

“Build Up” Investigation Directions

1. Note three cups on your sheet of paper labeled, 1, 2 and 3 and a line reading higher pH at one end and lower pH at the other end. Each cup contains limewater ($\text{Ca}(\text{OH})_2$ solution). Line the cups up from 1 to 3, with #1 closest to the higher pH end of the line, cup #2 in the middle of the line, and cup #3 at the lower pH end of the line.
2. Drop 10 drops of vinegar into cup #2.
3. Drop 20 drops of vinegar into cup #3.
4. Using the pH sensor (or litmus paper), measure the pH in each cup to confirm placement on the pH line.
5. Cover each of the cups with a lid.
6. When CO_2 mixes with Calcium in water, sometimes calcium carbonate is formed. **Predict what will happen** when you add CO_2 to each cup by breathing into them through a straw. This will mimic CO_2 naturally being absorbed by ocean water. You will be able to tell if calcium carbonate forms in the cups because the cup will become cloudy from the white calcium carbonate.
7. Unwrap the straws; insert one straw through the lids into each of the three cups of limewater. Do not drink the water. Give each of the cups to different people.
8. At the same time, have each of the people holding a cup begin blowing into the straws. If the air is going all the way in, you will see bubbles. Have them each blow for the same amount of time—about 30-45 seconds.
9. Record what you observe in each of the cups and answer the wrap-up question: Which of the cups of water seems to have more calcium carbonate available for organisms to use to build shells? What is your evidence?

“Build Up” Student Worksheet:

Use the pH strips to determine the pH of each of the cups:

Cup 1 pH	Cup 2 pH	Cup 3 pH

Make a prediction of what will happen when you add CO₂ to each cup by breathing into them through a straw:

Cup 1 Prediction	Cup 2 Prediction	Cup 3 Prediction

Describe what happened when you added CO₂ to each cup by breathing into them through a straw:

Cup 1 Observations	Cup 2 Observations	Cup 3 Observations

Which of the cups of water seems to have more calcium carbonate available for organisms to use to build shells? What is your evidence?