**Cellular Respiration Activities**

You will perform two activities, record your results, graph data, and answer post-activities questions. Next, you will use the reading provided to draw some conclusions.

**PART A:**

**Resting (no exercise)**

Measuring Heart Rate:

1. Download on one of your phones the heart rate app

2. Use the app to take the resting pulse of each person 3 times. Record this data in Table 1.

4. Average the 3 trials to get your average resting heart rate.

5. Be sure to record your partner’s data as well.

**Increased Muscle Activity (Exercise)**

1. Exercise for exactly 1 minute by doing jumping jacks.

2. Immediately take your pulse on the phone app and record results. You only need to do this once.

3. Also, observe what happened to your breathing rate and record in table.

4. Repeat the entire procedure for your lab partner.

**PART B: Muscle Fatigue**

1. Grasp a binder clip in one hand with your fingers.
2. You will be doing 5 (30 second) trails with a 15 second break between trials. I suggest you let your clock run and have your partner keep track of when you need to pause and start.
3. When your partner says, “Go”, start squeezing the clip and opening it as many times as possible within the thirty-second interval. Be sure to open it the same width every time.
4. Your partner should keep track of the number of times you squeeze the clip each 30-second time interval and record that data.
5. Repeat the entire procedure for your partner.

**Reading:**

Cellular respiration (see chemical reaction below) is a chemical reaction that occurs in your cells to create energy; when you are exercising your muscle cells are creating ATP to contract. ATP is the chemical energy used by our cells. Cellular respiration requires oxygen (which is breathed in) and creates carbon dioxide (which is breathed out). The oxygen is used to break down glucose.

 C6H12O6 + 6 O2 6 CO2 + 6 H2O + 36 ATP (energy)

When cells are using oxygen to create ATP the process is known as aerobic respiration. This process is very efficient and produce 36 net ATP for each molecule of glucose. Aerobic respiration occurs in the mitochondria of cells.

When muscles undergo rigorous exercise they require more oxygen to make ATP than the blood can supply. At this point the muscle is forced to produce ATP without oxygen. This is known as anaerobic respiration or fermentation. Anaerobic respiration produces only 2 ATP’s for each molecule of glucose. The result of this reaction in muscles is lactic acid. Anaerobic respiration occurs in the cytoplasm of cells.

The advantages of anaerobic respiration are that muscle cells can make ATP without oxygen and it can make ATP very quickly. This is a particular advantage when lifting heavy objects. The big disadvantage to anaerobic respiration is that it produces lactic acid which gives muscles a temporary burning sensation.

Muscle fatigue results when the demand for ATP is greater than the rate at which ATP can be produced in the muscle fibers. As a result, ATP levels are too low for muscle fibers to produce their maximum force contraction. Under condition of extreme fatigue, muscles become incapable of contracting or relaxing.