

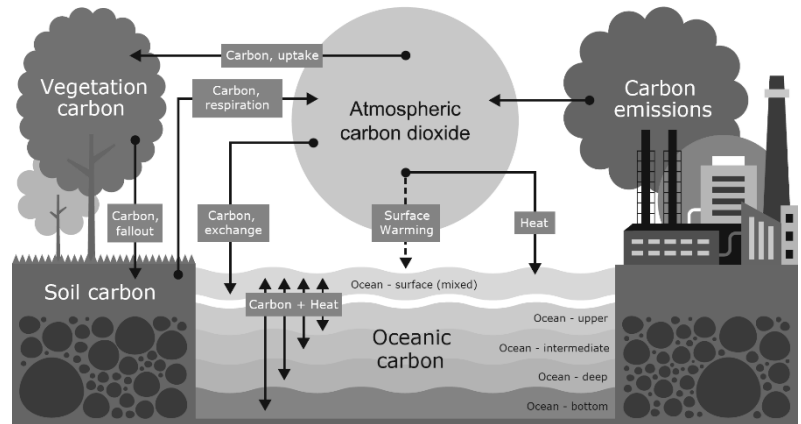
OCEAN ACIDIFICATION LAB PT. 1

Oceans and the Carbon Cycle

Name: _____ Date: _____ Block: _____

Introduction:

Many people have never seen an ocean, yet no matter where each of us lives on Planet Earth, we depend on the health of the oceans in so many ways—for food, recreation, jobs, shipping of goods, medicine, and simply for the wonder of ocean exploration and the discoveries yet to be made. But, we also depend on the oceans to absorb approximately **92 gigatons** of carbon dioxide from the atmosphere each year. As humans have added more and more carbon dioxide to the atmosphere by burning fossil fuels, oceans have responded by absorbing more and more carbon dioxide. Indeed, the oceans have absorbed about half all of the extra carbon dioxide people have put into the air over the last **150 years!**



Procedure:

1. Go to <http://serc.carleton.edu/eslabs/carbon/6a.html>
2. Read part A, review the diagram and answer the questions below.

CHECKING-IN QUESTIONS- Mark only the correct answers on your answer sheet.

1. Which areas of the ocean are absorbing more CO₂ from the air? **Choose all that apply.**
 - a. Cold northern oceans
 - b. Warm equatorial (tropical) waters
 - c. Cold southern oceans
2. Which general areas of the oceans have low amounts of CO₂ diffusing into sea surface waters? **Choose all that apply.**
 - a. Cold southern oceans
 - b. Cold northern oceans
 - c. Warm equatorial (tropical) water
3. Parts of the ocean that behave as strong carbon sinks are: **Choose all that apply.**
 - a. The cold Southern Ocean
 - b. The cold North Atlantic ocean
 - c. Warm equatorial (tropical) water

4. True or false:

_____ More CO₂ diffuses and dissolves in colder sea surface water and less CO₂ diffuses and dissolves in warmer water.

_____ Sea surface waters have become slightly warmer as the climate warms. If this continues, you would expect concentrations of CO₂ in the atmosphere to decrease.

DISCUSSION QUESTIONS– Continue reading. Answer the following discussion questions.

Re-examine the Ocean CO₂ flux map and compare it to the Deep Ocean Conveyor Belt Map.

1. What patterns if any, do you see that are the same in both maps?
2. Explain how a CO₂ molecule that diffuses into the ocean in the North Atlantic Ocean could eventually diffuse into the atmosphere off the eastern coast of Africa hundreds of years later.
3. Describe the physical pump's role in enabling the ocean to be a carbon sink.

 **Continue reading and completing the interactive lab, stopping to answer the Check in questions.**

DISCUSSION QUESTIONS– After reading about phytoplankton, answer the following discussion questions.

1. As the carbon moves down through the biological pump, less and less carbon actually makes it down into the deep ocean. **How** do microbes and zooplankton reduce the amount of carbon that eventually sinks to the ocean bottom?
2. Why are particles such as marine snow so important in bringing carbon down into the twilight and deep ocean zones?

 **Continue reading and completing the interactive lab, stopping to answer the Check in questions.**

CHECKING-IN QUESTIONS– Mark only the correct answers on your answer sheet.

1. Shell-builders use calcium carbonate molecules (CaCO₃) to build their shells. Which of the following could be a source for the carbon atom in the calcium carbonate (CaCO₃) molecules? **Choose all that apply.**
 - a. Respiration by organisms such as plants, animals and microbes
 - b. Burning coal
 - c. Calcium ions
 - d. Car exhaust
 - e. Wildfires

 Continue reading and completing the interactive lab, stopping to answer the Check in questions.

CHECKING-IN QUESTIONS- Mark only the correct answers on your answer sheet.

1. Name all of the places in the ocean that you would find carbon. **Choose all that apply.**

 - a. Fecal pellets and other particles
 - b. Phytoplankton and other members of the food web
 - c. Carried in downwelling and upwelling currents
 - d. Sea floor sediments
 - e. In shells

DISCUSSION QUESTIONS- STOP & THINK. Answer the following discussion questions.

1. Underline or circle the correct answer in the dichotomous choices in **boldtype**

If phytoplankton populations decrease, you might expect:

- The amount of CO2 in the atmosphere would **increase/decrease**.

Explain: _____

- The amount of carbon moving down to be stored in deep ocean sediments would **increase/decrease**.

Explain: _____

2. Choose two of the following and **describe their role** in the ocean's biological pump.

- phytoplankton
- food webs
- microbes
- zooplankton
- shells

4. How are marine phytoplankton and forests similar in their role in the carbon cycle?
