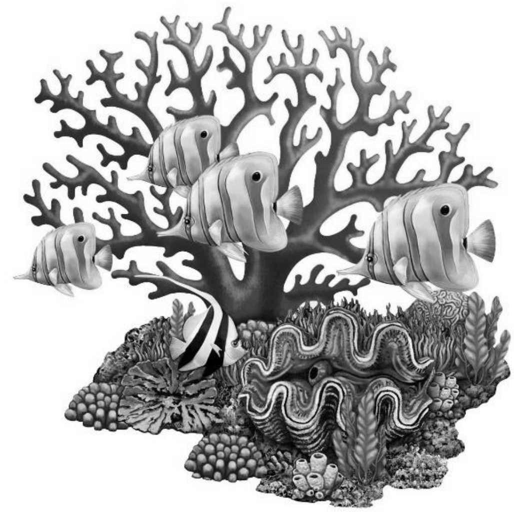
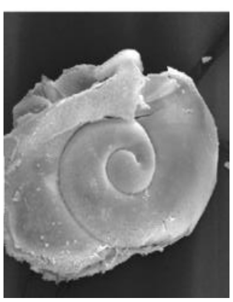
Ocean Acidification Lab Pt. 2
Oceans and the Carbon Cycle

Name: ______________________________ Date: ______________ Block: ________

Introduction:

In the previous lab(s), you learned that oceans currently behave as carbon sinks because they absorb approximately **25-30%** of the **carbon dioxide** put into the atmosphere by human activities. That's a good thing, right? Not necessarily so, as scientists are now discovering. Oceanographers and marine biologists are now seeing a relationship between changes in ocean pH and carbon dioxide dissolved in sea water. Ocean acidity, as measured by pH, has increased by 30% since the industrial revolution and scientists predict pH will continue to change as increasing amounts of carbon dioxide are absorbed by oceans. Because the chemistry of the oceans is important to life, subtle changes in that chemistry may have significant effects on the health of individual species and on entire ecosystems. Corals and other shell-builders such as oysters, lobsters and pteropods may be at risk as ocean pH chemistry becomes more acidic.





What is ocean acidification? The world's oceans play a vital role in keeping the Earth's carbon cycle in balance. As people add more greenhouses gases to the atmosphere by burning fossil fuels, the oceans respond by absorbing more CO_2. *Ocean acidification* occurs when CO_2 is absorbed by seawater causing the water to become more acidic (lowering the pH).

Why is ocean acidification a problem? CO_2 has increased dramatically since people began using fossil fuels, causing ocean acidification. Increasing acidity is a problem because it reduces the ability to make calcium carbonate, which corals, shellfish, and other creatures rely on to produce their hard skeletons and shells. Coral reefs are created in shallow tropical waters by millions of tiny animals called corals. Each coral makes a skeleton for itself and over time these skeletons build up to create coral reefs. Coral reefs are an essential part of our ecosystem.

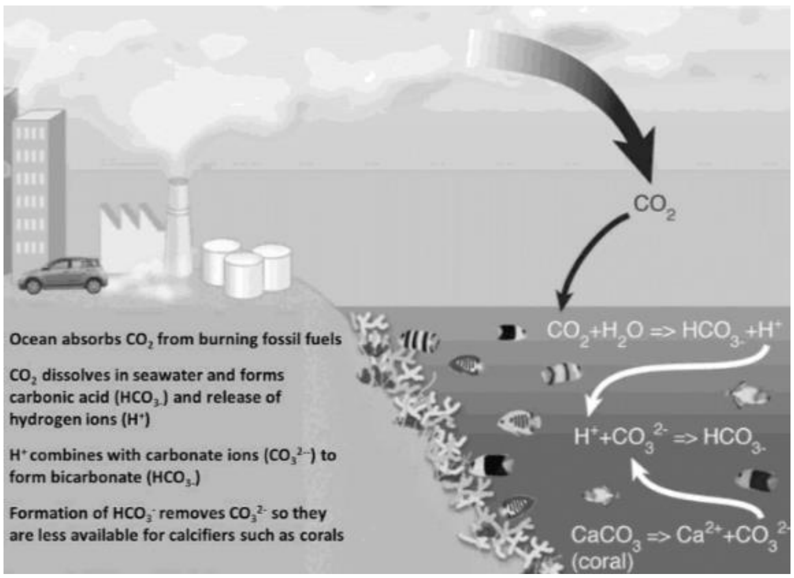
Pre-lab questions:

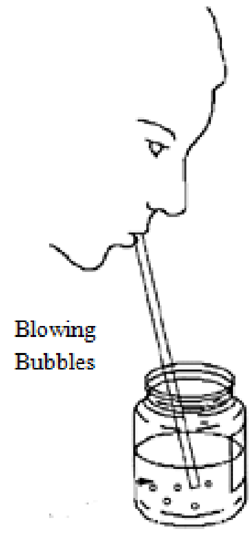
1. Explain what ocean acidification is and why it is happening.

2. Describe ways in which individual species and marine ecosystems might respond to ocean acidification.

3. Describe how ocean acidification may impact the ability of oceans to store carbon in deep sea sediments.

Model Ocean Acidification: Label the diagram demonstrating what each part represents.





Hypothesis: How will the *CO_2 from my breath* affect the cabbage juice *acidity*?

Procedure:

1. Pour about 5mL of cabbage juice into 4 jars (about 1/3 full).
2. Add about 5mL of vinegar to jar #1. Observe and record any changes.
3. Add about 1 gram of baking soda to jar #2. Observe and record any changes.
4. Set aside jar #3 as a *control* jar.
5. Cover jar #4 and use a straw to blow into the other container.
6. Blow CO_2 until you observe a *change in the cabbage juice.*
7. Record your results.

Results:

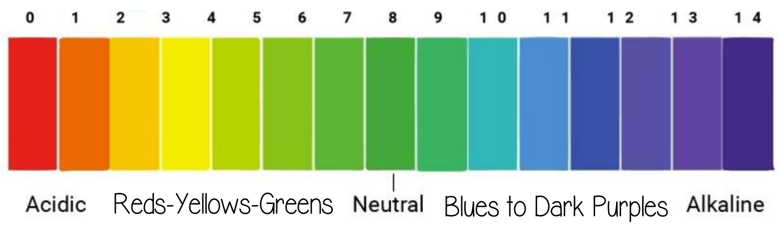
1. Which jar(s) served as the **control group?**

2. Which jar(s) served as the **experimental group?**

3. Record your observations in the table below. **Describe in detail any color changes.**

JAR	CONTENTS	OBSERVATION
1	**Vinegar** + Cabbage Juice	
2	**Baking Soda** + Cabbage Juice	
3	Cabbage Juice	
4	**CO_2 from breath** + Cabbage Juice	

pH Scale:



Discussion Questions:

1. How did the ***acidity*** of the last jar change after blowing CO_2 into it?

2. What steps can we take to limit (reduce) ocean acidification?

3. How is the ***data on the right*** related to ocean acidification? **BE SPECIFIC.**

Figure 3: Source of Reduction in the Carbon-Intensity of US Energy Supply
Actual vs. business-as-usual, 2012