

Ultimate State Lab Review Packet

Diffusion Through a Membrane

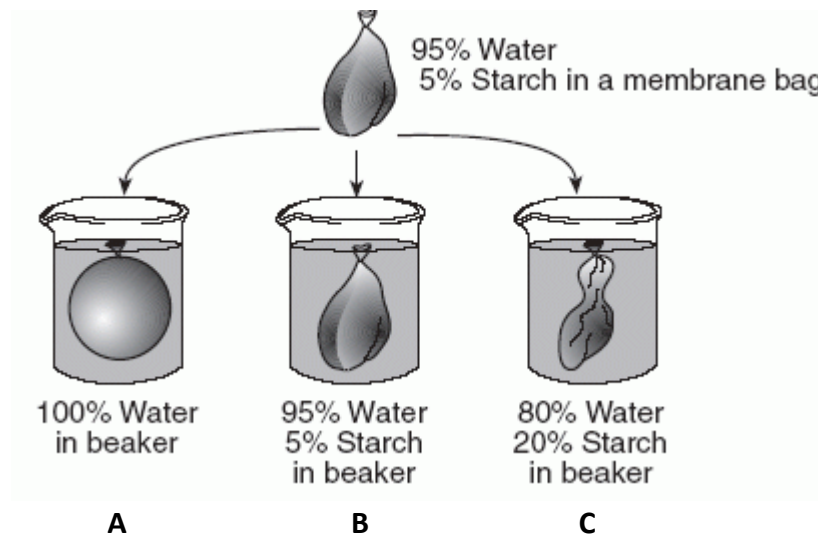
Key Points:

1. The dialysis tubing is a model of the cell with the tube representing the membrane.
2. The **size** of the molecule determines whether or not it moves through the membrane.
3. **Indicators** are chemicals that turn color to indicate the presence of a particular substance.

Indicator	Substance	Color Change
Iodine	Starch	Amber → Blue - Black
Benedict's Solution	Glucose	Blue → Red (After Heating)

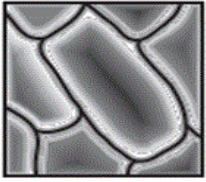
4. Molecules move from a region of **high** concentration to **low** concentration. (DIFFUSION)
5. Water moves toward salt.
6. A cell placed in a salt solution will shrink.
7. A cell placed in 100% water (distilled) will swell.

Review the following diagrams, and describe what is happening to the cell in each beaker?

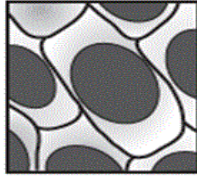


Beaker	Description:
A	
B	
C	

Cell A is in an isotonic environment, describe what you think happened to cell B.



A



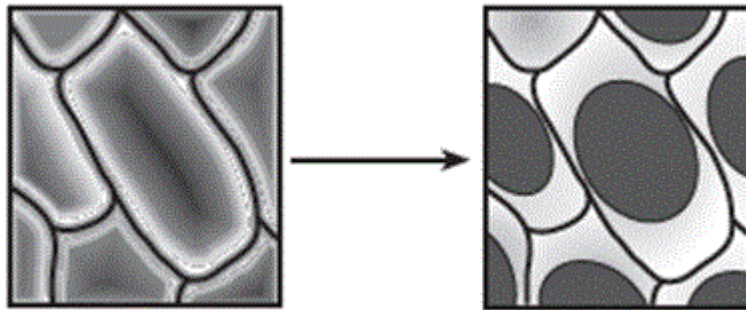
B

Description:

Complete diagram C to show how the contents of the red onion cells from Cell B should appear if they are rinsed with distilled water for several minutes.

Diagram C:

A student prepared a wet mount slide of red onion skin and observed it under high power of a compound light microscope. (View A). After adding a substance to the slide and waiting one minute, the student observed that there were changes in the onion cells (View B).

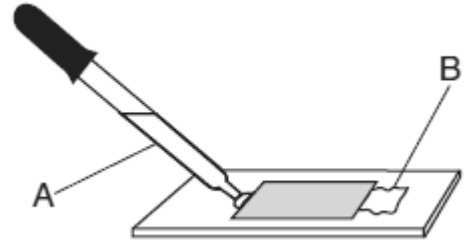


A

B

1. Describe the process that caused the cell to change. _____
2. Which direction did the water move? _____
3. Was the cells in view B in a hypotonic, hypertonic or isotonic solution? _____
 - a. How do you know? _____
4. In the box below, sketch how view B would appear when viewed under low power of the same compound light microscope.

