**EXPLORE…Ocean Acidification, Changes in Seaside…**

**8th Grade Science**

**Ms. Forman**

**Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ P:\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_\_\_\_\_\_**

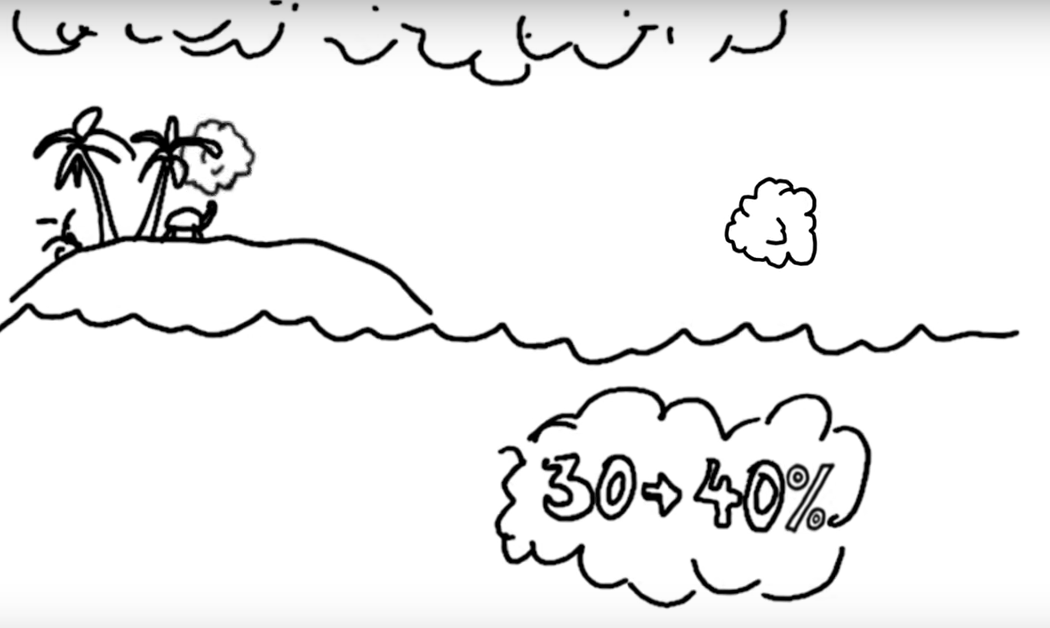
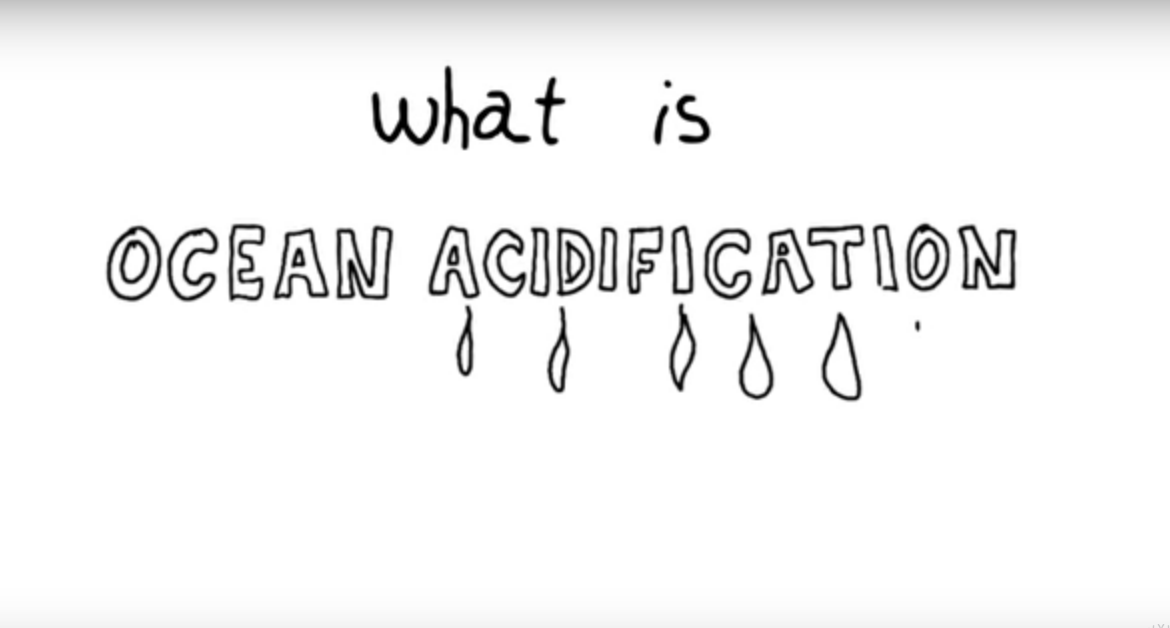
**Objective:** *Students will be able to plan and carry out an investigation regarding the chemistry of our local ocean.*

