

Biology I End-Of-Course Training Test Answer Key

Question 1

Reporting Category: Scientific Process

Benchmark: SC.BS.2.1 Explain how scientific advancements and emerging technologies have influenced society

Answer Key: B

A judge allowed a DNA analysis to be entered as evidence in court.

Which of the following statements *best* explains why the use of DNA analysis is so effective in establishing identity?

A. The procedure for DNA fingerprinting is an accurate series of simple techniques.

This answer is not correct. How simple or complex the technique is does not indicate whether this procedure is a reliable way to identify individuals.

B. The probability of two people having similar DNA fingerprints is small.

This answer is correct. There are billions of base pairs within each individual's DNA. These base pairs form sequences, and the probability of two individuals having the same sequence of base pairs is very slight. Therefore, the use of DNA fingerprinting to establish identity can be used as evidence in a court of law.

C. The purpose of DNA fingerprinting is to match sections of base pairs.

This answer is not correct. The purpose of DNA fingerprinting is to identify individuals and family relationships between individuals based on their DNA.

D. The percentage of identical DNA within a species is high.

This answer is not correct. Individuals within a species share a large percentage of their DNA, but there is still enough difference among individuals for this to be a useful technique.

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Question 2

Reporting Category: Organisms and the Environment

Benchmark: SC.BS.3.2 Explain the chemical reactions that occur in photosynthesis and cellular respiration that result in cycling of energy

Answer Key: D

A researcher wants to measure the rate of photosynthesis in two different types of water plants growing in two different aquariums under the same conditions.

Which measurement would give the *most* information about the rate of photosynthesis?

A. The intensity of light available to each aquarium

This answer is not correct. The amount of light available does affect the rate of photosynthesis, but measuring the intensity of light would not provide the most information on how quickly photosynthesis is occurring in each plant.

B. The temperature of water in each aquarium

This answer is not correct. The temperature of the water can change the rate of photosynthesis, but measuring the water temperature would not provide the most information on the rate of photosynthesis in each plant.

C. The level of dissolved nitrogen in each aquarium

This answer is not correct. The process of photosynthesis does not use nitrogen.

D. The amount of oxygen produced in each aquarium

This answer is correct. Oxygen is produced during photosynthesis. Measuring the amount of oxygen produced is the best way to measure the rate of photosynthesis.

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Question 3

Reporting Category: Structure and Function in Organisms

Benchmark: SC.BS.4.6 Explain the organization of life on Earth using the modern classification system

Answer Key: D

The table below shows the classifications of four animals.

Animal Classification

Animal	Q	R	S	T
Kingdom	Animalia	Animalia	Animalia	Animalia
Phylum	Chordata	Chordata	Chordata	Chordata
Class	Mammalia	Mammalia	Mammalia	Mammalia
Order	Carnivora	Rodentia	Rodentia	Carnivora
Family	Canidae	Muridae	Muridae	Felidae
Genus and species	<i>Canis familiaris</i>	<i>Mus musculus</i>	<i>Mesocricetus auratus</i>	<i>Felis sylvestris</i>

According to their classification, which of the following animals are *most* closely related?

A. Q and R

This answer is not correct. The most closely related organisms share the greatest number of classification levels. Animals Q and R share only three classification levels, which is not the greatest number of all the animal pairs.

B. S and T

This answer is not correct. The most closely related organisms share the greatest number of classification levels. Animals S and T share only three classification levels, which is not the greatest number of all the animal pairs.

C. Q and T

This answer is not correct. The most closely related organisms share the greatest number of classification levels. Animals Q and T share only four classification levels, which is not the greatest number of all the animal pairs.

D. R and S

This answer is correct. The most closely related organisms share the greatest number of classification levels. Animals R and S share five classification levels, which is the greatest number of all the animal pairs.

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Question 4

Reporting Category: Diversity, Genetics, and Evolution

Benchmark: SC.BS.5.4 Explain how Mendel's laws of heredity can be used to determine the traits of possible offspring

Answer Key: C

In pea plants, the allele for red flowers (R) is dominant, and the allele for white flowers (r) is recessive. The Punnett square below shows the cross of two pea plants, each with red flowers.

	R	r
R		
r		

According to the Punnett square, what percent of the offspring resulting from this cross will have red flowers?

A. 25%

This answer is not correct. Because the allele for red flowers (R) is dominant, the offspring with the Rr allele combination are also expected to develop red flowers, not just those with the RR combination.

B. 50%

This answer is not correct. Because the allele for red flowers (R) is dominant, all offspring with a copy of the R allele are expected to develop red flowers, not just those with the Rr combination.

C. 75%

This answer is correct. Red flowers are dominant, and the offspring only need to inherit one copy of the dominant (R) allele to develop red flowers. All the offspring with the RR and Rr allele combinations are expected to develop red flowers. This is 75% of the offspring.

