Minnesota MCA High School Science Practice

Exam Materials
Pages 2 - 21

Name _____

Minnesota Comprehensive Assessments-Series III

Science Item Sampler

Grade HS

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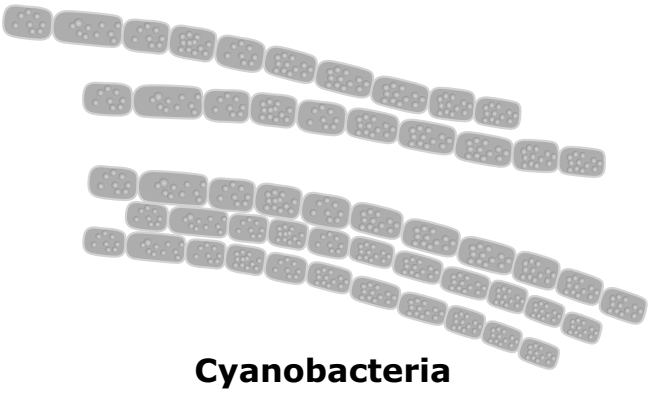
DEPARTMENT OF EDUCATION

1 Cyanobacteria are aquatic bacteria with many unique characteristics. Cyanobacteria are single-celled, but sometimes they live in multicellular colonies or chains. The diagram shows cyanobacteria chains.



Cyanobacteria

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1. Genetic material in bacteria is organized differently than genetic material in plant and animal cells. Identify the correct genetic material for each cell.

1

Each genetic material is labeled A or B. Write the letter of the correct genetic material in each empty box. You may use each letter more than once.

 **Bacterial cell**	
 **Plant cell**	
 **Animal cell**	

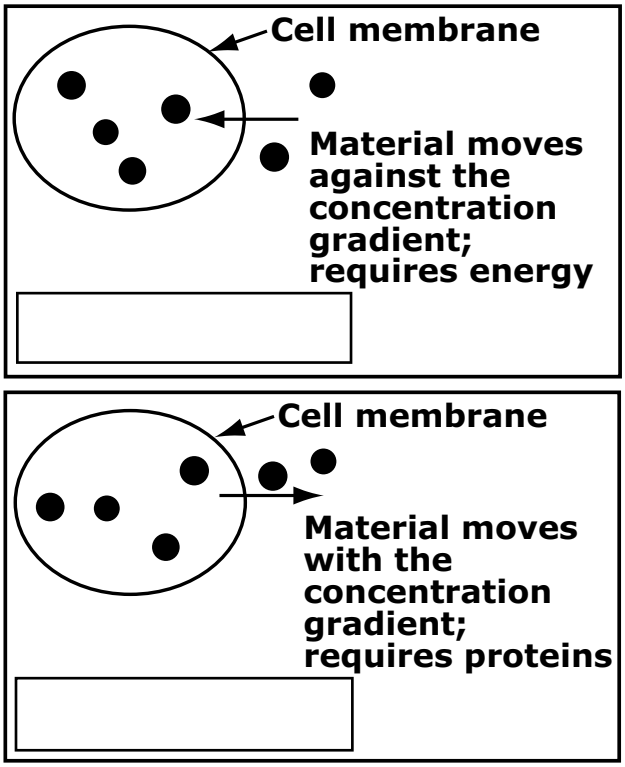
A.  **1 circular chromosome**

B.  **Chromosomes inside a nucleus**

1

2. Cyanobacteria cell membranes are selectively permeable. Cells use many methods of transport to move materials into and out of the cells. Label each method of material transport in the diagram.

Each method of material transport is labeled A, B, or C. Write the letter of the correct method of material transport in each empty box.



