**Carbon cycle webquest pdf**

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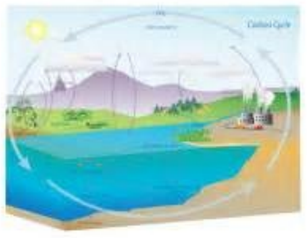
## The Carbon Cycle



4. **Category 3:**

   **Location:**

   **Effect:**

**What Can I do?**

5. Go to the Union of Concerned Scientists Web site: http://www.ucsusa.org/global_warming/what_you_can_do/
6. Read what you can do about Global Warming.
7. Record five things that you or your family can do:
   1.
   2.
   3.
   4.
   5.

Students will then be required to finish all remaining questions on the Web quest explanation guide.

V. **Accommodation(s) for Diverse Learner(s) (Differentiation)**

**Profile:** This will be more of an individual assignment where students will have to learn on their own.

**Interest:** Since this lesson utilizes technology most students should show great interest in doing the worksheet. It is different than all other lesson plans so may provide the appropriate motivation for students to learn these more difficult concepts.

**Readiness:** Most students will have heard of the carbon cycle, greenhouse gases and global warming. However, most of them probably forgot or did not care. Since we have covered organisms and their relationship to the environment this should be a smooth transition.

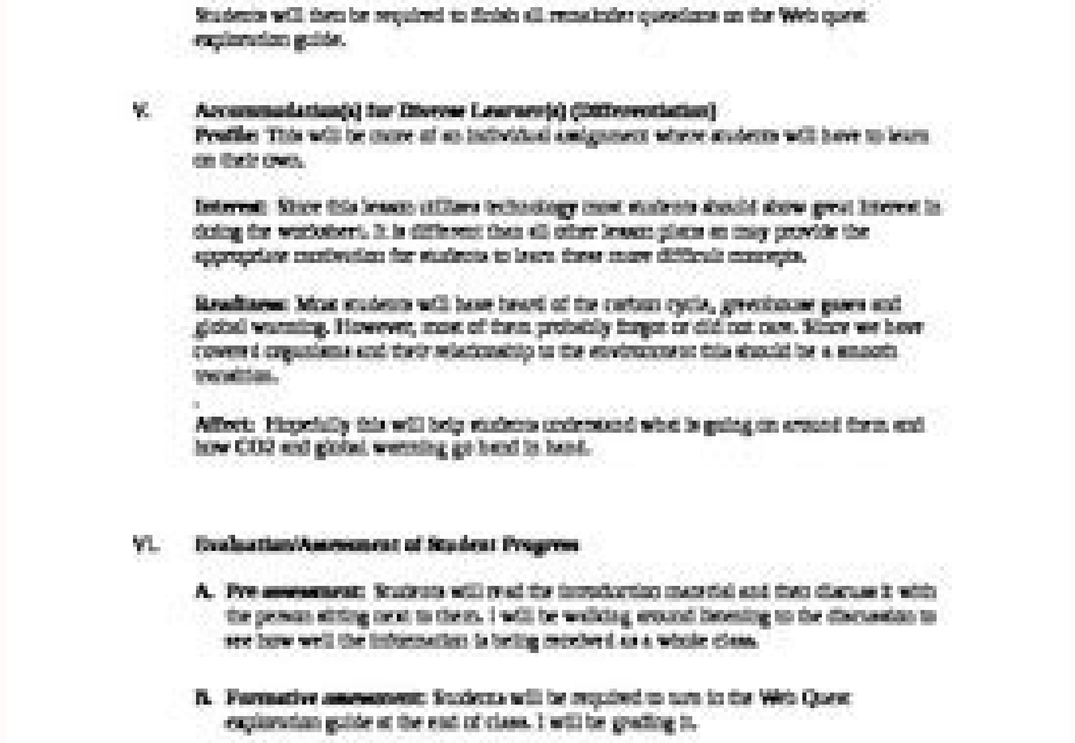
**Affect:** Hopefully this will help students understand what is going on around them and how CO2 and global warming go hand in hand.

VI. **Evaluation/Assessment of Student Progress**

A. **Pre-assessment:** Students will read the introduction material and then discuss it with the person sitting next to them. I will be walking around listening to the discussion to see how well the information is being received as a whole class.

B. **Formative assessment:** Students will be required to turn in the Web Quest explanation guide at the end of class. I will be grading it.