D. 100%

This answer is not correct. Because the allele for red flowers (R) is dominant, all offspring with a copy of the R allele are expected to develop red flowers. Only 75% of the offspring will receive at least one copy of the R allele. The other 25% are expected to develop the recessive white flowers.

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Question 5

Reporting Category: Scientific Process

Benchmark: SC.BS.1.5 Communicate the components of a scientific investigation, using appropriate techniques

A scientist studying wolves in Yellowstone National Park collects the following data about their population.

**Number of Wolves in
Yellowstone National Park**

Year	Number of Wolves
2003	175
2004	170
2005	120
2006	135
2007	170

- A. Use the “Add Point” tool to plot 5 points on the graph for the data shown in the table.
B. Place two labels in the blank boxes for the graph axes.
- You should only use two of the labels shown.
 - Be sure to label both axes.

Answer Key:

2 points

For this item, the response correctly:

- plots all 5 data points on the graph, with no incorrect points plotted

AND

- places the label “Year” in the box for the x-axis and the label “Number of Wolves” in the box for the y-axis.

1 point

For this item, the response correctly:

- plots all 5 data points on the graph, with no incorrect points plotted

OR

- places the label “Year” in the box for the x-axis and the label “Number of Wolves” in the box for the y-axis.

0 points

The response provides an incorrect response for both parts. The response may have incorrectly plotted one (or all) of the points and placed the incorrect label in the box for the x- and y-axes.

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Sample Student Answer:

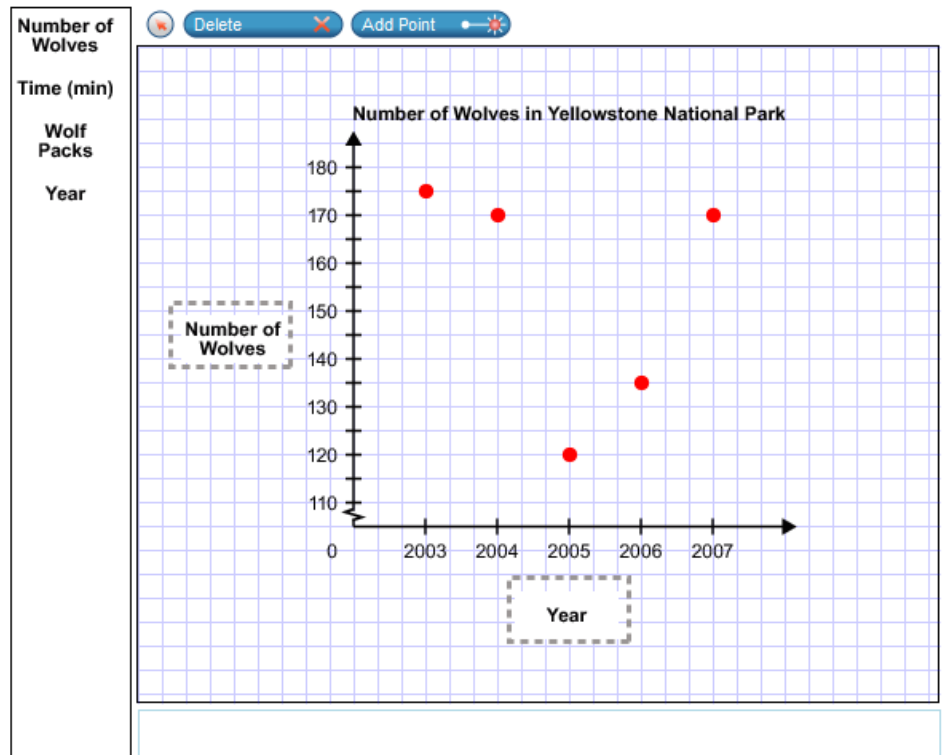
A scientist studying wolves in Yellowstone National Park collects the following data about their population.

Number of Wolves in Yellowstone National Park

Year	Number of Wolves
2003	175
2004	170
2005	120
2006	135
2007	170

- A. Use the "Add Point" tool to plot 5 points on the graph for the data shown in the table.
- B. Place two labels in the blank boxes for the graph axes.

- You should only use two of the labels shown.
- Be sure to label both axes.



Explanation of Correct Answer:

Based on the data in the table, five points are plotted on the graph at these coordinates: (Year, Number of Wolves) (2003, 175), (2004, 170), (2005, 120), (2006, 135) and (2007, 170). The label "Year" is the x-axis and the label "Number of Wolves" is the y-axis label.

