

Name:

1. A student squeezes a clothespin as rapidly as possible for one minute. Without stopping to rest, the student continues to squeeze the clothespin for a second minute. At the end of the second minute, the student's fingers and hand feel very cramped and tired. The physical tiredness and cramping in the muscles in the student's hand were most likely due to the increased production of
- 1) ATP 2) waste products 3) oxygen 4) glucose

Base your answers to questions 2 through 4 on the information and data table below and on your knowledge of biology.

During a laboratory activity, a group of students obtained the data shown below

Pulse Rate Before and After Exercise

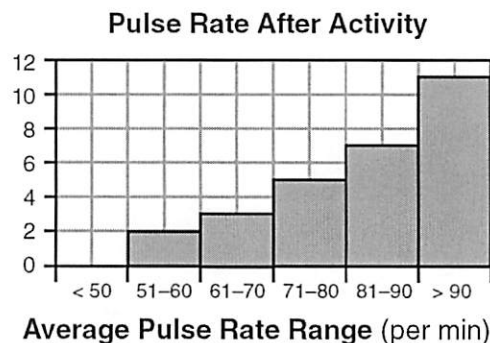
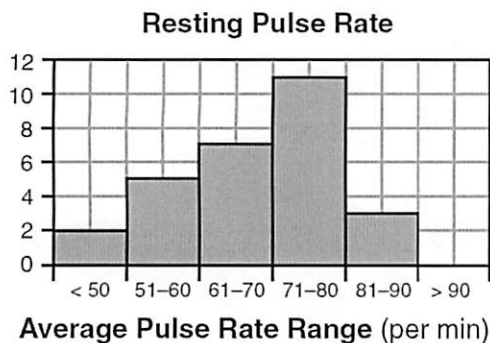
Student Tested	Pulse Rate at Rest (beats/min)	Pulse Rate After Exercise (beats/min)
A	70	97
B	74	106
C	83	120
D	60	91
E	78	122
Group Average		107

2. A change in pulse rate is related to other changes in the body. Write the name of *one* organ that is affected when a person runs a mile and describe *one* change that occurs in this organ.
3. Which procedure would increase the validity of the conclusions drawn from the results of this experiments?
- 1) increasing the number of times the activity is repeated
2) changing the temperature in the room
3) decreasing the number of students participating in the activity
4) eliminating the rest period before the resting pulse rate is taken
4. Calculate the group average for the resting pulse rate.

_____ beats/min

Base your answers to questions 5 through 7 on the histograms below and on your knowledge of biology.

Students in a class recorded their resting pulse rates and their pulse rates immediately after strenuous activity. The data obtained are shown in the histograms below.



5. State *one* biological explanation for the fact that not all students had the same resting pulse rate.
6. An appropriate label for the y-axis in each histogram would be
- 1) Number of Students
 - 2) Average Number of Heartbeats
 - 3) Time (min)
 - 4) Amount of Exercise
7. According to the data, compared to the average resting pulse rate, the average pulse rate immediately after strenuous activity generally
- 1) decreased
 - 2) increased
 - 3) remained the same
 - 4) decreased and leveled off
-
8. A marathon runner frequently experiences muscle cramps while running. If he stops running and rests, the cramps eventually go away. The cramping in the muscles most likely results from
- 1) lack of adequate oxygen supply to the muscle
 - 2) the runner running too slowly
 - 3) the runner warming up before running
 - 4) increased glucose production in the muscle
9. A student hypothesized that the pulse rate in humans would increase 1 hour after eating a meal. Pulse rates were obtained from nine classmates 1 hour after eating lunch. The data in beats per minute were recorded as: 60, 64, 56, 68, 72, 76, 72, 80, and 68. State *one* error in this experiment.
10. Which statement best describes a change that usually takes place in the human body when the heart rate increases as a result of exercise?
- 1) More oxygen is delivered to muscle cells.
 - 2) Blood cells are excreted at a faster rate.
 - 3) The rate of digestion increases.
 - 4) No hormones are produced.
11. Which statement best describes a controlled experiment?
- 1) It eliminates the need for dependent variables.
 - 2) It shows the effect of a dependent variable on an independent variable.
 - 3) It avoids the use of variables.
 - 4) It tests the effect of a single independent variable.

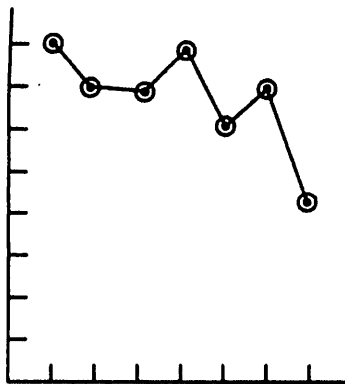
12. As part of an experiment, the heart rate of a person at rest was measured every hour for 7 hours. The data are shown in the table below.

