Name: _____ Period: _____ Date: _____

Cellular Respiration Lab

Purpose/Question: Does exercise have any effect on the rate of cellular respiration?

Background Information:
To maintain life the trillions of cells that make up the human body must constantly use energy. This energy is obtained through a process called respiration. Using respiration, oxygen provided by the respiratory system is taken in by our cells and used to change the chemical energy found in a molecule of sugar (glucose) into an energy form that is usable for humans.

$C_6H_{12}O_6$ (glucose) + O_2 (oxygen) → → CO_2 (carbon dioxide) + H_2O (water) + ATP (energy)

Through this process a waste product called carbon dioxide is created. If carbon dioxide builds up in the body it can be fatal to humans. Therefore, we must have a way to get rid of it. This is accomplished by breathing air out of the lungs when we exhale. Using bromothymol blue, an indicator that turns yellow in the presence of carbon dioxide, you can detect the presence of carbon dioxide in the breath you exhale.

With respect to the human body, the term homeostasis refers to the ability of the body to keep relatively stable internal conditions. In this case that means the body's ability to keep oxygen levels high enough so that the chemical energy in glucose can be changed into usable energy for the body and carbon dioxide levels will be kept low enough so that cells don't die.

Pre-Lab Questions:

1. What goes INTO the reaction (reactants) that transforms food into energy within our cells? ***Circle all that apply**

a. Carbon dioxide
b. Water
c. Oxygen
d. Sugars (glucose)
e. Energy (ATP)

2. What is PRODUCED (products) by the reaction that transforms food into energy within our cells? ***Check all that apply**

a. Carbon dioxide
b. Water
c. Oxygen
d. Sugars (glucose)
e. Energy (ATP)

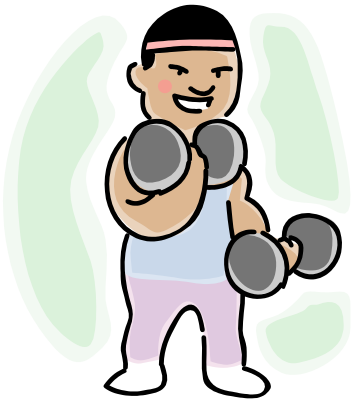
3. Write down the reaction for CELLULAR RESPIRATION

4. What is the **<u>main purpose</u>** of cellular respiration?

5. How are cellular respiration and photosynthesis alike? How are they different?

Materials:

- Test tube
- Straw
- Bromothymol Blue solution
- Water
- Stop watch
- Pen/pencil



Procedure:

Set-up:

1. Obtain a clean test tube & fill with 5 ml of water.
2. Add two drops of bromothymol blue to the test tube.

Without exercise:

3. Measure your resting heart rate
    a. Count # beats for 15 seconds, then multiply # beats by 4 = #beats/minute
    b. Record in data table #1
4. Exhale -- **SLOWLY** through the straw into solution in your test tube - partner records time until color change.
    a. Exhale slowly to avoid the solution from bubbling up
    b. Save the straw for next part – keeping it in your test tube is good place to store it
5. Clean this test tube.

With exercise:

6. Using the same test tube (now clean) fill with 5 ml of water and add 2 drops bromothymol blue.
7. Exercise vigorously for 2 minutes. (Jog in place, do jumping-jacks, etc.)
8. Immediately after you stop exercising, take your active heart rate
    a. Count # beats for 15 seconds, then multiply # beats by 4 = #beats/minute
    b. Record in data table #2
9. Exhale -- **SLOWLY** through the straw into solution in your test tube - partner records time until color change.
10. Clean this test tube & throw out used straw.
11. Record the “change in heart rate” and “change in time” on data table # 2

Data:

Data Table #1 – Without Exercise

	# Beats in 15 sec	X 4 = # Beats per minute	Time for indicator to turn blue to yellow (sec)
Partner 1			
Partner 2			
Partner 3			
Partner 4			
Average			

Data Table #2 – After Exercise

	# Beats in 15 sec	X 4 = # Beats per minute	Time for indicator to turn blue to yellow (sec)
Partner 1			
Partner 2			
Partner 3			
Partner 4			
Average			

Analysis: Answer the following in complete sentences

1. What happened to the rate of cellular respiration after 5 minutes of exercise?

_____

_____

2. Which byproduct of cellular respiration caused the color of the bromothymol blue to change?

_____

3. Did this test indicate that you produce more or less carbon dioxide after exercising? Explain.

_____

4. Did you notice during exercise that your body needed more oxygen to produce energy? How did your body compensate for that?

_____

_____

Conclusion: Fill in the table below

	Photosynthesis	Cellular Respiration
Organelle for process		
Reactants	$CO_2 + H_2O$	
Products		