Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Teacher: \_\_\_\_\_\_\_\_\_\_\_\_Period:\_\_\_ Date:\_\_\_\_\_\_\_

**Pre-Assessment for *Ocean Acidification: A Systems Approach to a Global Problem***

*****Instructions:*** *This worksheet will be used as a way to assess your understanding before you begin this new set of lessons. Please try your best to give an answer to every question, even if you need to guess. It is important for us to see where your thinking is now, before beginning new learning activities. Thank you!*

Use the diagram at the right to answer the following questions. Circle the best answer.

1. If the circles (nodes) in the diagram are people, how many people can 1A directly contact?

0 1 2 3 4

1. How many people can contact 1A?

0 1 2 3 4

1. How many people can directly contact 4A?

0 1 2 3 4

1. If 2A sees a funny picture, who else will know about it? (Circle all that apply.)

Nobody 1A 2A 3A 4A

1. Explain how/why a network diagram is a useful tool.

Students should recognize the diagram shows connections and the direction information flows.

1. Various things are listed below. Place an X in front of the things that can be thought of as a system.

\_ X\_\_aquarium \_\_ X\_bicycle \_\_\_\_pile of sand \_ X\_\_ocean \_\_\_\_box of nails

1. Explain your thinking. How did you decide whether something is a system?

When there are interacting components, complexity.

1. What do you think systems thinking is? Describe a time when have you used systems thinking.

When having to consider several (many) parameters at once; figuring out a class schedule for next year.

1. If you were going to do a systems level study, what do you think it would involve?

Consideration of as many factors as possible; collection and analysis of much data; data from many different experiments.

1. Describe an example of an emergent property.

Mix blue with yellow and getting green. Anything where the actions of one or more things produce something unforeseen.

1. Give an example of how your actions have a large impact on the environment.

Buying bottled water and making lots of trash.

1. What are some ways that carbon dioxide gets into our atmosphere?

Breathing out; car exhaust.

1. Explain the connection between carbon dioxide in the air and carbon dioxide in oceans and lakes.

CO2 is a heavy molecule and sinks toward the air/water interface. Air is increasingly composed of CO2 which increases the likelihood of CO2 in water as CO2 is soluble in water.

Students conducted an experiment to determine what causes seeds to germinate the fastest. The students used the same type of seed and water. They placed the six seeds of each test group on a paper towel in a petri dish. The data table below shows the data that they collected over several days on three groups of six seeds.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Test Group | Amount of Water | Temperature | Environmental Condition | Time of germination |
| 1 | 5 ml | 5oC | Dark | 7 days |
| 2 | 10 ml | 25oC | Dark | 6 days |
| 3 | 15 ml | 40oC | Light | 4 days |

1. **What is the best conclusion based on these results? Circle the best answer.**
2. The amount of water and the temperature affect the germination of the seeds.
3. The temperature and the amount of light affect the germination of the seeds.
4. The amount of water, the temperature, and the amount of light affect the germination of the seeds.
5. No conclusion can be made from this data because too many variables were changed.
6. **What would your next experimental step be after these results?**

Choose one variable at a time and do the experiments separately.

1. The “amount of light and temperature” are often coupled in the environment. What do you think this means when experimenting with these factors in the lab? Is this a good thing, a bad thing, or just something that must be considered?

It should be considered because they are connected in the environment.

1. Why are diatoms a good organism for study?*(photo from http://www.ucmp.berkeley.edu)*

They are easy to grow, safe to handle, and indicate the health of an ecosystem.

1. How can you assess the reliability (accuracy and trustworthiness) of something that you are reading, such as a newspaper or online article?

If it is from a peer-reviewed journal, provides evidence to back up claims made by the author, if the author is reputable

1. Which of the following comparisons between pH and a centimeter are true? (Circle all that apply.)
2. pH tells us how acidic or basic something is; centimeters tell us how long or short something is.
3. There are many ways and tools to figure out the pH of something; there are many ways and tools to figure out how many centimeters something is.
4. Both pH and centimeters are measured on linear scales. In other words, when a plant grows from 4.0 centimeters tall to 8.0 centimeters tall, it has doubled in height; when the ocean increases in pH from 4.0 to 8.0, it has doubled in alkalinity (how basic it is).
5. Both pH and centimeters are measured on logarithmic scales. In other words, a solution with a pH of 8.0 is 10 times more alkaline (basic) than a solution with a pH of 7.0, and a string that is 8.0 centimeters long is 10 times longer than a string that is 7.0 centimeters long.
6. Please describe why any of the above is/are NOT true.

pH is measured on a logarithmic scale; length is measured on a linear scale

1. Draw a flow chart or network diagram showing what specifically happens when carbon dioxide (CO2) is produced by anthropogenic processes and makes its way to the sea. (Side note:Anthropogenic definition = of, relating to, or resulting from the influence of human beings on nature). CO2 production should be your first step. Next, include as many steps and as much information as you can in your diagram to show where CO2 goes, any chemical reactions that happen, and what might result. “End” with any effects on various specific sea life and human economies.
2. What grade are you? (Circle your answer.)
3. 9th grade (Freshman)
4. 10th grade (Sophomore)
5. 11th grade (Junior)
6. 12th grade (Senior)
7. College
8. In what course or class are you doing these lessons?
9. What state is your school in? If your school is outside the USA, please skip this question and go on to the next question.
10. If your school is outside the USA, in what country is your school located?