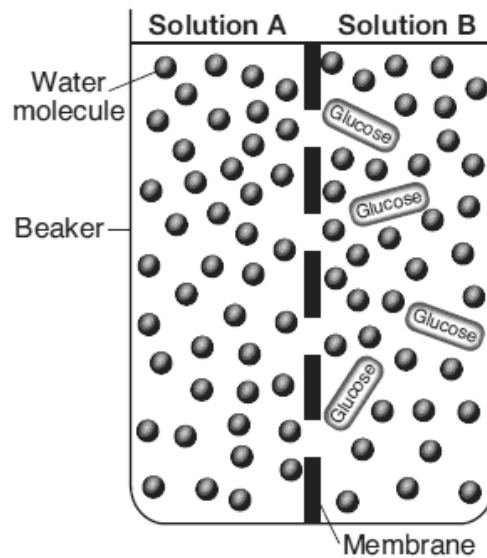
A laboratory procedure involving a microscope slide is represented in the diagram below.



State **one** purpose for this procedure. _____

Identify **one** specific substance represented by the liquid in A.

Base your answer to the question on the diagram below and on your knowledge of biology. The diagram represents two solutions, A and B, separated by a selectively permeable membrane.



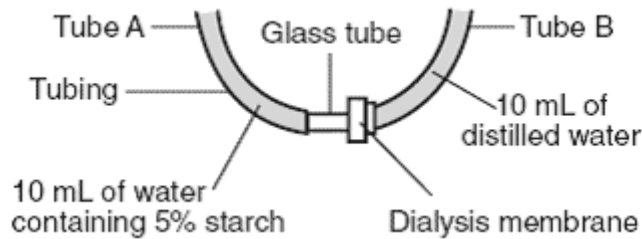
Which statement best describes the outcome after 20 minutes?

1. Solution A will contain approximately the same number of glucose molecules as solution B.
2. Solution A will contain all of the water molecules.
3. Solution B will remain unchanged.
4. Solution B will lose all of the glucose molecules to solution A.

A sample from solution A and solution B were each tested with blue-colored glucose indicator solution before the solutions were placed in the beaker. Which row represents the results?

Row	Solution A	Solution B
1.	red or orange	blue
2.	blue black	amber
3.	blue	red or orange
4.	amber	blue black

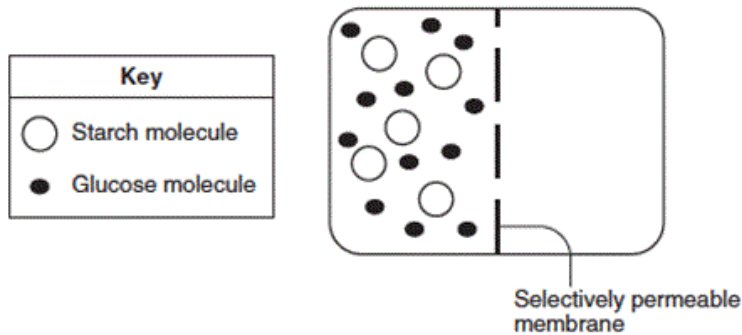
The diagram below represents a laboratory setup used by a student during an investigation of diffusion.



