**FEEL THE BURN**

**CELLULAR RESPIRATION LAB**

**Read Before Starting:**

Your body is made of trillions of cells all working together. For each cell to be able to perform its actions, it has to be able to make energy. That is why all of our cells contain an organelle called a ***mitochondria***, which spends all of its time making energy.

We all know that we get our energy from food, but it is not quite that simple. We do get our supply of sugar (***glucose***) from the food we eat, but our body is not designed to burn sugar, just like a car is not designed to burn crude oil. In the same way that we have to refine crude oil into gasoline before our cars can burn it, we have to refine sugar into ***ATP*** (*adenosine triphosphate*) for our cells to burn it. This is why we say that ***ATP is like the gasoline of your cell****.*

Food (sugar) is not the only thing our body uses to make energy (ATP). Our bodies also use the oxygen that we take in every breath to make energy (*you breathe in energy*!). When our body is resting or doing very light exercise, our cells make energy very ***efficiently*** by a process called ***Aerobic Respiration*** (“air”-obic), which uses Oxygen. When we are doing heavy or continuous exercise, however, our body may not be able to get enough Oxygen, so it goes into an emergency mode called ***Anaerobic Respiration*** (“no air”), which makes energy without using oxygen. Anaerobic respiration is very ***inefficient***, so our body only uses it when it runs out of oxygen. Another problem with anaerobic respiration is that it releases a chemical called ***Lactic Acid*** into our muscles, which causes them to get tired and sore.

**Pre-Lab Questions: answer these before starting your lab procedure.**

1. Name at least 2 different kinds of cells in your body. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. How does each of those cells use energy?
3. Which organelle makes the cell’s energy?
4. What molecule is the “food” that plants and animals use to make energy? Write the name of this sugar and its chemical formula.
5. What molecule is “the energy molecule” and is “like the gasoline of your cells?”
6. List at least 3 differences between Aerobic and Anaerobic respiration in the chart below.

|  |  |
| --- | --- |
| Aerobic Respiration | Anaerobic Respiration |
| 1.  2.  3. | 1.  2.  3. |

1. What causes an athlete’s muscles to feel sore during and after a hard work-out?

**Lab Procedure:**

1. Each student will work with a partner. One student will be the test subject and the other student will be the experimenter, recording data and keeping time.
2. The experimenter will record data in 20-second intervals with as little time as possible in between. Test subjects should not be allowed to take breaks in between intervals. If you must take a break, THE TIME MUST CONTINUE.
3. The test subject will lay his/her arm on the desk palm-up, with fingertips touching the desk.
4. Then the test subject will open and close his/her hand as many times as possible during each 20-second interval. It only counts if the hand opens all of the way (so that the fingertips touch the desk!)

**Data Table: *record your data here as you go.***

|  |  |  |
| --- | --- | --- |
| Time (Min:Sec) | Number of hand-closes | How test subject’s forearm feels |
| 0 (before starting) |  |  |
| 20 |  |  |
| 40 |  |  |
| 1:00 |  |  |
| 1:20 |  |  |
| 1:40 |  |  |
| 2:00 |  |  |
| 2:20 |  |  |
| 2:40 |  |  |
| 3:00 |  |  |

**Line Graph of your Data:**

*Your graph needs a title, labels on the x and y axis, and the points should be connected with a line.*

**Questions:**

1. Why do you think the test subject was not allowed to take breaks?
2. You recorded the number of hand-closes and how the test subject’s forearm felt at each 20-second interval. Which of these data is **quantitative**, and which is **qualitative**? Explain.
3. Do you think your arm muscles started out using Aerobic or Anaerobic Respiration? Why?
4. From the 1:00 mark to the end, were your muscles using Aerobic or Anaerobic Respiration? How can you tell?
5. **(15 pts) Analysis**: Explain why you could open and close your hand slowly all day, but when you try to do it quickly, your arm wears out in just a minute or two? (**hint**: use the concepts of Aerobic and Anaerobic respiration.)