BI-165C LAB REPORT #1
NAME _____

EXERCISE 1

Oceanography

Introduction
To investigate the principles of Oceanography and our Oregon coastal regions, you will complete a variety of exercises including answering questions based on diagrams, searching websites, and research current trends. You will also use data collected on our field trips to analyze our coastal oceanographic parameters. You will need access to a few materials so read ahead and make sure you have what you need.

EXERCISE 1.3
Ocean Acidity

The pH scale measure the acidity or alkalinity of a solution by measuring the concentration of hydrogen ions it contains. The more hydrogen ions there are, the more acidic the solution. **Refer to Figure 5.20 on page 150 of your textbook**.

The pH scale goes from 0-14. It is logarithmic, which means that for each number difference on the scale there is a 10-fold change in the amount of hydrogen ions.

1. What is the pH of pure water (completely natural)? _____
   What about rainwater? _____ What about sea water? _____

2. What is the stronger acid, black coffee or lemon juice?
   _____

3. Complete the following sentence: The **lower** the number is on the pH scale, the _____ (more or less) acidic the solution is.

Carbon Dioxide and the pH of Water: When carbon dioxide (a gas) dissolves in water it can change the pH of water. You will complete a simple experiment showing this principle.

Obtain a 250 mL Flask filled with a solution of 150mL distilled water + 15 mL Bromothymol blue 0.2%. Bromothymol blue is an acid-base indicator. It is blue in neutral solutions and turn to green and yellow as the pH changes. Test the ph of the solution using a strip of pH paper and record below:

Color	pH of Solution

Insert a straw into the solution allowing the end to touch the bottom of the beaker. Take a deep breath and **blow** slowly into the solution in a controlled manner. ***Caution: do not suck solution into your mouth.*** Repeat the process until a total of 5 breaths have been blown (you may have a team of people to help you). Test the ph of the solution using a strip of pH paper and record below:

Color	pH of Solution

1. Describe how the color of your solution has changed.

2. What was the change in the pH of the solution? In other words, did the solution become more acidic or more alkaline?

3. What is in your breath that could account for the change in pH?

4. Where is carbon dioxide found in nature? (refer to Chapter 16)

5. What are some of the man-made causes of excessive carbon dioxide in the atmosphere?

The acid that you have made by bubbling CO_2 into the water is called **carbonic acid**. This is the same process that is occurring as CO_2 dissolves in ocean water from the atmosphere.
Fill in the following chemical equation by counting the total of each element on the left side and filling them into the right side: *(Remember that if the chemical symbol does not have a subscript number after it,that means there is only*

H2O (water) + **CO2** (carbon dioxide) ⟶ **H_CO_** (carbonic acid)

The chemical formula for carbonic acid is: _____

Referring to Table 16.1 on page 478, record the levels of CO2:

	Pre-Industrial (circa 1750)	Present Concentration	Current Rate of Increase (%/yr)
CO_2			

Acids can have a profound effect on marine animals and plants that have shells made of calcium carbonate. In this part, you will investigate that effect. Using a pH strip,

record the pH of the vinegar you are using:
_____

PROCEDURE:
Gather the following materials:

- Shell fragments from at least three different shelled mollusks
- 6 contianers (glass or Dixie cup)
- Labels for containers (grease pencil, tape)
- pH solutions (may use vinegars or other phosphate pH solutions)
- pH meter or Litmus paper
- Digital scale

Obtain fragments from three different shelled molluscan species (clam, oyster, scallop, etc). Record their weights and appearances below..

	Shell Weight	Appearance
Species _____		
Species _____		
Species _____		

Choose your pH to test. Recall what the pH of our coastal water was found and compare to the average pH range for our location.

pH of Ocean off our coast_____
Average according to your text _____

What pH solutions would you test? Why? Remember, you will test two solutions.

Develop your hypothesis for this test just focusing on the pH value.

Place each shell fragment in its own container and label with the species, the shell weight and pH solution being tested. Fill the container with enough pH solution to cover the shell. Watch it fizz. The fizzing is the reaction of the calcium carbonate with the acid; it releases carbon dioxide. Let the shell soak for approximately a day. Remove the shell and wash with soap and water to remove the pH solution. Record the changes below.

	Shell Weight			
	Initial Weight	After 1 day	After 1 week	% Weight lose over one week
Species _____				
Species _____				
Species _____				

Analyze your data:
Create an excel graph showing the weights over time for each shell species. Attach the graph to the back of your lab report. Utilize your graph to answer the conclusion questions below.

1. What was the effect of the different pH solutions overall on all the shells?

2. Was there a difference between the different species? What might account for this? Recall the general appearance of the initial shells. Do ridges or other structures perhaps have an influence?

3. Review the Nature article at the following site:
   http://www.nature.com/nature/journal/v437/n7059/abs/nature04095.html

   What is meant by "**Anthropogenic ocean acidification**

   What range of pH changes are they estimating?

4. What does this experiment and the estimates given in the Nature article mean for the shelled animals who live in oceans around the world?

5. Why might the changes not occur consistently across the globe?

6. In what ways is this experiment different than what is happening in our oceans?