# Ocean Acidification Simulator Activity: pH Effects on Marine Life

## AP Biology/College Level Teacher Guide

### Overview

This guide supports implementation of the Ocean Acidification Simulator Activity: pH Effects on Marine Life using the 5E instructional model.

### Learning Objectives

- Students will model $CO_2$-driven ocean acidification through chemical equilibria
- Students will analyze the carbonate buffer system and pH changes
- Students will quantify the relationship between atmospheric $CO_2$ and coral growth
- Students will evaluate marine ecosystem responses to pH changes

### Standards Alignment

- **ESSENTIAL KNOWLEDGE 8.1.A.1:** Organisms interact with their environment.
- **ESSENTIAL KNOWLEDGE 8.2.C.1:** Human activities affect ecosystems.
- **ESSENTIAL KNOWLEDGE 1.1.A.1:** Living systems depend on the properties of water to sustain life.

### Prerequisites

- Chemical equilibria and Le Chatelier's principle
- pH and buffer systems
- Carbon cycle understanding
- Marine ecosystem dynamics

## Time Estimate

90 minutes

## Materials Needed

- Computer/tablet with internet access
- Student worksheet
- Calculator for quantitative analysis
- Graph paper or spreadsheet software

## Teaching Tips by Phase

### Phase 1: ENGAGE (5-10 minutes)

- Start with the phenomenon or problem presented
- Elicit student predictions and prior knowledge
- Create cognitive dissonance if possible
- Build excitement for investigation

### Phase 2: EXPLORE (15-20 minutes)

- Allow students to investigate with minimal guidance
- Circulate and ask probing questions
- Encourage systematic data collection
- Note common discoveries and difficulties

### Phase 3: EXPLAIN (10-15 minutes)

- Have students share their findings first
- Build on their observations to introduce concepts
- Address misconceptions directly
- Connect to broader biological principles

### Phase 4: ELABORATE (10 minutes)

- Apply knowledge to new scenarios
- Make real-world connections

- Encourage deeper investigation
- Support transfer of learning

### Phase 5: EVALUATE (5-10 minutes)

- Use varied assessment strategies
- Focus on conceptual understanding
- Provide immediate feedback
- Plan follow-up based on results

> **Remember:**
>
> The goal is student discovery through guided inquiry. Resist the urge to explain concepts before students have explored them!

---