

# South Carolina End of Course Examination Program



**Biology 1**

**SAMPLE ITEMS**

## Introduction

The South Carolina State Department of Education provides districts and schools with tools to assist in delivering focused instruction aligned with the South Carolina Academic Standards and Performance Indicators for Science. This document contains a set of twenty End-of-Course Examination Program (EOCEP) Biology test items that have been written to align with the South Carolina Academic Standards and Performance Indicators for Science. These items were reviewed for content and bias prior to being field tested and approved for release to the public.

## Purpose

This document is intended to be a resource for educators; it is not designed to be a practice test for students. The sample items are examples of college- and career-ready assessment items. These items were chosen to reflect the increased rigor of assessing two-dimensional standards that blend disciplinary knowledge with science and engineering practices. The EOCEP assesses content standards in a variety of ways. This document does not include all item types.

## Item Information Format

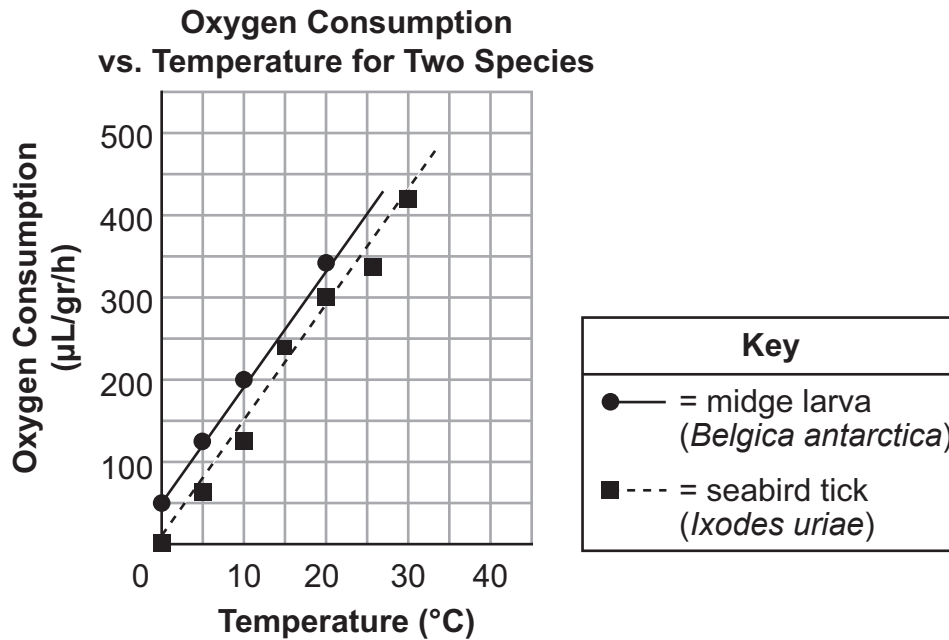
<b>Indicator Alignment</b>	South Carolina Academic Standards and Performance Indicators for Science
<b>Indicator Description</b>	text from the South Carolina Academic Standards and Performance Indicators for Science
<b>Answer Key</b>	correct answer
<b>Depth of Knowledge</b>	cognitive demand
<b>Estimated Difficulty</b>	estimate based on student responses

## Links

South Carolina Academic Standards and Performance Indicators for Science  
<https://ed.sc.gov/instruction/standards-learning/science/standards/>

Norman Webb's Depth-of-Knowledge for the Four Content Areas  
<http://www.webbalign.org/Webbs-DOK-Levels-Summary.pdf>

1. Examine the graph.



Which statement can **best** be concluded from these data?

- A. The respiration rate in both species is independent of both temperature and oxygen consumption.
- B. The respiration rate of midge larvae increases more rapidly than the rate for seabird ticks at all temperatures.
- C. As the temperature increases, there is an inverse relationship between oxygen consumption and the respiration rate in both species.
- D. As the temperature increases, the respiration rate in both species increases, with the rate for midge larvae being higher than that for seabird ticks at all temperatures.

EOCEP Sample Item

1

**Indicator Alignment** H.B.1A.5 (H.B.3A.5)

**Indicator Description** Use mathematical and computational thinking to (1) use and manipulate appropriate metric units, (2) express relationships between variables for models and investigations, and (3) use grade-level appropriate statistics to analyze data.

**Answer Key** D

**Depth of Knowledge** 3

**Estimated Difficulty** Medium Difficulty

2. Marine scientists monitor atmospheric levels of carbon dioxide. As atmospheric levels rise, more of the gas dissolves in the oceans. Calcium carbonate ( $\text{CaCO}_3$ ) dissolves as more carbon dioxide enters the oceans. Marine organisms such as clams need  $\text{CaCO}_3$  to build their exoskeletons.

Based on this information, which change is **most likely** to be a direct result of these increasing levels of oceanic carbon dioxide?

- A. Frequent rainfall will dilute the effect of the carbon dioxide in the water.
- B. There will be an overpopulation of oysters and other shelled marine species.
- C. The water level will rise and cause floods, damaging coastal ecosystems with contaminated water.
- D. Many species of marine organisms will be weakened, making them unable to produce and maintain their shells.

<b>EOCEP Sample Item</b>  <b>2</b>	<b>Indicator Alignment</b>	H.B.1A.6 (H.B.6B.1)
	<b>Indicator Description</b>	Construct explanations of phenomena using (1) primary or secondary scientific evidence and models, (2) conclusions from scientific investigations, (3) predictions based on observations and measurements, or (4) data communicated in graphs, tables, or diagrams.
	<b>Answer Key</b>	D
	<b>Depth of Knowledge</b>	3
	<b>Estimated Difficulty</b>	Medium Difficulty

3. A landscaper researched five grass types recommended for use in South Carolina lawns.

**Characteristics of Grasses**

Grass Type	Fertilizer Use	Water Use	Drought Tolerance	Shade Tolerance	Mowing Frequency
rough bluegrass	moderate to high	moderate to high	poor	excellent	high
perennial ryegrass	moderate to high	moderate to high	good	poor to moderate	medium
Bermuda grass	moderate	moderate to high	excellent	poor	high
buffalo grass	low	low	excellent	very poor	low
zoysia grass	moderate	moderate	excellent	moderate	medium

The landscaper decides to select a grass type that does not require much fertilizer, does not need constant watering, and grows best in direct sunlight. Which grass type **best** fits the criteria?