Date _____ pg. ____

**WebQuest: The Cycling of Materials - Carbon, Nitrogen, and Water**

When scientists talk about **cycles**, they are talking about sequences of events that repeat themselves. In the biosphere, cycles can be very complex. There are many different types of elements and nutrients in each ecosystem. These elements cannot be made or destroyed, but they can change their location. In this way, elements cycle through the biosphere. These cycles are called **biogeochemical cycles.**

**Go to:** http://www.windows.ucar.edu/tour/link=/earth/climate/cycles_general.html&edu=high&portal=vocals&nl=8l and answer the following questions.

**Click on the carbon cycle.**

**Sketch the carbon cycle here:**

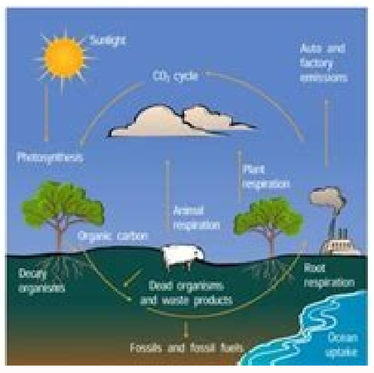
1. What five things is the element carbon a part of?
2. What is the carbon cycle?
3. How does carbon move from the atmosphere to plants?
4. How does carbon move from plants to an animal?
5. How does carbon move from plants and animals to soil?
6. How does carbon move from living things to the atmosphere?
7. How does carbon move from the atmosphere to the oceans?

**Background:** In biogeochemical cycles (including carbon, water and nitrogen cycles), elements are transported between the atmosphere, biosphere (living things), hydrosphere (water), and geosphere (rocks, minerals, and soils). These cycles help us remember that Earth is a complex system.

**Carbon Cycle:**

Go to http://www.windows.ucar.edu/tour/link=/earth/Water/co2_cycle.html and answer these questions:

