



Pre-AP Homeostasis and Exercise

Background:

Homeostasis means maintaining a relatively constant state of the body’s internal environment. Pulse rate is constantly checked by receptors throughout your body. A stimulus such as elevated pulse rate leads to a reaction by an organ making the response. An appropriate response will return the pulse rate to normal.

An independent (manipulated) variable is defined as a variable that is deliberately (on purpose) changed. A dependent (responding) variable in an experiment is the variable that is observed and that changes in response to the independent variable. In this experiment, you will be observing heart rate, breathing rate, and perspiration level during 8 minutes of activity. The dependent (responding) variables in this experiment are heart rate, breathing rate, and perspiration level and the independent (manipulated) variable is time (or the duration of exercise).

Problem:

How does exercise affect a person's heart rate, breathing rate, and perspiration level?

Pre-Lab:

- 1. What is an independent (manipulated) variable?

- 2. What is a dependent (responding) variable?

- 3. What are the independent (manipulated) and dependent (responding) variables in this experiment? (HINT: there is more than one dependent (responding) variable)

- a. Independent (manipulated) variable: _____

- b. Dependent (responding) variables: _____

- 4. List the 8 characteristics of life:

- a. _____

- e. _____

- b. _____

- f. _____

- c. _____

- g. _____

- d. _____

- h. _____

- 5. Body temperature is also regulated when exercising. What is one way the body adjusts to the increasing body temperature when exercising?

Hypothesis:

Write a hypothesis about the effect of exercise on the dependent (responding) variables you are measuring, giving a possible explanation of the problem listed above. (You may read the procedure first to gain a better understanding).



Materials:

- You, plus two other group members
- A clock or stopwatch
- Calculator

Procedure:

1. Choose one volunteer to complete jumping-jacks at a pace that can be maintained for 8 minutes. Make sure the subject is inactive for a few minutes before the experiment begins. One member will act as the recorder, one as the time keeper, and one as the subject.
 - a. Timer: _____
 - b. Recorder: _____
 - c. Subject: _____
2. Measure the heart rate by taking his/her pulse. Count the number of beats in 15 seconds.
 - a. Carotid Pulse: Take your 2nd and 3rd finger and place them along the outer edge of the trachea (wind pipe). The carotid arteries supply blood to the head and neck (including the brain). It is important to not press on both arteries at the same time.
3. Multiply the number of beats in 15 seconds by 4 to calculate the beats per minute.
4. Record the data in **TABLE 1** under the 0 minutes box.
5. Measure the person’s breathing rate by counting the number of breaths taken in 15 seconds. Then multiply this number by 4 to calculate breaths per minute. Add this information to **TABLE 1** under 0 minutes.
6. Rate the person’s perspiration level from 1 to 5 (1 = none; 5 = droplets dripping down the face). Note this observation in **TABLE 1**.
7. Have the subject do jumping jacks for **2 minutes**. CAUTION: if the person exercising feels discomfort at any time, stop the experiment and inform your teacher. After 2 minutes, measure the heart rate, breathing rate, and perspiration level (refer to steps 2 through 5), and record the data. Be sure to take these measurements as quickly as possible so the subject can resume exercise. While the recorder is calculating, the time keeper and subject can progress to the next step.
8. Repeat STEP 6 three more times and record your data at each point.
9. After the final recording of the dependent variables, wait 2 minutes with the subject at rest. Then measure all variables again. Record this data under the “10 Time (min.)” box.

TABLE 1— EFFECTS OF EXERCISE

Time (min.)	# of Heartbeats in 15 Seconds	# of beats x 4 = Heart Rate (beats/min)	# of Breaths in 15 Seconds	# of Breaths x 4 = Breathing Rate (breaths/min)	Perspiration Level
0					
2					
4					
6					