- A. perennial ryegrass
- B. Bermuda grass
- C. buffalo grass
- D. zoysia grass

EOCEP Sample Item

**3**

**Indicator Alignment**

**H.B.1A.8 (H.B.6A.1)**

**Indicator Description**

Obtain and evaluate scientific information to (1) answer questions, (2) explain or describe phenomena, (3) develop models, (4) evaluate hypotheses, explanations, claims, or designs or (5) identify and/or fill gaps in knowledge. Communicate using the conventions and expectations of scientific writing or oral presentations by (1) evaluating grade-appropriate primary or secondary scientific literature, or (2) reporting the results of student experimental investigations.

**Answer Key**

**C**

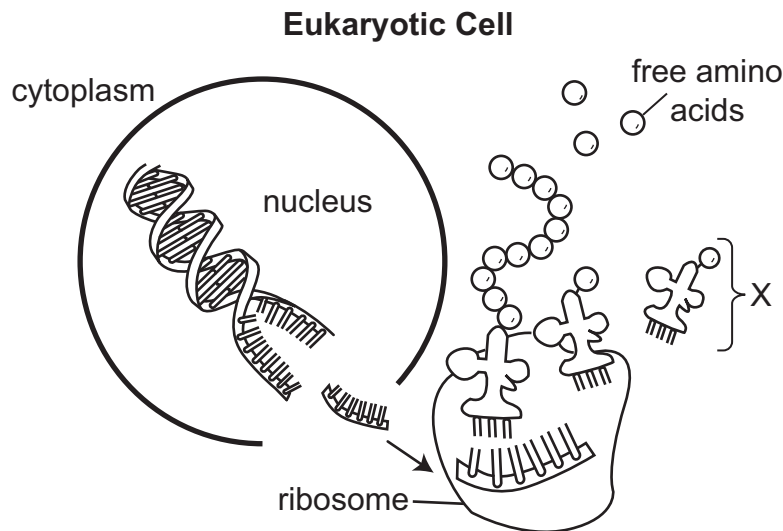
**Depth of Knowledge**

**2**

**Estimated Difficulty**

**Low Difficulty**

4. A student constructed a model to illustrate some of the processes involved in the production of proteins in a eukaryotic cell.



Which statement correctly describes the structure and activity identified by the letter X?

- A. A tRNA molecule reacts with an amino acid to produce ribosomal RNA.
- B. A tRNA molecule transports an amino acid for incorporation into a polypeptide.
- C. An rRNA molecule carries an amino acid away from the site of protein synthesis.
- D. An mRNA molecule transports a single amino acid to the site of protein synthesis.

EOCEP Sample Item

4

**Indicator Alignment****H.B.2B.1****Indicator Description**

Develop and use models to explain how specialized structures within cells (including the nucleus, chromosomes, cytoskeleton, endoplasmic reticulum, ribosomes and Golgi complex) interact to produce, modify, and transport proteins. Models should compare and contrast how prokaryotic cells meet the same life needs as eukaryotic cells without similar structures.

**Answer Key****B****Depth of Knowledge****3****Estimated Difficulty****High Difficulty**


5. Examine the data table.

**Data Table**

Potato Sample	NaCl Concentration Outside of Potato (g/mL)	Initial Mass of Potato (grams)	Final Mass of Potato (grams)	Percent Change
1	0.050	2.02	1.38	-31.68
2	0.050	2.00	1.47	-26.50
1	0.025	1.93	1.42	-26.42
2	0.025	2.02	1.56	-22.77
1	0.000	2.04	2.48	21.57
2	0.000	1.98	2.46	24.24

Select **two** statements that support the data and explain the movement of molecules across the cell membranes.

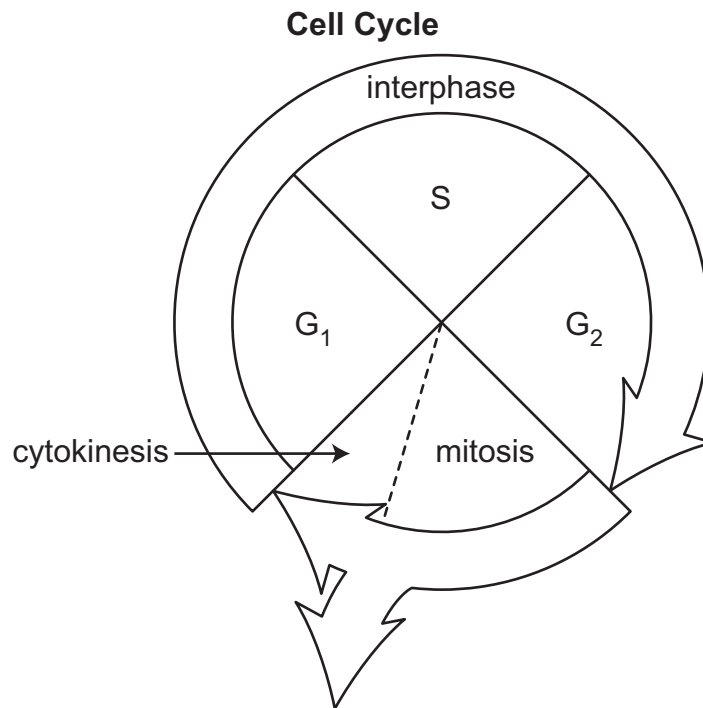
- A. As the NaCl moved into the potato cells, the potato increased in mass.
- B. The potatoes in the 0.025 g/mL solution increased in mass as water molecules moved into the potato cells.
- C. As the NaCl concentration decreased, the mass of the potato increased as water molecules moved out of the potato cells.
- D. The potatoes in the 0.050 g/mL solution lost the greatest amount of mass as water molecules moved out of the potato cells.
- E. As the NaCl concentration increased, the mass of the potato increased as more NaCl moved into the potato cells.
- F. The potatoes in the 0.00 g/mL solution increased in mass as water molecules moved into the potato cells.

