OCEAN ACIDIFICATION/CARBON CYCLE/CLIMATE CHANGE TEACHER INSTRUCTIONS

Pre-Session

1. Make copies of student data sheet.
2. Break whole oyster shells into smaller pieces.
3. Obtain solutions for oyster shell experiment.

Session Procedure

Discussion points:

1. Oceans are affected by climate change. Increased CO_2 in our earth's atmosphere is one of the main culprits causing change of our global climate and in our oceans.
2. What is CO_2? What is Carbon? (element which is the building blocks of all living things)
3. How does Carbon get released into the atmosphere? (see slide)
4. Once in the atmosphere, C mixes with O_2, and becomes carbon dioxide. Believe it or not, CO_2 is readily absorbed by the oceans.
5. When CO2 is absorbed by the ocean water, it causes the water to become more acidic.
6. Discuss equation: $CO_2 + H_2O \rightarrow H_2CO_3$
    a. "Carbon dioxide plus water yields carbonic acid."
7. We measure how acidic or basic something is using the pH scale. The pH scale is 1-14, with 7 being neutral, neither acidic nor basic. Less than 7 is acidic; greater than 7 is basic. Pure water has a pH of 7.

Soda Siphon Experiment

<u>Introduction</u>
This experiment demonstrates what is happening in the world's oceans as a result of excess CO_2 in the atmosphere as if it were on fast forward. Remember that most changes on a global scale take quite a bit of time to occur. It's also important to remember that organisms are adapted to live in a certain set of environmental conditions (temperature, pH, salinity, food supply ect) and can tolerate a certain range of variability in those conditions. Some organisms are more sensitive than others; some can tolerate a wider range of conditions than others.

In the case of ocean acidification, it only takes a very small decrease in pH (an increase in acidity) to affect the fragile organisms-such as plankton-that form the base of the marine food web. Sturdier organisms, such as oysters may not be affected as quickly or until a lower pH is reached.

Procedure:

1. Begin with the introduction following a discussion about CO_2 in the atmosphere.

2. Ask a student to use the pH meter to measure and record the starting pH of the water. Pour the water into the soda siphon.

3. Insert the CO_2 cartridge into the siphon. Before cracking it, ask the students a few questions; perhaps:
    a. What state is the CO2 in inside the metal casing? (gas)
    b. What do you think will happen to the pH? (it will go down, become more acidic.)
    c. What will the water look like? (the same but with bubbles like soda)

4. Crack the cartridge. Pour the water back into the jar.

5. Ask a student to measure the pH. Record.

6. Discuss/confirm what happened. Review the equation $CO_2 + H_2O \rightarrow H_2CO_3$
    a. What did we create in our water by adding CO_2? (Carbonic acid.)

Oyster Shell Experiment
*See student worksheet for complete instructions

1. Break group into pairs. Assign each a solution (coke, soda water or ocean water).

2. Show list of materials needed. Have one person in each pair collect the items.

3. Each group needs a worksheet, jar w/ lid, shell, pH meter and digital scale.

4. Students follow procedure on Part A of the worksheet. Instructors should help make sure the students understand how to zero the scale and set it to grams.

5. Students need to see an instructor for their solution. Be sure that the worksheet is completed before giving out the solutions

Carbon Clean Up Obstacle Course

Instructions and documents can be found at:
http://wildbc.org/index.php/programs/climate-change-education/

Climate Change Bingo

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http://wildbc.org/index.php/programs/climate-change-education/