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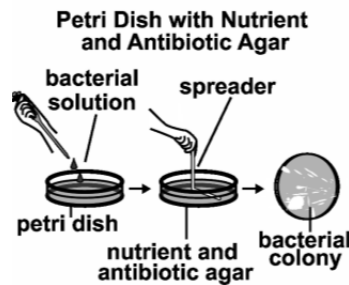
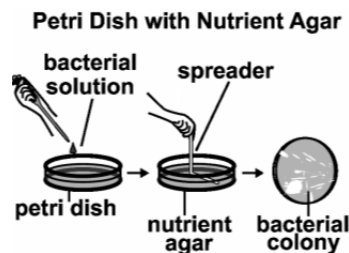
Question 6

Reporting Category: Scientific Process

Benchmark: SC.BS.1.2 Design and safely implement an experiment, including the appropriate use of tools and techniques to organize, analyze, and validate data

Answer Key: D

A student tests the effects of antibiotics on bacteria. She uses two petri dishes that contain a solid agar on the bottom. Both dishes have nutrients in the agar, but the second dish also has an antibiotic in the agar. She puts 0.1 mL of a bacterial solution into one petri dish and 0.2 mL of the same bacterial solution into the second petri dish. She spreads out each solution over the agar. She allows the bacteria to grow overnight. The pictures below show the student's experimental setup.



The next day, the student counts the number of colonies in each dish. Each colony appears as a spot in the dish and contains millions of cells that grew from a single bacterium. The dish without antibiotics has 190 colonies, and the dish with antibiotics has 200 colonies. She concludes that antibiotics have little effect on bacteria.

Which statement describes what the student could do to improve her experimental procedure?

- A. Add more of the antibiotic to the agar in the second dish.

This answer is not correct. Adding more antibiotic would not strengthen the conclusion, because the amount of bacterial solution added to each dish may not be the same.

- B. Let the bacteria grow in the dishes for another day.

This answer is not correct. This would not necessarily change the results, because the amount of bacterial solution added to each dish may not be the same.

Biology I End-Of-Course Training Test Answer Key

C. Place the dish without the antibiotic in the refrigerator.

This answer is not correct. Placing the dish in the refrigerator adds another variable (temperature). This would weaken the conclusion.

D. Put the same amount of bacterial solution into each petri dish.

This answer is correct. *The student should ensure that the same amount of bacterial solution is added to each dish. The experiment has two variables (the amount of bacterial solution and the presence of antibiotics), which makes drawing a conclusion difficult.*

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Question 7

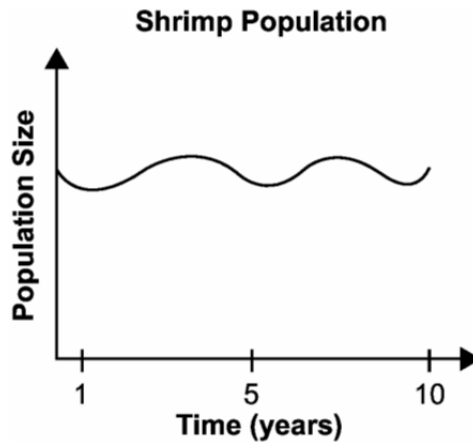
Reporting Category: Scientific Process

Benchmark: SC.BS.1.3 Defend and support conclusions, explanations, and arguments based on logic, scientific knowledge, and evidence from data

Answer Key: D

The graph shows changes in a population of shrimp over time.

Which conclusion is supported by this data?



A. An invasive species lives in this ecosystem.

This answer is not correct. The graph provides no information that would allow an individual to make conclusions about the presence of an invasive species in this ecosystem.

B. Shrimp have a symbiotic relationship with another organism.

This answer is not correct. Because the graph only shows the population size of the shrimp, a symbiotic relationship cannot be assumed or supported.

C. The food source for this population changes seasonally.

This answer is not correct. The major changes in population size occur across years; therefore, they do not correlate with seasonal changes.

D. This population of organisms lives in a stable environment.

This answer is correct. The graph shows periodic fluctuations in the population size of the shrimp. There are no major increases or decreases in population size; therefore, these fluctuations indicate that the population is living in a stable environment.

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Question 8

Reporting Category: Structure and Functions in Organisms

Benchmark: SC.BS.4.5 Describe the components and functions of a variety of macromolecules active in biological systems

Answer Key: A

Carbohydrates are macromolecules used for energy in living organisms. Large carbohydrate molecules are made of smaller building blocks called monosaccharides.

The arrangement of which three components is used to distinguish one monosaccharide from another?

A. Carbon, hydrogen, and oxygen

***This is the correct answer.** Monosaccharides all contain carbon, hydrogen, and oxygen. It is the arrangement of these three components that makes one monosaccharide different from another.*

B. Glucose, fructose, and ribose

This answer is not correct. Glucose, fructose, and ribose are all three examples of monosaccharides.

