Bienvenue 欢迎 Welcome

Baltimore International Academy

Academia Internacional de Baltimore
巴尔的摩国际学校
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Grade 8 Science Packet

June 1 – June 5, 2020

BIA Weekly Instructional Plan Middle School Level					
Week of June 1 – June 5					
MYP Subject	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Science G8 Science Unit 4 HOW DOES FOOD PROVIDE MY BODY WITH ENERGY?	Lesson 8 ReadingOne: What Can Burning Food Teach Me about Food Providing Energy to My Body? Lesson 9 Reading One: Does a Reaction Similar to Burning Happen in My Cells? Students can access the IQWST readings and Student edition pdfs at https://portal.activatelearning.com/book/iqwst-3 and use the password Observe20 The student portal can also be accessed here https://activatedlearning.com/login Go to: 1. digital resources → 2. IQWST student portal → 3. IQWST 3.0 portalAccessing Content: 8th Grade IQWST curriculum & ScienceFlix				**Review: Deadline for submitting your weekly packet**

Добро пожаловать Bienvenidos

Lesson 8 ReadingOne: What Can Burning Food Teach Me about Food Providing Energy to My Body?

Getting Ready

The bus runs on a fuel called *biodiesel*. Biodiesel is not like normal gasoline—it does not come from oil drilled from the earth. Instead, biodiesel comes from vegetable oil. This bus is powered with soybean oil.

How do you think burning soybean oil can make this bus go?

Burning soybean oil releases energy. A very similar chemical reaction provides your cells with energy. In this reading, you will learn more about burning food so that you can better understand the chemical reaction that happens in your cells.

This bus burns fuel from soybeans for energy.

What Are the Reactants of Burning Food?

You are using burning food as a model for the chemical reaction that provides your cells with energy. In chemical reactions, old stuff (reactants) changes into new stuff (products). Your class performed one investigation with many probes to learn about the reactants and products of burning oil. Your teacher might have burned the oil under a large glass container (see picture). This container trapped all the reactants and products of burning the oil so that your probes could measure the changes.

You learned from this experiment that there are two reactants involved when oil burns. First, you found that the mass of oil decreased. Second, you found that the concentration of oxygen in the container also decreases. This shows you that both oil and

oxygen molecules are being used up in this chemical reaction. During burning, the atoms in the molecules of oil and oxygen rearrange to form the products of this chemical reaction.

What Happens When You Add More Reactants?

In this lesson, you are studying burning food, but many substances burn using the same chemical reaction. In forests, wildfires burn plants in a chemical reaction that requires oxygen. Wildfires are deadly natural disasters that cause millions of dollars of damage in the United States each year. A strong wind can make a wildfire especially hard to fight. Not only does wind push the fire along, but it also brings more air to the fire.

Why would having a lot of air fuel a wildfire?

Why does more air make a fire stronger?

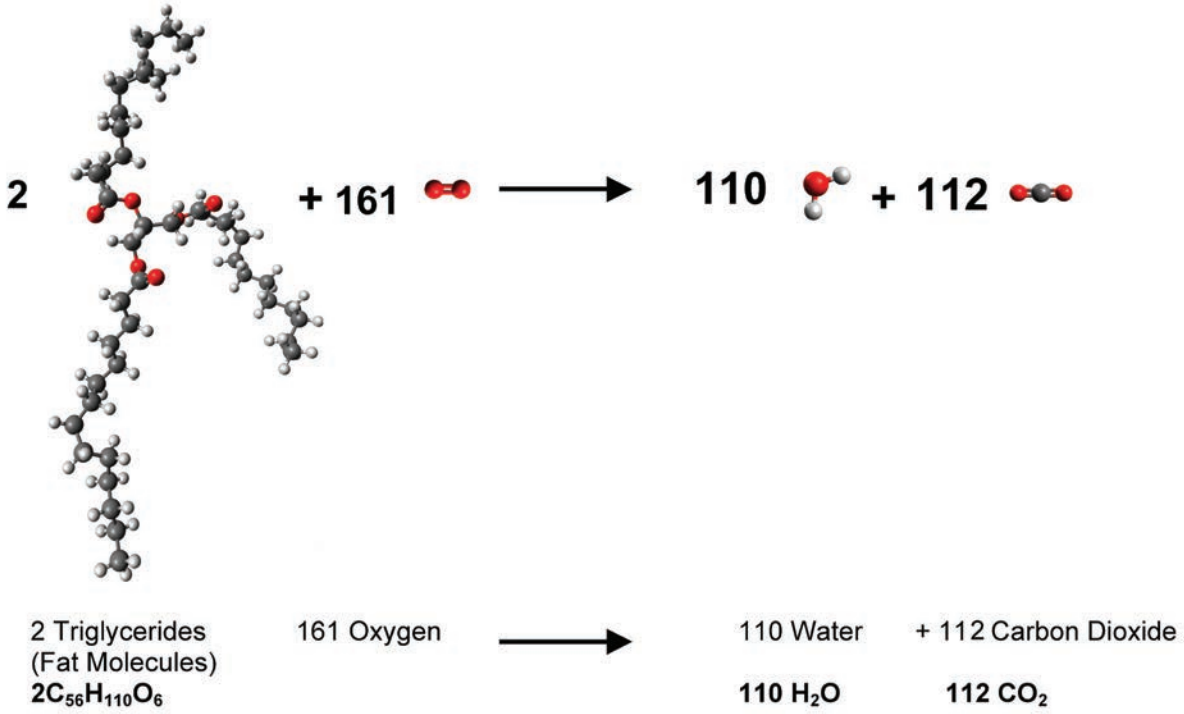
Air makes fires stronger because of one of the gases that is in the air. Air is 21% oxygen gas. Therefore, adding more air to the fire adds more of this reactant and keeps the fire going longer and stronger.

