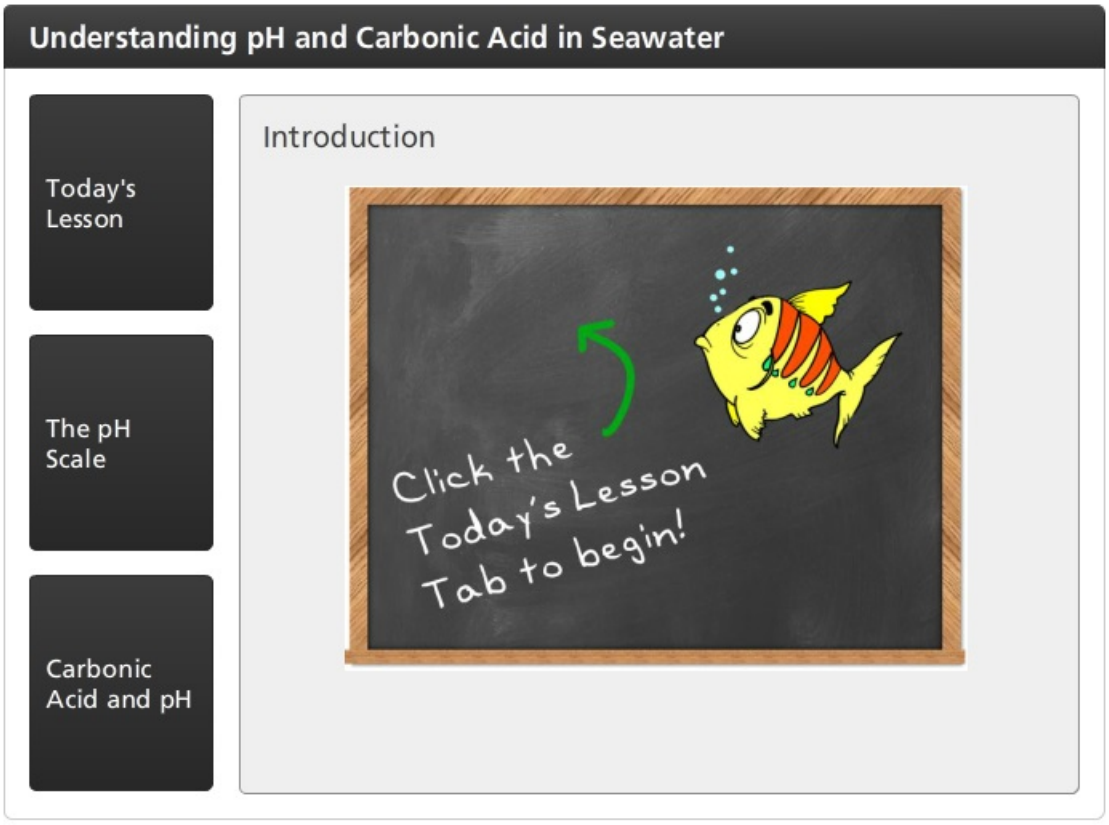
Module 6: Ocean Water Chemistry
Topic 6 Content: Understanding pH and Carbonic Acid in Seawater



Click the Today's Lesson Tab to begin!

