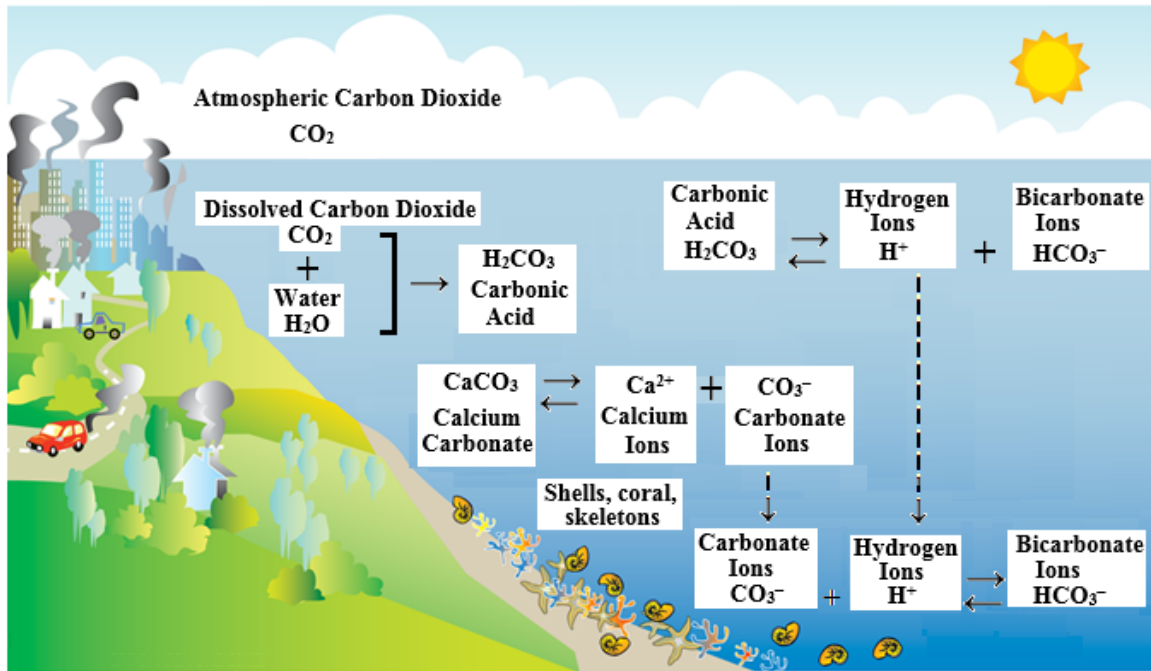


Lab: Ocean Acidification

Name: _____

Period: _____

Objective: To determine the effect of solution pH on an egg shell and make predictions as to the environmental consequences of ocean pH on marine life.



Pre-Lab Questions:

(1) What contributes to atmospheric carbon dioxide? Give two examples. _____ and _____

(2) (a) What is the name of the acid that is formed when carbon dioxide reacts with water? _____

(b) Give the balanced chemical equation for this reaction.

(3) (a) When carbonic acid dissociates, which product affects the pH of the solution? _____

(b) What is the effect on pH as the concentration of this product increases in solution? _____

(4) Of what chemical is an eggshell (and other shells) primarily composed? _____

(b) Give the equilibrium reaction for this chemical in an aqueous environment.

(5) (a) As hydrogen ions are added to water, what chemical do they react with? _____

(b) How does this affect the concentration of the carbonate ion? _____

(c) What is the resulting shift on the equilibrium reaction? _____

(d) How does the amount of calcium carbonate change as a result of this shift? _____

(e) What is the biological consequence that occurs as a result of this shift in equilibrium? _____

Procedure:

- (1) Obtain an eggshell. Divide into three samples of approximately equal mass, within 0.05 grams. Record the mass of each sample.
- (2) Obtain three cups labelled "1", "2", and "3". Fill cup 1 and 2 approximately halfway with distilled water and fill cup 3 approximately halfway with vinegar.
- (3) Using a straw, blow air into the water in cup 2 to make the solution is acidic. This will require approximately 15 to 20 large breaths (take breaks between breaths to avoid feeling light-headed).
- (4) Using pH paper measure and record the approximate pH of the solution in each of the cups.
- (5) Add one of the eggshell samples into each of the three cups. Make sure the eggshell is completely submerged; break into smaller pieces if necessary. Leave the eggshells in the solutions for approximately 30 minutes. After 30 minutes, record observations of the three samples. Note: You may touch the eggs but do not remove any of the sample pieces. Allow the cups to sit overnight.
- (6) After about 24 hours have passed: Observe the eggshell samples and record. Empty the liquid from the cups and allow the egg shells samples to dry on a paper towel. Make sure you label the egg shell samples appropriately.
- (7) After the eggshell samples have completely dried, determine the mass of each sample and record. Use a weigh paper when placing each sample on the electronic balance.
- (8) Discard the materials in the garbage.

| Data: | Cup 1 water | Cup 2 water + breath | Cup 3 vinegar |
|--------------------------------|-----------------------|--------------------------------|-------------------------|
| Initial Mass of eggshell (g) | | | |
| pH | | | |
| Observations after 30 minutes | | | |
| Observations after 24 hours | | | |
| Final mass of eggshell (g) | | | |
| Change in mass of eggshell (g) | | | |

Questions:

- (1) (a) What was added to the cup in step 3 when you blew into the water? _____
(b) What substance was formed when this chemical reacted with water? _____
(c) How did this affect the pH of the solution? _____
- (2) Which solution was the most acidic? _____
- (3) How did the acidity of the solution affect the eggshell sample? _____
- (4) Which eggshell changed mass the most? What factor in the solution contributed to this change? _____
- (5) What prediction can you make about the solubility of calcium carbonate and the acidity/pH of a solution? _____

Conclusion:

What did blowing in the straw represent in the "real world"? What implications does this have for marine life?