15 minute Laboratory exercise: The Oxygen Cycle and Photosynthesis

Problem: To observe the oxygen cycle as a result of photosynthesis by an aquatic plant.
Skills: Observation and manipulation
Objectives:

1. Observe evidence of photosynthesis in an aquatic plant.
2. Count bubbles of oxygen gas given off by *Elodea* to determine the rate of photosynthesis.
3. Determine the rate of photosynthesis (oxygen production) under various environmental conditions (e.g. light intensity & CO_2 level).
4. Collect, graph and analyze data.

Materials: 2 liters of dechlorinated water, 150 mL screw cap test tubes, elodea sprigs, lamp (40 watt), razor blade (single-edge), tape, baking soda (sodium bicarbonate), timer test tube rack and metric ruler.

Experimental Set-up

1. Obtain a sprig of elodea. Remove several leaves from around the cut end of the stem.
2. Slice off a portion of the stem at an angle and lightly crush the cut end of the stem.
3. Fill a test tube with dechlorinated water, then insert the plant stem end up.
4. Secure the test tube in a test tube rack.

Procedure:

1. Place a 40-watt lamp 5 cm from the plant. After one minute, count and record the number of oxygen bubbles rising from the cut end of the stem. Count bubbles for five minutes. If bubbles fail to appear, cut off more of the stem and re-crush.
2. Run a second five-minute trial. Record and average your results.
3. Move the lamp 20 cm from the plant. After one minute, count and record bubbles for two five-minutes trials. Average and record your results.
4. Add a pinch of sodium bicarbonate powder to the test tube. Place the lamp 5 cm from the test tube. After one minute, record bubbles for two five-minute trials. Average and record your results.
5. Graph of your results using the average number of bubbles as the y-axis and environmental condition as the x-axis.

Questions:

1. How does this investigation demonstrate that plants give off oxygen during photosynthesis?
2. How does the rate of photosynthesis change when the light source is moved from a distance of 5 cm to 20 cm?
3. How does the rate of photosynthesis change when sodium bicarbonate is added to the water?