C. Peptide, fatty acid, and purine

This answer is not correct. Peptide, fatty acid, and purine are all components of the other three types of macromolecules.

D. Water, carbon dioxide, and nitrogen

This answer is not correct. Water, carbon dioxide, and nitrogen are essential for life processes. However, they are not the components of carbohydrates.

Biology I End-Of-Course Training Test Answer Key

Question 9

Reporting Category: Diversity, Genetics, and Evolution

Benchmark: SC.BS.5.3 Explain the structural properties of DNA and the role of DNA in heredity and protein synthesis

Answer Key: D

The table shows which mRNA codons code for various amino acids.

		Second Position				
		U	C	A	G	
First Position (5' end)	U	Phe	Ser	Tyr	Cys	Third Position (3' end)
		Phe	Ser	Tyr	Cys	
		Leu	Ser	Stop	Stop	
		Leu	Ser	Stop	Trp	
	C	Leu	Pro	His	Arg	
		Leu	Pro	His	Arg	
		Leu	Pro	Gln	Arg	
		Leu	Pro	Gln	Arg	
	A	Ile	Thr	Asn	Ser	
		Ile	Thr	Asn	Ser	
		Ile	Thr	Lys	Arg	
		Met	Thr	Lys	Arg	
	G	Val	Ala	Asp	Gly	
		Val	Ala	Asp	Gly	
		Val	Ala	Glu	Gly	
		Val	Ala	Glu	Gly	

Which amino acid sequence will be produced by translation of the mRNA sequence UAC UCU ACC?

A. Asn – Pro – Thr

This answer is not correct. The amino acid sequence produced from the RNA sequence is Tyr – Ser – Thr, not Asn-Pro-Thr.

B. Thr – Pro – Asn

This answer is not correct. The amino acid sequence produced from the RNA sequence is Tyr – Ser – Thr, not Thr-Pro-Asn.

C. Thr – Ser – Tyr

This answer is not correct. The amino acid sequence produced from the RNA sequence is Tyr – Ser – Thr, not Thr-Ser-Tyr.

D. Tyr – Ser – Thr

This answer is correct. The messenger RNA will code for the amino acid sequence Tyr – Ser – Thr.

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Question 10

Reporting Category: Life and Environmental Sciences

Benchmark: SC.BS.4.4 Describe how homeostatic balance occurs in cells and organisms

The diagram shows a model of a cell. For proper cell function, sodium (Na^+) and potassium (K^+) ions must be actively transported into and out of the cell. The arrows in the protein pump show the direction of the net flow of each ion.

- A. Place Na^+ labels inside and outside the cell to illustrate the correct concentration gradient for active transport to occur.
- B. Place K^+ labels inside and outside the cell to illustrate the correct concentration gradient for active transport to occur.
- C. Place the energy molecule that is required for active transport on top of the protein pump structure.
 - You should use more than one Na^+ label.
 - You should use more than one K^+ label.
 - Only one energy molecule is needed.

Answer Key:

3 points

For this item, the response correctly:

- places more sodium (Na^+) ions outside the cell than inside of it
- AND
- places more potassium (K^+) ions inside the cell than outside of it
- AND
- places one or more energy (ATP) molecules on top of (or in the vicinity of) the protein pump
- AND
- zero NADH molecules on top of (or in the vicinity of) the protein pump.

2 points

For this item, the response correctly:

- places more sodium (Na^+) ions outside the cell than inside of it
- OR
- places more potassium (K^+) ions inside the cell than outside of it
- AND
- places one or more energy (ATP) molecules on top of (or in the vicinity of) the protein pump
- AND
- zero NADH molecules on top of (or in the vicinity of) the protein pump.

Biology I End-Of-Course Training Test Answer Key

1 point

For this item, the response correctly:

- places more sodium (Na^+) ions outside the cell than inside it

OR

- places more potassium (K^+) ions inside the cell than outside it

AND

- places one or more energy (ATP) molecules on top of (or in the vicinity of) the protein pump

AND

- a NADH molecule on top of (or in the vicinity of) the protein pump.

0 points

The response is incorrect for all parts. The response does not have more sodium (Na^+) ions outside the cell than inside it and does not have more potassium (K^+) ions inside the cell than outside it, and does not have one or more energy (ATP) molecules on top of (or in the vicinity of) the protein pump.

