Name: _____-- Date: _____ Period: _____

Ocean Acidification Lab Questions
****Please Turn-In This Assignment****

Directions: Visit each station and complete the directions and questions associated with the station.

Green Station: Shells

Background information: The pH of the ocean is becoming slightly more acidic with an increase in carbon dioxide in the atmosphere and this may have an effect on ocean animals. Shells and coral are sensitive to slight changes in pH.

Name 3 animals that you know about who live in the ocean and have shells:
1. _____ 2. _____ 3. _____

Why is the shell important? _____

Question: What effect do you think an acid (like vinegar) will have on a shell?

Hypothesis: I think the vinegar will make the shell _____
(***Pick One:*** *Dissolve, Grow, Change Color by getting spots)*

Procedure: As a group, take **one** small sample of a broken shell and drop it into the vinegar testing solution.

1. What do you notice when you added the shell to the vinegar?
_____
_____
_____

Remove the shell from the vinegar solution with the tweezers and please dispose of the shell in the trash can. Remove the covering of the 1-day and 2 day-old shell. Investigate the effects.

2. What happened to the shell after 1 day in the vinegar?
_____
_____
_____

3. What happened to the shell after 2 days in the vinegar?
_____
_____
_____

4. What do you think will happen to an animal's shell if the pH of the ocean becomes more acidic?
_____
_____
_____

5. How do you think acidification of the ocean will affect marine life?
_____
_____
_____

Please recover the 1-day and 2 day-old shell for the next group!

Black Station: History

1. Why did scientists at first think that dissolved carbon dioxide in the ocean was a good thing?

_____

_____

2. How has the ocean's pH changed since the industrial revolution?

_____

_____

3. How much is it expected to change by the end of the century?

_____

_____

4. That doesn't seem like a very big drop in pH. Why does a small change in pH and acidity matter?

_____

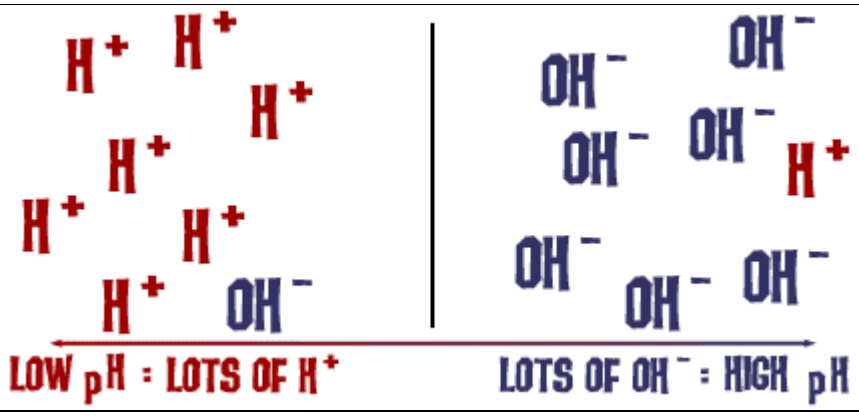
_____

Calculate it! Explore calculating pH by using the following formula and a calculator. Show your work!

$$pH = - \log [H^+]$$

The **$[H^+]$** represents the amount of hydrogen ions in the water. The more hydrogen ions you have and the more acidic your solution is.

Note: The presence of OH^- represents solution that are basic.



5. If $[H^+] = 0.0000025$ what is the pH?

6. Now what if we had just a little bit less hydrogen ions. If $[H^+] = 0.000025$ what is the pH?

Purple Station: Acidification Process

Background information: Nearly half the CO_2 produced by human activities in the last 200 years has been absorbed by the ocean. The ocean is now becoming more acidic as a result. When CO_2 dissolves into water, it forms carbonic acid. As pH decreases (becomes more acidic), it decreases the ability of shellfish to make their shells and corals to build their skeletons.

pH can be measured using what is known as the Universal Indicator (UI) where the color will change depending on pH. Fill in the chart below using the information at the station:

pH	1 (Acidic)	4	6	7 (Neutral)	10	14 (Basic)
Color Name						

Procedure: As a group prepare one solution by following these steps…

1. Everyone puts on a pair of goggles!
2. Take a clean small beaker
3. Pour the sodium hydroxide liquid into the beaker up to the 20mL mark. The liquid represents the ocean.