*Item Information on following page* 

<b>EOCEP Sample Item</b> <b>5</b>	<b>Indicator Alignment</b>	<b>H.B.2C.3</b>
	<b>Indicator Description</b>	Analyze and interpret data to explain the movement of molecules (including water) across a membrane.
	<b>Answer Key</b>	<b>D,F</b>
	<b>Depth of Knowledge</b>	<b>3</b>
	<b>Estimated Difficulty</b>	<b>Medium Difficulty</b>



6. Scientists can measure the DNA content of cells by using a dye that binds to DNA. After treating a sample of cells with the dye, the dye will appear more intense in cells where the quantity of DNA is higher.



During which stage or stages of the cell cycle would scientists observe the highest measurements of dye intensity?

- A. only during G<sub>1</sub>
- B. only during mitosis and cytokinesis
- C. the entire time that the cell is in interphase
- D. from late S through G<sub>2</sub> and mitosis

EOCEP Sample Item

**6**

**Indicator Alignment** H.B.2D.2

**Indicator Description**

Develop and use models to exemplify the changes that occur in a cell during the cell cycle (including changes in cell size, chromosomes, cell membrane/cell wall, and the number of cells produced) and predict, based on the models, what might happen to a cell that does not progress through the cycle correctly.

**Answer Key** D

**Depth of Knowledge** 3

**Estimated Difficulty** High Difficulty

7. The yew tree is a rare and slow-growing tree. Paclitaxel is an anticancer compound obtained from the bark of the yew tree. The extraction of the compound is expensive and damages the yew tree. Scientists have isolated and grown stem cells from a yew tree that could be used to produce paclitaxel.

Which statement describes an advantage of using stem cells from a yew tree to produce paclitaxel?

- A. Stem cells can be grown and reproduced in a laboratory.
- B. Stem cells can differentiate into cells of a different species.
- C. Stem cells from plants are more useful in producing animal protein.
- D. Stem cells from plants are less likely to cause unfavorable mutations than stem cells from animals.

EOCEP Sample Item

7

<b>Indicator Alignment</b>	<b>H.B.2D.4</b>
<b>Indicator Description</b>	Construct scientific arguments to support the pros and cons of biotechnological applications of stem cells using examples from both plants and animals.
<b>Answer Key</b>	<b>A</b>
<b>Depth of Knowledge</b>	<b>3</b>
<b>Estimated Difficulty</b>	<b>High Difficulty</b>

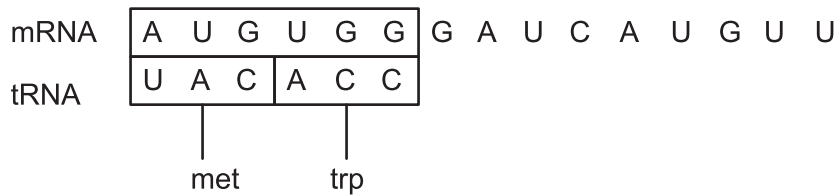
8. In a controlled experiment, a limited quantity of glucose was provided for cellular respiration. Researchers measured the quantity of reactants and products at the beginning of the experiment and again after 10 minutes.

How will the quantities of **glucose**, **oxygen**, and **carbon dioxide** most likely change after 10 minutes have passed?

- A. glucose will increase  
oxygen will increase  
carbon dioxide will decrease
- B. glucose will decrease  
oxygen will decrease  
carbon dioxide will increase
- C. glucose will decrease  
oxygen will increase  
carbon dioxide will increase
- D. glucose will increase  
oxygen will decrease  
carbon dioxide will decrease

<b>EOCEP Sample Item</b>	<b>8</b>	<b>Indicator Alignment</b>	<b>H.B.3A.5</b>
		<b>Indicator Description</b>	Plan and conduct scientific investigations or computer simulations to determine the relationship between variables that affect the processes of fermentation and/or cellular respiration in living organisms and interpret the data in terms of real-world phenomena.
		<b>Answer Key</b>	<b>B</b>
		<b>Depth of Knowledge</b>	<b>2</b>
		<b>Estimated Difficulty</b>	<b>High Difficulty</b>

9. This diagram represents part of the process of translation. One tRNA molecule has transported the amino acid methionine (met) to the mRNA. Another tRNA molecule has transported the amino acid tryptophan (trp) to the mRNA.



Which step is next during translation?

- A. The tRNA will attach to nucleotides in the cytoplasm.
- B. A peptide bond will form between the two amino acids.
- C. The mRNA carrying the amino acids will drop off the ribosome.
- D. The amino acids will be carried to the Golgi apparatus for packaging.

EOCEP Sample Item

9

<b>Indicator Alignment</b>	<b>H.B.4B.1</b>
<b>Indicator Description</b>	Develop and use models to describe how the structure of DNA determines the structure of resulting proteins or RNA molecules that carry out the essential functions of life.
<b>Answer Key</b>	<b>B</b>
<b>Depth of Knowledge</b>	<b>2</b>
<b>Estimated Difficulty</b>	<b>High Difficulty</b>

10. The table below shows some of the alleles for one of the genes for fur color in rabbits. Use this table to answer the question.

