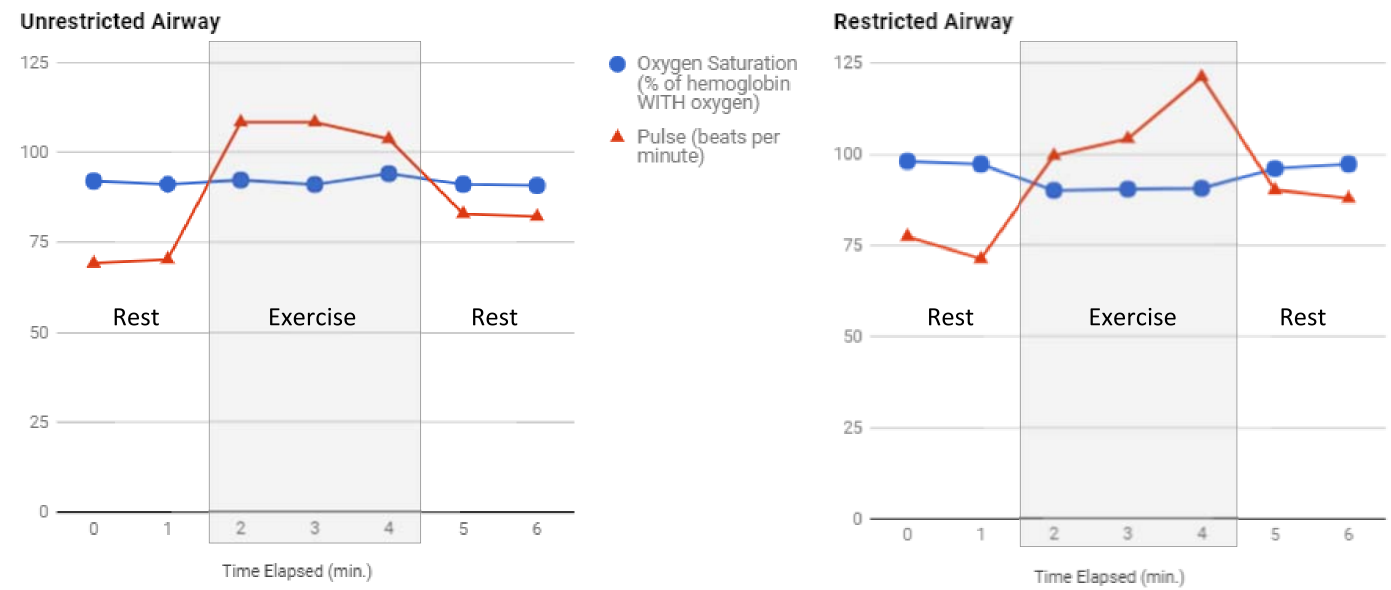
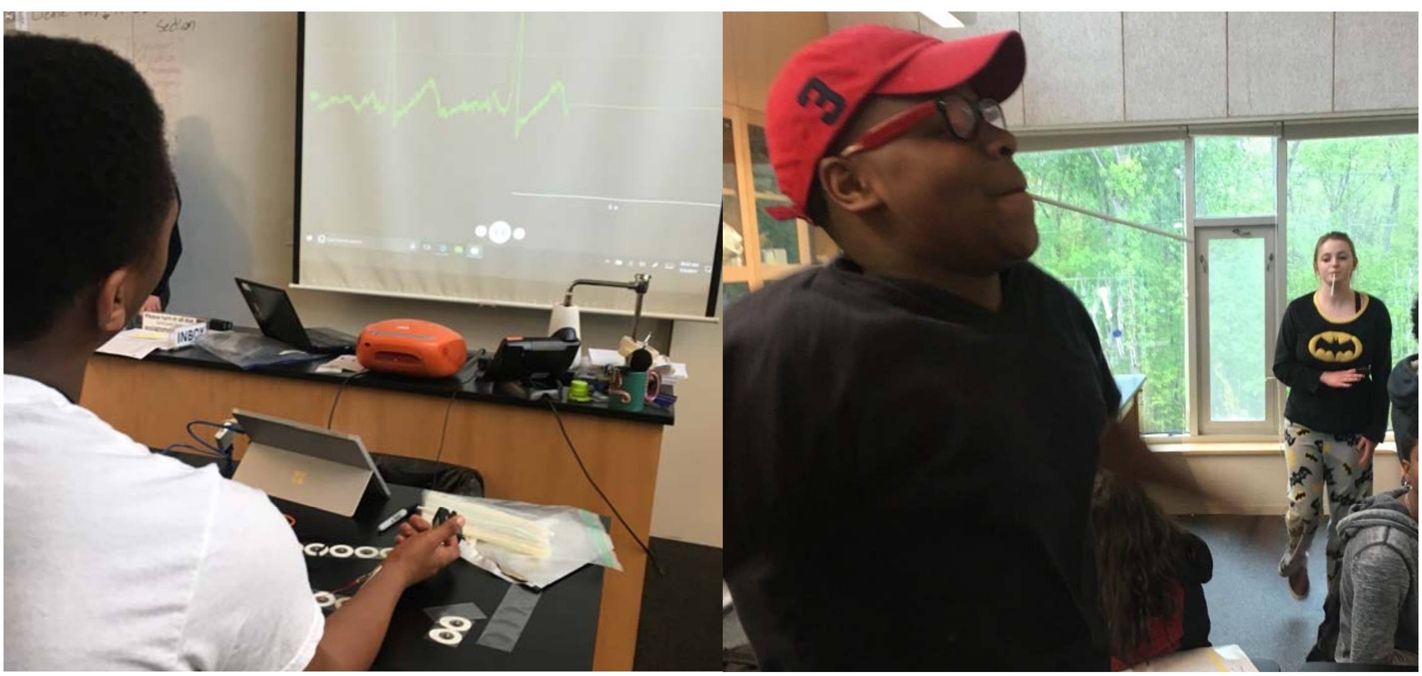


