Name: _____Date: _____Period: _____

Exercise & Cellular Respiration

Purpose:

The purpose of this lab activity is to analyze the affect of exercise on cellular respiration.

Background:

Cells normally contain small amounts of ATP produced during the **glycolysis** reaction of cellular respiration. Whenever the body needs lots of energy in a hurry, its cells quickly burn this stored ATP (in about 3-5 seconds). At this point, the cells of the body's muscles are producing most of their ATP by **lactic acid fermentation,** the slow process by which glucose is converted to lactic acid. This process supplies around 2 ATP energy molecules for approximately 90 more seconds of activity, a very inefficient process. For exercise longer than 90 seconds, the cell has to complete two more reactions for energy. These two reactions are called the **Krebs Cycle** and the **Electron Transport Chain**. These two reactions are the only way to generate a continuing supply of ATP. 36 total ATP for 1 glucose molecule. This is because the two reactions release energy much faster than Glycolysis and/or lactic acid fermentation. For the first 15 minutes of prolonged activity, your body uses energy stored in glycogen (this is a stored form of glucose). After using the available glycogen, the body begins to burn energy stored as fat. This is one reason why ***aerobic exercise*** is so beneficial to weight control – it helps you burn off that extra "love."

Materials:

2 small beakers | bromothymol blue solution (BTB) | 2 straws | stop watch

Pre-Lab: *Use your background information AND your Cellular Respiration notes to answer the following pre-lab questions.*

1. What is the **equation** for cellular respiration? **Label** which items are the **reactants** and the **products**.

$\longrightarrow$

2. What are the 3 reactions of Aerobic Cellular Respiration? A._____
   B._____C._____
3. In what **parts/area** of the cell does cellular respiration occur? A._____
   B. _____
4. **THINK**: After which reaction is CO_2 released? (***hint****: it is only one of the 3*) _____
5. Other than Aerobic Cellular Respiration, what is another type of respiration used for supplying energy?
   _____
6. Using your answer to #5, what are 2 examples of this type of respiration?
   A._____
   B._____
7. **Write a hypothesis** of how exercise will affect your body's production of carbon dioxide (i.e. do you think your body will produce *more* or *less* carbon dioxide as you exercise). Make sure you **EXPLAIN WHY** you feel that way.
   _____
   _____
   _____
   _____

Procedure:

1. Label two beakers **A** (resting) and **B (**exercise**)**.
2. Place **10mL** of water into each beaker → Use the ***Graduated Cylinder*** for accurate volume!!!
3. Place **10 drops** Bromothymol Blue (BTB) solution into each beaker.
   NOTE → *Carbon Dioxide (CO_2) causes Bromthymol Blue to turn YELLOW/GREEN..*
4. YOUR PARTNER WILL TIME YOU DURING THIS STEP:
   a. When your partner says "GO" **SLOWLY** blow air through a straw into the bottom of beaker A. ***Put your straw directly into the solution, blow carefully, try not to splash!*** **CAUTION: DO NOT INHALE THROUGH THE STRAW!!!!!!!!!!!!!!!!**
   b. When the solution changes color, your partner should say "STOP".
   c. Record how long it takes for the BTB to change from blue→yellow/clear. Write your results in the table below.

5. Now jog in place for 1-2 minutes. **CAUTION:** ***DO NOT*** *do this if you have a medical condition that interferes with exercise. If you feel dizzy, stop immediately and sit down!*
6. **Repeat step 4** using beaker B – don't forget to record your results!
7. Now trade roles with your partner. Repeat steps 1-6 using the same beakers and a different straw.

Results:

	Beaker A (Resting)	**Beaker B (Exercise)**
Your Time (s) Needed to Change Color		
Partner's Time (s) Needed to Change Color		

Analysis & Conclusions: *Answer the questions below using your BACKGROUND information in the lab, as well as your lab data. ANSWER THE QUESTIONS IN COMPLETE SENTENCES*

1. What was the purpose of this lab? _____

   _____

2. How did exercise **affect the time** needed for the solution to change color?

   _____

   _____

3. How does exercise **affect the process** mentioned in question # 2?

   _____

   _____

4. Was your hypothesis supported? _____ Explain your answer. _____

   _____

   _____

   _____

5. Why is Aerobic exercise a good thing compared to anaerobic respiration/fermentation is (read background)?

   _____

   _____

6. **THINK**: What are some reasons (GIVE ME 2) why your time may be different from your partner's time? Use the word glucose and/or glycogen in your answer. _____

   A._____

   _____

   B._____

   _____