**IB Biology: Syllabus Topic 4.3**

**CARBON CYCLE**

How does carbon move through our biosphere? How long does it reside in various reservoirs, such as the atmosphere, the ocean, the soil, and in plants? Since carbon dioxide is the most important greenhouse gas, understanding the cycle of carbon in the environment is critical to understanding how long CO2 will reside in the atmosphere, and how climate is predicted to change in the future (Hastings, 2006).

Ecologists studying the carbon cycle and the recycling of other elements use the terms pool and flux. A **pool** is a reserve of the element. It can be organic or inorganic. A **flux** is the transfer of the element from one pool to another. Diagrams can be used to represent the carbon cycle. Boxes can be used for pools and labeled arrows for fluxes (Allott & Mindorff, 2014).

You will be assigned one understanding of the carbon cycle from the IB syllabus. Research and become an expert on this understanding. Write at least two paragraphs on your topic including the information listed below. Cite all sources. In class, you will prepare a small poster illustrating your part of the carbon cycle (a "box" of your pool). You will then work together as a class to build a carbon cycle diagram with arrows and descriptions showing fluxes between the pools. Once the carbon cycle diagram is complete, you will present to others in the class the information learned during your research on your pool and the flux or fluxes that link it to other pools. At the end of this project, you should have a fairly comprehensive understanding of the entire carbon cycle.

Your write up should include the following:

* Describe the pool, including the chemical name and type of (organic or inorganic) carbon found in it.
* Where does this pool occur in the biosphere and geosphere?
* How important it is relative to other pools in the carbon cycle?
* What is the **residence time** of carbon in the pool?
* Which flux(es) contribute to this pool and which flux(es) reduce the carbon in this pool (i.e., which arrows lead in and out of your pool)?
* What is the correct chemical equation to describe the flux that creates this pool? (You may use approximations such as CH2O for organic carbon.)
* What is the rate of the flux, with correct units?
* How does this flux affect or control atmospheric CO2?

Please upload a copy of your summary of this assignment on Google Docs. Make sure you have created a Folder labeled “Topic 4 Ecology” with a sub folder labeled “Topic 4.3 Carbon Cycling”

Your score on this assignment will be determined as follows:

* Up to 20 points for the write up on your pool (2 pts. for each bullet point above plus 2 pts. each for overall construction of your paragraphs and proper citations)
* Up to 10 points for the illustration of your pool (pictures, labels and other text that explains the pool)
* Up to 10 points for collaborative work to create a whole-class carbon cycle, including labeled fluxes
* Up to 10 points for your presentation of your pool and associated flux

**References**:

Allott, A. and Mindorff, D. 2014. *Biology course companion: 2014 edition*. Oxford, U.K.: Oxford University Press.

Hastings, D. 2006. *Understanding the carbon cycle: A jigsaw approach*. Retrieved on Oct. 5, 2014, from <http://serc.carleton.edu/NAGTWorkshops/climatechange/activities/15162.html>

|  |  |  |
| --- | --- | --- |
|  | **Statement** |  |
| 4.3.U1 | Autotrophs convert carbon dioxide into carbohydrates and other carbon compounds, | |
| 4.3.U2 | In aquatic habitats carbon dioxide is present as a dissolved gas and hydrogen carbonate ions | |
| 4.3.U3 | Carbon dioxide diffuses from the atmosphere or water into autotrophs | |
| 4.3.U4 | Carbon dioxide is produced by respiration and diffuses out of organisms into water or the atmosphere | |
| 4.3.U5 | Methane I produced rom organic matter in anaerobic conditions by methanogenic archaeans and some diffuses into the atmosphere | |
| 4.3.U6 | Methane is oxidized to carbon dioxide and water in the atmosphere | |
| 4.3.U7 | Peat forms when organic matter is not fully decomposed because of anaerobic conditions in waterlogged soil | |
| 4.3.U8 | Partially decomposed organic matter from past geological eras was converted into oil and gas in porous rock or into coal | |
| 4.3.U9 | Carbon dioxide is produced by the combustion of biomass and fossilized organic matter. | |
| 4.3.U10 | Animals such as reef-building corals and molluscs have hard parts that are composed of calcium carbonate and can become fossilized in limestone. | |