Data Table

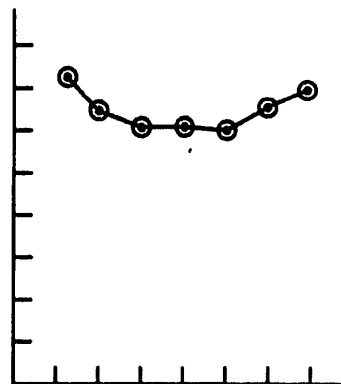
Hour	Heart Rate (beats/min)
1	72
2	63
3	61
4	61
5	60
6	63
7	68

Which graphed line best represents this data?

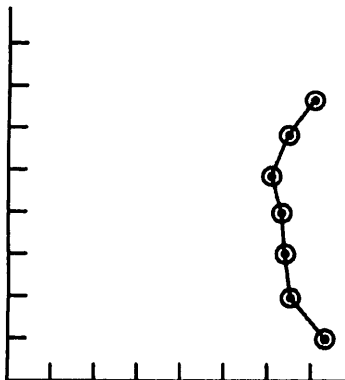
1)



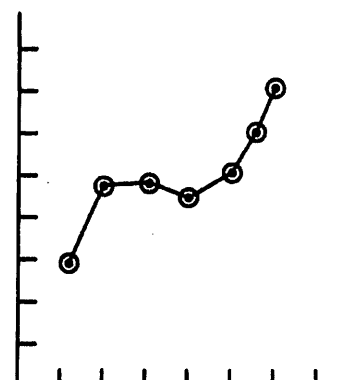
3)



2)



4)



13. A student hypothesizes that the pulse rate of a person and background music that is playing are related. The student designs an experiment to test this hypothesis. What would be an appropriate control for this experiment?

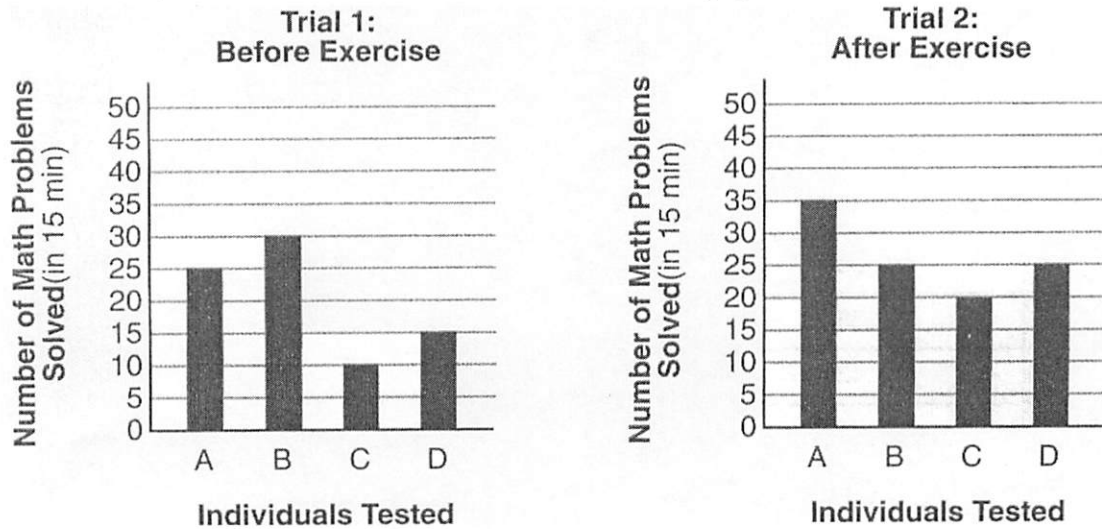
14. The data table below compares blood flow in various human body structures, both at rest and during strenuous exercise.

Structure	Blood Flow at Rest (mL/min)	Blood Flow During Strenuous Exercise (mL/min)
heart	250	750
skeletal muscle	1200	12,500
digestive organs	1400	600

Select *one* structure from the data table and write its name in the space below. Explain *one* way that the change in the rate of blood flow in this structure helps maintain homeostasis during exercise.

Base your answers to questions 15 and 16 on the information below and on your knowledge of biology.

A student read a magazine article that claimed people who exercise for 30 minutes are able to solve more math problems than if they had not exercised. The student convinced four of his friends to test this claim. First, he gave them 15 minutes to do 50 math problems. The number each person solved is shown in the trial 1 graph. Next, all four of the students exercised for 30 minutes. At the end of the 30 minutes, they were given another 50 math problems of equal difficulty for the same amount of time. The number of math problems each student solved is shown in the trial 2 graph.