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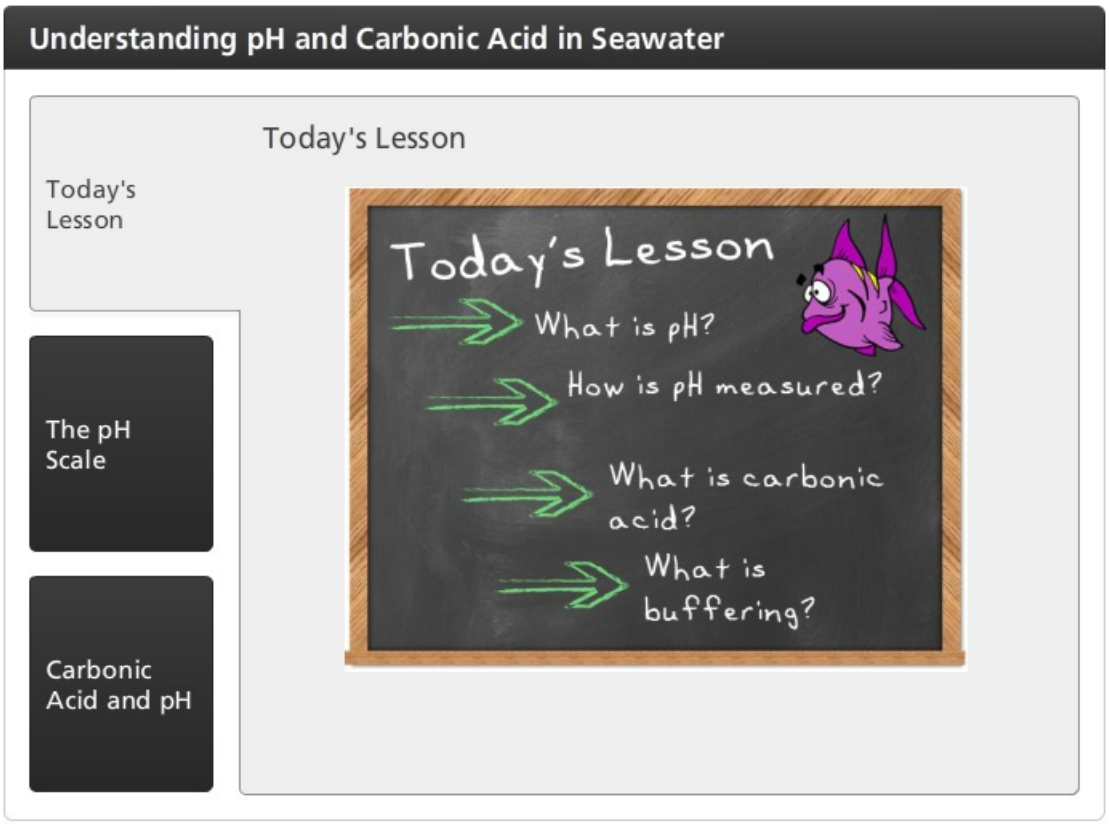

Today's Lesson

- What is pH?
- How is pH measured?
- What is carbonic acid?
- What is buffering?

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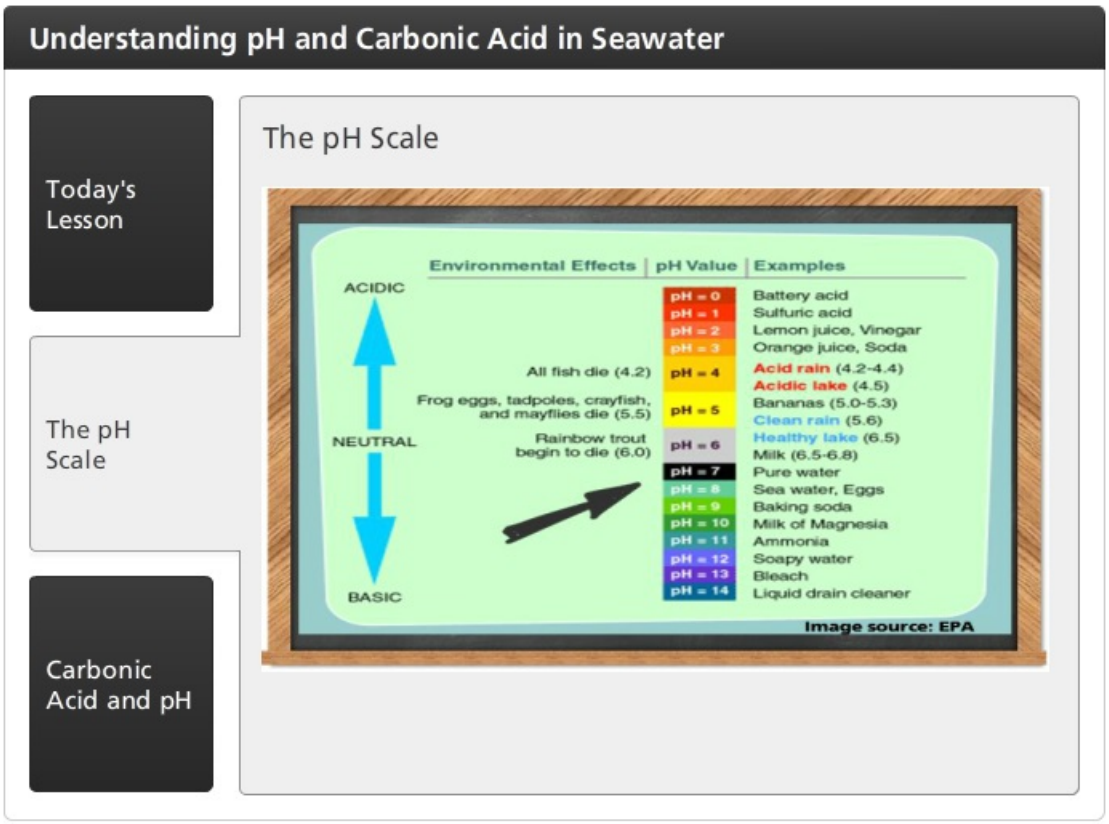