**Instructions:**

1. Watch the background video, complete the notes
2. Collect our first data set (we will collect in the **fall**, **win­ter**, **spring** and **summer**)
3. Analyze and Interpret Pacific Coast Data that we already have access to
4. Use mathematics and graphs to interpret data
5. Make some observations, construct some explanations based on the data.
6. FINALLY, create a question and hypothesis for our own investigation.

**Background:**

1. Watch the video “Demystifying Ocean Acidification and Biodiversity Impacts”, and complete the video notes below…

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https://www.calacademy.org/explore-science/demystifying-ocean-acidification

**Notes from Video:**

|  |  |
| --- | --- |
| **Basics of CO2 Emissions and Effects:** | **pH Scale:** |
| 1. Of the CO2 created by humans, \_\_\_\_-\_\_\_\_\_% (almost half), dissolves in the \_\_\_\_\_\_\_\_.  2. The rest stays in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, OR it’s incorporated into other living things.  3. The added CO2 causes an increase in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  4. We measure acidity by using \_\_\_\_\_\_. | 1. The pH scale goes from \_\_\_\_ to \_\_\_\_.  2. 0=highly \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  3. 14= highly \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (also known as highly \_\_\_\_\_\_\_\_\_\_\_\_\_)  4. A pH of 7 is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  5. An increase of ACIDITY means the number scale is going \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  6. An increase of ALKALINITY means the number scale is going \_\_\_\_\_\_\_\_\_\_\_.  7. Logarithmic means that the scale changes by factors of \_\_\_\_.  8. That means, a change in one step on the scale is \_\_\_\_\_X, a change in two steps on the scale is \_\_\_\_\_\_\_X.  9. The P stands for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  10. The H stands for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. |
| **Carbon in Seawater:** | **pH Levels:** |
| 1. Between 1751 and 1990s, ocean acidification increase from 8.25 to 8.14, that’s a \_\_\_\_\_\_% hydrogen ion concentration increase in the ocean.  2. CO2 plus H2O leads to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ acid.  3. An increase in hydrogen ions leads to an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in ocean acidity. **That’s the \_\_\_\_\_\_\_\_ point!** | 1. It’s not that the pH levels are changing, it’s that they’re changing \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ than ever!  2. According to geologic history, biodiversity can be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ by increased ocean acidity.  3. Drops in pH can cause destruction of \_\_\_\_\_\_\_\_\_\_\_\_\_\_, by triggering chemical reactions. |
| **Calcium Carbonate:** | **Foramanifera and Coccolithofor:** |
| 1. Many organisms in the ocean use a special building material called \_\_\_\_\_\_\_\_\_\_\_\_\_\_ carbonate.  2. Corals, mollusks and \_\_\_\_\_\_\_\_\_\_\_\_\_ use calcium carbonate.  3. Unfortunately, due to ocean acidification, calcium carbonate is being \_\_\_\_\_\_\_\_\_\_\_\_\_ (this means it is disappearing).  4. No calcium carbonate means that creatures can’t grow or repair their \_\_\_\_\_skeletons. | 1. Forams help create \_\_\_\_\_\_\_\_\_\_\_\_\_, but are deeply affected by ocean \_\_\_\_\_\_\_ levels.  2. Coccolithophores are \_\_\_\_\_\_\_\_\_\_\_-celled algae that are important for feeding phytoplankton (and phytoplankton feed many larger ocean organisms!!)  3. Less coccolithophores may mean that global warming gets \_\_\_\_\_\_\_\_\_\_\_\_. |
| **Increased CO2 effects on larger organisms:** | **Change in Ocean Chemistry:** |
| 1. Increased CO2 above a tank can lead to dissolving of the exoskeletons of \_\_\_\_\_\_\_\_\_\_\_\_, crabs, or \_\_\_\_\_\_\_ stars.  2. Increase CO2 can also lead to something called **hypercapnia,** that messes with the \_\_\_\_\_\_\_\_\_\_\_\_ systems of fish and squids. | 1. Organisms that use echolocation may be impacted because increased CO2 means more ocean \_\_\_\_\_\_\_\_\_\_\_\_\_\_.  2. Acidic environments can interfere with the construction of ear \_\_\_\_\_\_\_\_\_ and balance \_\_\_\_\_\_\_\_\_\_\_\_\_. |