Labels

A. osmosis

B. facilitated transport

C. active transport

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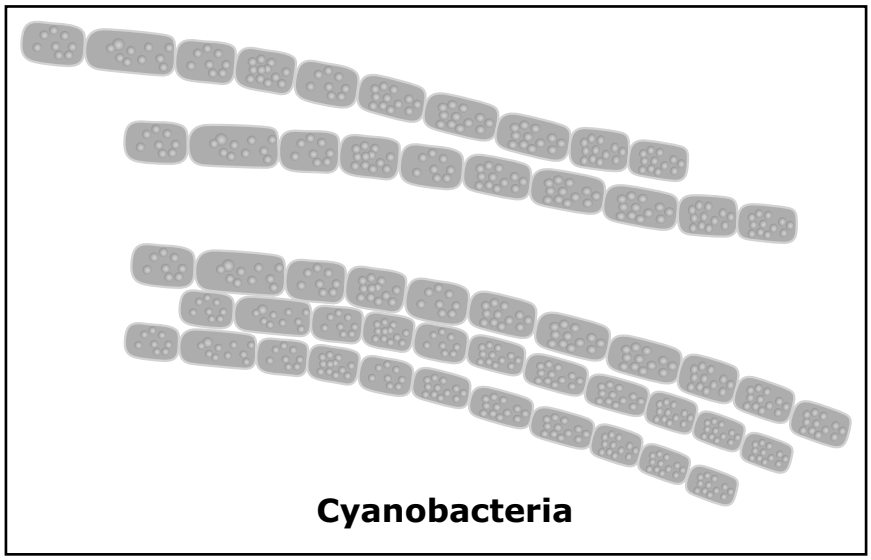
1 Unlike most kinds of bacteria, cyanobacteria contain chlorophyll and perform photosynthesis. Because they contain chlorophyll, most cyanobacteria are green.



Cyanobacteria