This diagram from the Environmental Protection Agency outlines the pH scale, which ranges from very acidic at 0 to very basic at 14. For each value of 1 indicated on the scale, the pH increases by 10 times. Listed on the right are everyday items, such as lemon juice, which has an acidic pH value of 2 and soapy water, which is basic with a pH value of 12. Pure water has a neutral pH value of 7. Whereas, seawater is slightly basic or alkaline. As indicated in the diagram seawater has a pH of about 8.1. So, now you know the pH of seawater, but was does pH value actually represent? Well, the pH scale is a measure of the amount of hydrogen ions in a solution. From where do these hydrogen ions originate and how do they get into seawater? Click on the carbonic acid and pH tab to find out.

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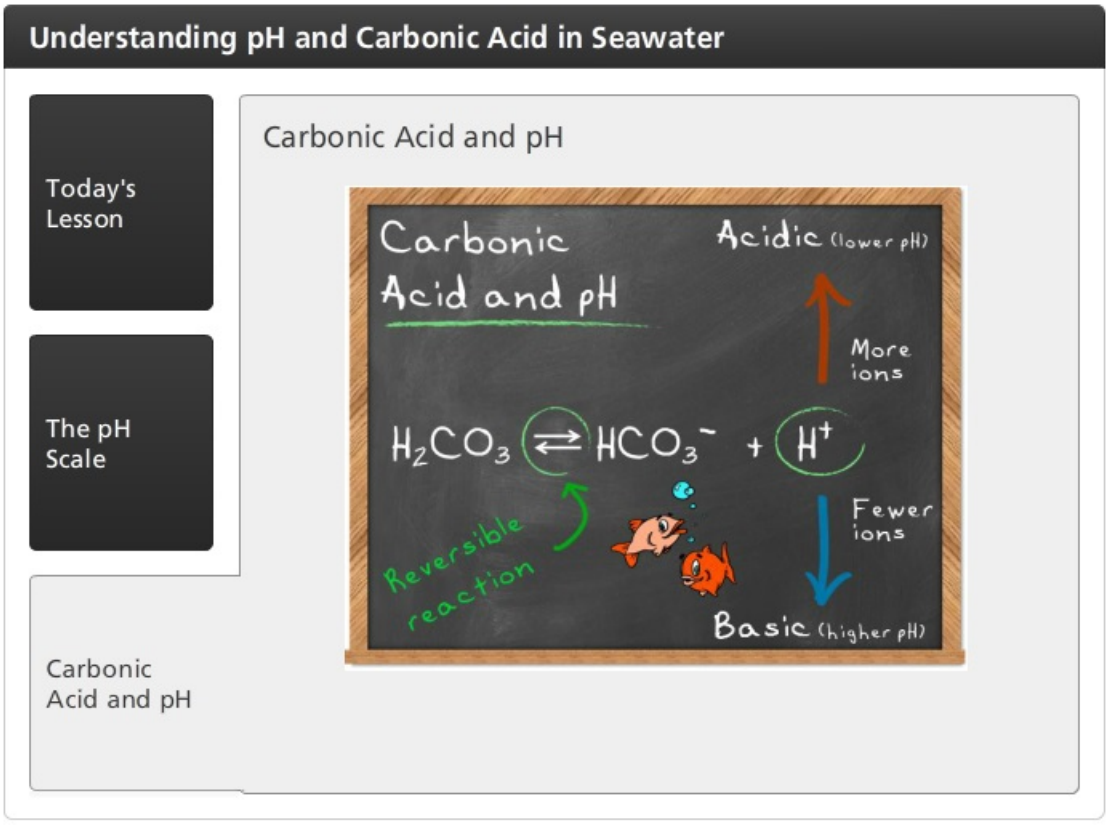

The pH of seawater remains relatively constant due to the buffering action of carbonic acid, which forms when carbon dioxide mixes with water. As shown in this chemical equation, carbonic acid dissociates into negatively charged bicarbonate ions (HCO3 minus) and positively charged hydrogen ions (H plus.) The pH scale indicates the measure of these free hydrogen ions. Why is this important? The quantity of hydrogen ions controls the pH of the water. Adding more hydrogen ions lowers the pH of water causing it to become more acidic. Whereas, removing hydrogen ions raises the pH causing the water to become more basic. As indicated by the double arrows in the equation, this chemical reaction is reversible. That is, if the seawater becomes too acidic, hydrogen ions can rejoin bicarbonate ions to form carbonic acid again. Reversing the chemical reaction results in fewer hydrogen ions and, thus, less acidity.