

# Making Connections

## Post Lab Questions

- In designing any experiment, which step should you perform first?
  - collect and organize the data
  - determine the question you are trying to answer
  - design the data tables
  - decide how many subjects to test
- Which activity was performed in lab to demonstrate muscle fatigue?
  - repeatedly taking your pulse
  - jogging around the school
  - repeatedly squeezing a clothespin
  - constructing a histogram
- Which best describes the proper technique for taking your own pulse as described in the lab directions?
  - Press your thumb lightly against your wrist.
  - Press two fingers firmly against the side of your neck.
  - Press two fingers firmly against your wrist.
  - Press two fingers lightly around your wrist.
- What was graphed in the histogram you created?
  - The number of students in each average pulse range.
  - How pulse rate affected muscle fatigue.
  - How muscle fatigue affected pulse rate.
  - The number of clothespins squeezed per minute.
- If a scientist suspects that two activities have a connection, what is one reliable way the scientist can find out if he or she is correct?
  - He/she should ask many people if they have noticed the same connection.
  - He/she should publish the idea in a scientific journal for peer review.
  - He/she should look for other connections that might be related.
  - He/she should design and perform a controlled experiment to test his suspicion.
- A student squeezes a clothespin 115 times in one minute. She then repeats the activity and squeezes the clothespin 96 times in one minute. Which would be the most likely biological explanation for this?
  - Her muscle cells became fatigued as waste product built up inside of them.
  - Her pulse rate became too fast to deliver oxygen to the cells.
  - The clothespin hinge became harder to squeeze as it heated up.
  - The experiment as not designed properly, causing human error.
- What is the best reason a person's pulse rate usually increases after exercise?
  - As the blood moves faster, it makes the heart pump faster.
  - Exercise raises blood sugar levels, causing more insulin in the heart.
  - When the lungs breathe faster, the heart has to work harder to keep up.
  - Muscles need extra oxygen and food to replace what was used up.

8. In this experiment, you measured the number of times that a clothespin was squeezed in a minute. What purpose in the experiment did the clothespin squeeze data serve?
- (1) control (3) hypothesis  
(2) dependent variable (4) independent variable
- (Control Group)
9. A student formulated a hypothesis that cotton will grow larger bolls (pods) if magnesium is added to the soil. The student has two experimental fields of cotton, one with magnesium and one without. Which data should be collected to support this hypothesis?
- (1) height of the cotton plants in both fields (3) diameter of the cotton bolls in both fields  
(2) color of the cotton bolls in both fields (4) length of the growing season in both fields
10. In an investigation to determine the change in heart rate with increased activity, a biology teacher asked students to take their pulses immediately before and immediately after exercising for 2 minutes. The data showed an average heart rate of 72 beats per minute before exercising and 90 beats per minute after exercising. If a valid conclusion is to be made from the results of this experiment, which assumption must be made?
- (1) In most students, the average heart rate is not affected by exercise.  
(2) Each student exercised with approximately the same intensity.  
(3) Exercise causes the heart rate to slow down.  
(4) The heart rate of each student goes up by 18 beats after jogging for 2 minutes
11. A student hypothesized that lettuce seeds would not germinate (*begin to grow*) unless they were covered with a layer of soil. The student planted 10 lettuce seeds under a layer of soil and scattered 10 lettuce seeds on top of the soil. To improve the reliability of these results, the student should -
- (1) conclude that darkness is necessary for seed germination.  
(2) conclude that light is necessary for seed germination.  
(3) revise the hypothesis.  
(4) repeat the experiment using a larger sample size.
12. Diagrams, tables, and graphs are used by scientists mainly to -
- (1) design a research plan for an experiment. (3) predict the independent variable.  
(2) test a hypothesis. (4) organize data.
13. In an experiment to determine the effect of exercise on pulse rate, a student checks his pulse rate before and after exercising for several minutes. The purpose of checking his pulse rate before exercising is that it -
- (1) serves as the conclusion for the experiment. (3) is needed to justify the sample size.  
(2) serves as a control for the experiment. (4) is needed to formulate a hypothesis.
14. An increase in heart rate will most likely result in -
- (1) a decrease in metabolic rate. (3) an increase in pulse rate.  
(2) an increase in cell division. (4) a decrease in body temperature.
15. The students want to improve the validity of their conclusion. The best way to accomplish this is to -
- (1) change the hypothesis. (3) repeat the investigation several times.  
(2) increase the number of variables. (4) increase the height of participants in each group.

16. When people exercise, their body cells build up more waste quickly. Which two body systems work together to remove these wastes from their cells?