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3. Identify 3 objects involved in photosynthesis.

Each object is labeled A, B, C, D, E, or F. Write the letter of the correct object in each empty box in the diagram. Three of the objects will be used.

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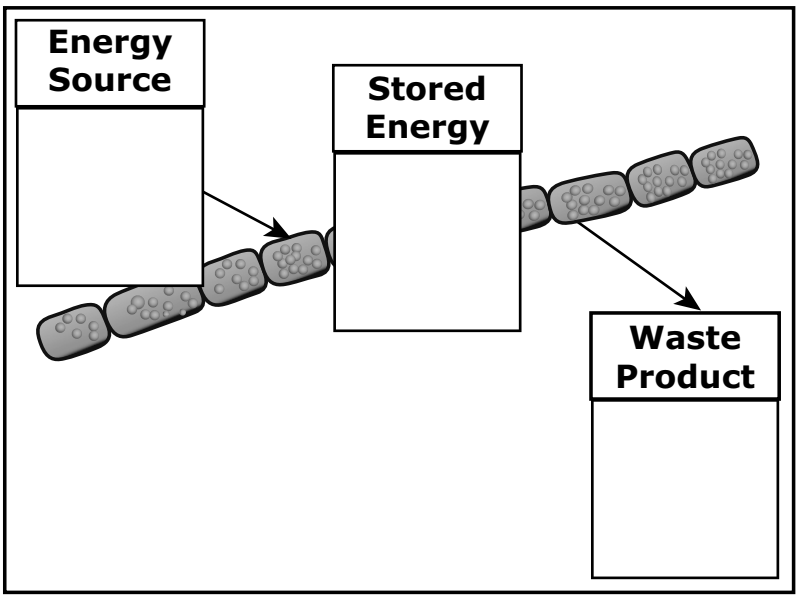
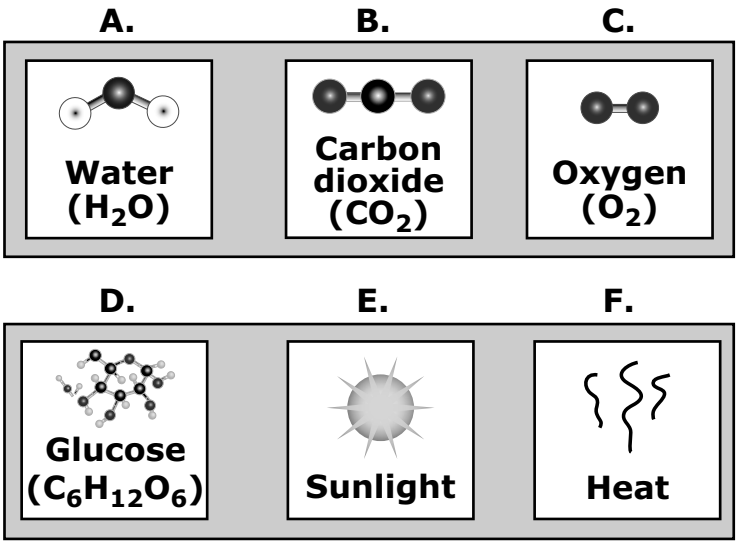
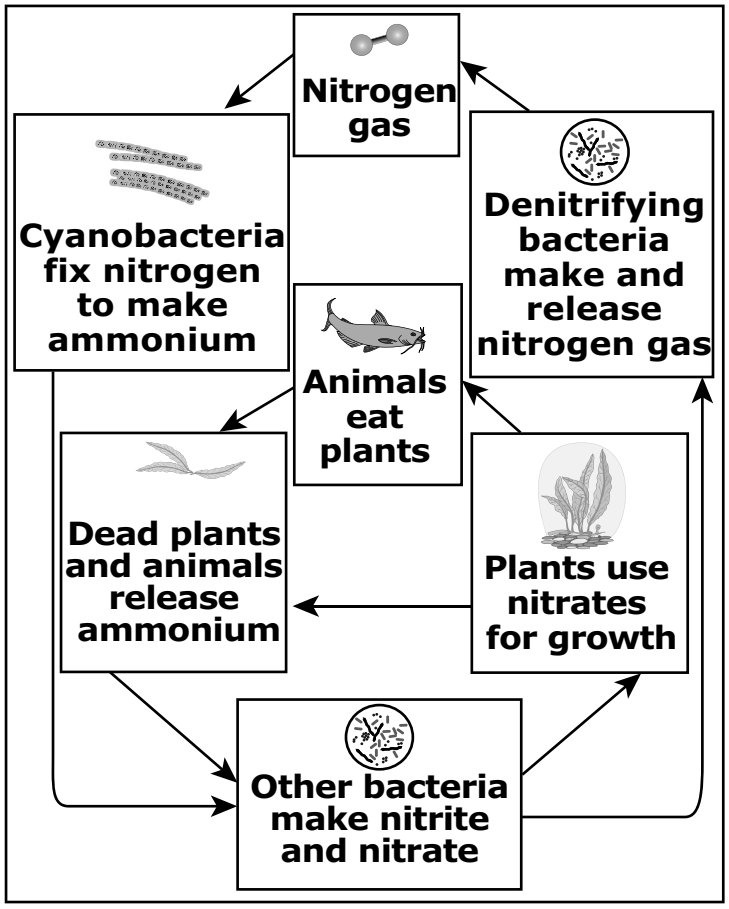