What Gases Are Produced from Burning Reactions?

When your class burned oil, you found that there are two products that are both gases. Both the concentration of carbon dioxide and water vapor increased when you burned oil. This means that atoms in the reactants of burning rearranged to form carbon dioxide and water molecules. When you put all of your evidence together, you find that the chemical reaction for burning oil is the following.

$$\text{Oil} + \text{Oxygen} \longrightarrow \text{Water} + \text{Carbon Dioxide}$$

The following model shows these molecules in a burning reaction. In this model, you can see that there are hundreds of molecules taking part in this reaction.



After burning the oil, there were water droplets in the glass container. Where did the water come from?

After burning the oil, there was more carbon dioxide in the glass container. Where did it come from?

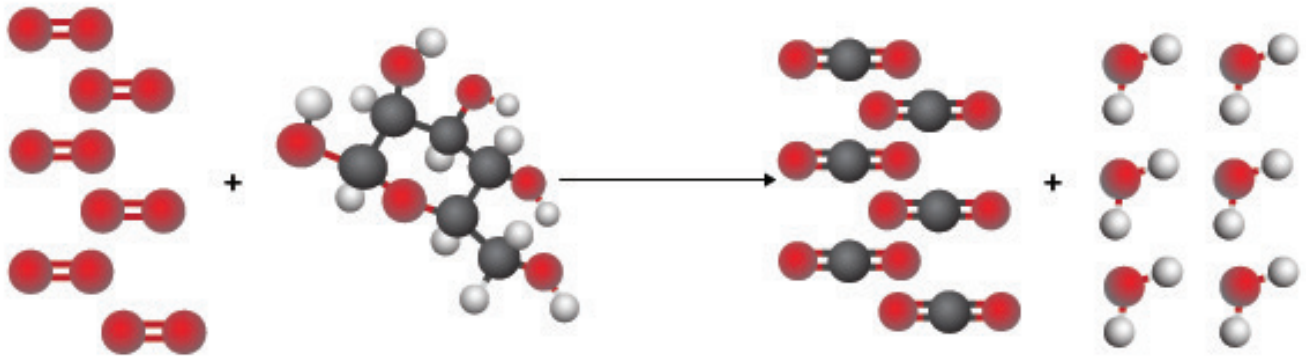
The bus in the Getting Ready section runs because of a similar chemical reaction. Inside of the bus, oxygen reacts with the soybean oil. When the products form, energy is converted into thermal energy and kinetic energy that the bus can use to move. When the bus burns soybean oil, it produces water and carbon dioxide. The products and reactants of burning cooking oil in class and soybean oil in the bus are very similar.

Soybeans are plants. Where did the energy the soybean oil provides to the bus come from originally?

What Is the Connection between Burning Oil and Other Chemical Reactions?

In this unit, you have learned about several chemical reactions, and they all have important connections to one another. First, in this lesson you investigated burning oil, but you have also burned lots of other foods in this unit—tortilla chips, wheatgrass, marshmallows, and potato chips. It is important to realize that all of these foods are made of molecules of carbohydrate, protein, or fat. All of these foods contain carbon, hydrogen, and oxygen atoms. Because of the similarities between these molecules, all of them can burn using a similar chemical reaction. All of these food molecules produce carbon dioxide and water. When these new molecules are formed, they release energy, typically thermal and light energy. That is why we see flames and feel heat during burning. The molecules of carbon dioxide and water have greater kinetic energy.

