**Objective:**

* Describe the processes of photosynthesis and respiration in terms of the chemical processes and production or consumption of energy.

**Background:**

Photosynthesis is a chemical process that produces sugar molecules from carbon dioxide gas, water, and sunlight. It takes place in cells of green plants and other producers. Respiration is a chemical process that all living cells use to release energy from sugar molecules. During cellular respiration, sugar reacts with oxygen to produce water, CO2, and energy. Do plants respire? How does light affect photosynthesis and respiration? In this investigation you will observe production and consumption of carbon dioxide. This observation is easily accomplished because when CO2 dissolves in water it produces an acid. We will use an indicator bromthymol blue (BTB) to visually see the changes in acidity of the water.

**Chemical Equations for Photosynthesis and Respiration**

**Photosynthesis:**

**6 H2O + 6 CO2 + energy 🡪 C6 H12 O6 + 6 O2**

Six molecules of water react with six molecules of carbon dioxide and energy from sunlight to form one molecule of glucose and six molecules of oxygen.

**Respiration:**

**C6 H12 O6 + 6 O2 🡪 6 H2O + 6 CO2 + energy**

One molecule of glucose (a type of sugar) reacts with 6 molecules of oxygen to form six molecules of water, six molecules of carbon dioxide, and energy.

**Prediction:**

Do you think any of the vials will show a color change over the next few minutes? Or hours?

**Observations:**

1. Describe the color changes, if any, which occurred in all the vials. Include explanations as to why the colors changed.

Water Cup Observations:

|  |  |
| --- | --- |
| **Before Blowing in Cup** | **After Blowing in Cup** |
|  |  |

Vial Observations:

|  |  |  |
| --- | --- | --- |
| **Before** | **At End of Class** | **Next Day** |
|  |  |  |

**Analysis Questions: (You may answer these on another sheet of paper if necessary.)**

1. What is the purpose of Vial #3?
2. What materials do plants need in order to carry out photosynthesis? What type of food do plants produce?
3. How do plants get the energy from the food they produce?
4. Explain what evidence you have from this activity that plants photosynthesize.
5. Explain what evidence you have from this activity that plants respire.
6. Does light affect photosynthesis and respiration? Use evidence to support your answer.

|  |
| --- |
| **Materials Manager:**   1. Obtain all materials. 2. After all vials are set up put Vial #1 in the light location. Put Vial #2 in dark location. Leave Vial # 3 on your desk. 3. Replace all unused materials in proper location.   Materials needed: 1 straw, 2 beakers, 60ml water, 2 sprigs Elodea, 3 vials, tape. |
| **Solution Maker/Safety Monitor:**   1. Obtain the cup of 60ml of water and straw from Materials Manager. Get BTB from Mrs. Spence 2. Monitor the safety of all group members throughout the investigation. 3. Make sure all members are participating in observations/analysis.   DO NOT DRINK/TOUCH GREEN SOLUTION! |
| **Label Maker/Time Keeper:**   1. Create Labels for all vials including Name and Vial number (1-3). 2. Keep track of time and make sure that the group is using time effectively. 3. Make sure all members are participating in observations/analysis. |
| **Recorder:**   1. Write Groups Observations in Lab Document. 2. Type analysis question answers in Lab Document. 3. Make sure all members are participating in observations/analysis. |