Objects



1 Some cyanobacteria change nitrogen gas in the air to a usable form. These cyanobacteria are nitrogen fixers and important components of the nitrogen cycle. The diagram shows part of the nitrogen cycle in an aquatic environment.

Nitrogen Cycle



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4. How are cyanobacteria important to aquatic plants in the nitrogen cycle?

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A. Aquatic plants use cyanobacteria for food.

B. Aquatic plants absorb cyanobacteria for nitrogen.

C. Aquatic plants depend on cyanobacteria to fix nitrogen gas.

D. Aquatic plants use the form of nitrogen made by cyanobacteria.

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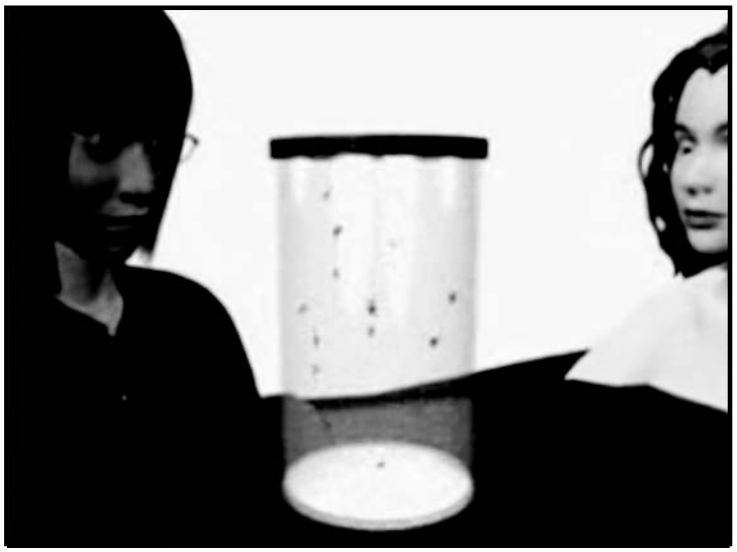
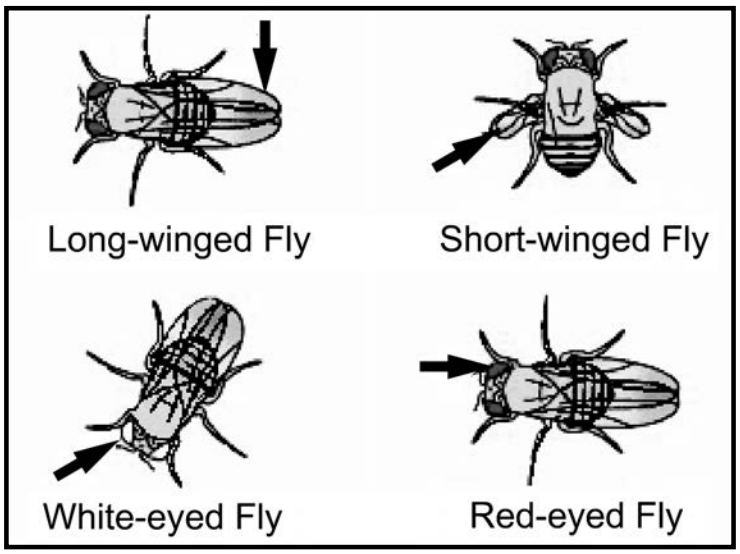
1 Biology students can use fruit flies in experiments. Fruit flies have short life cycles and easily observable traits. Genetics studies involving wing length and eye color are common.





5. Students observe fruit flies with different eye colors and wing lengths. Which type of molecule carries the instructions for characteristics in fruit flies?

A. ATP

B. Glucose

C. Fatty acids

D. Nucleic acids

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Each somatic cell, or body cell, in a fruit fly has chromosomes that contain the genetic information needed for life.

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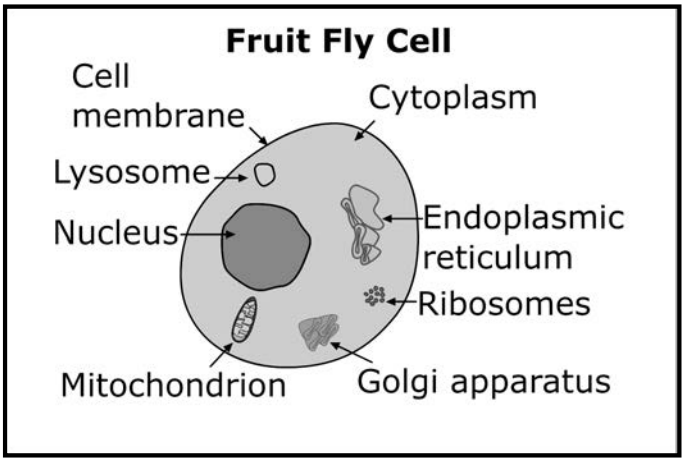
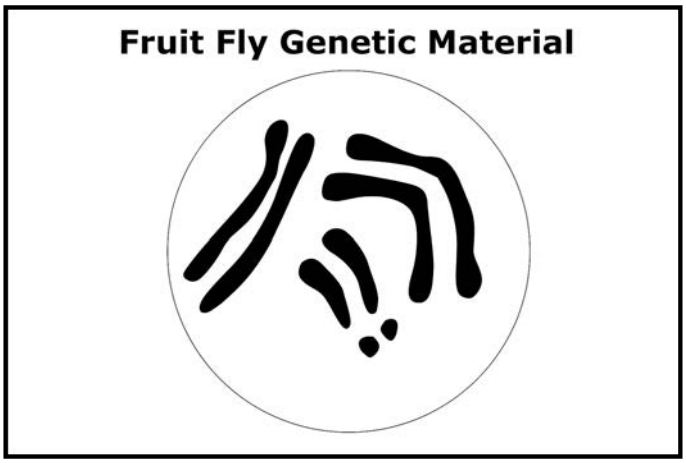




6. Which statement best describes the composition of genetic material in fruit flies and other animals?

A. Genes and chromosomes are composed of DNA.

B. Genes and chromosomes are composed of RNA.

C. Genes are composed of DNA; chromosomes are composed of RNA.

D. Genes are composed of RNA; chromosomes are composed of DNA.

Go on to the next page.

