



High School Science Virtual Learning

Environmental Science

Ocean Acidification

May 6, 2020



High School Environmental Science

Lesson: May 6, 2020

Objective/Learning Target:

Students will identify the effects of climate change on ocean acidification.



1. How much of all water in the world is freshwater? Of that percentage how much is frozen?
2. How high would sea levels rise if all the ice on land melted and why is that detrimental to mankind?

1. 3% of the water in the world is freshwater with 70% of that 3% being frozen.
2. The sea levels would rise 70 meters displacing roughly half of the world's population.



Lesson Activity:

Directions:

1. Watch the video and read the article that are linked below. As you do so, take careful notes about ocean acidification, what it is, and what causes/leads to it.
2. Write out a short explanation that you could use with others to explain what ocean acidification is and what causes it. Your explanation should be easy to understand to someone who has a limited background in the subject and should take no longer than 5 minutes to get through.
3. Use this information to answer the questions on the following pages.

Link(s):

[Video](#)

[Article](#)



Practice

You will use the information from the activity on slide 5 to answer the following questions.

Practice Questions

1. What is the pH of distilled water? What is the pH of carbonated water?
2. Why is there a difference in pH levels of distilled water and carbonated water?
3. When you add extra carbon dioxide what happens to the pH?
4. What happens to organisms when you decrease the pH they live in?
5. How much has the pH changes since the industrial revolution?

Answer Key

Once you have completed the practice questions check with the work.

1. Distilled water will be around 7 while carbonated water will be lower.
2. When CO_2 is added to water it creates carbonic acid which will then lose its hydrogen atoms to become carbonate. The extra hydrogen atoms in the water makes it more acidic therefore giving it a lower pH.
3. The more CO_2 added the more hydrogen ions we would have causing pH to decrease.
4. Organisms metabolism and immune response can decrease with a decrease in pH.
5. The pH has moved from 8.25 to 8.14. This doesn't seem like much, but since it is a log scale it equals about 30% change in the pH.



More Practice

You will use the information from the activity on slide 5 to answer the following questions.



More Practice Questions

1. How much carbon dioxide that is released into the atmosphere is absorbed by the ocean?
2. What is carbonic acid?
3. Why is ocean acidification such an issue for shelled organisms?
4. What effect does pH have on shells and skeletons?
5. What is the effect of pH on algae and seaweed?

Answer Key

Once you have completed the practice questions check with the work.

1. The ocean absorbs about 30% of the carbon dioxide (CO_2) that is released in the atmosphere.
2. Water and carbon dioxide combine to form carbonic acid (H_2CO_3), a weak acid that breaks (or “dissociates”) into hydrogen ions (H^+) and bicarbonate ions (HCO_3^-).
3. As ocean acidification increases, available carbonate ions (CO_3^{2-}) bond with excess hydrogen, resulting in fewer carbonate ions available for calcifying organisms to build and maintain their shells, skeletons, and other calcium carbonate structures.
4. If the pH gets too low, shells and skeletons can even begin to dissolve.
5. While some species will be harmed by ocean acidification, algae and seagrasses may benefit from higher CO_2 conditions in the ocean, as they require CO_2 for photosynthesis just like plants on land.



Extra Resources

Interested in the chemistry that leads to ocean acidification? This article explains just that: [Chemistry Behind Ocean Acidification](#)

Here is more information about ocean acidification and its impacts: [Ocean Acidification](#)

Want more information on how ocean acidification happens? Here is a video that explains it: [What is Ocean Acidification?](#)