

Ocean acidification

Overview:

Discover how the oceans become more acidic as CO₂ in the air dissolves into them.

The oceans play a key role as a 'carbon sink' in removing carbon dioxide from the atmosphere. As the carbon dioxide dissolves in the oceans, the sea water becomes more acidic. This acidification affect has consequences for our sea life. This activity demonstrates how CO₂ in the atmosphere dissolves into water changing the pH by making it more acidic.



Equipment needed:

- Large (transparent) plastic beaker (e.g. 500ml).
- Small plastic beaker (e.g. 200ml).
- Plastic Circular Plate.
- Bicarbonate of Soda.
- Vinegar.
- Bromothymol Blue 0.04%aq.
- Sticky Tape.
- Measuring cylinder.
- Light box.
- Safety Goggles (PPE).
- Protective gloves.

How it works:

- 1.** Wear goggles and protective gloves.
- 2.** Inform the visitor: Environmental scientists know that ocean environments on Earth are becoming more acidic, and that this is due to

carbon dioxide in our atmosphere dissolving in them.

- 3.** Set-up a 500ml beaker on top of a light box. Pour in 100ml of diluted 0.04% aq Bromothymol Blue into the beaker.
- 4.** Stick a smaller beaker to the inside rim of the larger beaker using sticky tape. Make sure the smaller beaker is about 1-2 cm below the top of the larger beaker.
- 5.** Add 2 teaspoons of bicarbonate of soda into the smaller beaker.
- 6.** Measure 40ml of vinegar and add this into the smaller beaker containing the bicarbonate of soda. Take care not to add this into the indicator solution. Explain to the participant that this will produce CO₂.
- 7.** Once you've added the vinegar to the bicarbonate of soda, quickly place the plastic plate face-side down over the top of the large beaker to trap the CO₂. You will need to hold this in place.
- 8.** Ask the participant to observe the Bromothymol Blue and what they see happening to the solution. What do they think is happening? Why is this happening?



How does this relate to NERC science?

Increasing concentrations of carbon dioxide in Earth's atmosphere are causing the average temperature on Earth to rise. However, this is not the only change these increased gas concentrations cause.

Carbon dioxide in the atmosphere is absorbed by the oceans through a natural process which helps maintain a stable level of CO₂ in the atmosphere. However, increases in CO₂ emissions through the burning of fossil fuels has led to increased levels of CO₂ dissolving into the oceans. This increase level of CO₂ in the water is causing the oceans to become less alkaline (more acidic). Although the oceans are still alkaline (8.06 on pH scale), this reduction in pH is already having adverse consequences to marine life. By 2100 it is estimated that the pH could reduce to 7.76-7.86.

Key take home messages:

- Our oceans play an important role as a 'Carbon sink' – they absorb CO₂ from our atmosphere.
- CO₂ in the atmosphere dissolves into our oceans making them more acidic.
- This can affect a range of marine organisms.

Health and safety

Activity - Bromothymol Blue.

Hazard | Precaution

Eye Irritation - PPE: Goggles.

Skin Irritation - PPE: Disposable Gloves.

Respiratory Irritation - Adult Supervision.

Digestive Irritation - Adult Supervision.

Electric Shock - Annual PAT, Adult Supervision.

Risk - Low.