1

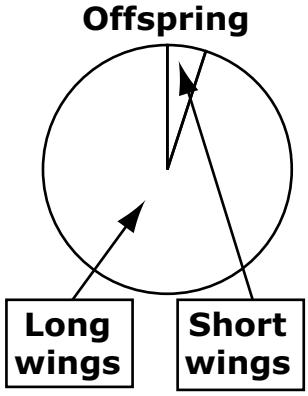
Biology students examine wing length inheritance in fruit flies by doing a cross and observing the offspring. In biology, a cross is defined as 2 organisms bred to produce offspring.

Results of a Fruit Fly Cross

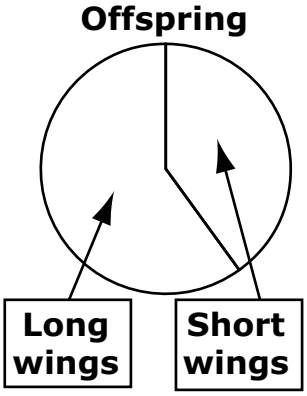
Cross	Offspring
 **Long–winged fly** **X**  **Long–winged fly**	75% long wings 25% short wings

7. The students count the offspring from the cross and show the results in a circle graph. Which graph best represents the results of the cross?

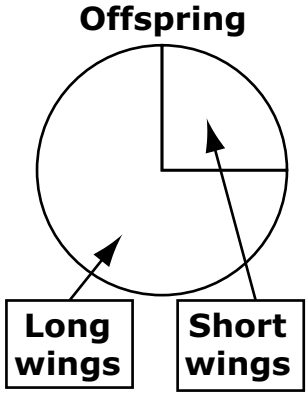
A.



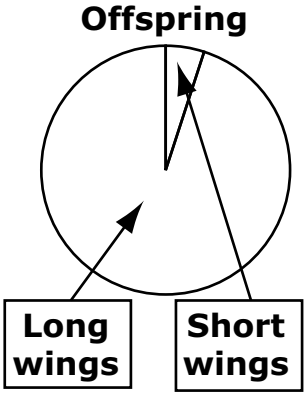
B.



C.



D.



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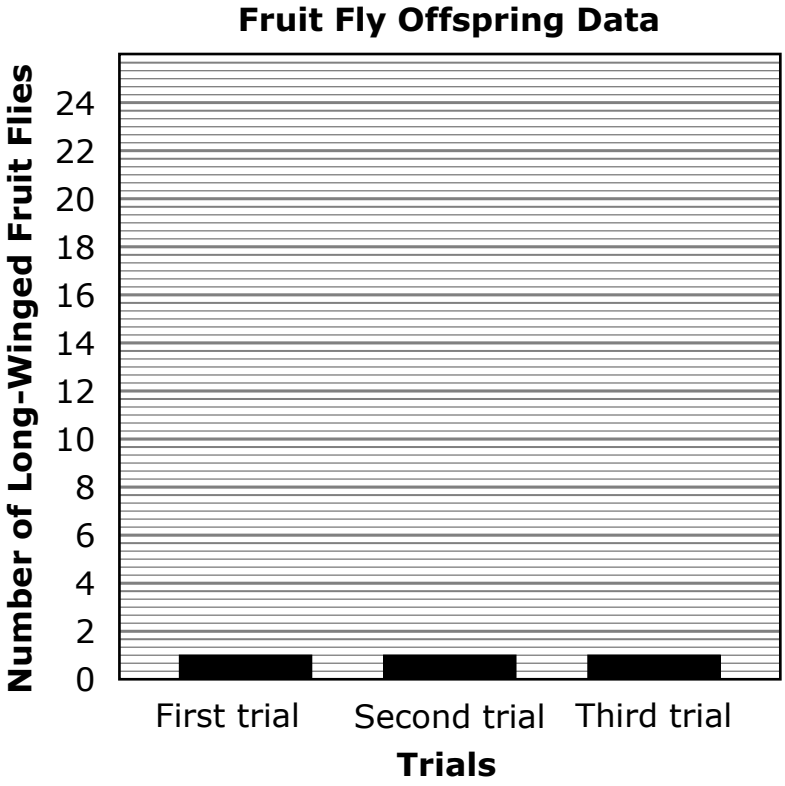
8. The students perform 3 trials of the cross. In the first trial, the students count 8 offspring. In the second trial, the students count 16 offspring. In the third trial, the students count 24 offspring.