**Rabbit Fur Color**

Allele	Fur Color	Dominant to
$c^d$	dark chinchilla	light chinchilla, Himalayan coloring, albino
$c^l$	light chinchilla	Himalayan coloring, albino
$c^h$	Himalayan coloring	albino
$c$	albino	none

Which genotype should have Himalayan fur coloring?

- A.  $c^d c^h$
- B.  $c^l c^l$
- C.  $c^l c^h$
- D.  $c^h c$

EOCEP Sample Item

**10**

**Indicator Alignment** H.B.4C.2

**Indicator Description**

Analyze data on the variation of traits among individual organisms within a population to explain patterns in the data in the context of transmission of genetic information.

**Answer Key**

D

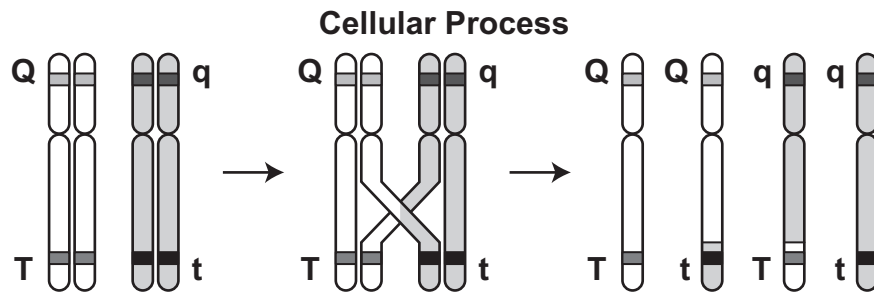
**Depth of Knowledge**

2

**Estimated Difficulty**

Medium Difficulty

11. Examine the diagram.



Which process is **best** explained by the diagram?

- A. the exchange of genetic material, resulting in genetic variation
- B. the transfer of DNA between alleles, allowing for new phenotypes
- C. the replication of sister chromatids during meiosis, preventing mutations
- D. the separation of alleles during gamete formation, resulting in identical offspring

EOCEP Sample Item

11

**Indicator Alignment** H.B.4C.3

**Indicator Description**

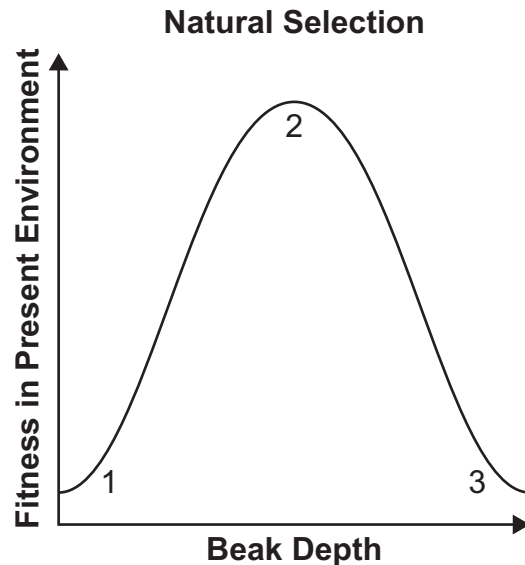
Construct explanations for how meiosis followed by fertilization ensures genetic variation among offspring within the same family and genetic diversity within populations of sexually reproducing organisms.

**Answer Key** A

**Depth of Knowledge** 2

**Estimated Difficulty** Medium Difficulty

12. The graph represents the outcome of natural selection in a population of Darwin's finches.



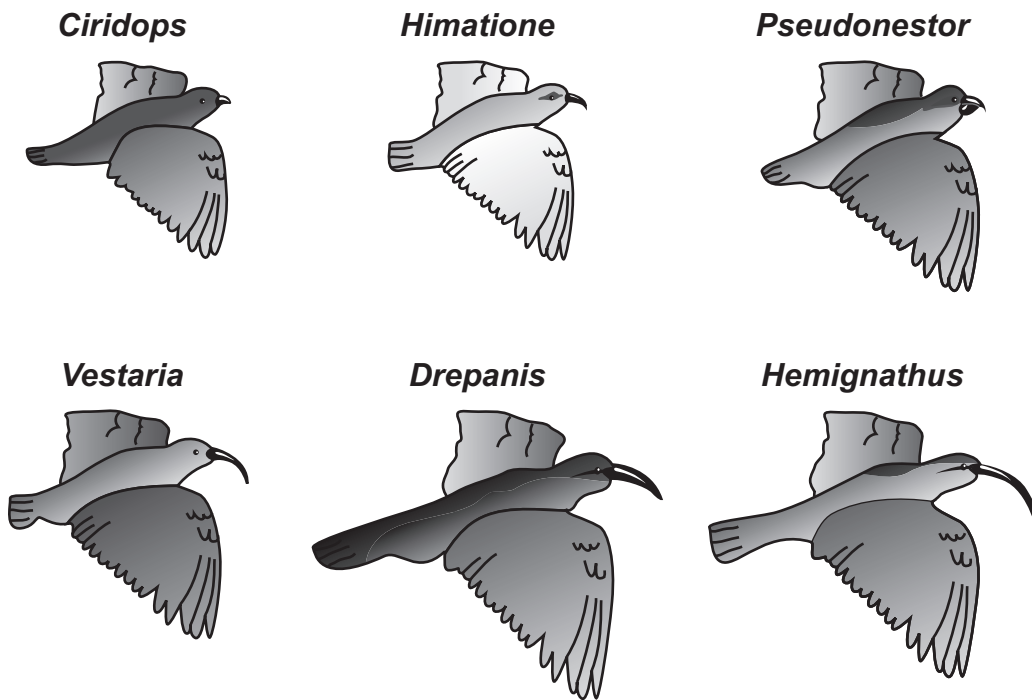
Which statement **best** describes this outcome?