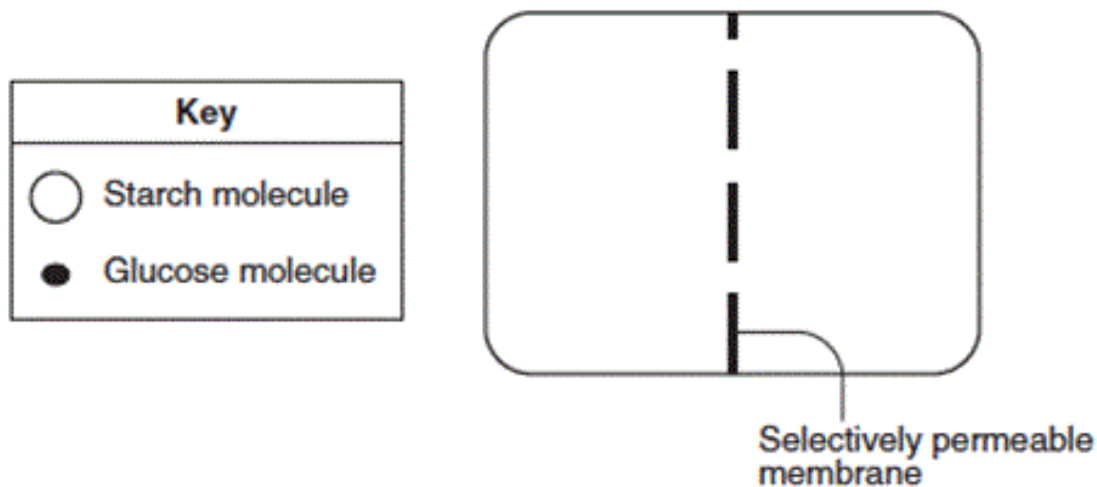
Which statement best explains why the liquid in tube A will rise over a period of time?

1. The starch concentrations are equal on both sides of the membrane.
2. The water will pass from a region of lower starch concentration to one of higher starch concentration.
3. Water and starch volumes are the same in both tubes A and B.
4. The fluids in both tubes A and B will change from a higher temperature to a lower temperature.

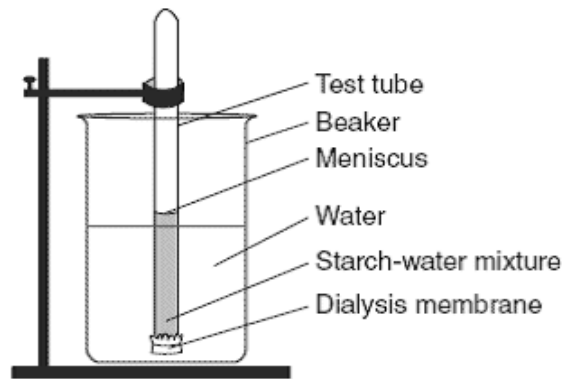
The diagram below represents a laboratory setup used to demonstrate the movement of molecules across a selectively permeable membrane.



In the diagram below, draw the 5 starch and the 12 glucose molecules to show where they would most likely be located after 15 minutes.



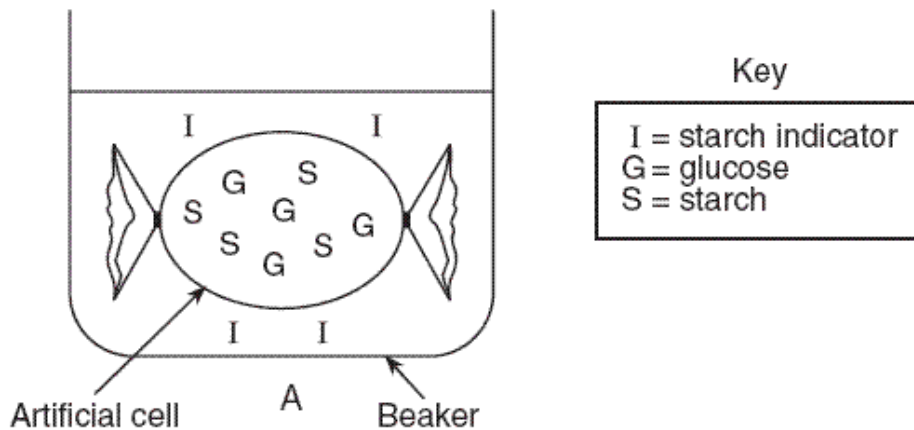
A laboratory setup for a demonstration is represented in the diagram below.