1

Calculate the number of long-winged fruit flies counted in each of the 3 trials. Make a graph of this data.

You can use the calculator to help you answer this question.

Write a "+" above each bar where the top of the bar should be.



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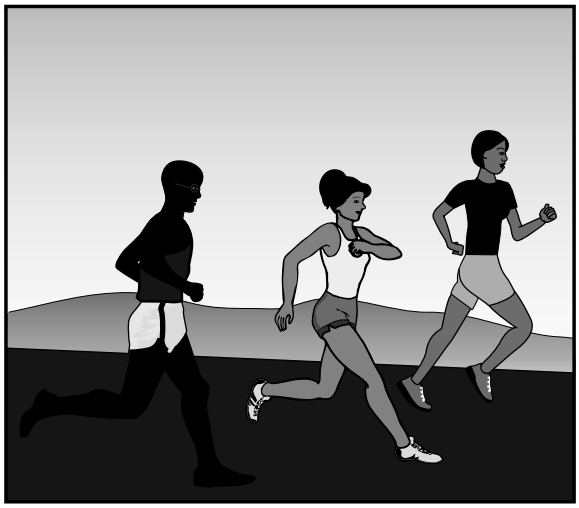
When athletes train and compete, their cells require large amounts of energy. For cells to get the energy they need, many organ systems must work together.



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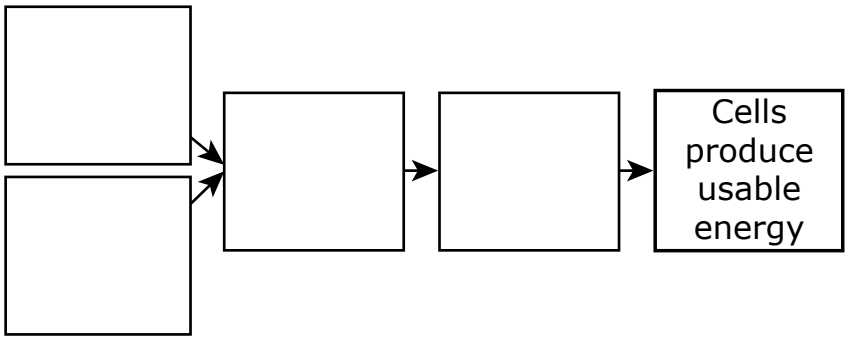
9. Write the letter of each activity in the diagram to show how organ systems work together to help the cells transform energy. The activities are labeled A, B, C, or D. You may use each letter 1 time.



Activities

A.	B.	C.	D.
Cells get raw materials	Circulatory system transports	Digestive system breaks down food	Respiratory system gets oxygen

2

Go on to the next page.

Some athletes train in locations that have high altitudes. Training in these locations may result in the body being able to get more oxygen to the muscles during exercise. More oxygen available to the muscles can help athletes perform better during competition.

2

Go on to the next page.