The connection between burning foods and the chemical reaction that provides energy to your cells is also important. These two chemical reactions are very similar. They use the same products and reactants and both can convert energy. Remember, however, that there is an important difference. When you burn food outside of the body, it produces thermal and light energy. Food inside of your body does not provide light energy and provides less thermal energy than burning.



Lastly, there is an important connection between burning and photosynthesis. The following model shows the chemical reaction involved in burning glucose. This chemical reaction happens when you burn a marshmallow. The chemical reaction shows glucose and oxygen reacting to form water and carbon dioxide.

You may remember that photosynthesis, the chemical reaction plants use to make food molecules, uses the same molecules, but the products and reactants are reversed. The following box compares these two chemical reactions.

These two chemical reactions have opposite products and reactants. The purposes of these chemical reactions in living things are reversed as well. Photosynthesis is a chemical reaction that uses energy to produce food molecules. Burning, on the other hand, uses up food molecules and releases energy.

Photosynthesis: Water + Carbon Dioxide ⟶ Glucose + Oxygen

Burning: Glucose + Oxygen ⟶ Water + Carbon Dioxide

Because the molecules involved in these two chemical reactions are the same, it can be easy to confuse photosynthesis and burning. It might help you to think about the purposes of these chemical reactions when you are trying to remember the correct reactants and products for each one. Photosynthesis is a chemical reaction that makes food molecules. Therefore, a product of photosynthesis is glucose. Burning uses food molecules, so food molecules are reactants in this chemical reaction.

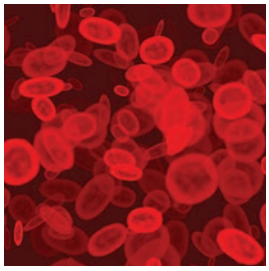
Now you know about the reactants and products of burning food. In the next lesson, you will learn about the reaction that is similar to this that provides your cells with energy. It will help you to answer the Driving Question: How Do Food Molecules Provide My Body with Energy?

In the following space, write any questions you still have about burning or how it relates to the chemical reaction happening in your cells.

Lesson 9 Reading One: Does a Reaction Similar to Burning Happen in My Cells?

Getting Ready

Scientists estimate that the human body is made up of over 100 trillion cells. Written out, that is 100,000,000,000,000 cells. Each of these cells has an important job. Red blood cells help you transport oxygen; fat cells help you store fat; muscle cells help you move; immune-system cells help you fight disease; and nerve cells help you transmit signals in your body. To do these jobs, each of these cells needs energy. Did you know that each of the 100 trillion cells in your body must get its own energy? That is right—food molecules must provide energy to all cells in your body. For example, when a muscle contracts, the movement we see is a result of all the muscle cells using energy provided by food molecules.



Your body has 20 to 30 trillion red blood cells.

How does every single cell in the body get the substances it needs to carry out the chemical reaction that provides it with energy?

As you read, you will learn (1) the reactants and the products of the chemical reaction that convert energy in the cells and (2) how every cell in the body obtains the reactants and removes the products of this chemical reaction.

Do Cells Need Oxygen to Provide Them with Energy from Food?

Food provides your body with energy in a chemical reaction called cellular respiration. Cellular respiration is similar to burning. You have evidence that burning food requires oxygen. In class, when oil burned inside of a glass jar (a closed system), the reaction stopped when the amount of oxygen inside of the jar decreased. The same is true for cellular respiration. Food molecules cannot provide the cells of the body with energy through cellular respiration without oxygen.

In class, you analyzed data that showed you that the cells do use oxygen. The concentration of oxygen in the blood going to the cells of the body is higher than the concentration of oxygen in

the blood coming from the cells. This is because cells use oxygen to react with food molecules during cellular respiration.

What Would Happen If You Did Not Get Enough Oxygen?