- A. Finches that are best suited to survive and reproduce (points 1 and 3) are more likely to pass on beneficial traits to their offspring; those less suited (point 2) fail to pass on their traits to their offspring.
- B. Finches that are least suited to survive and reproduce (points 1 and 3) are more likely to pass on beneficial traits to their offspring; those more suited (point 2) fail to pass on their traits to their offspring.
- C. Finches that are best suited to survive and reproduce (point 2) are more likely to pass on beneficial traits to their offspring; those less suited (points 1 and 3) fail to pass on their traits to their offspring.
- D. Finches that are least suited to survive and reproduce (point 2) are more likely to pass on beneficial traits to their offspring; those more suited (points 1 and 3) fail to pass on their traits to their offspring.

EOCEP Sample Item

	<b>Indicator Alignment</b>	H.B.5.1
	<b>Indicator Description</b>	Summarize the process of natural selection.
<b>12</b>	<b>Answer Key</b>	C
	<b>Depth of Knowledge</b>	2
	<b>Estimated Difficulty</b>	Low Difficulty

13. Hawaiian honeycreepers include a number of related bird species with different beak types, as shown below.



According to evolutionary theory, what **most likely** led to high biodiversity among these birds?

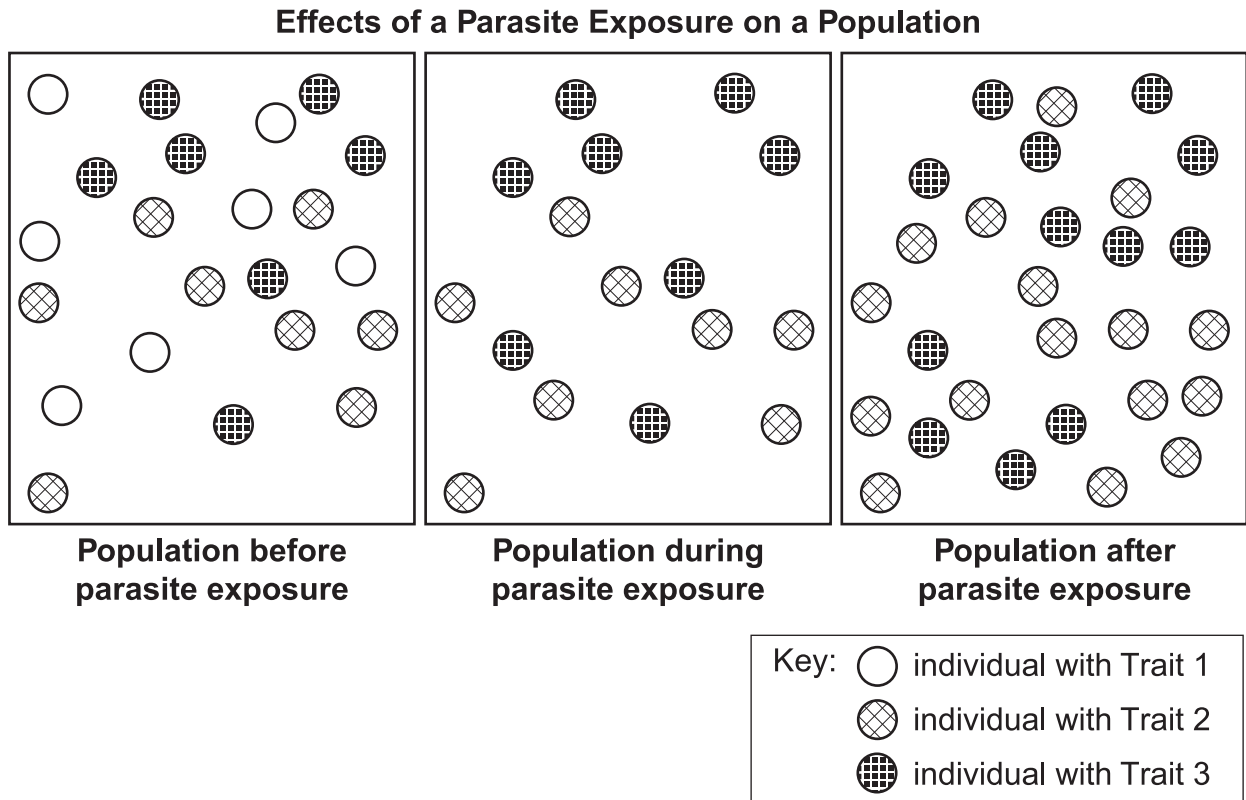
- A. Birds with a variety of adaptive traits migrated to the islands.
- B. Individual birds adapted to better utilize their ancestors' traits.
- C. Ancestor bird populations adapted to survive a variety of habitats.
- D. Unrelated birds reproduced to create new species with adaptive traits.

EOCEP Sample Item

	<b>Indicator Alignment</b>	H.B.5.1
	<b>Indicator Description</b>	Summarize the process of natural selection.
<b>13</b>	<b>Answer Key</b>	C
	<b>Depth of Knowledge</b>	2
	<b>Estimated Difficulty</b>	Medium Difficulty



14. These diagrams show the changes in a population when exposed to a parasite.



Which statement describes the population after parasite exposure?

- A. Individuals with dominant traits survived the parasite.
- B. Individuals that were weakened by the parasite randomly mated.
- C. Individuals that were homozygous recovered from the parasite.
- D. Individuals whose phenotype resisted the parasite increased in frequency.

EOCEP Sample Item

**14**

**Indicator Alignment**

**H.B.5.3**

**Indicator Description**

Explain how diversity within a species increases the chances of its survival.

