Observing Photosynthesis in Elodea

**Objective:** Observe the process of photosynthesis in Elodea plants.

**Background:** Photosynthesis is the cellular process in which autotrophs capture light energy and convert it to chemical energy (glucose) using carbon dioxide and water. The chemical reaction for photosynthesis is:

\[
6\text{H}_2\text{O} + 6\text{CO}_2 + \text{Energy from Light/Sun} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2
\]

Photosynthesis occurs within the chloroplasts of plant cells. Chloroplasts contain chlorophyll that capture the energy from light. Within the chloroplasts, water is split into hydrogen and oxygen atoms, and then through a series of chemical reactions, the hydrogen forms with carbon dioxide in the plant and forms glucose (sugar). Oxygen is released by the plant into its environment.

**Materials:**
- safety goggles
- lab aprons
- Elodea plant (3 sprigs)
- light source (window or lamp)
- water
- Bromothymol blue solution
- dropper
- labeling pencil
- 3 test tubes (able to hold at least 25 mL)
- 3 test tube stoppers
- test tube rack
- straw (1 per student)
- graduated cylinder (25 mL)
- foil

**Procedures:**
1. Wear your safety goggles and lab aprons throughout the investigation.
2. Label your test tubes #1, #2, and #3 and with your group name/initials.
3. Cover the outside of test tube #2 with foil. Ensure all of the test tube is covered.
4. Measure and pour 15 mL of water into each of the three test tubes.
5. Add 3–5 drops of Bromothymol blue indicator solution to test tube #1.
6. Using your straw, gently blow into the test tube until you notice a color change to yellow. Do not suck in through the straw. The indicator solution turned yellow because you blew carbon dioxide into the test tube. You have added carbon dioxide to the environment in the test tube. Remember that plants use carbon dioxide to carry out photosynthesis.
7. Place a sprig of Elodea and then a stopper into the test tube. Place test tube #1 in a test tube rack near sunlight or a lamp, and record the appearance of test tube #1 in the data chart.
8. Add 3–5 drops of Bromothymol blue indicator solution to test tube #2. Using your straw, gently blow into the test tube until you notice a color change to yellow. Place a sprig of Elodea and then a stopper into the test tube. Place test tube #2 in a test tube rack in a dark location, as instructed by your teacher. Record the appearance of test tube #2 in the data table.
9. Add 3–5 drops of Bromothymol blue indicator solution to test tube #3. Using your straw, gently blow into the test tube until you notice a color change to yellow. Place a stopper in the test tube, and then place test tube #3 in a test tube rack near sunlight or a lamp. Record the appearance of test tube #3 in the data table.
10. Leave the test tubes overnight. At the beginning of class tomorrow, collect your test tubes and record your observations in the data table below.
11. Clean up your materials according to your teacher’s instructions. Dispose of your materials appropriately. For example, recycle the aluminum foil.
12. Answer the analysis questions.

**Data Table:**
<table>
<thead>
<tr>
<th>Test Tube #</th>
<th>Initial Observation</th>
<th>Observation After 24 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Control/No Plant)</td>
<td>Yellow</td>
<td>Yellow</td>
</tr>
<tr>
<td>2 (Plant in Light)</td>
<td>Yellow</td>
<td>Blue</td>
</tr>
<tr>
<td>3 (Plant in Dark)</td>
<td>Yellow</td>
<td>Yellow</td>
</tr>
</tbody>
</table>

**Analysis Questions:**
1. Which test tube(s) showed a color change?
2. What does a change in color indicate?
3. Based on your observations during this lab, what is required for a green plant to carry out photosynthesis? Justify your answer.