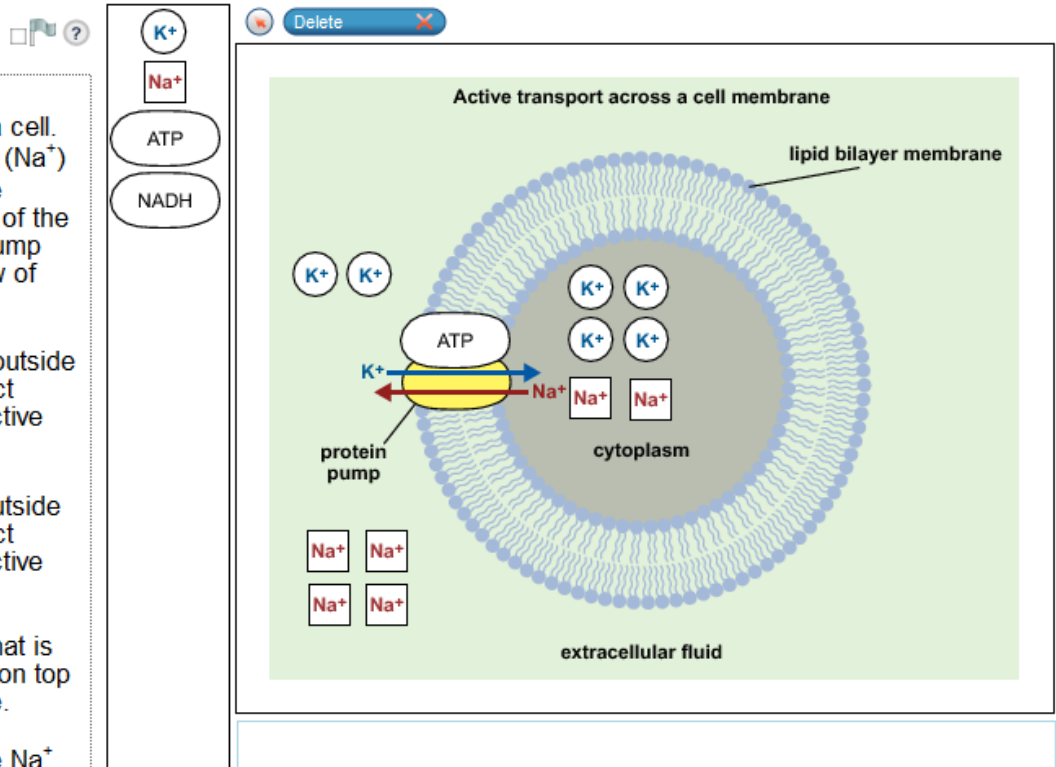
Biology I End-Of-Course Training Test Answer Key

Sample Student Answer:

The diagram shows a model of a cell. For proper cell function, sodium (Na^+) and potassium (K^+) ions must be actively transported into and out of the cell. The arrows in the protein pump show the direction of the net flow of each ion.

- Place Na^+ labels inside and outside the cell to illustrate the correct concentration gradient for active transport to occur.
- Place K^+ labels inside and outside the cell to illustrate the correct concentration gradient for active transport to occur.
- Place the energy molecule that is required for active transport on top of the protein pump structure.

- You should use more than one Na^+ label.
- You should use more than one K^+ label.
- Only **one** energy molecule is needed.



Explanation of Correct Answer:

K^+ ions are moving from the extracellular fluid into the cytoplasm. For active transport to be occurring, the concentration of K^+ ions inside the cell must be higher than outside the cell. Na^+ ions are moving from the cytoplasm to the extracellular fluid. For active transport to be occurring, the concentration of Na^+ ions outside the cell must be higher than inside the cell. ATP is the energy molecule required for active transport.

Biology I End-Of-Course Training Test Answer Key

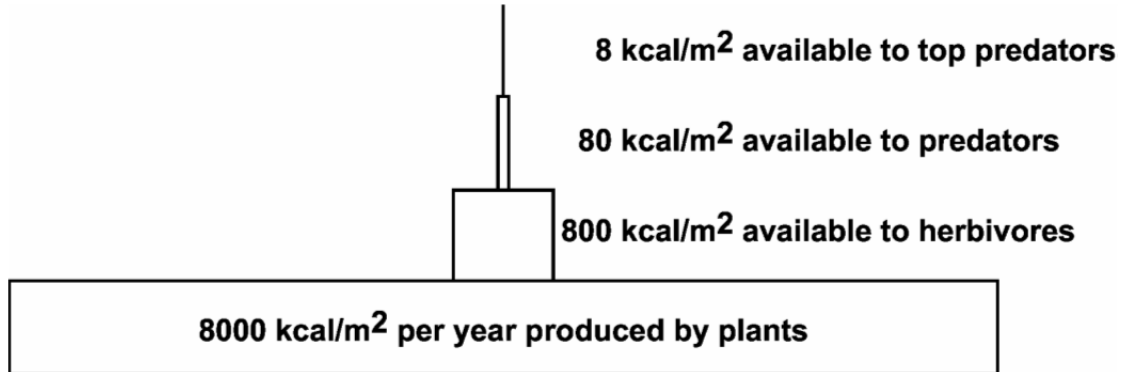
Question 11

Reporting Category: Organisms and the Environment

Benchmark: SC.BS.3.3 Explain how matter and energy flow through living systems and the physical environment

Answer Key: C

The diagram below is an energy pyramid showing the amount of energy available at each trophic level. Each level receives approximately 10% of the energy from the level below.