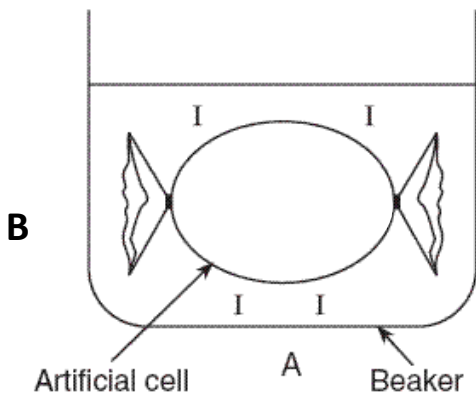
Describe how an indicator can be used to determine if starch diffuses through the membrane into the beaker. In your answer, be sure to include:

- the procedure used
- how to interpret the results

Base your answer to the question on the information and the diagram below and on your knowledge of biology. The diagram illustrates an investigation carried out in a laboratory activity on diffusion. The beaker and the artificial cell also contain water.



Predict what would happen over time by showing the location of molecules I, G, and S in diagram B.

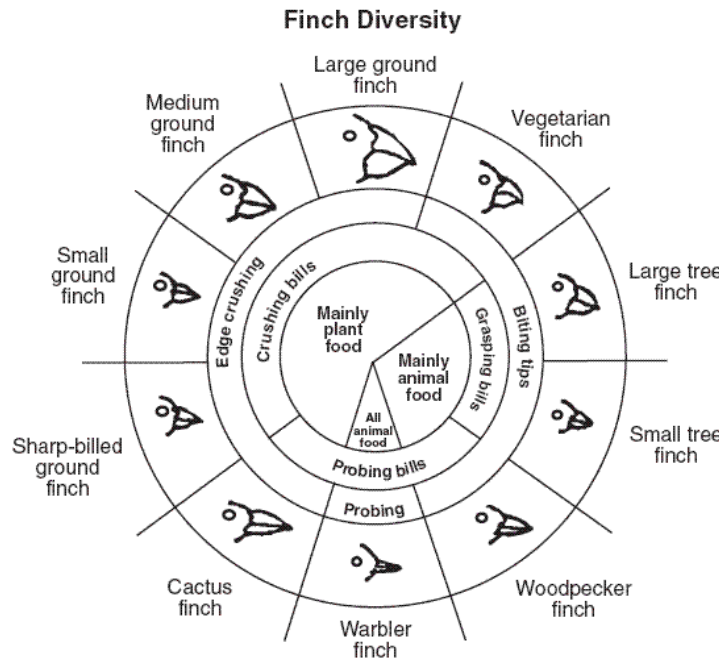


Lab #2 Beaks of Finches lab

Key Points:

- A. Competition for resources stimulates the struggle for survival
- B. Certain variations give some organisms an advantage to survive
- C. The environment “naturally selects” which organisms are best suited to survive and reproduce
- D. The surviving organisms reproduce and pass on favorable traits to the next generation
- E. The different tools represent different beak shapes
- F. Migration to another island represented adaptive radiation

Base your answer to the question on the finch diversity chart below, which contains information concerning the finches found on the Galapagos Islands.



1. Identify **one** trait, other than beak characteristics, that would contribute to the survival of a finch species and state **one** way this trait contributes to the success of this species.

2. The large ground finch, sharp-billed ground finch, and small tree finch inhabit the same island. If the insect population decreases, **which** finch would most likely be affected? **Support** your answer.

3. There are a number of islands in the Galapagos that these finches could possibly inhabit. **Explain** why each island would not be expected to have all of the species shown.

4. When Charles Darwin was developing his theory of evolution, he considered variations in a population important. However, he could not explain how the variations occurred.






Name **two** processes that can result in variation in a population. **Explain** how these processes actually cause variation.

Process 1: _____ : explain: _____

Process 2: _____ : explain: _____





Base your answers to the question on the information below and on your knowledge of biology.

The chart describes the beaks of various types of birds that live in a small island ecosystem containing flowering land plants, aquatic plants, many small mammals, amphibians, and several species of trees.

Beak Shape	Beak Type	Adaptation and Use
	Cracker	Seed eaters like sparrows and cardinals have short, thick beaks for cracking seeds.
	Shredder	Birds of prey like hawks and owls have sharp, curved beaks for tearing meat.
	Chisel	Woodpeckers have beaks that are long and chisel-like for boring into wood to eat insects.
	Probe	Hummingbirds have beaks that are long and thin for probing flowers for nectar.
	Strainer	Some ducks have long, flat beaks that strain small plants and animals from the water.

