Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Biology 9: Unit 3 Cell Energy Cycle Gizmo**

**Vocabulary:** aerobic respiration, anaerobic respiration, ATP, cellular respiration, chlorophyll, chloroplast, cytoplasm, glucose, mitochondria, photosynthesis

**Prior Knowledge Questions** (Do these BEFORE using the Gizmo.)

1. What does a plant need to survive and grow? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. What does an animal need to survive and grow? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. How do animals and plants depend on each other? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Gizmo Warm-up**

The *Cell Energy Cycle* Gizmo™ illustrates two processes

 that are essential to life: **photosynthesis** and

 **cellular respiration**.

Although both of these reactions involve a series of

complex steps, the basic reactants and products in

each process are four relatively simple molecules.

1. What is the chemical formula of oxygen? \_\_\_\_\_\_\_

(Hint: The chemical formula for water is H2O sue

that in #4!!!)

1. **Glucose** is a simple sugar.What is the chemical

formula of glucose?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What is the chemical formula of carbon dioxide? \_\_\_\_\_\_\_
2. What is the chemical formula of water? \_\_\_\_\_\_\_

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| **Activity A:** **Photosynthesis** | Get the Gizmo ready: * If necessary, click **Reset**.
* Check that the **PHOTOSYNTHESIS** tab is selected.
 | Cell Energy SE2 |

**Introduction:** Photosynthesis occurs in the **chloroplast**, an organelle found in plant and algae cells. Within the chloroplast, a green pigment called **chlorophyll** converts the energy of light into a chemical form that the plant can use.

**Question: What are the reactants and products of photosynthesis?**

1. Predict: Of the molecules shown on the CHEMICALS pane, which do you think are reactants in photosynthesis (reactants are the “ingredients” like flour, yeast, milk and sugar make bread, the product)? Which do you think are products?

Reactants: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Products: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Explore: Drag each molecule from the CHEMICALS pane to the chloroplast on the PHOTOSYNTHESIS pane. If a molecule is a reactant, it will stay in the chloroplast.

Which molecules are reactants in photosynthesis? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Observe: Click **Add light** and look at the **Output**. What are the products of photosynthesis?

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1. Summarize: A chemical equation shows reactants on the left side of an arrow, and products on the right, like this: *reactant* + *reactant* 🡪 *product* + *product*.

Based on your observations, what is the chemical equation for photosynthesis?

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Label with the words for Photosynthesis

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| **Activity B:** **Cellular respiration** | Get the Gizmo ready: * Click **Reset**.
* Select the RESPIRATION tab.
 | Cell Energy SE3 |

**Introduction:** Cellular respiration occurs in the **cytoplasm** of the cell and in **mitochondria**, organelles found in all complex cells. (Bacteria and other simple organisms do not contain mitochondria they are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cells and are older and then eukaryotic cells.) The Gizmo shows a green mitochondrion surrounded by blue cytoplasm.

**Question: What are the reactants (ingredients) and products of cellular respiration?**

1. Predict: Of the molecules shown on the CHEMICALS pane, which do you think are reactants (ingredients) in cellular respiration? Which do you think are products?

Reactants: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Products: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Explore: Drag each molecule from the CHEMICALS pane to the RESPIRATION pane.

Which molecules are reactants in cellular respiration? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Observe: Click **Next**. What happens in the cytoplasm? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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This entire process is called **cellular respiration**. Most living cells, PLANTS and animals get their cellular energy E from the process of cellular respiration. This is a several stepped process. The energy E that is formed and released is which is stored in the form of **ATP** (adenosine triphosphate) molecules.

1. Observe: Click **Next** two more times to complete the process of cellular respiration.
2. Where does cellular respiration take place in the cell? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Energy from the mitochondrion is also stored in the form of ATP. Thirty ATP molecules are produced for every two molecules of pyruvic acid.

1. Analyze: Cellular respiration involves two phases. **Anaerobic respiration** does not involve oxygen, while **aerobic respiration** does. Where does each phase take place?

Anaerobic respiration: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Aerobic respiration: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Summarize: Based on what you have seen, what is the overall chemical equation for cellular respiration? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



1. On your own: If no oxygen is present in the cells then ANAEROBIC

respiration takes place and Lactic acid is formed. You can feel the

effects of lactic acid if you exercise very hard. One way to produce

lactic acid is to do a “wall sit,” supporting yourself against a wall in

a sitting position. Try doing this for a few minutes. What do you

feel in your thigh muscles?

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| **Activity C:** **The carbon-oxygen cycle** | Get the Gizmo ready: * Click **Reset**.
* Select the CYCLE tab.
 | Cell Energy SE5 |

**Question: How is photosynthesis related to cellular respiration?**

1. Form a hypothesis: How do you think photosynthesis is related to cellular respiration?

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1. Draw conclusions: How are respiration and photosynthesis related to each other?

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1. Think and discuss: In what ways are plants and animals dependent on each other?

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1. Complete the diagram below on Cell respiration/photosynthesis:



What’s the energy produced?

Name the process

Name the process