Teacher Sign-Off				
InitialFurther Inquiry	Name			
	LAB MAP			
Experiment #		Per.	Lab Table #	

Investigative Lab: <u>Investigating Pulse Rate and Homeostasis</u>

- **1. Driving Question**: What effect might activities such as standing at attention, holding my breath, breathing deeply, or exercising have on my pulse rate?
- 2. Background/Pre-Lab: The heart pumps blood through blood vessels to all parts of the body. With each contraction of the heart, blood is forced into the arteries. The surge of pressure felt in the arteries is your pulse. The pulse rate is equal to your heart rate (heartbeat). The pulse rate is an indication of how the heart is functioning. Heart rate is influenced by exercise, temperature, age and gender. A normal resting heart rate for adults ranges from 60 to 100 beats a minute. Generally, a lower heart rate at rest implies more efficient heart function and better cardiovascular fitness. For example, a well-trained athlete might have a normal resting heart rate closer to 40 beats a minute. To measure your heart rate, simply check your pulse. Make sure you are sitting tall, both feet on the ground and very still. To check your pulse at your wrist, place two fingers between the bone and the tendon over your radial artery which is located on the thumb side of your wrist. When you feel your pulse, count the number of beats in 15 seconds. Multiply this number by 4 to calculate your beats a minute. After activity, your recovery rate is the time needed for your pulse to return to the resting pulse rate.

3. Hypothesis:

- a. If/then statement: If I ...(state your variables) then my heart rate should.... (deal with all three of your independent variables)
- b. Support of hypothesis "because": Your support needs to coincide with your independent variables. I've listed a few that you can use. Everyone must choose exercise as one of their three choices. Support ONLY those variables that you will actually perform When you exercise, your muscles use more energy. Your heart must beat faster to supply them with the oxygen they need to produce that energy. The signaling process that stimulates your heart to beat faster during exercise is complex, with inputs coming from many parts of your body and brain. When you are lying down -- and especially when you are lying in a declined position -- your heart beats fewer times per minute than when you are sitting or standing. When you are lying down, the effect of gravity on your body is reduced, allowing more blood to flow back to your heart through your veins. Because more blood returns to the heart, the body is able to pump more blood per beat, which means that less beats per minute are required to satisfy your body's demand for blood, oxygen and nutrients. If you move from a lying or sitting position to a standing position, you may experience a sudden increase in heart rate. When breathing deeply you are getting more oxygen into your lungs and then into your bloodstream, so your muscles will have more fuel and your heart will be able to beat slower and with less effort. In this way, you will interrupt the "fight or flight" response and trigger the body's normal relaxation, or "rest and digest," response. When you stand at attention, your heart has to work harder to keep pumping blood to your extremities so your heart rate should increase. As you hold your breath there is less oxygen circulating through your body and an increasing build up of carbon dioxide so cells will be asking for more oxygen making the heart pump faster.

c. Variables identified: Independent: (Choose three)

Dependent: pulse rate

- d. Constants: original resting heart rate, same procedure to determine heart rate regardless of independent variable
- 4. Flowchart/Procedures: diagrams/lists that would allow another student to repeat your steps of your lab. If appropriate, this may include a list of materials required.

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- 1. IMPORTANT!! All readings are for 15 seconds, multiply by 4 to get data for 1 minute
- 2. Start with identifying your "resting" heart rate". See the Background for the correct procedure. Sit quietly for two minutes, then take three readings rest for one minute in-between readings. Calculate an average for your resting heart rate and record your results in your data table. Include a diagram of where/how you take your pulse.
- 3. Choose three different activities. **Write the procedure for only the three activities you have chosen! Include a diagram for each activity.**
 - **a. Stand at Attention** stand at attention for two minutes. While the subject is still standing take the pulse rate for fifteen seconds. Record the data. Then it should be taken again after 45 seconds, so that a fifteen second pulse is taken every minute for 6 minutes.
 - **b. Holding Breath** While seated the subject should take a deep breath, exhale part of it, and hold the breath as long as possible. (No passing out!) At first breath take the pulse rate for fifteen seconds and record your data. The experimenter should begin breathing normally. Then it should be taken again after 45 seconds, so that a fifteen second pulse is taken every minute for 6 minutes.
 - **c. Deep Breaths** While seated, the subject should take deep, slow breaths regularly for 1 minute. After one minute take the pulse rate for fifteen seconds. as the experimenter begins to breath normally. Then it should be taken again after 45 seconds, so that a fifteen second pulse is taken every minute for 6 minutes.
 - **d. Exercise** The experimenter should do jumping jacks for one minute. Immediately after exercise, the pulse should be taken for 15 seconds. Then it should be taken again after 45 seconds, so that a fifteen second pulse is taken every minute for 6 minutes.
 - **e. Lying down -** The experimenter should lie down on their back with their arms at their sides. At the end of the minute the pulse should be taken while the experimenter is still lying down. Now have the experimenter slowly sit up. Then the pulse should be taken again after 45 seconds, so that a fifteen second pulse is taken every minute for 6 minutes.
- **5. Data Table Set-up:** First column is the independent variable, followed by your dependent variable (data) and finally any derived calculations. Include any math calculations *below your graph* in your notebook if appropriate.

Title: <u>Table 1: Resting Heart Rate</u>

Resting Heart Rate	Pulse Rate (15 secs)	Pulse Rate (1 minute)
Trial 1		
Trial 2		
Trial 3		
My Average	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	
Female Average	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	
Male Average	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	

Title: <u>Table2</u>: <u>Activity Data Table</u>

Activity	Pulse Rate (p	er 1	5 seconds) / p	er minu	te					
	Imediately after activity	1		2		3		4		5	
		()	()	()	()	()
		()	()	()	()	()
		()	()	()	()	()

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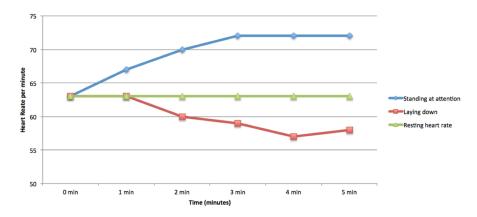
6. Graph Set-up: Be sure to label axes with units

Title: _____

X axis, independent variable: time (minutes)

Y axis, dependent variable: heart rate/min

Draw a straight line to indicate resting heart rate Make sure the different activities are easily identifiable



- **7. Analysis:** These are complete sentences that highlight the information from the data tables/graphs. This would also include any statistical analysis (if done) as well as experimental uncertainty. In complete sentences start by identifying your claim, then evidence for your claim (with any statistical analysis) and finally the reasons for this/these trends. Remember reread your background and "because". Follow by identifying any experimental error (not human error, you should have fixed that or repeated that part of the experiment).
- **8. Conclusions:** A summary statement starting with, "Our data supports/does not support my hypothesis..." if appropriate. Answer any prompts provided and what have you determined regarding the "Driving Question". What could you do to reduced the experimental uncertainty?
- 1. How does your resting heart rate compare with the average for your sex? What might be the cause of the difference between your resting pulse rate and the average?
- 2. Why did you take a resting pulse rate?
- 3. Which activity had the greatest affect on the heart rate? Explain why you think this occurred.
- 4. What do you think is the relationship between physical condition and recovery time?