What is the color of the solution before UI is added? _____

4. Ask Mrs. Feldmann for the Universal Indicator
5. Carefully add just <u>one</u> drop of Universal Indicator to your beaker

What is the color of the solution after the UI is added? _____ Approximate pH? _____
Note that this starting solution is very basic in order to more easily see the change in pH. The real ocean has a standard pH of approximately 8.2.

6. Carefully add <u>one</u> small piece of the white solid which represents carbon dioxide.

What is the color of the solution after CO_2 is added? _____ Approximate pH? _____

7. Please dump your solution into the waste water bucket and return all supplies to the station.

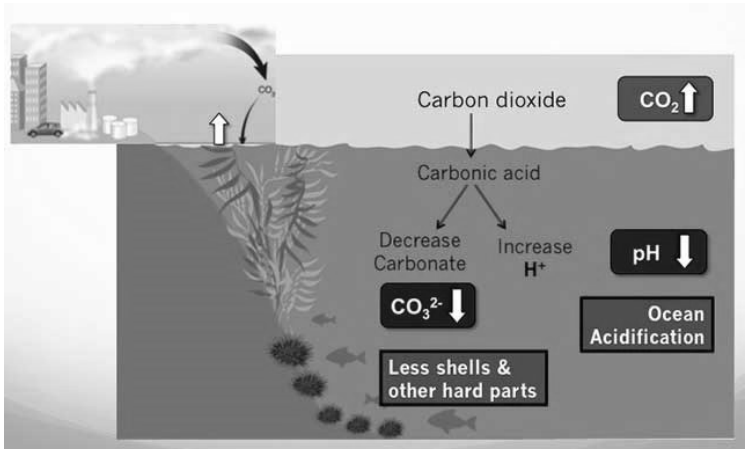
Reflection Questions:

1. Why is it important that some carbon dioxide enters the ocean?

_____
_____
_____
_____
_____
_____

2. What do you think could happen if too much carbon dioxide enters the ocean?

_____
_____
_____
_____
_____
_____



Blue Station: Coral Reefs

Background: A coral reef is a community of living organisms. It is made up of plants, fish, and many other creatures. Coral reefs are some of the most diverse ecosystems in the world. They are home to about 25% of all marine life!

Procedure: As a group watch the short video on the computer and answer the following questions.

Florida's Coral Reefs Face Altered Oceans: https://www.youtube.com/watch?v=t1AyIs1xNCk

1. According to data from 100 monitoring stations in the Florida Keys, there has been a _____% decline in coral reefs over the past 20 years.

2. It's enough railroad cars stacked end-to-end to wrap around the Earth 7 times. That's how much carbon is going into the ocean every single year. All of that carbon has caused global sea surface temperatures to _____ by about 1.5° F over the last century.

3. Acidification acts a lot like Osteoporosis does in humans. But in marine animals, it makes their shells and skeletons brittle. The more _____ the water, the harder it is for coral's to grow their skeletons.

4. There are some corals species that may be able to _____ to high CO_2. And that corals can recover if pH levels can be raised.

5. The decline of coral reefs have ecological and economic consequences. Coral reefs are the most biodiverse ecosystem in the world. With more than 500 species of fish living on Florida's reefs, less coral has a ripple effect up the _____ _____.

Red Station: Possible Solutions

Background: Ocean acidification is an emerging global problem. Over the last decade, there has been much focus in the ocean science community on studying the potential impacts of ocean acidification.

Procedure: Read the article at the station and answer the question below:

1. Describe the three solutions highlighted in the article to limit and reduce ocean acidification.

(1)_____
_____
_____
_____

(2)_____
_____
_____
_____

(3)_____
_____
_____
_____