24.4 Oceans

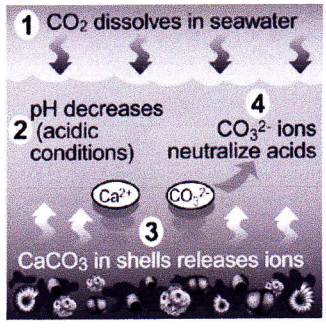
Question: How does carbon dioxide affect the oceans?

In this Investigation, you will:

1. Identify how carbon dioxide affects the pH of solutions.
2. Explore how calcium carbonate acts as a buffer in the oceans.

The oceans contain a natural *buffer* called calcium carbonate. A buffer is a substance that helps maintain the pH of a solution. When carbon dioxide (CO_2) from the atmosphere dissolves into seawater, it produces acidic conditions. However, the pH of the oceans remains relatively stable because of the calcium carbonate buffer system.

In this Investigation, you will observe what happens when CO_2 dissolves in water. You will then conduct an experiment to test how a buffer works.



1 How does carbon dioxide affect the pH of solutions?

1. Obtain a pH meter and two clean beakers. Choose members of your group for the following roles:
   - Bubbler: blows bubbles into the beaker;
   - Timer: keeps track of time in 10-second intervals; and
   - Recorder: records the pH reading from the meter every 10 seconds.
2. Obtain a beaker and fill it 1/2 full of tap water.
3. Immerse a pH meter into the beaker and turn it on.
4. Wait a few moments until the pH reading on the meter stabilizes. Record the pH in "initial" row under the "tap water" column of Table 1. (Your teacher will give you a handout with a larger table.)
5. The timer should start the clock while the bubbler gently blows bubbles into the beaker with a straw. This is the source of CO_2 in the experiment.
6. Record the pH reading from the meter every 10 seconds for a total of two minutes.
7. Remove the pH meter, turn it off, and rinse it with tap water.
8. Obtain another beaker and fill it 1/2 full of tap water. Add one calcium carbonate antacid tablet to the beaker.
9. Repeat steps 3 through 7 and record your results in the "calcium carbonate" column of Table 1.

Table 1: The effect of carbon dioxide on pH

Time (sec)	Tap water (pH)	Calcium carbonate (pH)
initial		

a. How does adding carbon dioxide to a solution affect its pH?

b. In which beaker did the pH change the fastest?

c. How did the calcium carbonate tablet affect pH changes in the second beaker?