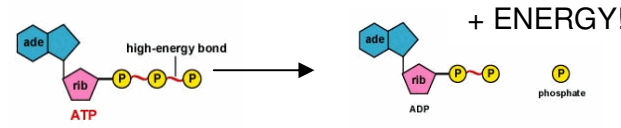
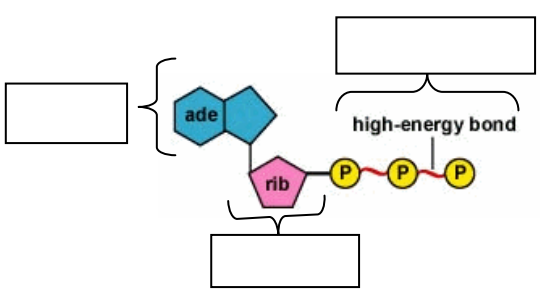



Name:

Date:

Energy and Cells

READ	RESPOND
<p>Energy</p> <p>All living things need energy. But where does that energy come from? Most of us would probably say our energy comes from the food we eat. But what does this mean? I can't see the energy in my sandwich, so where is it?</p> <p>Energy comes in many forms, including light, heat, and electricity. Energy can be stored in the chemical bonds between atoms and molecules. When these bonds are broken, energy is released. So when you say that there is energy in your food, you are really saying that energy is <i>stored</i> in the food. Our body can break apart the atoms in the food to <i>release</i> the energy.</p>	<p>Pre-reading Question Why do organisms need energy?</p> <ol style="list-style-type: none">1. Where is energy stored?2. How is energy released?
<p>ATP</p> <p>There is one molecule in our bodies that is particularly good at storing and releasing energy. This molecule is called adenosine triphosphate (or ATP for short).</p> <p>ATP consists of adenine, a 5-carbon sugar called ribose, and 3 phosphate groups. The 3 phosphate groups are where ATP gets its name – adensine triphosphate.</p> <p>ATP stores energy in the chemical bond between the 2nd and 3rd phosphate groups. When a cell needs energy, it can break this bond, releasing the energy.</p>  <p>ATP is so good at storing and releasing energy that it is considered the universal energy source for cells. All living things – from bacteria, to plants, to animals, use ATP to carry out important functions.</p>	<p>3. Label the 3 parts of the ATP molecule:</p>  <ol style="list-style-type: none">4. What are some things a cell might need energy for?5. Why is ATP an important molecule?6. How does a cell get the energy out of an ATP molecule?
<p>Making ATP</p> <p>Our cells make ATP by breaking down food molecules, specifically the sugar glucose. This process is called <u>respiration</u>. There are two types of respiration - aerobic respiration and anaerobic respiration.</p>	<ol style="list-style-type: none">7. How do your cells get their ATP?8. What are the 2 types of respiration?

<p>READ</p> <p>Aerobic respiration</p> <p>Aerobic respiration happens at two levels. At the organism level, it involves your body taking in air that contains oxygen, and breathing out carbon dioxide. At the cell level, it involves using the oxygen you breathe to help break down glucose and release energy. This energy is used to put together ATP molecules, which the cell can then use as energy for all its important functions. Carbon dioxide and water are waste products. Here is the chemical equation for aerobic respiration:</p> $6\text{O}_2 + \text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 6\text{H}_2\text{O} + 6\text{CO}_2 + \text{ATP}$ <p>oxygen + glucose → water + carbon dioxide + ATP!</p> <p>In the cell, aerobic respiration takes place in the mitochondria. That's why the mitochondria are called the "powerhouses" of the cell, because this is where food is broken down to make ATP energy. If oxygen is available, one molecule of glucose can be used to create 36 molecules of ATP!</p>	<p>RESPOND</p> <p>9. Why is cellular respiration important?</p> <p>10. What are the reactants and products of aerobic respiration? How many ATP molecules are produced?</p> <p>11. Where does aerobic respiration take place?</p> <p>12. Explain why you always need to inhale oxygen and exhale carbon dioxide.</p>
<p>Anaerobic Respiration</p> <p>Aerobic respiration can only happen when an organism has oxygen. So what happens when oxygen is not present? For example, bacteria that live in deep in the soil do not have oxygen. A process called anaerobic respiration, or fermentation, can occur when there is no oxygen available. Anaerobic respiration does not make as much energy as aerobic respiration – only <u>2 ATP</u> – but it's better than nothing.</p> <p>Fermentation produces some interesting products besides ATP. In one type of fermentation, ethanol (ethyl alcohol) and carbon dioxide are produced as waste products. This type of fermentation – called alcoholic fermentation – is used to make beer and wine, and to make bread rise.</p> <p>The other type of fermentation – lactic acid fermentation – makes lactic acid as a waste product. This often happens in our muscle cells when we exercise or participate in a strenuous activity. Our muscle cells run out of oxygen and start using fermentation to produce ATP. But the fermentation also makes lactic acid, which causes your muscles to feel like they are burning, and makes them sore the</p>	<p>13. What are 2 differences between aerobic respiration and anaerobic respiration?</p> <p>14. Sprinter Usain Bolt is practicing for the 2012 summer Olympics. He's been running all day, and now has a burning sensation in his leg muscles but doesn't know why. Explain to Usain why his muscles are burning:</p> 

next day.

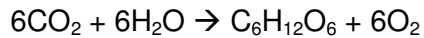
READ

Photosynthesis

So, you just learned that Respiration is the process your cells use to get energy out of your food. But where did the energy in your food come from in the first place? You guessed it – the SUN! Sunlight energy is converted to chemical energy in the process of PHOTOSYNTHESIS. Photosynthesis captures the Sun's energy in the chemical bonds of the carbohydrate glucose

Process of Photosynthesis

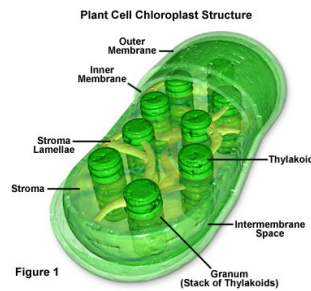
The overall process of photosynthesis uses carbon dioxide and water to make glucose (sugar):



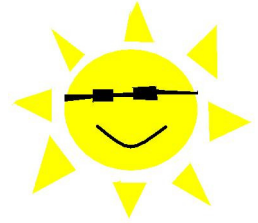
carbon dioxide + water → glucose and oxygen

This process takes place in the chloroplast of the cell, and it occurs in 2 steps: The Light-Dependent Reactions and the Light-independent reactions.

The Light-Dependent reactions occur first. The sun's energy is absorbed by chlorophyll, then it is stored in the chemical bonds of a molecule called NADH. This molecule carries the energy to the second step, which is called the Light-Independent reaction (aka the Calvin Cycle, or the Dark Reactions). The Calvin Cycle uses what was made in the first phase, along with some carbon dioxide it gets from the atmosphere, to make sugars.



15. What is photosynthesis? Why is it important?



16. What are the reactants of photosynthesis? What are the products?

17. Where in the cell does photosynthesis take place?

18. What is the purpose of the Light-Dependent Reactions?

19. What is the purpose of the Light-Independent Reactions?