5. Identify the beak type that would be characteristic of predators of small mammals.

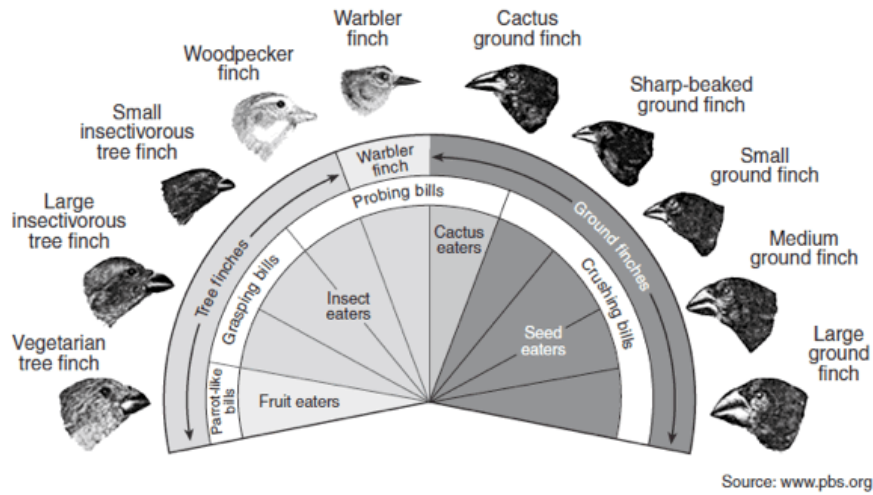
Base your answer to the question on the information below and on your knowledge of biology.

 <p>Warbler finch <i>Certhidea olivacea</i> Probing bill, insect eater, feeds in trees</p>	 <p>Woodpecker finch <i>Camarhynchus pallidus</i> Probing bill, insect eater, uses twig or cactus spine to remove insects from cactus</p>	 <p>Mangrove finch <i>Camarhynchus heliobates</i> Grasping bill, insect eater, feeds in trees</p>	 <p>Vegetarian finch <i>Camarhynchus crassirostris</i> Crushing bill, cactus seed eater</p>
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Source: <http://taggart.glg.msu.edu/isb200/beagle.htm>

6. A person expressed concern that the vegetarian finch may face greater competition when other finch populations increase. **State** whether the vegetarian finch will face competition if the populations of warbler finches, woodpecker finches, and mangrove finches increase. **Support** your answer.

Base your answer to the question on the diagram below and on your knowledge of biology. The diagram shows variations in the beaks of finches in the Galapagos Islands.



7. State **one** reason why the large ground finch and the woodpecker finch can live successfully on the same island.

8. Identify **one** finch in the diagram that is least likely to compete with any of the other finches. **Support** your answer.

Base your answer to the question on the information below and on your knowledge of biology.

In birds, the ability to crush and eat seeds is related to the size, shape, and thickness of the beak. Birds with larger, thicker beaks are better adapted to crush and open seeds that are larger.

One species of bird found in the Galapagos Islands is the medium ground finch. It is easier for most of the medium ground finches to pick up and crack open smaller seeds rather than larger seeds. When food is scarce, some of the birds have been observed eating larger seeds.

9. Explain this long-term change in beak characteristics using the concepts of:

- competition
- survival of the fittest
- inheritance

Base your answer to this question on the information below and on your knowledge of biology.

In the *Beaks of Finches* laboratory activity, students were each assigned a tool to use to pick up seeds. In round one, students acting as birds used their assigned tools to pick up small seeds from their own large dishes (the environment) and place them in smaller dishes (their stomachs). The seeds collected by each student were counted. Some students were able to collect many seeds, while others collected just a few.

In round two, students again used their assigned tools to collect seeds. This time several students were picking up seeds from the same dish of seeds.

10. **Explain** how this laboratory activity illustrates the process of natural selection.

A population of bats feeds on flying insects. Some of these bats have a gene that results in much stronger flight muscles than those of the other bats in the area. **Explain** how this variation could lead to evolutionary change within this species of bat.

11. **In your answer, be sure to include an explanation of:**

- competition within the bat population
- survival of various individuals within the bat population
- how the frequency of the trait for stronger flight muscles would be expected to change within the bat population over time

Base your answer to this question on the information below and on your knowledge of biology.

