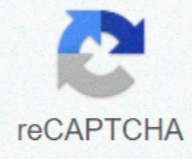




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Gizmos answer key carbon cycle

Scientists' study: Carbon cycle vocabulary: atmosphere, biomass, biosphere, carbon reservoir, carbon sink, fossil fuel, geosphere, greenhouse gases, hydrosphere, lithosphere, photosynthesis Preliminary knowledge Questions (Make those before using Gizmo.) In the process of photosynthesis plants are infused into carbon dioxide (CO₂) from the atmosphere and water (H₂O) from the soil. Using the energy of sunlight, plants build glucose molecules (C₆H₁₂O₆) and oxygen (O₂). How do plants on Earth affect the amount of carbon in Earth's atmosphere? Animals eat plants and produce carbon dioxide and water. How do animals affect the amount of carbon in Earth's atmosphere? Gizmo Carbon Cycle™ allows you to follow many paths a carbon atom can handle through earth's systems. To get started, notice the atom of soot in the area of atmospheric CO₂, highlighted in yellow. Glowing blue areas are possible places that a carbon atom can pass through. From earth's atmosphere, where can the carbon atom be dictated? Click on Earth plants and read the description. How did a carbon atom get from the atmosphere to a plant? Choose terrestrial animals. How did a carbon atom come from the earth's vegetation in the animal? Select Atmospheric CO₂. How did a carbon atom get from Earth's animals back into the atmosphere? Introduction: The Earth can be divided into four systems. The atmosphere is air above the Earth's surface. The hydrosphere is made up of all the water on Earth. The geosphere is the rocky, non-living part of the Earth. The biosphere consists of all living things, including humans. Some scientists use the term anthroposphere to describe everything humans have done or modified. Question: How does carbon move between the atmosphere, hydrosphere, biosphere and geosphere? Explore: Use Gizmo to create a carbon path that starts and ends in the atmosphere. Fill in the steps in the path below. Then label each location with the system it represents. Finally, summarize very briefly how a carbon atom got to this place. Create: Click Reset. Use Gizmo to create a path in which the carbon atom passes from the atmosphere to the hydrosphere, biosphere and geosphere. Briefly describe each transition. Volcanoes burning fossil fuels and other sources. Rainwater decomposes on open rocks. During photosynthesis, seaweed and plants remove carbon dioxide. Uneasy plants and algae that descend down to the seabed and separate from marine sediments (Activity A continues on the next page) Activity A (continuation from the previous page) Explore: Use Gizmo to create three more carbon pathways, each starting and ending in the atmosphere. Mark any location with A for atmosphere, B for biosphere, G for geosphere or H for hydrosphere. (You can use P for an anthroposphere if you or simply plug it into the biosphere.) Explanation: Based on Gizmo, explain how the following transitions can be made: Describe at least two ways carbon emissions can end up from a land plant in the atmosphere. Describe to the two ways carbon can get from the atmosphere to the hydrosphere. Can you find two ways carbon can get from the ocean to the lithosphere? (The lithosphere is the solid layer of the Earth, including the crust and part of the mantle.) Describe at least two ways carbon emissions can rotate from mussels to the atmosphere. Study: Natural gas is a mixture of methane (CH₄), ethane (C₂H₆) and other gases. Find two ways natural gas is formed. List the steps of the two carbon paths below. How is natural gas generation related to coal and oil formation? Description: Fossil fuels are used in many ways. With the help of Gizmo, describe the main use of any fuel. In any case, what is the end product of burning fossil fuels and where does it go? (Activity B continues on the next page) Activity B (continuation from the previous page) Consider: Another important contribution to atmospheric carbon dioxide is the cement industry. Using Gizmo, find the path of the carbon atom from the atmosphere to the cement plant. (Hint: One of the ingredients in cement is limestone.) Road: Atmospheric CO₂ oceanic CO₂ Shells / coral Lyme stone Cement How is carbon dioxide produced in a cement plant? Analysis: Click Reset, then go to animal land. Select Atmospheric CH₄. How do terrestrial animals create methane? People pick up a large number of cattle for food. How will these herds of cows affect the Earth's atmosphere? Carbon cycle modelling Introduction: Humans have been burning fossil fuels rapidly over the past 250 years. As a result, the amount of CO₂ in the atmosphere has increased by about 40% since 1800. By measuring the amount of carbon moving in the atmosphere and from the atmosphere, scientists can predict the change in the amount of atmospheric carbon dioxide each year. Question: How can we model changes in atmospheric carbon over time? Watch: Gizmo's MODEL tab shows a significantly simplified carbon cycle model. Ovals are carbon reservoirs where carbon is stored. Arrows represent the movement of carbon from one reservoir to another. What are the two main sources of carbon in the atmosphere? A carbon sink is a place that stores carbon for a long period of time. What are two carbon sinks that remove carbon from the atmosphere? The GTC unit means gigaton carbon, where one GTC is equal to one trillion kilograms of carbon. Without making any changes to Gizmo, list the carbon tanks from the largest to the smallest. Note: The largest carbon reservoir is actually the Earth's lithosphere, which contains about 80,000 GTC. However, there is not much exchange between the lithosphere and other reservoirs on a short timeframe. Experiment: If necessary, click Go back to original settings. These settings approximate conditions nowadays, but should not be as exact values. What is the total amount of carbon released each year from the atmosphere by ocean and terrestrial plants? What is the total amount of carbon added to the atmosphere from the soil and fossil fuels? How much will atmospheric carbon change in a year? Ten years from now? In 100 years? Calculation: Carbon dioxide is a greenhouse gas that helps capture heat in the Earth's atmosphere. We need carbon dioxide to maintain a warm planet, but excess carbon can cause significant warming of the planet. What use of fossil fuels will not lead to a change in CO₂ emissions into the atmosphere each year? What percentage reduction in the use of fossil fuels is needed to achieve this goal? Experiment: Using the Gizmo model, consider the following questions: How does increasing plant biomass (the amount of plants) affect atmospheric CO₂? How does increasing ocean CO₂ intake affect atmospheric CO₂ and ocean CO₂? As carbon dioxide is absorbed from the ocean, the ocean becomes a little more acidic. This can make it more difficult for many organisms to build their shells and skeletons. The consequences of ocean acidification are not yet fully understood. In conclusion: Click Reset and Return to original settings. Suppose we stopped burning fossil fuels immediately. How many years will CO₂ levels in the atmosphere have been re-created since 1800, about 600 GTC? Use Gizmo to find the answer. Write 350 words about your thoughts on the role CO₂ plays in climate change and global warming. Is that a villain? Is there anything else to blame? Do you think Canada has gone too far in reducing CO₂ emissions when the rest of the world is not contributing? Contributes?

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