**Answer Key**

**D**

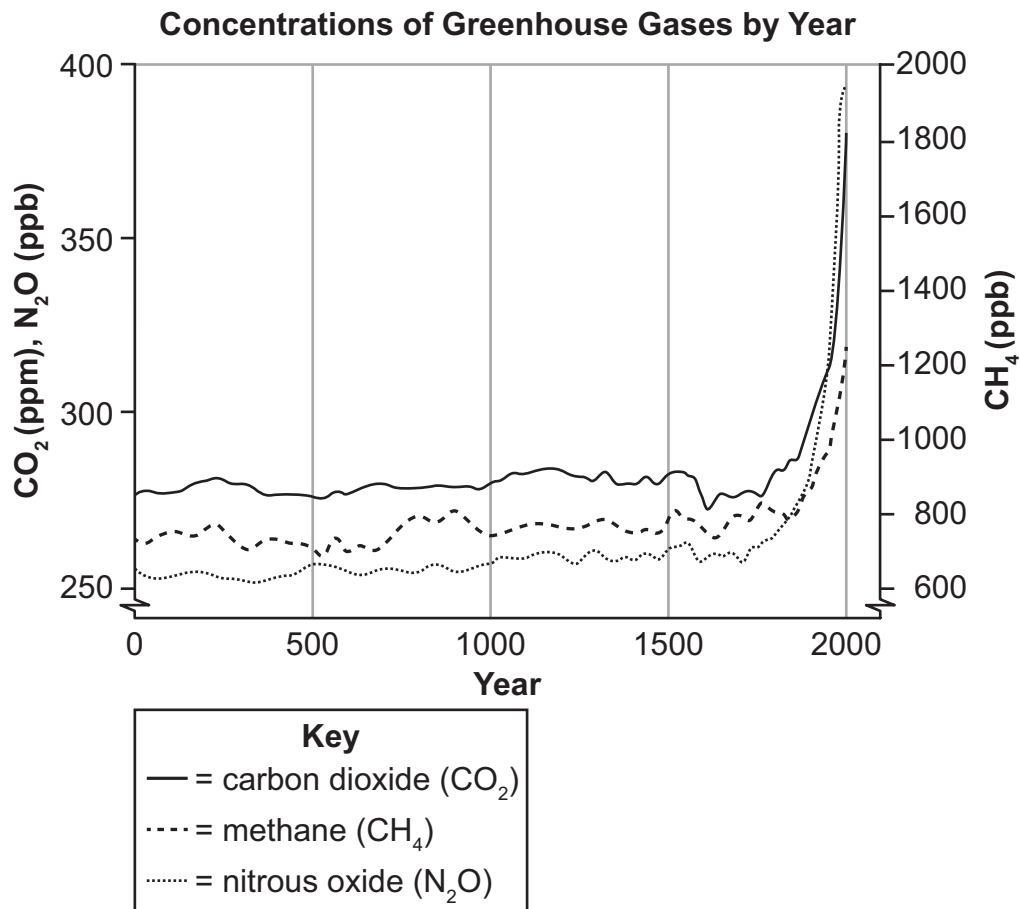
**Depth of Knowledge**

**2**

**Estimated Difficulty**

**High Difficulty**

15. Scientists have collected data showing that carbon dioxide and other greenhouse gases in our atmosphere are increasing.



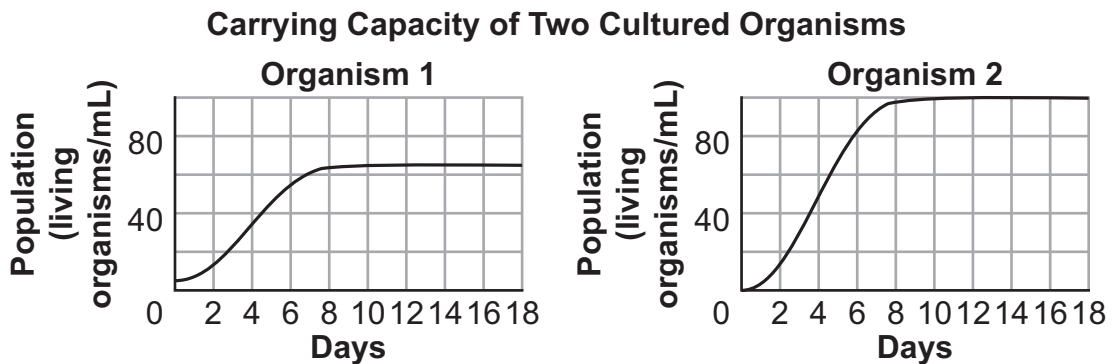
Which statement is **best** supported by the information in the graph?

- A. N<sub>2</sub>O levels will begin to decrease, stopping ozone layer depletion.
- B. CO<sub>2</sub> levels will continue to rise, increasing average global temperatures.
- C. CH<sub>4</sub> levels will increase further, decreasing average global temperatures.
- D. All greenhouse gases will have a rapid decline, returning to levels prior to the 1500s.

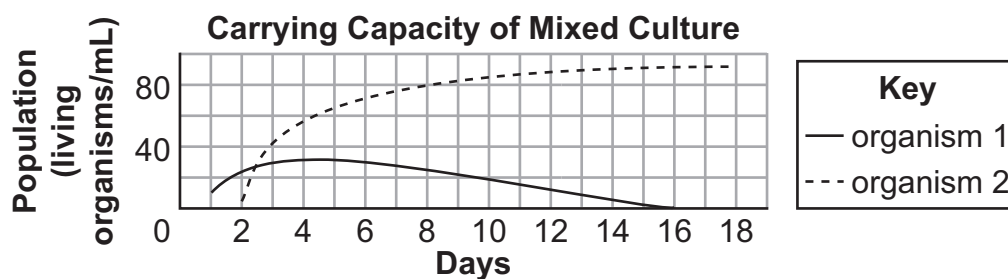
*Item Information on following page* 

<b>EOCEP Sample Item</b> <b>15</b>	<b>Indicator Alignment</b>	<b>H.B.6B.2</b>
	<b>Indicator Description</b>	Analyze and interpret quantitative data to construct an explanation for the effects of greenhouse gases (such as carbon dioxide and methane) on the carbon cycle and global climate.
	<b>Answer Key</b>	<b>B</b>
	<b>Depth of Knowledge</b>	<b>2</b>
	<b>Estimated Difficulty</b>	<b>Low Difficulty</b>

16. A laboratory technician grew two types of microorganisms in separate containers for 18 days. The results are shown below.



