



Do Plants Consume or Release CO₂? Or Both?

1. Background

In this lab, you will use phenol red as an indicator to show whether CO₂ is being consumed or produced in a reaction.

It is well known that in the presence of light plants perform photosynthesis. It is less well understood that at the same time plants are also performing cell respiration. To demonstrate this we will determine whether CO₂ is consumed or produced as Elodea is placed in either a light or dark environment. The change in CO₂ will be detected by the pH indicator phenol red.

Think about the chemical equations for respiration and photosynthesis. Which one releases CO₂ causing an increase and which one uses up CO₂ which will cause a decrease?

Phenol red is yellow under acidic conditions (high H ion concentration), pink under basic or alkaline conditions (low H ion concentration) and orange under neutral conditions. A change in CO₂ will cause a directly proportional change in H ion.

*If the CO₂ concentration decreases, the H ion concentration will also decrease and the solution will change to **pink**, becoming basic.*

*If the CO₂ concentration increases, the H ion concentration will also increase and the solution will change to **yellow**, becoming acidic.*

*Neutral solutions of phenol red will be **orange**.*



2. Preparation

Create a solution of phenol red by adding concentrated phenol red to about 100 ml of water. The phenol red may change color as a result of adding water (depending on how acidic your tap water is). Your goal is to make your solution a neutral orange color. You can do this by gently blowing into the solution with a straw. Once you have the solution at an orange color, transfer it to 4 test tubes (they should be filled about 2/3 full with your orange solution).

Place a cut piece of elodea (cut end up) into two of the four tubes. The other two test tubes will not have elodea and will serve as controls. One set will be placed in the light, and one set in the dark (see data table).

Aluminum foil can be used to seal the test tubes to be set in the dark. All test tubes should be stoppered or covered with parafilm to minimize reactions with the air.

3. Data - Record the colors of the solutions in the test tubes after 1-2 days.

Elodea + PR/ dark	Elodea + PR / light	PR / dark (control)	PR / light (control)

4. Analysis: Describe what happened. Explain what happened.