**Molecular Models of Photosynthesis and Respiration**

In these activities, you will model how photosynthesis and respiration work to transform energy to different forms needed by organisms.

**Part 1:** [**HS-LS1-5 From Molecules to Organisms: Structures and Processes**](http://www.nextgenscience.org/pe/hs-ls1-5-molecules-organisms-structures-and-processes)

Target: Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

**Instructions (Read carefully and do these Step by Step!):**

Step1: Examine the equation for photosynthesis: 6 CO2 + 6 H2O 🡪 C6H12O6 + 6O2

Step 2: After discussing with your group, write down your responses to the following:

1. Predict how a plant might make the products of photosynthesis (C6H12O6 + 6O2) from the reactants (6CO2 + 6 H2O).
2. What else is missing from this equation that a plant needs in order to do photosynthesis?

Step 3: Go to the Molecular Models for Photosynthesis and Respiration page on biomanbio.com. Here is the URL: <https://biomanbio.com/HTML5GamesandLabs/PhotoRespgames/molecular-models-page.html>

Step 4: Complete Task 1 online. As you do, take down notes on your observations regarding how photosynthesis transforms light energy into stored chemical energy. Put a box around your notes when you are done, as shown below:

Notes and Observations:

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Step 5: Answer the following questions:

1. What did the light energy do to the water?
2. Once your oxygen (O2) is created, what atoms do you have left and how many of each?
3. Did you have any leftover atoms after creating the oxygen and the glucose? Explain why/ why not.
4. Make a clearly labeled diagram or flowchart showing how photosynthesis transforms light energy into stored chemical energy.

[**HS-LS1-6 From Molecules to Organisms: Structures and Processes**](http://www.nextgenscience.org/pe/hs-ls1-6-molecules-organisms-structures-and-processes)

Target: Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

Step 6: Complete Task 2 of the online activity and answer the following questions:

1. Explain how sugar molecules could be used to make other organic compounds.
2. What else is needed to make a Glycine (amino acid) from a molecule of Glucose? Where do you think that comes from?

[**HS-LS1-7 From Molecules to Organisms: Structures and Processes**](http://www.nextgenscience.org/pe/hs-ls1-7-molecules-organisms-structures-and-processes)

Target: Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

Step 7: Complete Task 3 online. As you do, answer the following questions:

1. Chemical bonds are broken in which molecules?
2. Why must the bonds of these molecules be broken before anything else happens?
3. What new compounds are formed?
4. How does this process result in a transfer of energy?
5. Create a diagram or flowchart that illustrates how cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.
6. What do you notice about the products of cellular respiration compared to the reactants of photosynthesis? Explain...