Which of the following statements *best* explains the difference in the amount of energy available at each trophic level?

- A. Higher trophic levels contain 90% more organisms than lower levels.

This answer is not correct. Since each trophic level receives approximately 10% of the energy from the level below, this will severely limit the number of organisms at the higher trophic levels.

- B. Producers pass 90% of the energy from sunlight to the next level.

This answer is not correct. Each trophic level receives approximately 10% of the energy from the level below.

- C. Life functions at each trophic level consume 90% of the remaining energy.

This answer is correct. Since approximately 10% of energy is passed from one trophic level to the next, approximately 90% of the energy must be consumed at each trophic level.

- D. Organisms in lower trophic levels digest food 90% faster than those in the middle levels.

This answer is not correct. Each trophic level receives approximately 10% of the energy from the level below. There is no indication in the energy pyramid other rate of food digestion.

Biology I End-Of-Course Training Test Answer Key

Question 12

Reporting Category: Structure and Functions in Organisms

Benchmark: SC.BS.4.2 Explain how cells are specialized into different tissues and organs

Answer Key: D

When a cyclist rides up a steep hill, the cyclist's circulation and breathing rate increase, allowing a greater amount of oxygen to reach the cyclist's muscles. In order to generate energy from this extra oxygen, skeletal muscle must contain a greater number of a certain cell part than other tissues.

Which of the following cell parts is *more* numerous in skeletal muscle than in other tissues?

A. Golgi bodies

This answer is not correct. The Golgi bodies are responsible for modifying, packaging, and transporting proteins through the cell.

B. Lysosomes

This answer is not correct. The lysosomes are responsible for the breakdown of ingested substances, damaged organelles, and cell macromolecules.

C. Ribosomes

This answer is not correct. The ribosomes are responsible for protein synthesis.

D. Mitochondria

This answer is correct. *The mitochondria are responsible for cellular respiration. During cellular respiration, the energy molecule ATP is produced.*

Biology I End-Of-Course Training Test Answer Key

Question 13

Reporting Category: Structure and Functions in Organisms

Benchmark: SC.BS.4.3 Differentiate between the processes of mitosis and meiosis

Answer Key: A

A student uses a microscope to observe cells in the root tissue of an onion. He concludes that the cells are reproducing by mitosis.

Which hypothesis is supported by his conclusion?

A. The root tissue cells all have the same set of chromosomes.

***This answer is correct.** The cells created by mitosis are clones of each other and all have the same chromosomes.*

B. The root tissue cells each have a unique genetic make-up.

This answer is not correct. Each cell has the same genetic makeup because the cells were created by mitosis—none is genetically unique.

C. The root tissue cells produce identical gametes.

This answer is not correct. Gametes are sex cells that are produced through meiosis.

D. The root tissue cells split to form stem cells.

This answer is not correct. Root tissue cells that split through mitosis do not form cells from other plant tissues, such as the stem.

Biology I End-Of-Course Training Test Answer Key

Question 14

Reporting Category: Diversity, Genetics, and Evolution

Benchmark: SC.BS.5.2 Explain the theory of natural selection

Answer Key: A

C. reinhardtii is a species of unicellular green algae that primarily produce energy for growth through photosynthesis. However, when necessary, they can also produce energy from a carbon source, which allows them to grow in total darkness. A scientist grows a population of this algae in the dark and finds that after 600 generations, the algae population now grows better in the dark than in the light.

Which statement *best* explains what has happened to the cells in the algae population?

A. The cells that were better adapted to growing in the dark reproduced more.

This answer is correct. Over the 600 generations of the algae culture, algae cells that were better able to grow in the dark would survive better and reproduce more than the other algae cells.

B. The cells that were better adapted to growing in the light got smaller in size.

This answer is not correct. This would not explain why the population grows better in the dark.

C. They became contaminated with a species of algae that grow only in the dark.

This answer is not correct. It would not be likely that the algae population would be contaminated by another species that could grow only in the dark.

D. They evolved into a different species that can grow only in the dark.

This answer is not correct. The introduction states that the population grows better in the dark, not that it can grow only in the dark. Therefore, the algae still retain some ability to grow in the light.

Biology I End-Of-Course Training Test Answer Key

Question 15

Reporting Category: Structure and Functions in Organisms

Benchmark: SC.BS.4.1 Describe different cell parts and their functions

Answer Key: C

The cytoplasm of muscle cells experiences an increase in CO₂ levels and a decrease in pH during heavy aerobic exercise.