After observing the results, the technician predicted that neither population would be negatively affected if the two microorganisms were grown in the same container. To test this prediction the technician grew the two organisms in the same container for 18 days. The results are shown in the graph.



Which statement **best** evaluates the technician's prediction and the resulting data?

- The data support the prediction: both organisms reached a maximum population in the mixed culture.
- The data do not support the prediction: both organisms initially thrived in the mixed culture.
- The data do not support the prediction: the presence of organism 2 negatively affected the population of organism 1.
- The data support the prediction: both organisms initially thrived, but only organism 2 reached carrying capacity in the mixed culture.

Item Information on following page

---

<b>EOCEP Sample Item</b>  <b>16</b>	<b>Indicator Alignment</b>	<b>H.B.6C.1</b>
	<b>Indicator Description</b>	Construct scientific arguments to support claims that the changes in the biotic and abiotic components of various ecosystems over time affect the ability of an ecosystem to maintain homeostasis.
	<b>Answer Key</b>	<b>C</b>
	<b>Depth of Knowledge</b>	<b>2</b>
	<b>Estimated Difficulty</b>	<b>Medium Difficulty</b>

---

17. The homeostasis of an ecosystem is disrupted when decomposers are unable to perform which activity?
- A. absorb sunlight in order to produce proteins
  - B. break down organic matter to release nutrients
  - C. recycle dissolved oxygen to reduce temperatures
  - D. transform nitrogen from the air into a usable form

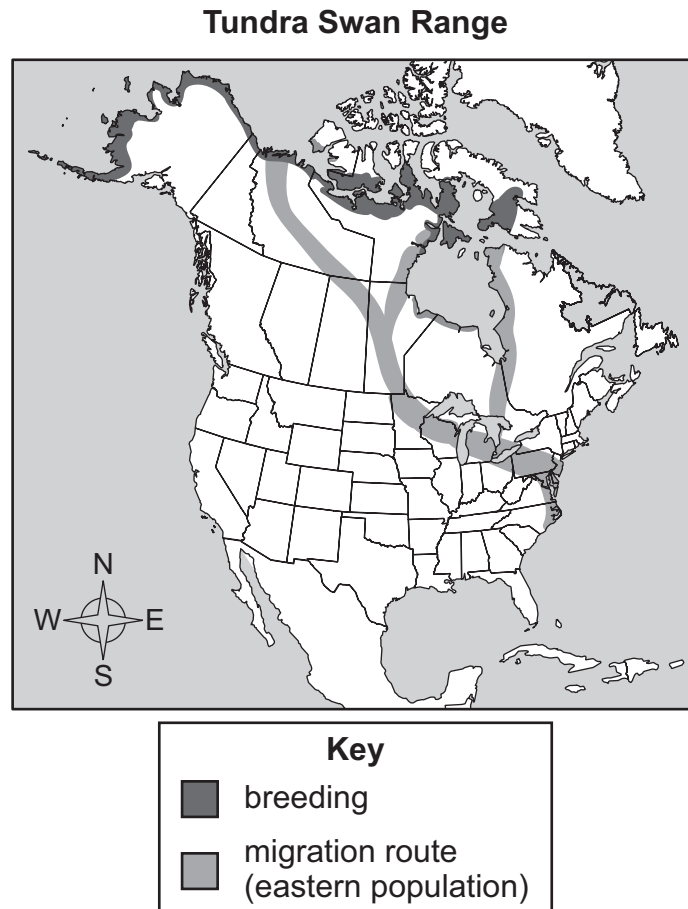
EOCEP Sample Item

17

<b>Indicator Alignment</b>	H.B.6C.1
<b>Indicator Description</b>	Construct scientific arguments to support claims that the changes in the biotic and abiotic components of various ecosystems over time affect the ability of an ecosystem to maintain homeostasis.
<b>Answer Key</b>	B
<b>Depth of Knowledge</b>	2
<b>Estimated Difficulty</b>	Low Difficulty

## The Great Bird Migration

Each year, millions of birds, such as swans, geese, ducks, and many songbirds, take part in the seasonal movement between breeding and wintering locations. The map shows the range and migratory path of the tundra swan.