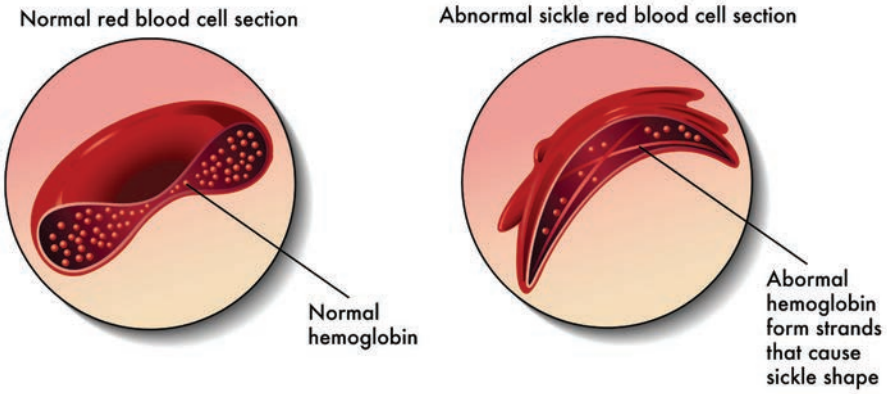
Every cell in your body, from the skin cells protecting your toes to the nerve cells helping you to read this, needs energy. If cellular respiration provides cells with energy, then each cell needs oxygen.

Sometimes a person's body cannot provide its cells with the oxygen they need.

What do you think happens to the cells when they do not get the oxygen they need? Why?

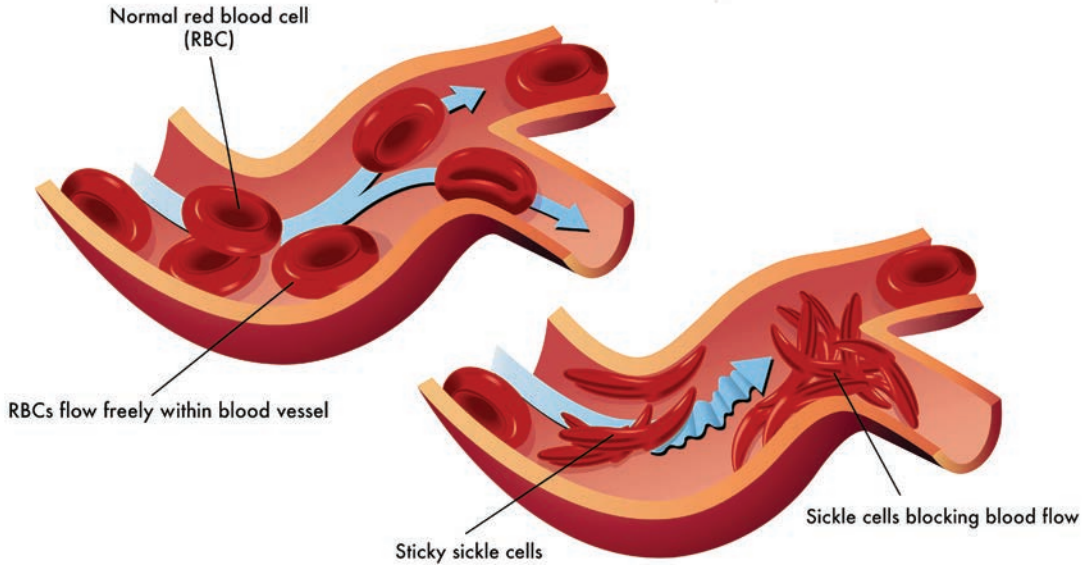
The cells of people who suffer from a disease called sickle-cell anemia have difficulty getting oxygen they need. Sickle-cell anemia is an inherited disease that affects about 1 in 625 Americans, mostly of African descent. People who have sickle-cell anemia have red blood cells that are an unusual shape. Red blood cells are usually round. However, people who have sickle-cell anemia have red blood cells that look like the blade of a farming tool called a sickle. In the following pictures, you can see how the sickle-shaped red blood cell is similar in shape to a farming sickle.

A sickle is a sharp, curved blade on a handle used for cutting plants.



Normal red blood cells are round. Blood cells of a person with sickle-cell anemia are curved like a sickle.

Sickle-shaped cells do not flow through blood vessels as easily as round blood cells. They end up getting stuck, clogging blood vessels, and preventing oxygen from reaching some cells. See the picture that shows a clot of sickle cells stuck inside of a blood vessel. People with this disease also have fewer red blood cells than healthy people do, so less oxygen can be carried to the body's cells.



Normal red blood cells slide easily through blood vessels, but sickle-shaped cells clog blood vessels.

One of the symptoms of sickle-cell anemia is becoming very tired after only a little bit of exercise. Why would people with sickle-cell anemia get tired more easily healthy people?

How Does Every Cell in My Body Get the Reactants of Cellular Respiration?