The processes of which cell organelle are responsible for these changes?

A. Endoplasmic reticulum

This answer is not correct. The endoplasmic reticulum transports materials around the cell and produces certain biological molecules. It does not directly affect the carbon dioxide (CO₂) levels or pH in the cell during exercise.

B. Golgi apparatus

This answer is not correct. The Golgi apparatus prepares material for export from the cell. It does not directly affect the carbon dioxide (CO₂) levels or pH in the cell during exercise.

C. Mitochondrion

This answer is correct. Mitochondria participate in metabolism, which is a process whereby oxygen is used up and converted into carbon dioxide. Carbon dioxide (CO₂) is a weak acid that lowers the pH. During respiration, additional acids are produced that also lower pH.

D. Nucleus

This answer is not correct. The nucleus has little direct effect on how much carbon dioxide (CO₂) is produced or how much the pH varies in a cell during exercise.

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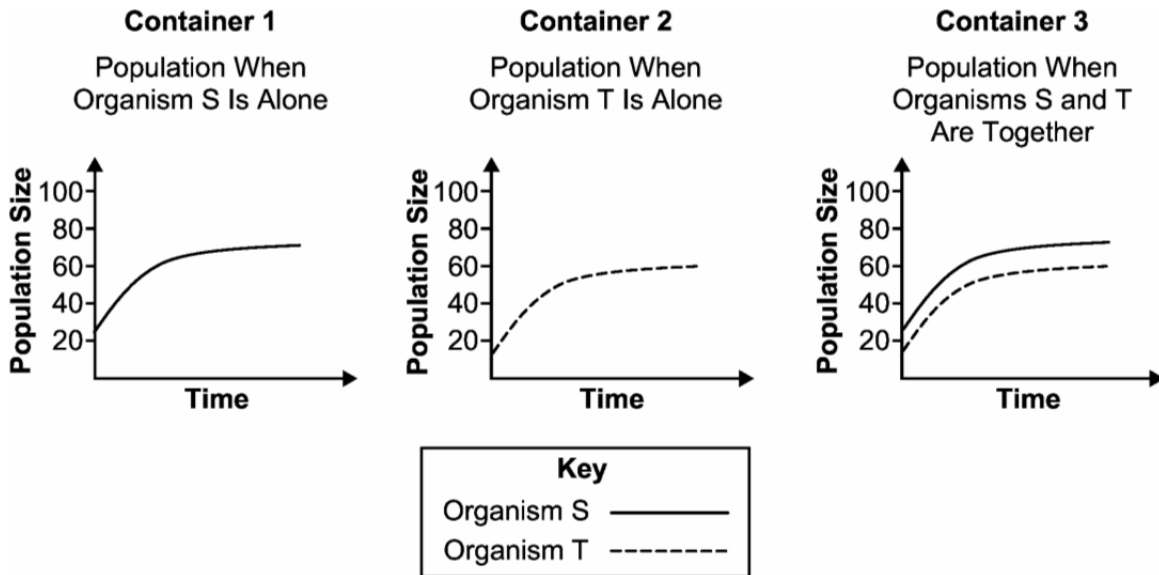
Question 16

Reporting Category: Scientific Process

Benchmark: SC.BS.1.4 Determine the connection(s) among hypotheses, scientific evidence, and conclusions

Answer Key: A

A scientist investigates the interaction of single-cell pond organisms S and T. He places organism S in pond water in Container 1. He places organism T in pond water in Container 2. He places both organisms in pond water in Container 3. The graphs show how the populations of the organisms in the containers change over time.



What can the scientist conclude from this data about the interaction of organisms S and T?

- A. Organisms S and T are neither benefited nor harmed by living together.

This answer is correct. Both Organism S and Organism T show similar population growth, whether they are grown together or grown separately.

- B. Organisms S and T both benefit from living together.

This answer is not correct. The data do not support this conclusion. In order to support it, the data would have to show both populations of organisms increasing more when grown together than when grown alone.

Biology I End-Of-Course Training Test Answer Key

- C. Organism S benefits from living with organism T and organism T is harmed.

This answer is not correct. The data do not support this conclusion. In order to support it, the data would have to show the population of Organism S increasing more when living with Organism T than when living alone. The data would also have to show that Organism T increases less when living with Organism S than when living alone.

- D. Organism S benefits from living with organism T and organism T is unaffected.

This answer is not correct. The data do not support this conclusion. In order to support the conclusion, the data would have to show the population of Organism S increasing more when living with Organism T than when living alone.

