"Save our Shells" - Shells Protocol- Please DO NOT WRITE ON THIS PACKET- PUT DATA INTO NOTEBOOK!

Central Question:
How does a decrease in the pH of seawater affect the **calcium carbonate shells** of animals?

Overview of Experiment:
Shelled organisms and organisms that create calcium carbonate skeletons are threatened by the drop in ocean pH (rise in ocean acidity) related to increased atmospheric carbon dioxide levels. Increasing acidity/lowered pH in ocean water not only causes the shells to dissolve, but it reduces the availability of carbonate ions – which animals use to build their shells and skeletons.

$$Ca^{2+} + CO_3^{2-} \rightarrow CaCO_3$$

Calcium + Carbonate -> Calcium Carbonate

You will observe the effect of an acidic environment on mussel shells through observations and measurements.

Student Pre- lab Questions:

1. How do organisms make their shells? What are shells made of?
2. What do you expect to happen to the shell in an acidic solution such as vinegar?
3. What are sources of carbon dioxide and which of these sources are most likely to affect ocean pH?

Hypothesis:

_____

_____

_____

Role in Group	***Student Name***
Timer	
Recorder	
Materials	
Measuring	

Material Checklist

___ (4) shells (2 untreated and 2 pre-treated in vinegar)
___ 150 mL vinegar
___ 150 mL salt water
___ (1) beaker
___ (1) tweezer
___ (3) paper towels
___ (1) sharpie
___ (1) timer

Lab Procedure

1. MATERIALS: Remove your two untreated shells from their bags.

2. MATERIALS: With a sharpie, label one shell "E' for experimental and one shell "C" for control.

3. RECORDER: Using your data table record your group's initial observations of the control and experimental shell characteristics.

4. MATERIALS: Find the mass of each of the shells.

5. RECORDER: Record the starting masses of both shells on your data table.

6. MEASURING: Pour 150 ml of vinegar into a 500 ml beaker and 150 ml of salt water into a second 500ml beaker.

7. TIMER: Set the timer for 30min.

8. MATERIALS: At the same time: Add the untreated, control shell "C" shell to salt water and the untreated, experimental shell "E" to the beaker of vinegar and start the timer.

9. RECORDER: In your data table, observe and record your group's observations of what is happening to the shell while exposed to the vinegar over time. (at 0 minutes and 15 minutes)

10. ***EVERYONE: Between observations of your shell in acid (vinegar), spend time observing and recording observations of shell characteristics for the pre-treated ("Low Exposure" and "High Exposure") shells.

11. MATERIALS: After 30min use the tweezers to remove the shell from the vinegar and place on a paper towel. Dry the shell with a paper towel as best as you can.

12. MEASURING: Find the mass of both the control and the experimental shells.

13. RECORDER: Record the final masses and observations of the experimental and control shells after treatment.

14. EVERYONE: Decide how to test the strength of the shell. Options are:
    a. Test the shell strength by dropping the shell from a height of 5 feet from the ground and then record the damage or breakage on your data table
    b. Break the shell with text books to see how easily the shells break

Analysis/Discussion of Data

1. When you immersed the shells in vinegar how did you know that a reaction was happening?

2. How did observing the shells in vinegar relate to how animals are affected by a lower pH of ocean water?

3. How would shelled organisms be affected by a lower pH of ocean water?

4. What are the primary functions of shell for these animals?

5. Does it cost the animal energy to rebuild or repair their shell?

Conclusion/summary (revisit hypothesis)