- (1) immune and endocrine
- (2) respiratory and circulatory

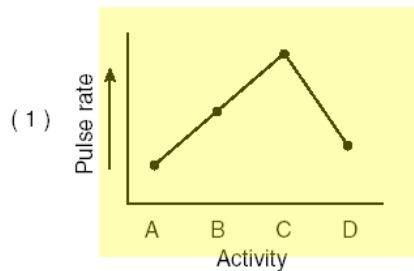
- (3) digestive and skeletal
- (4) circulatory and digestive

17. What is an advantage of a change in pulse rate after exercising?

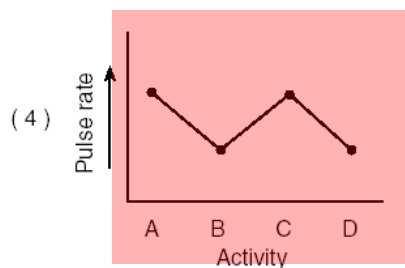
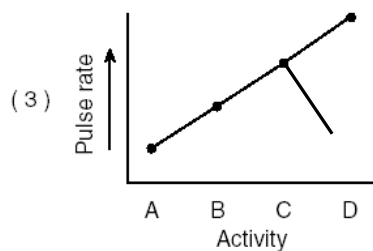
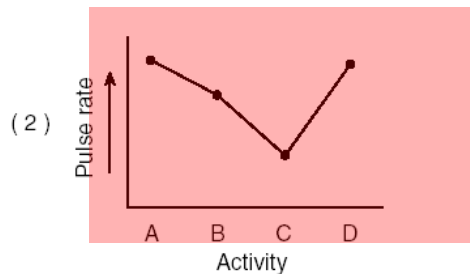
- (1) The heart needs to produce more energy to supply the active muscle cells and maintain homeostasis.
- (2) An increased blood flow carries excess waste products away from the active muscle cells.
- (3) The blood is removing oxygen from muscle cells that were not active and carrying it to muscle cells that are active.
- (4) The blood is supplying the active muscle cells with carbon dioxide to neutralize wastes in those cells.

18. A student measures his pulse rate while he is watching television and records it. Next, he walks to a friend's house nearby and when he arrives, measures and records his pulse rate again. He and his friend then decide to run to the mall a few blocks away. On arriving at the mall, the student measures and records his pulse rate once again. Finally, after sitting and talking for a half hour, the student measures and records his pulse rate for the last time.

Which graph to the right best illustrates the expected changes in his pulse rate according to the activities described above?



**Key:Activity**  
 A = after watching television  
 B = after walking to a friend's house  
 C = after running to the mall  
 D = after sitting and talking



19. Students noticed that some of their classmates have a hard time concentrating during class. They thought it may have some connection with the fact that these students consume energy drinks just before class. An experiment was proposed to find out if there is a connection between energy drinks and the lack of ability to concentrate in class. A properly designed experiment to determine this would include having -
- (1) the whole class drink energy drinks and no water at all, for the entire time of the experiment.
  - (2) the whole class drink water and no energy drinks at all, for the entire time of the experiment.
  - (3) the students drink both water and an energy drink just before class.
  - (4) half the students drink water and the other half drink an energy drink just before class.
20. Complete the “Pulse/Min” column in the data table below for all three trials as well as the average pulse rate per minute.

**Pulse Rate After Activity**

$60/20 = 3$

Trial	20-Second Pulse Counts	Pulse/Min <b>60</b>
1	$23 \times 3$	<b>69</b>
2	$26 \times 3$	<b>78</b>
3	$21 \times 3$	<b>63</b>
Average	$70/3 = 23.3 = 23$	$210/3 = 70$

21. Explain how the validity of the above experiment could be improved.

**The validity of the above experiment could be improved by repeating the experiment several times.**

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22. When a person exercises, changes occur in muscle cells as they release more energy. Explain how increased blood flow helps these muscle cells release more energy.

**Increase blood flow bring more food (glucose) and oxygen TO the muscle cells needed for energy (ATP) production.**

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23. The activity of which body system was measured during Part II of this lab?

**Pulse rate (*circulatory system*) was measure in Part I. of this lab.**

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24. The activity of which other body system would be altered as a direct result of the exercise?

**The other body system that would be altered as a direct result of the exercise is the respiratory system (*breathing*).**

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25. What effect would exercise have on the system you identified in question 24?

**Exercise would cause the respiratory system or breathing rate to increase.**

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26. Explain how this change in pulse rate helps maintain homeostasis in muscle cells. .

**This change maintains homeostasis by removing wastes (CO<sub>2</sub>) from the muscle cells.**

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