Rabbits eat plants and in turn are eaten by predators such as foxes and wolves. A population of rabbits is found in which a few have a genetic trait that gives them much better than average leg strength.

12. **Predict** how the **frequency** of the trait for above average leg strength would be expected to change in the population over time. Explain your prediction.

13. **State** what is likely to happen to the rabbits in the population that **do not** have the trait for above average leg strength.

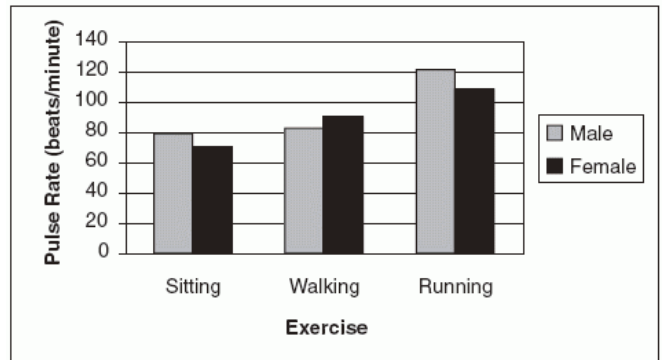
Lab #3 making connections lab

Key points:

1. Resting pulse varies with each individual
2. Pulse rate increases under physical or emotional stress
3. Increasing in activity produces muscle fatigue
4. By collecting data scientists can help to answer questions they have proposed
5. Ask a question, state a hypothesis design a controlled experiment, collect data, organize data, make conclusions based on data
6. Two ways to improve any experiment include repeating the experiment and increasing the sample size

Base your answer to the question on the information and on your knowledge of biology.

In an investigation, 28 students in a class determined their pulse rates after performing each of three different activities. Each activity was performed three times during equal time intervals. The average results are shown in the graph below.



1. [Refer to figure 1]

Some students concluded that males always have a higher pulse rate than females. Does the graph support this conclusion? Justify your answer.

Figure 2

Base your answer to the question 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.

2. [Refer to figure 2]

State the relationship between activity and pulse rate.

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

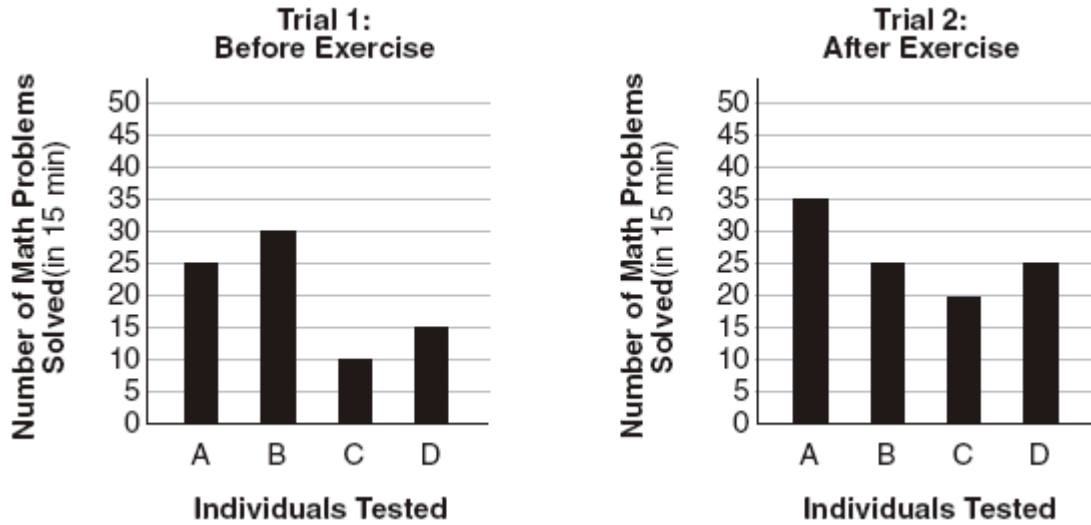
Data Table

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

Figure 3

Base your answer to the question 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.



4. [Refer to figure 3]

Explain why exercise could influence the ability of a student to solve math problems.