1. Draw the carbon cycle:

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Carbon Cycle: 1. Draw the carbon cycle (on a separate piece of paper) 2. How does carbon exist in the atmosphere?Carbon exists in the atmosphere with oxygen that combine to make CO2 which is carbon dioxide3. How are fossil fuels created? Explain.Fossil fuels are created by the leftovers of dead animals and plants that get buried deep underneath the ground as carbon for millions of years.4. Describe two ways that carbon enters the atmosphere. Carbon can enter the atmosphere by burning fossil fuels, and us humans inhaling oxygen and then exhaling CO25. How are the oceans involved in the carbon cycle?Oceans soak up CO2 from the atmosphere6. How is the temperature of the Earth partly controlled by carbon? Carbon is a green house gas it traps heat in the atmosphere. The earth would be frozen without green house gases7. What role do rocks have within the carbon cycle? Weathering rocks add carbon onto surface water and then the ocean8. Where are you starting within the carbon cycle? As a fossil fuel underground9. How much of the atmosphere is made of carbon dioxide (CO2)? 0.04% of the atmosphere is made of CO210. By how much has CO2 increased in the atmosphere during the past 150 years?CO2 increased 30% in the atmosphere during the past 150 years.11. Next stop = _____Surface ocean____What did you learn? That the ocean absorbs more CO2 then the atmosphere does12. Next stop = _____Deep ocean_______What did you learn? That the deep ocean accounts for more than 65% of earths carbonThe deep ocean accounts for more than 65% of the Earth’s carbon. How much carbon does the surface ocean absorb from the atmosphere each year? It absorbs 90 gigatonsTrue or False: When plants die and decay, they bring carbon into soil. True13. Next stop = ____Land plants_____What did you learn? Plants are able to grow faster as more carbon is added to our atmosphere14. Next stop = _______Soil_______ What did you learn? Soil stores about 3% of Earths carbon15. Next stop = _______Marine life_______What did you learn? High levels of Carbons dissolved in the water is harmful to marine organisms like Algae, Corals, and Mollusks.When carbon enters the deep ocean, how long does it stay there? It stays for hundreds of yearsTrue or False: Phytoplankton are tiny plants and algae that float in the ocean and take up carbon dioxide as they grow. TrueTrue or False: Plants both absorb CO2 from the atmosphere and release it into the atmosphere.TrueNitrogen Cycle: 16. What are the two conditions under which nitrogen will react with oxygen? (In other words, what is necessary for nitrogen in the air to combine with oxygen?) The two conditions which nitrogen will react with oxygen is in high temperatures and pressures found near lightning bolts17. What are the two compounds that are formed when nitrogen combines with oxygen? Nitric oxide (NO) and nitrogen dioxide (NO2)18. How does nitric acid (HNO3) form?HNO3 forms when nitrogen dioxide reacts with water in rain19. Why is nitric acid (HNO3) important? Plants may use it for nutrients20. What percentage of the air we breathe is nitrogen? The percentage of nitrogen we breathe is 79%21. Even though considerable nitrogen is available in the air, most plants do not use the nitrogen (N2) found in the air. Why not?Because plants must secure their nitrogen in "fixed forms".22. In what compounds can plants use nitrogen? Nitrate ions (NO-3), ammonia (NH3), and urea (NH2)2CO23. How do animals get the nitrogen they need? By feeding off plants 24. Atmospheric nitrogen (N2) is pretty inert. This means that it does not easily break apart. When molecules do not break apart easily, it is difficult (or impossible) for organisms to use them as a nutrient source. As a result, nitrogen fixation is the term used to describe the process of breaking up N2. a. What is atmospheric fixation? High energy of lightning breaking nitrogen molecules apart and enabling their atoms to combine with oxygen to form nitrogen oxide.b. What is industrial fixation? [This is how artificial fertilizers are made.]When nitrogen is at 600 degrees Celsius combined with nitrogen, catalyst, and hydrogen  to make ammonia that can be used as a fertilizerc. What is biological fixation? (In your answer, describe the types of plants associated with the symbiotic relationship.)Fixing nitrogen through bacteria and archaea, that later have relationships with plants.25. Draw the nitrogen cycle: On a separate piece of paper: (Remember there are other diagrams on the previous websites.) If you’re not sure what a term means, look through the reading and links for help. Water Cycle:26. Why is nitrogen needed by plants and animals? It is needed by plants and animals because they produce organic molecules like amino acids, proteins and nucleic acids.1. Define "water cycle".A process that creates water clean enough to drink, fish to eat, and help grow crops by weather patterns.2. What fraction of the Earth’s surface is covered in water? 3/4 of the Earth's surface is covered in water.3. What percentage of all the Earth’s water is in a form that is useable to humans and land animals? 1% of all the Earth's water in a form useable to humans and land animals.1. Evaporation is the process where a liquid changes from its ___Liquid_____ state to a __Gaseous____ state. 2. Why is evaporated water so clean? From the impurities left behind3. Condensation occurs when a ____Gas_______ is changed into a ___Liquid_____. 4. Condensation is the opposite of ____evaporation_____. 5. When the _____temperature_____ and ____atmospheric pressure_____ are right, the small droplets of water in clouds form larger droplets and precipitation occurs.6. Define transpiration:When plants absorb water and the water goes to the leaves and evaporates there7. Define percolation:When water absorbs underground1. Using the terms "evaporation", "condensation", and "precipitation", explain the water cycle in your own words. The water cycle starts with evaporation, evaporation is when water evaporates into the atmosphere. Condensation is the opposite of evaporation and turns gas into liquid. Precipitation is rainfall from clouds.2. What factor is most important in determining whether water is a solid, liquid, or gas? Temperature is the most important factor3. Is the amount of water on Earth always changing or is it a constant amount?It is always a constant amount The Earth's atmosphere is mostly composed of nitrogen. Oxygen makes up just 21 percent of the air we breathe. Carbon dioxide, argon, ozone, water vapor and other gasses make