

6: Dissolved Oxygen

Summary: Learn about Dissolved Oxygen, its sources, what uses it, and the effects of eelgrass on dissolved oxygen in tanks.

Objectives:

students will:

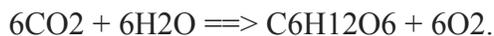
- Understand the connection between Eelgrass photosynthesis, respiration and dissolved oxygen levels.

Materials

- Pencil or Pen
- Eelgrass Tank
- Lamott Dissolved Oxygen Test Kits
- Gloves and Safety glasses
- Control Tank without eelgrass, if doing the experiment on page

Background:

Like all plants, eelgrass produces oxygen as a byproduct of photosynthesis. Eelgrass meadows increase the level of dissolved oxygen in the water, which fish and other marine life need for respiration. The chemical equation of photosynthesis is:



Activity:

The following page can then be handed out, along with gloves and safety goggles and DO test kits (for each group if you have enough). Demonstrate how to measure the dissolved oxygen in the eelgrass tanks. Students follow along and measure DO in groups with their own samples from the tank. Record the dissolved oxygen on the water quality data sheet. Follow with experiment on page 86.

Eelgrass's Effect on Dissolved Oxygen

What is dissolved oxygen (DO)? Dissolved Oxygen is oxygen in the water whose molecules are spread out evenly between the water molecules.

How does Dissolved oxygen enter the water?

Oxygen enters the water in two ways:

- 1) Absorption: Oxygen is constantly moving between the water and surrounding air. Moving water (tumbling over rocks, etc) has more surface area than a calm, still water and absorbs more oxygen. In a tank, a bubbler provides the motion for absorption.
- 2) Photosynthesis: Photosynthesis converts Carbon Dioxide, Water and Sunlight into Oxygen and sugar. At lower light, less oxygen is produced.

Where does dissolved oxygen go (what processes use it)?

Respiration: All animals, even fish, need oxygen to live.

Decomposition: Bacteria use oxygen to decompose organic material.

What else affects oxygen level?

Salinity: Fresh water can hold more oxygen than salty water

Temperature: Cold water can hold more oxygen than warm water.

Measuring Dissolved Oxygen using the Winkler Method: Wear gloves and goggles for safety!

Fixing the Sample

- 1) Slowly fill the sample bottle underwater until there is no air left in the bottle. If you fill it too quickly, the movement of the water will add the oxygen from the air in the bottle into your sample.
- 2) Cap the bottle under water.
- 3) Add 8 drops of Manganous Sulfate and 8 drops of Alkaline Potassium Iodide.
- 4) Cap the bottle and mix by gently shaking it for 30 seconds.
- 5) Let the bottle sit until the precipitate (a solid formed in the solution) settles to below the neck of the bottle.
- 6) Add 8 drops of Sulfuric Acid solution and replace caps.
- 7) Mix the solution by inverting the bottle until the precipitate is gone and the sample has turned yellowish brown.

Titrating the Sample

- 1) Fill the titration tube to the 20 mL line with the fixed sample.
- 2) Add 8 drops of Starch Indicator Solution. (This will turn the sample purple) Put the cap back on and swirl to mix.
- 3) Fill the Titrator to the 0 mark with Sodium Thiosulfate, by putting the point into the bottle and inverting it.
- 4) Add the Sodium Thiosulfate to the sample one unit at a time. Swirl gently after each drop.
- 5) When the solution becomes clear, read the number on the side of the titrator. This is the amount of dissolved oxygen in parts per million in the water sample.
- 6) Enter this figure in your science journal.
- 7) Neutralize the sample with sodium bicarbonate before disposing down the drain.