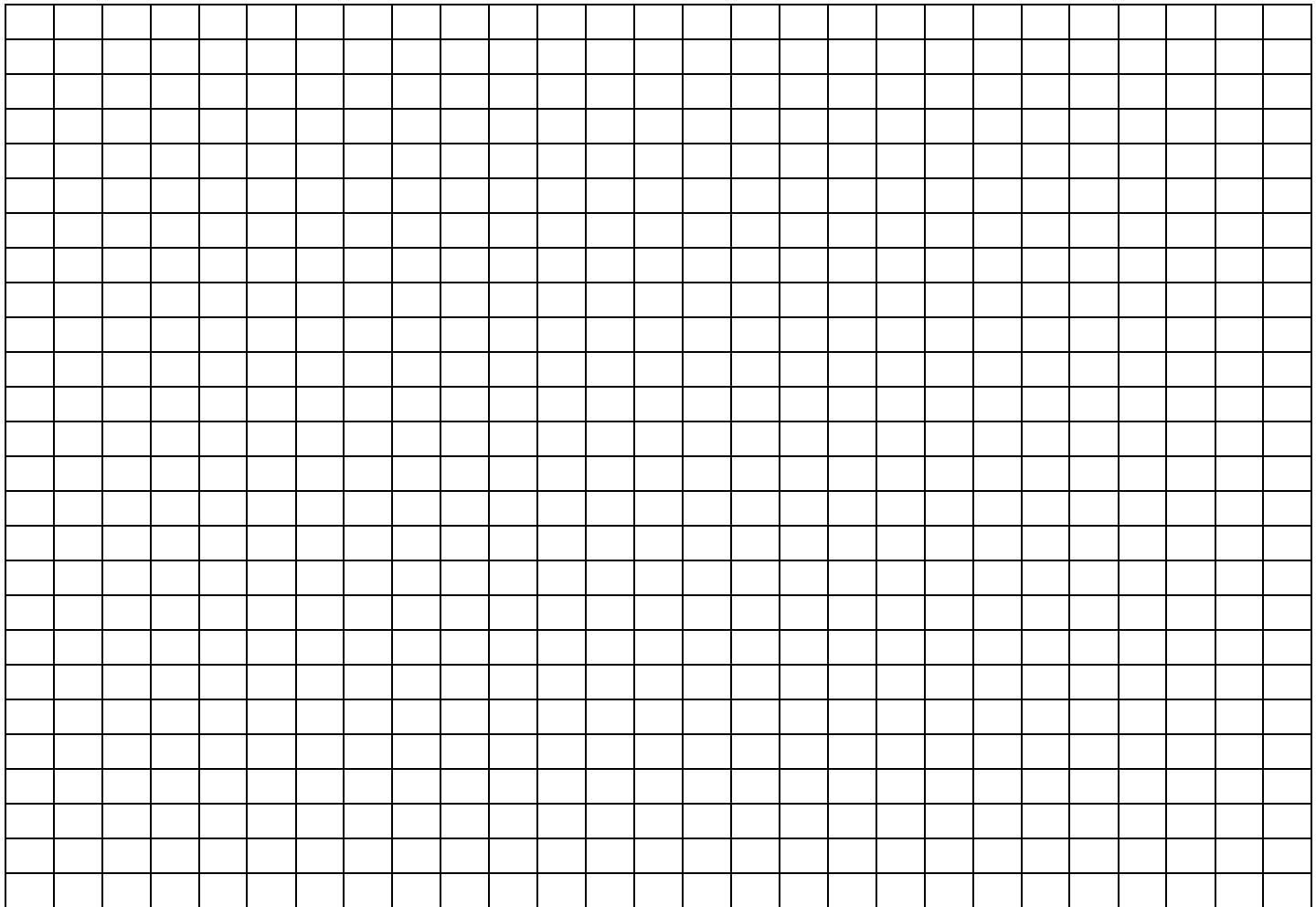


8					
10					

Analysis:

Draw a multi-line LINE GRAPH to show the relationship between the duration of exercise (time) and the heart rate, breathing rate, and perspiration level. You will need to use THREE different colors to represent your dependent (responding) variables. **Be sure to include a KEY, TITLE, and LABEL YOUR AXES.**

TITLE: _____





Key	
<input type="checkbox"/>	= Heart Rate
<input type="checkbox"/>	= Breathing Rate
<input type="checkbox"/>	= Perspiration Level

Post-Lab Questions:

1. What happens to your pulse rate with vigorous exercise? How does your heart respond and why does this occur?

2. How do you think the results from this lab would compare for a trained athlete and an average person? Explain.

3. How is perspiration level related to body temperature? How is perspiration related to homeostasis?

4. Explain how the changes help the body made during the lab (breathing and heart rate) maintain homeostasis.

5. What is equilibrium and how does it relate to homeostasis?

6. Explain why an increased breathing rate accompanies exercise.