Graph created from the combined data collected by all the biology classes. Description below by SAM PASCUCCI.

Having restricted airways or asthma from air pollution can definitely affect your health. In class, we wanted to see the effects of having restricted breathing and how it affects your pulse and oxygen saturation. If you didn't already know, your pulse is how many times your heart muscles beat per minute to push blood through your body. Oxygen saturation is a measure of the amount of oxygen in your blood. The average human's blood oxygen level is 95-100%. To see how having restricted breathing affects these things, we did an experiment where a couple students put pulse and blood oxygen readers on themselves. What we did was have some people who breathed normally out of their mouths and some people who breathed through a straw which mimicked restricted breathing. Next, we had both groups exercise and rest. What we saw was that those who had restricted airways had a higher pulse and a bigger drop in oxygen saturation levels. This means that the body had to work harder to supply the body with oxygen. Those who had normal air access did not have a large drop in oxygen saturation level and their pulse did not increase much.

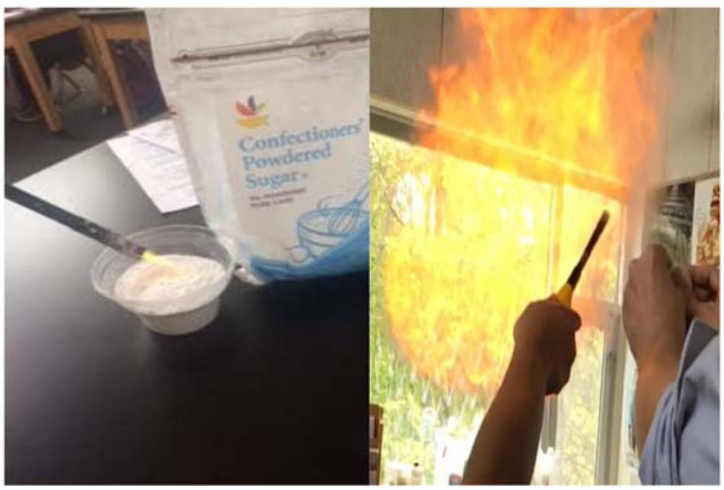


Left. After exercising, Tariq Bolden watches his increased pulse on a computer readout of the electrical signals being sent from his brain to his heart muscles. **Right.** Michael Smith and Evann Meyers simulate exercising with restricted airways, as in asthma, by breathing through a straw.

