Name ______________________________ Teacher ________________ Date __________

Activity 4.3: Molecular Models for Potatoes Making Food Worksheet

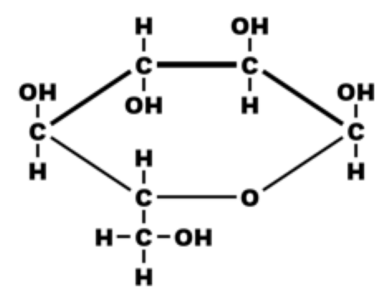
You will use models to learn about how potatoes make food at the atomic-molecular scale, as you continue to look for answers to “unanswered questions” from your investigation.

A. Introduction

Plants photosynthesize when they are in the light. Light energy is changed into chemical energy, which is stored in the high-energy bonds of glucose: C-C and C-H bonds. Use the molecular models to show how this happens.

B. Using molecular models to show the chemical change

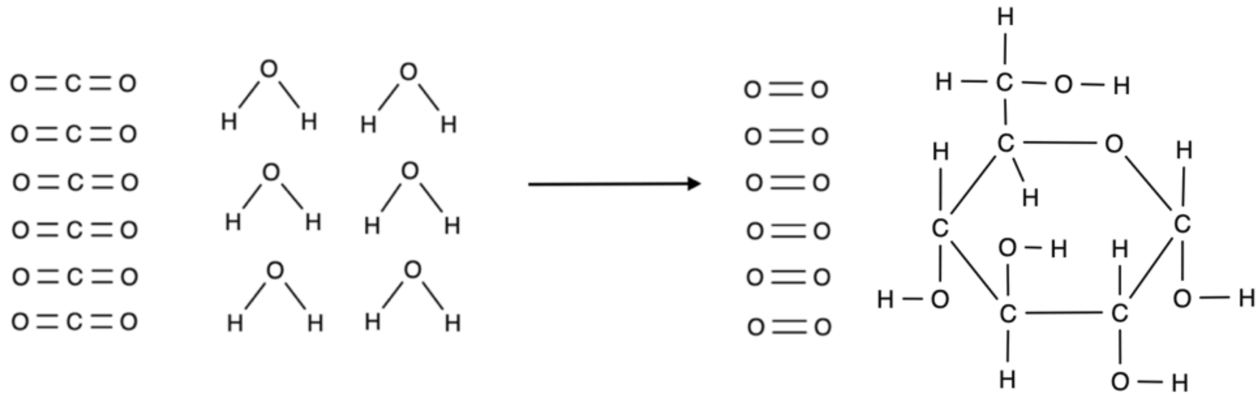
1. *Work with your partner to make models of the reactant molecules: carbon dioxide and water.*
    a. □ Make models of 6 carbon dioxide (CO_2) molecules and 6 water (H_2O) molecules. Put these molecules on the *reactant* side of the *Molecular Models Placemat*.
    b. □ When you are finished creating the reactant molecules, carbon dioxide and water, put away all extra pieces that you didn’t use from the molecule kit. <u>This is an important step!</u>
    c. □ Place 12 twist ties in the “reactants” square on your poster with a “Light Energy” card. These twist ties represent light energy coming from the Sun.
2. *Show how the atoms of the reactant molecules can recombine into product molecules—oxygen and glucose—and show how light energy is transformed into chemical energy when this happens.*
    a. □ Take the carbon dioxide and water molecules apart and recombine them into glucose ($C_6H_{12}O_6$) and oxygen (O_2) molecules. Put these molecules on the *product* side of the *Molecular Models Placemat.* <u>Answer these questions</u>:



        i. How many carbon dioxide molecules were used? ____
        ii. How many water molecules were used? _____
        iii. How many glucose molecules were produced? _____
        iv. How many oxygen molecules were produced? _____
    b. □ Energy lasts forever, so move the twist ties to the *product* side of the *Molecular Models Placemat*. Glucose has high-energy bonds (C-C and C-H). Add a twist tie to all the C-C and C-H bonds in the products. What form of energy did the light energy change into? (Re-read the introduction if you aren’t sure.) Put the correct energy card(s) under the twist ties.

C. Atoms last forever!

Account for all the atoms in your models.



(Reactants) (Products)

1. Circle all of the Carbon ATOMS in the <u>reactants</u>. How many are there? ___
2. Circle all of the Carbon ATOMS in the <u>products</u>. How many are there? ___

3. Underline all of the Hydrogen ATOMS in the <u>reactants</u>. How many are there? ___
4. Underline all of the Hydrogen ATOMS in the <u>products</u>. How many are there? ___

5. Put a square around all of the Oxygen ATOMS in the <u>reactants</u>. How many are there? ___
6. Put a square around all of the Oxygen ATOMS in the <u>products</u>. How many are there? ___

D. **Energy lasts forever!** Account for all the energy in your models**.**

1. How many twist ties are there before the chemical change? ________
2. What form of energy is there before the chemical change?_____________________________
3. How many twist ties are there after the chemical change?__________
4. What forms of energy is there after the chemical change? _____________________________

E. Check Yourself!

1. Did the number and type of atoms stay the same at the beginning and end of the chemical change? ____

2. Did the number of twist ties (representing energy) stay the same at the beginning and end of the chemical change? ____

3. Why do the numbers of atoms and twist ties have to stay the same?

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F. Writing the chemical equation

Use the molecular formulas ($C_6H_{12}O_6$, O_2, CO_2, H_2O) and the yield sign (→) to write a balanced chemical equation for the reaction:

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