up a tiny portion of it, as little as 1 percent. These gasses probably came from several processes as the Earth evolved and grew as a planet. But some scientists believe that the Earth's atmosphere would never have contained the oxygen we need without plants. Plants (and some bacteria) release oxygen during photosynthesis, the process they use to change water and carbon dioxide into sugar they can use for food. Photosynthesis is a complex reaction. In a lot of ways, it's similar to the way your body breaks down food into fuel that it can store. Essentially, using energy from the sun, a plant can transform carbon dioxide and water into glucose and oxygen. In chemical terms: $6CO_2 + 12H_2O + Light \rightarrow C_6H_{12}O_6 + 6O_2 + 6H_2O$ In other words, while we inhale oxygen and exhale carbon dioxide, plants inhale carbon dioxide and exhale oxygen. Some scientists believe that our atmosphere had little to no oxygen before plants evolved and started releasing it. Without the sun to feed plants (and the plants to release oxygen), we might not have breathable air. Without plants to feed us and the animals most people use for food, we'd also have nothing to eat. Obviously, plants are important, but not just because they give us food to eat and oxygen to breathe. Plants help control the amount of carbon dioxide, a greenhouse gas, in the atmosphere. They protect the soil from wind and from water runoff, helping to control erosion. In addition, they release water into the air during photosynthesis. This water, along with the rest of the water on the planet, takes part in a huge cycle that the sun controls. We'll look at this cycle on the next page. The Carbon Cycle Carbon is fundamental to life -- all organic forms of life contain it. On Earth, carbon cycles through the atmosphere and the planet itself. This cycle has two components. The geological component involves carbon-containing compounds eroding from the land, washing into the sea, entering the Earth's mantle layer and being expelled through volcanoes. The biological component involves plants' and animals' inspiration and expiration. Since carbon is a greenhouse gas, its presence affects how warm or cool the planet is. The NASA Earth Observatory has a thorough explanation of the carbon cycle. The carbon cycle describes the storage and exchange of carbon between the Earth's biosphere (living matter), atmosphere (air), hydrosphere (water), and geosphere (earth). The main reservoirs of carbon are the atmosphere, biosphere, ocean, sediments, and interior of the Earth. Both natural and human activities transfer carbon between the reservoirs. The carbon cycle is the process through which the element carbon moves through the atmosphere, land, and ocean.The carbon cycle and nitrogen cycle are key to Earth's sustainability of life.The main reservoirs of carbon are the atmosphere, biosphere, ocean, sediments, and Earth's crust and mantle.Antoine Lavoisier and Joseph Priestly were the first to describe the carbon cycle. There are two important reasons the carbon cycle is worth learning about and understanding. Carbon is an element that is essential for life as we know it. Living organisms obtain carbon from their environment. When they die, carbon is returned to the non-living environment. However, the concentration of carbon in living matter (18%) is about 100 times higher than the concentration of carbon in the earth (0.19%). The uptake of carbon into living organisms and return of carbon to the non-living environment are not in balance. The second big reason is the the carbon cycle plays a key role in the global climate. Although the carbon cycle is huge, humans are able to effect it and modify the ecosystem. Carbon dioxide released by fossil fuel burning is about double the net uptake from plants and the ocean. Photoautotrophs take carbon dioxide and turn it into organic compounds. sarayut Thaneerat / Getty Images Carbon exists in several forms as it moves through the carbon cycle. The non-living environment includes substances that never were alive as well as carbon-bearing materials that remain after organisms die. Carbon is found in the non-living part of the hydrosphere, atmosphere, and geosphere as: Carbonate ($CaCO_3$) rocks: limestone and coralDead organic matter, such as humus in soilFossil fuels from dead organic matter (coal, oil, natural gas)Carbon dioxide ($CO_2$) in the airCarbon dioxide dissolved in water to form $HCO_3^-$ Carbon enters living matter through autotrophs, which are organisms capable of making their own nutrients from inorganic materials. Photoautotrophs are responsible for most of the conversion of carbon into organic nutrients. Photoautotrophs, primarily plants, and algae, use light from the sun, carbon dioxide, and water to make organic carbon compounds (e.g., glucose).Chemoautotrophs are bacteria and archaea that convert carbon from carbon dioxide into an organic form, but they get the energy for the reaction through oxidation of molecules rather than from sunlight. Carbon returns to the atmosphere and hydrosphere through: Burning (as elemental carbon and several carbon compounds)Respiration by plants and animals (as carbon dioxide, $CO_2$)Decay (as carbon dioxide if oxygen is present or as methane, $CH_4$, if oxygen is not present) The carbon cycle generally consists of carbon movement through the atmosphere, biospheres, ocean, and geosphere, but the deep carbon cycle between the mantle and crust of the geosphere is not as well understood as the other parts. Without the movement of tectonic plates and volcanic activity, carbon would eventually become trapped in the atmosphere. Scientists believe the quantity of carbon stored in the mantle is about a thousand times greater than the amount found on the surface. Archer, David (2010). The Global Carbon Cycle. Princeton: Princeton University Press. ISBN 9781400837076.Falkowski, P.; Scholes, R. J.; Boyle, E.; et al. (2000). "The Global Carbon Cycle: A Test of Our Knowledge of Earth as a System". Science. 290 (5490): 291–296. doi:10.1126/science.290.5490.291Lal, Rattan (2008). "Sequestration of atmospheric CO2 in global carbon pools". Energy and Environmental Science. 1: 86–100. doi:10.1039/b809492fMorse, John W.; MacKenzie, F. T. (1990). "Chapter 9 the Current Carbon Cycle and Human Impact". Geochemistry of Sedimentary Carbonates. Developments in Sedimentology. 48. pp. 447–510. doi:10.1016/S0070-4571(08)70338-8. ISBN 9780444873910.Prentice, I.C. (2001). "The carbon cycle and atmospheric carbon dioxide". In Houghton, J.T. (ed.). 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