Why We Need to Breathe

by JENISHA KHADKA

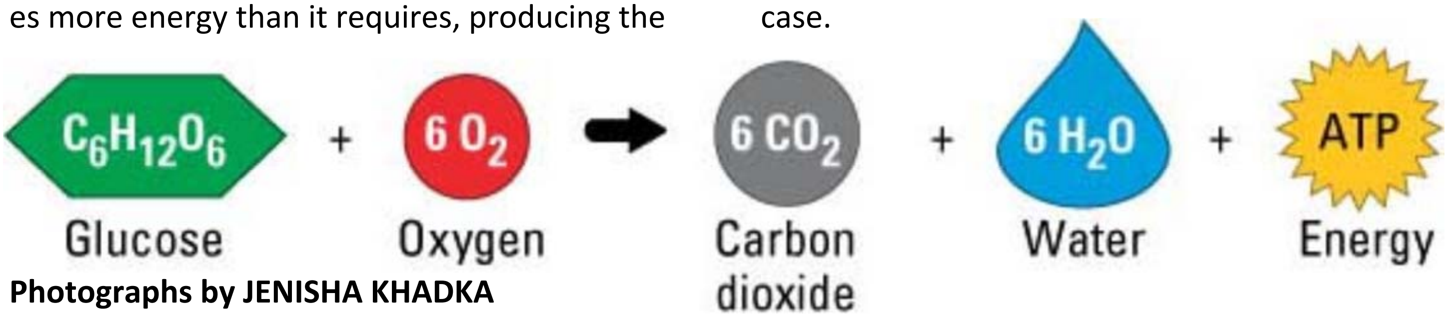
We need to breathe because we need oxygen in our body. Oxygen is needed to burn the fuel, mostly sugar, in our cells. We did an experiment in class which showed why oxygen is needed in our body. We put sugar in a pile and tried to light it on fire, but nothing happened to that pile of sugar because there was not enough oxygen mixed with it. On the other hand, when we sprayed the sugar into the air through the lighter, a giant fireball was created.



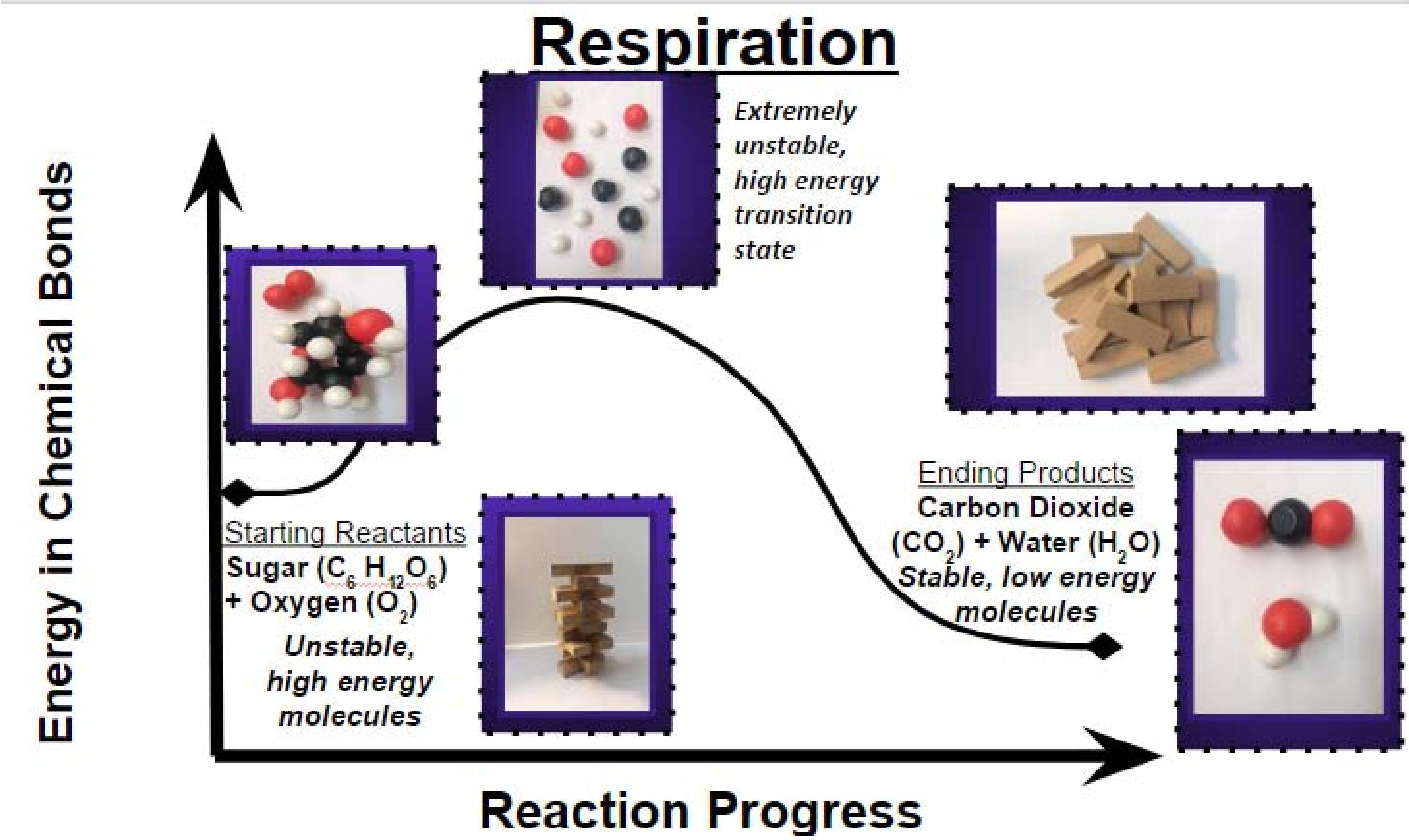
Your body cells use the oxygen you breathe to get energy from the food you eat, which is called the process of cellular respiration. During cellular respiration, the cell puts in a little bit of energy to break down the bonds in sugar and oxygen. When the new, more stable bonds in carbon dioxide and water are formed a lot of energy is released. This process releases more energy than it requires, producing the all of the energy your body needs to keep living.

