Name $\qquad$

## Evidence of Photosynthesis

Background Infommation: PHOTOSYNTHESIS is the process during which a plant's chlorophyll traps light energy and sugars are produced. In plants, photosynthesis occurs only in cells with chloroplasts. The chemical reaction for photosynthesis is:


Green plants use energy from light to

combine carbon dioxide and water to make food. Lightenergy is converted to chemical energy and is stored in the food that is made by green plants. The light used in photosynthesis is absorbed by a green pigment called chlorophyll. Each foodmaking cell in a plant leaf conta ins chlorophyll in small cells c a lled chloroplasts. In chloroplasts, light energy causes water drawn from the soil to split into molecules of hydrogen and oxygen. In a series of chemical reactions, the hydrogen combines with carbon dioxide from the air, forming a simple sugar. Oxygen from the water molecules is given off in the process. From sugar, along with nutrients from the soil, green plants can make starch, fat, protein, vita mins, a nd other complex compounds necessary for life.
Photosynthesis supplies the chemic al energy needed to produce these compounds.

When a person exhales, carbon dioxide is released.
Bromothymol blue solution, BTB, can indic ate the presence of carbon dioxide in the water. When little or no carbon dioxide is present, BTB will show a blue color. Depending upon the a mount of carbon dioxide, BTB will change to green or yellow. Yellow indic ates more carbon dioxide.

## Materials:

| 3 test tubes with caps | Bromothymol Blue <br> solution | Light source |
| :--- | :--- | :--- |
| Beaker | Straw | Foil |

## Procedure:

1. Place 75 ml of bromothymol blue in a beaker.
2. Observe the color of the solution.
3. Introduce carbon dioxide into the solution. Use a straw from to slowly blow carbon dioxide from your lungs into the solution until it just tums yellow.
4. Pour the solution into three screw cap test tubes, dividing it evenly.
5. Get one 6 cm piece of Elodea, place it in one of the tubes, and cap it.
6. Get two 6 cm pieces of Elodea, place it in a second tube completely covered with foil (to prevent light from reaching the solution \& Elodea), and cap it. In both of these test tubes, be sure the plant is completely submerged in the solution.
7. Cap the test tube that has no plant in it.
8. Place the test tubes into a beaker of water and put the beaker about 250 cm from a lamp.
9. Allow the plants to sit undisturbed for ovemight.
10. Compare the colors of the solutions by removing the plants and holding the tubes in front of a white background. Record the final colors of all three tubes.
11. After all mea surements have been completed, rinse out yourglassware.

## Data:

| Observations of Test Tubes |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Test Tube 1 <br> BTB Solution \& Elodea; <br> Uncovered | Test Tube 2 <br> BTB Solution \& Elodea; <br> Covered |  | Test Tube 3 <br> BTB Solution; Uncovered |  |  |
| Start | After 24 hrs | Start | After 24 hrs | Start | After 24 hrs |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

## Data Analysis:

1. Which test tube(s) showed a color change in this investigation?
2. What does a color change indicate in this investigation?

## Questions:

1. What is the independent variable in this investigation?
2. What is the dependent variable in this investigation?
3. What are some controlled variables in this investigation?
4. What color is the water in all three test tubes at the start of the activity?
5. What does this color tell us?
6. After sitting ovemight, did any of the test tubeschange color? Which one(s)?
7. Foreach tube that changed color, why do you think there was a color change?
8. From your observations, when doesa green plant camy on photosynthesis? Explain your thinking.
9. Challenge: Why did we cover the test tubes with stoppers rather than leave them open?
10. Describe the photosynthesis equation in words.

## Conclusions:

1. Explain why the plant was producing bubbles when placed near the light source.
2. How doesthis investigation show that plants give off oxygen during photosynthesis? Use evidence from the investigation to support your answer.
3. Write a short paragraph expla ining the results of this investigation. Provide evidence from the investigation to support what you say.