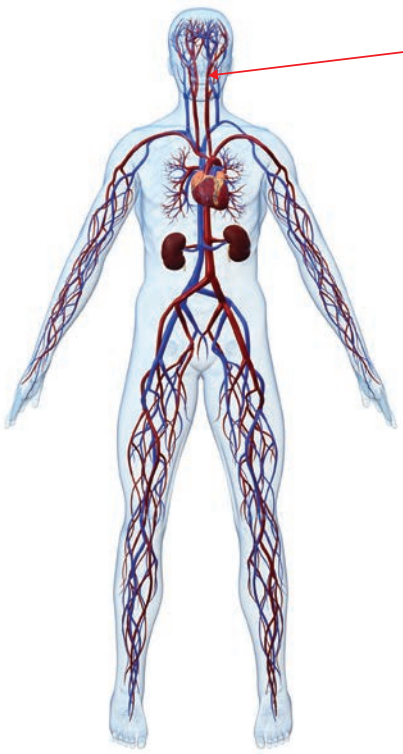
If cellular respiration takes place in every cell, then the reactants of this chemical reaction must be transported to every cell.

How do food molecules and oxygen get to each cell of the body?

Previously, you learned that when you eat very complex carbohydrates (starch molecules), they are broken down into subunits (glucose molecules). Then glucose molecules move from the small intestine into the blood vessels in the circulatory system. Finally, the glucose molecules travel to all the cells of the body.

At the same time, your body takes in oxygen through your lungs when you breathe. Then the blood vessels in the circulatory system carry that oxygen to every cell of the body.

Imagine that a person ate a cracker. Use the following model of the human body to keep track of all the molecules that are necessary for providing cells with energy from the cracker.



Food molecules
1. Starch molecules in a cracker enter the body.

2. Starch breaks down through a chemical reaction into carbohydrate subunits (glucose).

3. Glucose enters the circulatory system. Now glucose travels through the circulatory system.

4. Glucose enters a muscle cell in the leg.

Oxygen
5. Oxygen enters the circulatory system. Now oxygen travels through the circulatory system.

6. Oxygen enters a muscle cell in the leg.

Draw a line from the number on the list to the place where each process occurs in the body. (The first one has been done for you.)

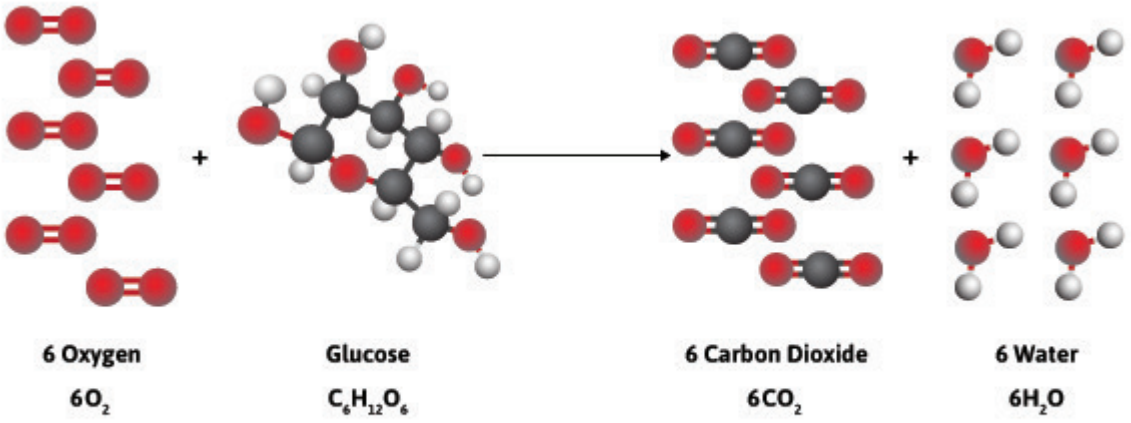
What two molecules are in the muscle cell at the end of the processes listed in the model?

What Is Produced When Oxygen and Food Molecules React?

In cellular respiration, food molecules react with oxygen in the cells. These reactants can also burn. If cellular respiration is similar to burning, the products must be the same too. The products of burning are carbon dioxide and water. The data you analyzed in class showed that cellular respiration also produces carbon dioxide. In the blood vessels, the amount of carbon dioxide coming from the cells is higher than the amount of carbon dioxide going to the cells. This is because carbon dioxide is produced by a chemical reaction in the cells.