This process in your cells is very similar to sugar burning in the fireball. As the sugar burns, it is combining with oxygen to create water and carbon dioxide and to release heat energy. When the cell uses oxygen to break apart sugar in your body, carbon dioxide and water are created, and energy is released. But instead of heat energy, the energy produced in cellular respiration is stored chemically for the cell to use later in a special chemical form called ATP.

In a chemical reaction, the molecules produced by the reaction are called products. Molecules are the smallest unit of most materials, and are made up of two or more atoms held together by chemical bonds. The main products of cellular respiration, in addition to ATP, are carbon dioxide and water. No new atoms are created and no atoms are destroyed. In a chemical reaction, reactants contact each other, bonds between atoms in the reactants are broken, and atoms rearrange and form new bonds to make the products. In respiration, the bonds in the sugar are broken and new connections between atoms are formed as carbon dioxide and water. Everything on the left side of the equation breaks down and is rearranged, forming new bonds between the atoms to make the molecules on the right side of the equation, which releases a lot of energy in this case.

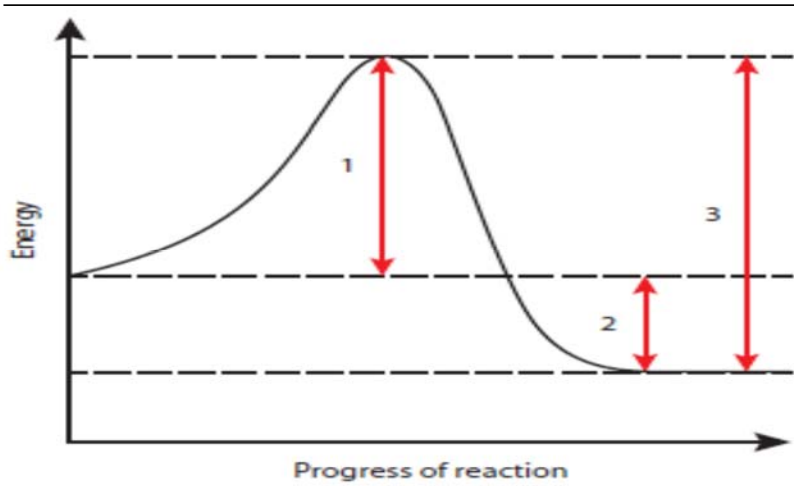


Photographs by JENISHA KHADKA
Diagram source: www.khanacademy.org



Photographs, reaction diagram, and description by EVANN MEYERS and JAYLIN DEJESUS

At first energy is put into the reaction to break the bonds, or connections between atoms, in sugar and oxygen. These starting reactants were very unstable and high energy, like a tall, wobbly tower of blocks. After going through a very brief and extremely unstable transition state, new stronger bonds are formed between atoms as carbon dioxide and water molecules form. These stable, low energy molecules are like a collapsed pile of blocks. The difference in energy between the unstable and stable molecules is released to the environment, just like the noise and motion of a collapsing tower of blocks going from its unstable to stable form.



Graphical analysis by SHAWN WILLIAMS-WELLONS

Image source: www.kentchemistry.com

1. The amount of energy it takes to break the bonds holding together the reactant molecules

2. The difference between the amount of energy it takes to break bonds in the reactants and the amount of energy released when new bonds of the products form, in this example more energy is released than stored

3. The amount of energy released when new bonds are formed in the product molecules