15. State whether or not exercising for 30 minutes improved the ability of students to solve math problems. Support your answer using data from the graphs.
16. Explain why exercise could influence the ability of a student to solve math problems.

17. The data in the table below were collected during a reaction-time experiment conducted in five biology classes. Average reaction times for each class were determined first at room temperature and then after cooling each student's hand in cold water for two minutes.

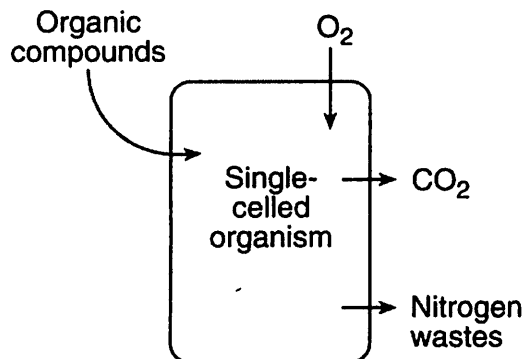
Average Reaction Times to Grab a Falling Ruler

Class	At Room Temperature (seconds)	After Cooling (seconds)
1	.42	.48
2	.36	.41
3	.35	.47
4	.43	.58
5	.44	.47
Averages	.40	.48

Which statement is best supported by the data?

- 1) Cooling the hand increases the reaction time.
- 2) Cooling the hand does not affect the reaction time.
- 3) Cooling the hand affects only some subjects.
- 4) Two minutes of cooling is not enough to affect reaction time

18. The arrows in the diagram below indicate the movement of materials into and out of a single-celled organism.



Students were asked to determine if they could squeeze a clothespin more times in a minute after resting than after exercising. An experiment that accurately tests this question should include all of the following *except*

- 1) a hypothesis on which to base the design of the experiment
- 2) a large number of students
- 3) two sets of clothespins, one that is easy to open and one that is more difficult to open
- 4) a control group and an experimental group with equal numbers of students of approximately the same age

Base your answers to questions 19 and 20 on the information and data table below and on your knowledge of biology.

Two students collected data on their pulse rates while performing different activities. Their average results are shown in the data table below.

Data Table

Activity	Average Pulse Rate (beats/min)
sitting quietly	70
walking	98
running	120

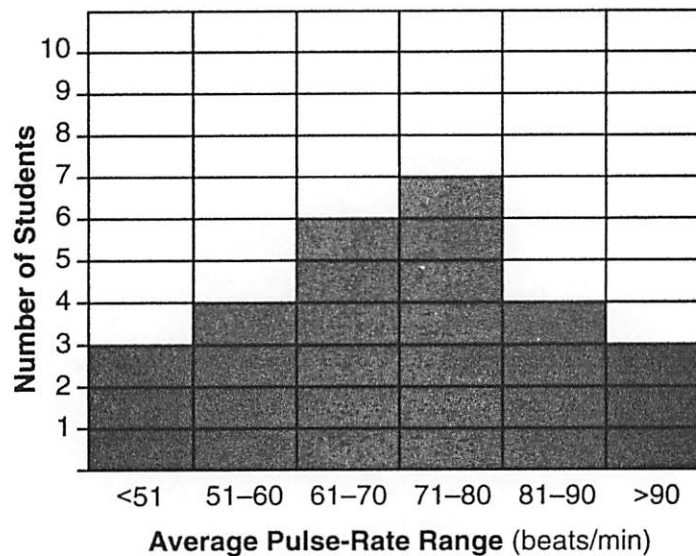
19. State *one* way that this investigation could be improved.

20. State the relationship between activity and pulse rate.

Base your answers to questions 21 through 23 on the information and graph below and on your knowledge of biology.

Pulse-rate data were collected from some students during their lunch time for the lab activity, Making Connections. The data are represented in the histogram below.

Student Pulse-Rate Data



21. State one way the data would most likely be different if the pulse rates were collected immediately after exercising instead of during lunch.

22. The histogram includes data from a total of how many students?

1) 6

2) 7

3) 10

4) 27

23. Describe one way in which a pulse rate below 45 would disrupt homeostasis in an individual whose average resting pulse rate falls in the range of 71-80.

Base your answers to questions **24** and **25** on the information below and on your knowledge of biology.

A student squeezes and releases a clothespin as often as possible for 2 minutes and then takes his pulse for 20 seconds. After a 2-minute rest, he repeats the procedure. This pattern is repeated one more time. The student's 20-second pulse counts were 23, 26, and 21.

Pulse Rate After Activity

Trial	20-Second Pulse Counts	Pulse/Min
1	23	
2	26	
3	21	
Average		

24. What additional data should the student have collected in order to determine the effect of squeezing a clothespin on his pulse rate?
25. Complete the "Pulse/Min" column in the data table below for all three trials as well as the average pulse rate per minute.