**Ocean acidification is a global problem, which needs global solutions.**

Some solutions to lower YOUR OWN contribution of CO2 include:

1. **Eat less meat** (meat production releases carbon)

2. **Drive less** (this is the number one driver!)

3. **Reduce or stop using plastics** (creating plastics releases carbon)

4. **Buy less STUFF!! No more dollar store!** (Production of anything means CO2 release)

**2. So, WE LIVE ON THE OCEAN!!!**

Does this make you a little bit curious about what the levels might be on OUR COAST!?

How are \_\_\_\_\_\_\_\_\_\_ impacted?

How are \_\_\_\_\_\_\_\_\_\_ impacted?

3. Let’s collect some data. **Ms. Forman will describe how to use the Vernier probes. Please listen carefully ☺**



#3

#2

#1

**Site #1, Seaside Beach**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Date:**  **(04-21-1988)** | **Time:**  **(0930)** | **Temperature of Water: (°C)** | **pH of Water:**  **(# to the nearest tenth)** | **Salinity:**  **(ppt)** | **General Observations:** |
|  |  |  |  |  |  |

**Site #2, Necanicum River**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Date:**  **(04-21-1988)** | **Time:**  **(0930)** | **Temperature of Water: (°C)** | **pH of Water:**  **(# to the nearest tenth)** | **Salinity:**  **(ppt)** | **General Observations:** |
|  |  |  |  |  |  |

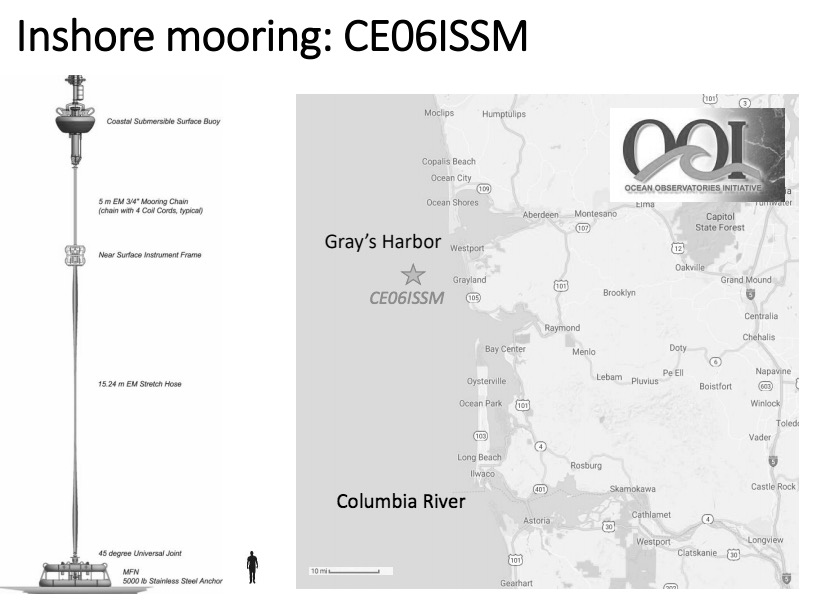
**Site #3, Neawanna Creek**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Date:**  **(04-21-1988)** | **Time:**  **(0930)** | **Temperature of Water: (°C)** | **pH of Water:**  **(# to the nearest tenth)** | **Salinity:**  **(ppt)** | **General Observations:** |
|  |  |  |  |  |  |

