**Lesson 3A**: Impact of increased CO2 in the ocean on organisms with carbonate structures

NGSS crosscutting concepts:

1. **MS-LS2-3.** Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
   1. Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system
2. **MS-LS2-4.** Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
   1. Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.

Lesson Objectives:

1. Students will hypothesize how two shells would differ after a few days if one was in purified water and one was slightly acidic water.
2. Students will explain how organisms with carbonate structures are impacted by ocean acidification.

Lesson:

1. Powerpoint:
2. Set up Activity: Shell experiment (see worksheet)
   1. Students will hypothesize the impact of increased levels of CO2 on various organisms, given the type of Calcium Carbonate. (MS-LS2-4)
      1. Write initial hypothesis down
3. Powerpoint Lesson: How do shells form?
   1. Calcium Carbonate: What is Aragonite and Calcite?
   2. How do carbonate ions impact shell formation?
4. Re-visit Activity:
   1. Revisit written hypothesis (MS-LS2-4) - students will assess if they need to make any changes to their initial hypothesis.
   2. How would this experiment affect other shelled organisms?
      1. Ie. Mussels, urchins, calcifying plankton, crabs, marine snails, (corals?)