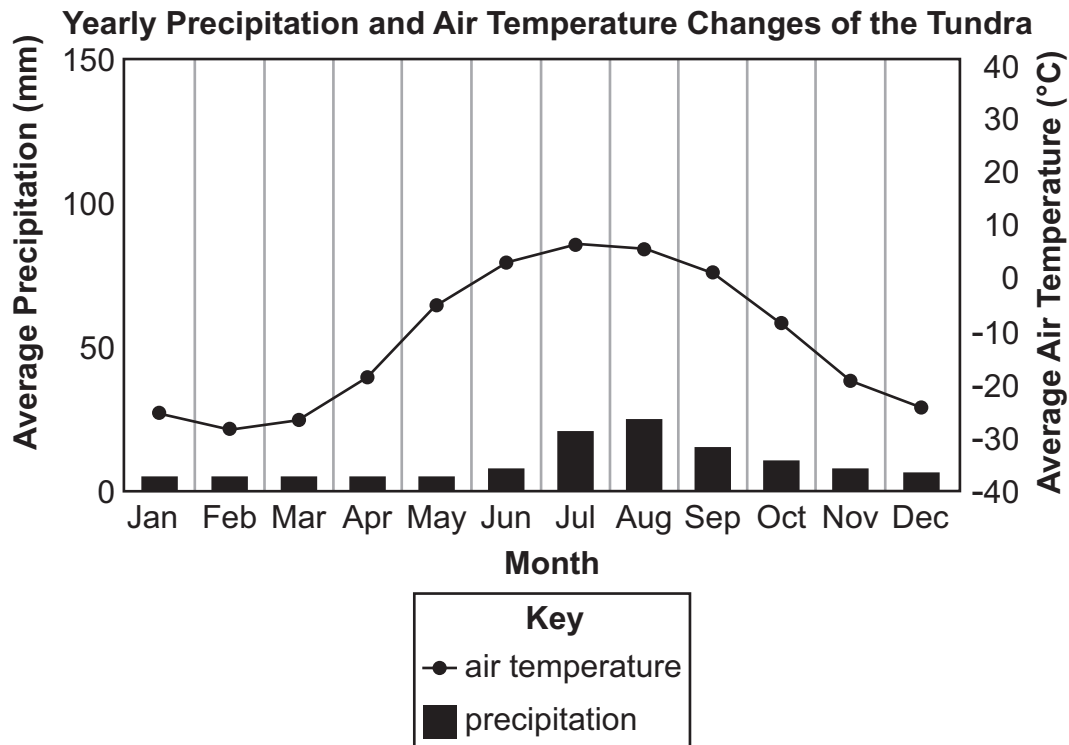


Birds migrate to move from areas of decreasing resources to areas of increasing resources. Food and nesting locations are the primary resources that determine long-distance migration. Birds that nest in the Northern Hemisphere tend to migrate northward in the spring to take advantage of growing insect populations, budding plants, and an abundance of nesting locations. As winter approaches and the availability of insects and other food drops, the birds move south again.

The Atlantic flyway is a bird migration route that goes through South Carolina. The tundra swan range is part of the Atlantic flyway. Each year, approximately 100,000 tundra swans migrate along this flyway from northern Alaska and Canada to the southern Atlantic coast. Most of them spend the winter in North Carolina, but several hundred tundra swans winter in the wetlands of the ACE basin in South Carolina.

*Continued on following page*

The graph below represents climate conditions of the Tundra.



As the time to migrate approaches, birds exhibit physiological changes, such as increased muscle mass, increased fat storage, and changes in metabolism. Although birds accumulate fat reserves of up to 50% of their body weight in preparation for departure, the rigors of long-distance flight require most birds to rest and refuel several times before they reach their final destination. Without places along the way that provide an adequate food supply for the quick replenishment of fat reserves, shelter from predators, and water for rehydration—places referred to as stopover sites—these birds would be doomed.



18. As birds prepare for their migration, they go through many changes. Which equation shows the cellular process that occurs more as a bird prepares to fly thousands of kilometers?

- A.  $6 \text{H}_2\text{O} + 6 \text{CO}_2 \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{O}_2$
- B.  $\text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{O}_2 \rightarrow 6 \text{H}_2\text{O} + 6 \text{CO}_2$
- C.  $6 \text{H}_2\text{O} + 2 \text{O}_2 + 6 \text{CO} \rightarrow \text{C}_6 \text{H}_{12}\text{O}_6 + 10 \text{CO}_2$
- D.  $\text{C}_6\text{H}_{12}\text{O}_6 + 10 \text{CO}_2 \rightarrow 6 \text{H}_2\text{O} + 2 \text{O}_2 + 16 \text{CO}$

<b>EOCEP Sample Item</b>  <b>18</b>	<b>Indicator Alignment</b>	<b>H.B.3A.4</b>
	<b>Indicator Description</b>	Develop models of the major inputs and outputs of cellular respiration (aerobic and anaerobic) to exemplify the chemical process in which the bonds of molecules are broken, the bonds of new compounds are formed and a net transfer of energy results.
	<b>Answer Key</b>	<b>B</b>
	<b>Depth of Knowledge</b>	<b>3</b>
	<b>Estimated Difficulty</b>	<b>High Difficulty</b>

19. Migrating tundra swans are seen in large groups, at times covering an entire field. If an ecosystem is 10,000 acres and each adult tundra swan needs  $\frac{1}{10}$  of an acre, how many adult tundra swans can the ecosystem support?
- A. 1,000 adult tundra swans
  - B. 10,000 adult tundra swans
  - C. 100,000 adult tundra swans
  - D. 1,000,000 adult tundra swans

EOCEP Sample Item

19

<b>Indicator Alignment</b>	H.B.6A.2
<b>Indicator Description</b>	Use mathematical and computational thinking to support claims that limiting factors affect the number of individuals that an ecosystem can support.
<b>Answer Key</b>	C
<b>Depth of Knowledge</b>	2
<b>Estimated Difficulty</b>	High Difficulty

20. A student notices that many migrating birds that are flying south for the winter stop to rest and eat in South Carolina. The feeding of these migrant birds causes a temporary disturbance in the local ecosystem. The student hypothesizes that when the birds leave, stability will return to the ecosystem. Which statement **best** supports the student's hypothesis?
- A. The amount of space per organism is reduced so it stabilizes the environment.
  - B. As the birds leave for the winter there are fewer food sources available for other organisms.
  - C. The food sources are limited so the birds' departure reduces the stress on the food sources.
  - D. When there are fewer organisms in the ecosystem, more water is available in the system to replenish the lakes and rivers.

<b>EOCEP Sample Item</b>	<b>Indicator Alignment</b>	<b>H.B.6C.1</b>
	<b>Indicator Description</b>	Construct scientific arguments to support claims that the changes in the biotic and abiotic components of various ecosystems over time affect the ability of an ecosystem to maintain homeostasis.
	<b>Answer Key</b>	<b>C</b>
	<b>Depth of Knowledge</b>	<b>3</b>
	<b>Estimated Difficulty</b>	<b>Medium Difficulty</b>