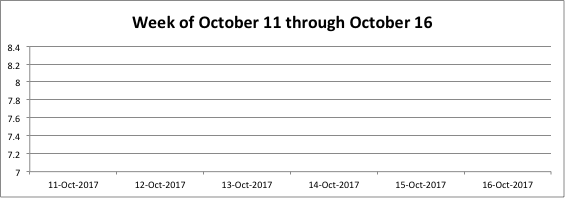
4. When you get back to the classroom, choose one person from your group to enter your data into the class data sheet (on G. Classroom)

5. In the meantime, let’s look at some data gathered locally…***calculate the mean and find the range.***

|  |  |  |  |
| --- | --- | --- | --- |
| **Date** | **pHround** | **Date** | **pHround** |
| 11-Oct-2017 | 8 | 21-Oct-2017 | 7.9 |
| 11-Oct-2017 | 7.8 | 21-Oct-2017 | 7.9 |
| 12-Oct-2017 | 7.9 | 22-Oct-2017 | 7.9 |
| 12-Oct-2017 | 7.7 | 22-Oct-2017 | 7.9 |
| 13-Oct-2017 | 8 | 23-Oct-2017 | 8.1 |
| 13-Oct-2017 | 7.6 | 23-Oct-2017 | 7.7 |
| 14-Oct-2017 | 8.1 | 24-Oct-2017 | 7.9 |
| 14-Oct-2017 | 7.6 | 24-Oct-2017 | 7.7 |
| 15-Oct-2017 | 8.3 | 25-Oct-2017 | 7.8 |
| 15-Oct-2017 | 7.8 | 25-Oct-2017 | 7.8 |
| 16-Oct-2017 | 7.6 | 26-Oct-2017 | 7.7 |
| 16-Oct-2017 | 7.8 | 26-Oct-2017 | 7.4 |
| Average (mean) |  | Average (mean) |  |
| Range |  | Range |  |



***6. Graph it…plot your points and connect them with a trend line. USE A RULER.***



**7. Make some observations.**

|  |  |  |
| --- | --- | --- |
| In one complete sentence, describe what happens to the **pH levels during the first week?** | In one complete sentence, describe what happens to the **pH levels during the second week?** | In one complete sentence, describe the **change** in the pattern of pH level changes. |
|  |  |  |

8. Stability and Change…Cause and Effect…

1. *In the first week there was a stability in the levels…* agree disagree
2. *In the second week there was a change in the pH level pattern…* agree disagree

**I can tell you right now, that the scientist who presented these data DID NOT KNOW why this happened, but she had a theory…do YOU have a theory?**

**Potential Cause:**

**Effect:**

9. Question and Hypothesis…

We are located just south of the mouth of the Necanicum and Neawanna rivers. We will be conducting this data collection during **October, December, March** and **June.** The LAST thing you will do today is to ask a question, and ***create a hypothesis for what you think will happen with levels throughout the seasons.***

|  |  |
| --- | --- |
| Question: | Hypothesis: |
|  |  |