____ that contain nitrogen compounds that plants need for growth.

C. _____ - how carbon molecules move between the living and nonliving world.
   1. Producers remove _____ from the air during photosynthesis.
   2. _____ - the chemical process that provides energy for cells

Carbon Sequestering

The word *sequester* means to separate or isolate. That's what scientists want to with the buildup of CO_2 in the air. Why? Because too much CO_2 can trap heat from the Sun and cause increases in Earth's temperature. Carbon sequestering is one way to reduce the buildup of greenhouse gases.

Scientists are studying the carbon cycle so they can evaluate both the impact of human activity on the cycle and subsequent changes in climate. The carbon cycle has changed dramatically in the last 200 years due to the use of new energy resources following the Industrial Revolution. In fact, CO_2 levels are up by 30 percent since the mid-1800s.

Capturing Carbon

Carbon sequestering involves capturing CO_2 then storing it underground. Power plants produce one-third of the United States' manufactured CO2 emissions and are ideal places to capture CO_2 before it's released into the atmosphere. Carbon sequestering would supplement, not replace, finding alternative fuel sources and reducing emissions.

Ideas being investigated by the United States Department of Energy include sequestering carbon underground and in the oceans, as well as enhancing natural processes like carbon sinks. Carbon sinks are places, such as forests, that naturally remove carbon from the air and store it. One million hectares of forest can absorb 25 megatons of CO_2 each year.

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The USDA estimates that 154 million tons of CO2 could be sequestered by agricultural soils each year.

A Controversial Idea

Perhaps the most controversial sequestering idea is to inject CO_2 into the ocean. Although the CO_2 would be injected well below what scientists call the "biologically rich upper 1,000 m," the environmental risks of carbon sequestering on aquatic life are essentially unknown. Some scientists say that CO_2 changes the pH of the seawater, making it more acidic. This, of course, wold have an effect on ocean life.

However, sequestering carbon in the ocean already is being done. Since 1996, offshore oil and gas workers in the North Sea have been taking CO_2 from power plants and injecting it into sandstone beneath the ocean floor. They're able to sequester more than 1 million tons of CO_2 each year.

In the United States, more than 65 oil fields have the technology available to them to inject CO_2 into oil reservoirs. That's because CO_2 commonly is injected underground to make oil recovery easier.

The Department of Energy spent $29 million in 2000 to study carbon sequestering, looking for ways to make it affordable, reliable, and environmentally safe. Although nobody knows if carbon sequestering will become an everyday occurrence, it could be one of the best options we'll have to lessen global warming.

1. What is a carbon sink? How does a carbon sink differ from carbon sequestering?

2. How has the carbon cycle changed in the last 200 years? What was the impact of the Industrial Revolution on the change?