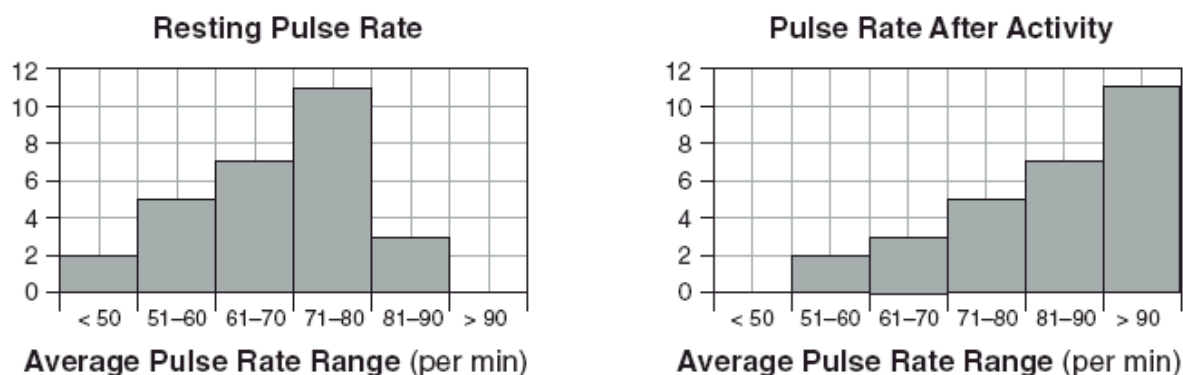
5. [Refer to figure 3]

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.

Figure 4

Base your answer to this question 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.



6. [Refer to figure 4]

State *one* biological explanation for the fact that *not* all students had the same resting pulse rate.

Figure 5

Base your answer to this question on the information below and on your knowledge of biology.

Two students each design their own investigations to determine whether resting or exercising beforehand allows a person to squeeze a clothespin more times over a certain period of time.

Student *A* squeezes the clothespin as many times as he can after sitting quietly for two minutes. In the second trial he runs in place for two minutes and then squeezes the clothespin as many times as he can. He records the results of each trial in his data table.

Student *B* uses the same procedure as student *A*. She also asks that the other 25 boys and girls in her class carry out the same procedure and she records their data. She then calculates the average number of times that the clothespins had been squeezed without exercise and with exercise before the trials.

7. **Based on the description given of the investigations, state one reason why student *B*'s investigation will give more reliable results than student *A*'s.**

8. **Student *B* states that exercising before the second trial will always have the same effect on this type of muscular activity. Explain why the statement made by student *B* could be questioned.**

9.

Base your answer to the question on the information below and on your knowledge of biology.

Biology students conducted a preliminary survey to study the relationship between body height and resting pulse rate. The students collected data from 10 classmates and the results are shown in the graph below.

Is there a relationship between height and resting pulse rate? Support your answer.

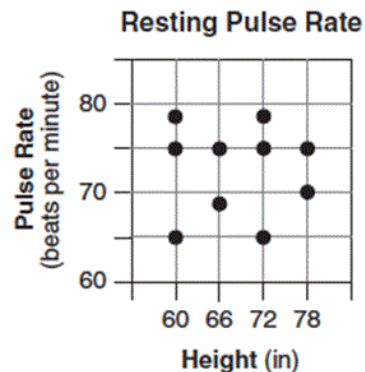
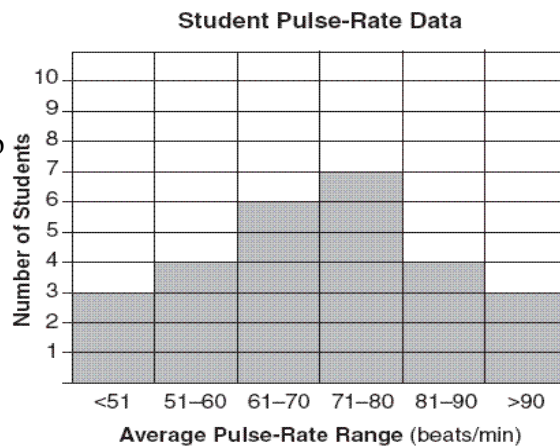


Figure 6

Base your answer to the question 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.



10. [Refer to figure 6]

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.

11. [Refer to figure 6]

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