You do not have evidence that the cells of the body produce water because water is very difficult to track in the body. You investigated burning outside of the body, which is a chemical reaction that involves the same substances as cellular respiration, therefore you know water must be a product.

The following model shows the chemical reaction that occurs in the cells of your body to provide energy from food. Again, this chemical reaction is called cellular respiration, and it has the same reactants and products as burning.



In cellar respiration, oxygen reacts with glucose to form carbon dioxide gas and water in the cells of organisms.

Although burning and cellular respiration are very similar, the two chemical reactions have some important differences. As you continue investigating cellular respiration, you will learn what those differences are.

How Does Every Cell in My Body Get Rid of Carbon Dioxide?

In this lesson, you learned the circulatory system performs many jobs during cellular respiration. The red blood cells bring oxygen to all the cells of the body through the circulatory system. The blood also carries glucose to all of the cells of the body. Once the circulatory system brings glucose and oxygen to the cells, they can undergo cellular respiration. This chemical reaction produces carbon dioxide and water.

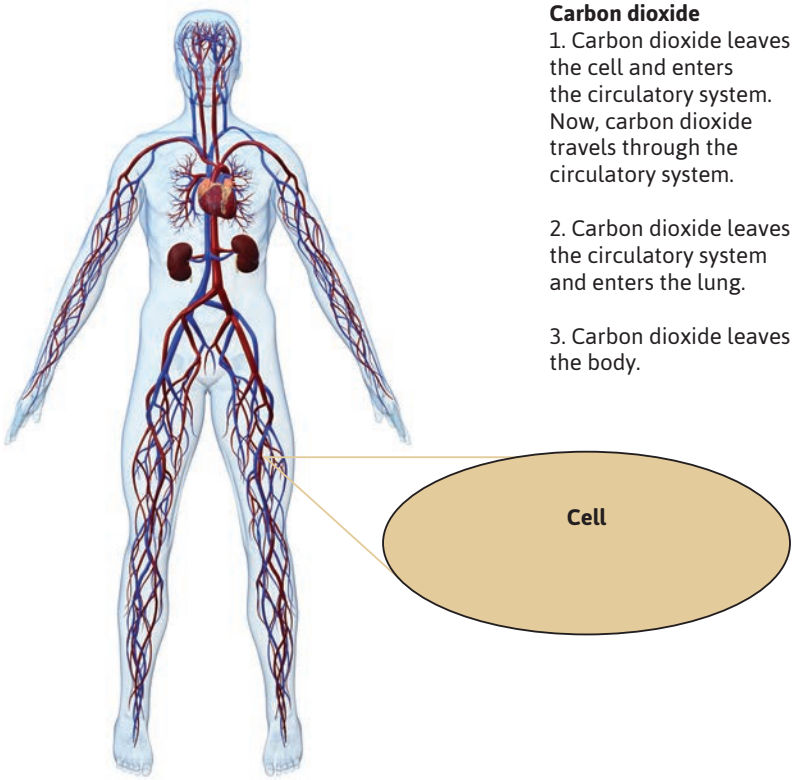
The cells of the body need to get rid of carbon dioxide because it is waste that can poison the cell, so it is also the job of the circulatory system to bring the carbon dioxide from all of the cells of the body back to the lungs. There, your lungs exhale the carbon dioxide when you breathe out. Depending on your activity level, you exhale about 1kg (2.2lb) of carbon dioxide per day. People who exercise more exhale more carbon dioxide.

Why do people who exercise more produce more carbon dioxide?

The diagram shows one muscle cell in the leg of the person who ate the cracker. Use this diagram, and follow the directions.

Inside the cell, write the chemical reaction that the muscle cell uses to provide energy from the cracker.

Draw a line from each number on the list to the place where the listed event happens in the body.



Can Plants Perform Cellular Respiration?

In this activity, you analyzed data that suggested that cellular respiration, a chemical reaction similar to burning, happens in every cell of the body. Your data came from humans and dogs. Do you think this chemical reaction also happens in plants? What data would support the claim that the cells of plants also perform a similar chemical reaction to convert energy from food?

Complete the following sentences.

If plants perform a chemical reaction similar to burning, the cells of plants would use

If plants perform a chemical reaction similar to burning, the cells of plants would produce

You have already found that when plants perform photosynthesis in the light, they use carbon dioxide and water and produce glucose and oxygen. During photosynthesis, plants make their own food. In the next activity, you will investigate whether plants can also perform cellular respiration to convert the energy in the food molecules they make.