



Mission: How does acidity impact corals?

Age: 8+

Materials cost: \$15

Time: 1 hour (Set-up: 10 min | Activity: 40 min | Clean-up: 10 min)

What you need:

Materials:

- 1 Red Cabbage
- Bottled alkaline water (1 cup)
- White Vinegar (1 cup)
- 1 lemon or 1/2 cup lemon juice
- Tap water (1 cup)
- Antacid tablets (e.g., Tums)
- Straws
- Permanent markers
- 12-16 clear plastic cups
- Additional household liquids (optional)
- Crushed eggshells (optional)

Equipment:

- Blender
- Spoons
- Liquid measuring cups

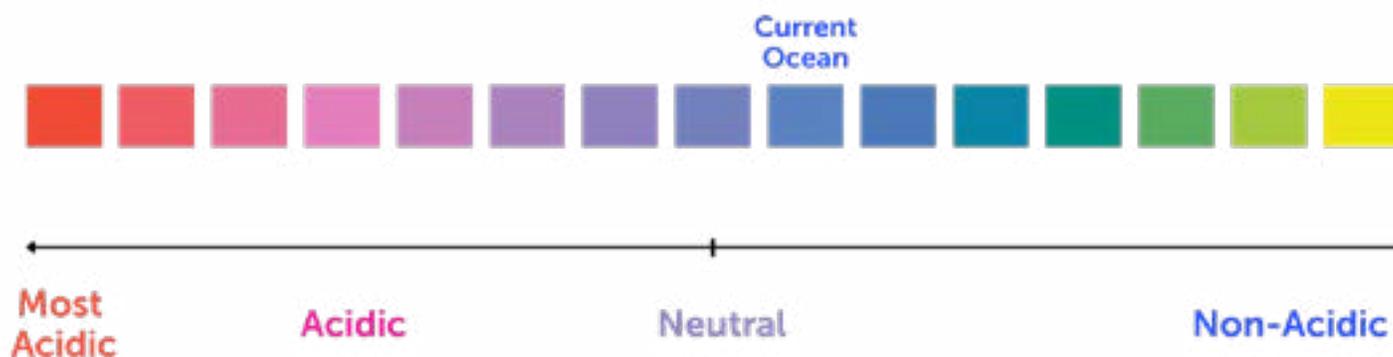
What to do:

Set Up:

1. With help from a grownup, prepare your acidity indicator solution.
 - Cut a small red cabbage into pieces.
 - Place the cabbage pieces in a blender and add enough water to cover them.
 - Blend the cabbage and water until smooth.
2. Make lemon water as one of your test liquids. Mix either 1/2 cup of water with 1/2 cup of lemon juice, or squeeze the juice from one lemon into 1 cup of water.

Part 1: Measuring acidity

1. You will be measuring the acidity of four different water-based liquids. To keep them organized, label four clear cups: Alkaline Water, Tap Water, Lemon Water, and Vinegar. Pour 1 cup of the corresponding liquid into each of your labeled cups.
2. Grab four new empty cups and again label them with the names of the liquids. Use a straw to add the red cabbage indicator solution, just enough to fully cover the bottom of each new cup. To do this, dip a straw down into the cabbage liquid (avoid any solid stuff that may have settled at the bottom), cover the top of the straw with your finger, lift the straw out and position it over the cup, and release your finger to let the liquid fall out.
3. Add a 1/2 cup of each liquid (that's **half** the amount in your original cups!) To its correspondingly labeled cup containing the red cabbage indicator solution. Stir or gently swirl to mix.
4. Observe how the color of each liquid changes compared to its original cup. If a change isn't obvious, add more red cabbage indicator. Avoid mixing liquids between containers. Using the color chart below, decide whether each liquid is acidic, neutral, or non-acidic:
 - Acidic solutions will turn the indicator red or pink.
 - Neutral solutions will keep the indicator purple.
 - Non-acidic solutions will turn the indicator blue or green.
5. Record your observations on the Data Sheet by circling the best color match that you observe for each. Which liquid is the most acidic?
6. Optional: Repeat the activity with other household liquids to test their acidity. Check with a grownup to make sure your materials are safe to work with!



Part 2: Reactions with calcium carbonate

1. Label 4 new clear cups again: Alkaline Water, Tap Water, Lemon Water, and Vinegar.
2. Antacid tablets contain calcium carbonate, the same material that forms the structure of coral reefs. We will use the tablets as a coral substitute to test how acidic liquid affects coral. Place one tablet into each empty cup.
3. Take your original cup of Lemon Water (not the one with red cabbage indicator), and slowly pour just enough to barely cover the tablet. Watch closely and record your observations on the Data Sheet. Do you see bubbles or not? Circle your result.
4. Repeat these steps for the other three liquids, again using the original cup of each. Be sure to record your observations each time.
5. Look closely at your results on the Data Sheet and compare the four liquids.

How does the acidity of a liquid affect its reaction with calcium carbonate? Do you see a clear pattern that helps you draw a conclusion? If not, what could you do to gather more evidence?

Go further: Modeling coral with eggshells

Eggshells also contain calcium carbonate. Their structure is even more similar to coral than antacid tablets, so the experiment is more realistic but you'll need more time, patience, and observation skills to see the effect.

1. Place a small amount of crushed eggshells into four new cups. Label each cup with the same four liquids.
2. Use the straw to add each liquid to its corresponding cup of crushed eggshells, again adding just enough to cover the shells.
3. Place the experimental cups in a location where they can remain for several days. To prevent the liquid from evaporating during the experiment, cover the top of each cup with plastic wrap.
4. Check the cups at least once or twice a day. (It could take several days to see changes.) Observe carefully and record your observations each time you check the eggshells. Taking pictures may help to remember what each sample looked like at the start. What do you notice over time?
5. Compare the speed and results of this reaction to the activity using antacid tablets. What conclusions can you draw? Are your results consistent with your first experiment? What else do you want to know?

Clean-up:

Pour any leftover liquids down the drain and rinse the cups. Recycle the cups if possible. Clean the blender and any other tools you use. Dispose of the tablets (and eggshells) in the trash. Be sure to wipe down and clean all surfaces. Be sure to wash your hands.

CORAL PROTECTION DATA SHEET



Liquid 1:

Circle color observed:



Circle one: Bubbles or No bubbles

Liquid 2:

Circle color observed:



Circle one: Bubbles or No bubbles

Liquid 3:

Circle color observed:



Circle one: Bubbles or No bubbles

Liquid 4:

Circle color observed:



Circle one: Bubbles or No bubbles