10. What is 1 way more oxygen helps athletes' muscle cells when they exercise? Athletes' muscle cells

A. require less food.

B. produce less waste.

C. use more carbon dioxide.

D. convert more glucose to energy.

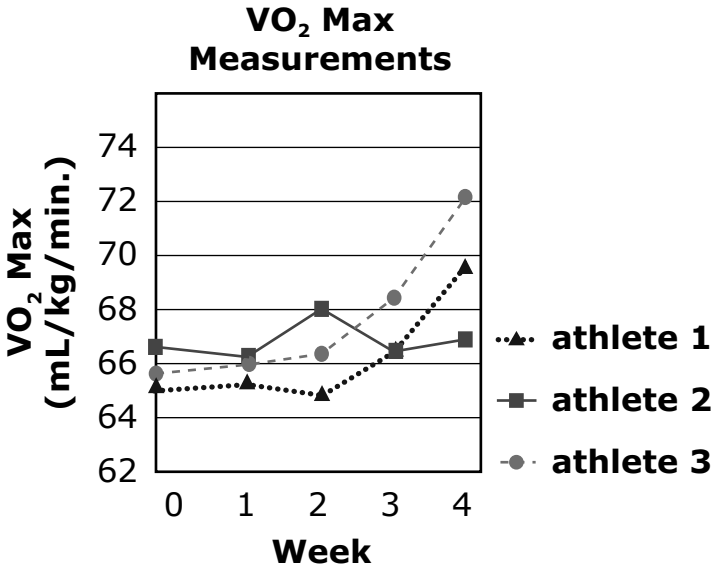
2

Go on to the next page.

2

To determine if athletes are benefiting from training in high altitudes, scientists measure the volume of oxygen that athletes use during exercise. This measurement is called VO_2 max. Athletes benefit when they increase their VO_2 max.

The graph shows the VO_2 max for 3 athletes who trained in high altitudes for 4 weeks.



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11. Identify the time period during which each athlete showed the greatest increase in VO_2 measurements.

The time periods for Athlete 1 are labeled A, B, C, or D. The time periods for Athlete 2 are labeled A, B, C, or D. The time periods for Athlete 3 are labeled A, B, C, or D. Write the letter of the correct time period in each empty box.

Greatest Increase in VO_2 Measurements

Athlete 1	Athlete 2	Athlete 3

	Athlete 1	Athlete 2	Athlete 3
A.	Week 0–1	Week 0–1	Week 0–1
B.	Week 1–2	Week 1–2	Week 1–2
C.	Week 2–3	Week 2–3	Week 2–3
D.	Week 3–4	Week 3–4	Week 3–4

2

Go on to the next page.

Athletes who increase their VO_2 max may also improve their performance during competition.

The table shows the race times for the 3 athletes before and after they trained in high altitudes.

Athletes' Race Times

	Before Training (min.:sec.)	After Training (min.:sec.)
Athlete 1	17:46	17:02
Athlete 2	16:58	16:32
Athlete 3	17:24	16:12
Average	17:23	16:35

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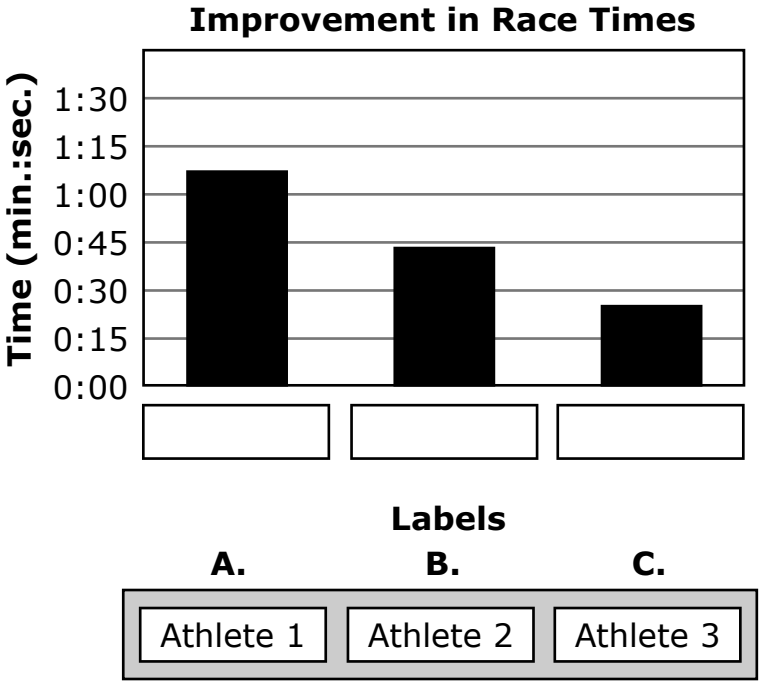
Go on to the next page.

12. The graph shows the improvement in race times (min.:sec.) for each of the 3 athletes. Complete the graph by putting labels on the x-axis.

Each label is marked A, B, or C. Write the letter of the correct label in each empty box. You may use each letter 1 time.



Labels

A. **B.** **C.**

Athlete 1 | Athlete 2 | Athlete 3

2