

INVESTIGATING MUSCLE FATIGUE

(Anaerobic Respiration Lab)

Purpose: In this activity you will investigate the relationship between cellular respiration and muscle fatigue.

Background Information: Just as an automobile must be supplied with gasoline as a source of energy before it can move, so too must your muscles be supplied with energy in order to contract. This energy, in the form of ATP, can be produced in the presence of oxygen (Aerobic respiration) or in the absence of oxygen (Anaerobic respiration). In animal cells the anaerobic process of cellular respiration is called Lactic Acid Fermentation, which occurs when there isn't any oxygen available in the cells for aerobic respiration. As a byproduct of this anaerobic process lactic acid builds up in the body's muscle cells. This buildup of lactic acid continues to the point where muscles have a reduced ability to contract and eventually leads to exhaustion and the cessation of muscle contraction. This is what we call muscle fatigue. Similarly in the case of an automobile if waste products (exhaust) cannot be removed, they build up inside the engine and cause the automobile to stop (stall).

Pre-Lab Question: Describe some situations when we are unable to maintain or supply the demand for oxygen for certain muscles?

Lab Procedure:

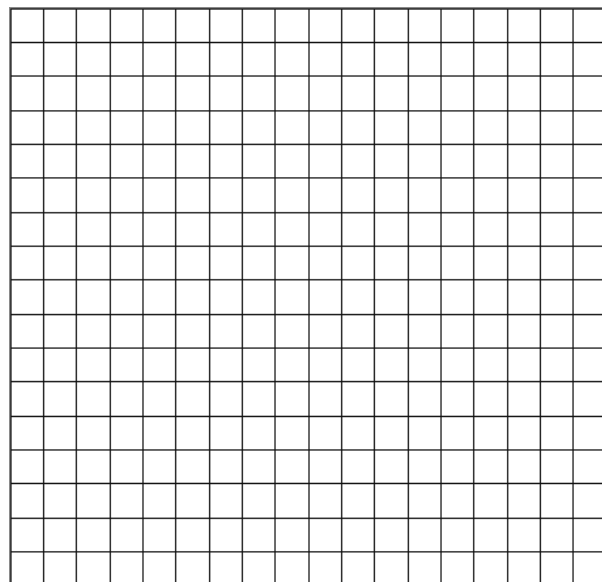
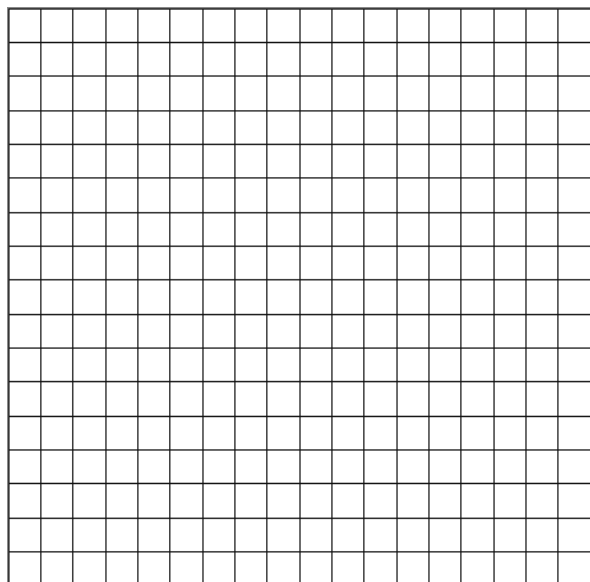
1. Find a partner and get ONE clothes pin.
2. Determine your roles: one of you will assume the role of the "timer" and the other will assume the role of the "squeezer".
3. Squeezer: Hold the clothes pin between your thumb and index finger of your dominant hand (right hand if you are right-handed). Open and close the clothes pin while keeping your other fingers held out straight.
4. Timer: Watch the clock and time the squeezer for 20-second intervals.
5. Timer: Use the Data Table in your notebook to record the number of times the "squeezer" is able to open and close the clothes pin to its maximum distance during each 20-second time period.
6. Squeezer: You should attempt to squeeze quickly and completely in order to get the maximum number of squeezes for each trial. You should NOT rest your fingers between trials!
7. Repeat this process 9 times!
8. Repeat steps 4-8 using your non-dominant hand.
9. Switch roles and repeat the process.

Data Collection:

Trial	# of squeezes in 20 seconds - Dominant Hand	# of squeezes in 20 seconds - Non-Dominant Hand
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Plotting Data:

1. Use your data to prepare a line graph.
2. Your graph should include two sets of data points: data from your dominant hand and data from your non-dominant hand.
3. Be sure to label the axes and title your graph.



Reflection Questions:

4. What happened to your 'strength' as you progressed through each trial? Use your graph to help you explain this.

5. Describe how your hand and fingers felt during the end of your trials.

6. Based on what you learned in this lab describe the relationship between your ability to do work with your muscles and anaerobic respiration.

7. Were your results different for the dominant and the non-dominant hand? Explain why this might be the case.

8. Your muscles would probably recover enough after 10 minutes to operate at the original efficiency. Explain why this would be true.