Biology I End-Of-Course Training Test Answer Key

Question 17

Reporting Category: Scientific Process

Benchmark: SC.BS.1.8 Describe the importance of ethics and integrity in scientific investigation

Answer Key: D

A scientist crosses a homozygous red-eyed fruit fly with a homozygous white-eyed fruit fly. He returns to the lab several days later to record the phenotypes of the offspring in the F1 generation. While collecting his data, the scientist realizes that individuals in the F1 generation have produced an F2 generation of offspring in the same test tube. Which statement explains what the scientist should do next in his experiment?

A. Find similar fruit fly studies and use the data from those investigations.

This answer is not correct. Using the data from other studies would be unethical; the investigation should be repeated to collect new data.

B. Finish collecting his data on all of the offspring and record it as the F1 generation.

This answer is not correct. Altering the data of an investigation is unethical; the investigation should be repeated to collect new data.

C. Record half of the individuals as the F1 generation and the other half as the F2 generation.

This answer is not correct. Altering the data of an investigation is unethical. The investigation should be repeated to collect new data.

D. Repeat the initial cross using a new pair of homozygous individuals.

This answer is correct. *When there are mistakes that compromise the validity of an investigation, the study should be repeated so that new data are collected.*

Biology I End-Of-Course Training Test Answer Key

Question 18

Reporting Category: Diversity, Genetics, and Evolution

Benchmark: SC.BS.5.5 Explain chromosomal mutations, their possible causes, and their effects on genetic variation

Answer Key: D

A substitution of thymine with adenine in one DNA codon causes a particular disorder.

Which statement explains how the change in DNA leads to this disorder?

A. The deletion mutation prevents the production of the hemoglobin protein in the body.

This answer is not correct. Sickle-cell anemia is caused by a point mutation, not a base deletion or frameshift mutation. The change in the base pair results in a different amino acid being added to the protein chain.

B. The frameshift mutation prevents the production of several proteins found in the blood.

This answer is not correct. The same number of base pairs exists after the mutation; therefore, the mutation is not a frameshift mutation but a point mutation. The substitution in the base pair results in a different amino acid being added to the protein chain.

C. The insertion mutation causes extra hemoglobin proteins to attach to red blood cells.

This answer is not correct. Sickle-cell anemia is caused by a point mutation, not a base insertion or frameshift mutation. The change in the base pair results in a different amino acid being added to the protein chain.

D. The point mutation causes a different amino acid to be added to the hemoglobin protein.

This answer is correct. *The substitution of the DNA base is a point mutation that leads to a change in the conformation of the hemoglobin protein, causing some red blood cells to be deformed.*

Biology I End-Of-Course Training Test Answer Key

Question 19

Reporting Category: Scientific Process

Benchmark: SC.BS.1.9 Explain how scientific explanations must meet a set of established criteria to be considered valid

Answer Key: C

A student is investigating the effect of temperature on the growth rate of two variations of a plant species. One variation of the plant has broad leaves and the other has narrow leaves. The student prepares to grow several plants of each variation at four different temperatures. She then creates the data table shown to record the height of each plant at the end of the experiment.

Plant Growth Rate Experiment

	Final Plant Height (cm)	
Temperature (°C)	Broad Leaf Variation	Narrow Leaf Variation
15		
21		
26		
32		

How can the student *best* improve the validity of the experiment?

- A. Complete the experiment outside to better control the growing conditions.

This answer is not correct. While there are benefits to growing plants in their natural environment, properly testing the hypothesis would require the student to control the temperature at which the plants are grown.

- B. Grow only one variation of the plant species to simplify the data analysis.

This answer is not correct. Experimenting on only one variation of the plant species would not allow the student to compare the plants' growth rates to their leaf shapes.

- C. Record the heights of the plants daily throughout the length of the experiment.

This answer is correct. To calculate the growth rates of the two plant variations, the student would need to record the heights of the plants throughout the experiment, not just at the end of the experiment.

- D. Reduce data collection by focusing on one temperature instead of several.

This answer is not correct. Having one temperature would not allow the student to investigate how a change in temperature affects each plant's growth rate.

Biology I End-Of-Course Training Test Answer Key

Question 20

Reporting Category: Scientific Process

Benchmark: SC.BS.1.7 Revise, as needed, conclusions and explanations based on new evidence

Answer Key: A

A student examines the information in the table. The student concludes that Organism W should be placed at the base of the food web, to represent the feeding relationships in the marine ecosystem. However, the student later learns that Organism W's cells do not contain chloroplasts.

Marine Organism Observations

Organism	Behavior	Movement
T	Feeds on Organism U	Mobile
U	Feeds on Organism V and W	Mobile
V	Is eaten by Organism U	Mobile
W	Is eaten by Organisms U and V	Stationary

Which conclusion would be appropriate, based on the new information?

A. Another organism in the marine ecosystem is a producer.

This answer is correct. The animal life in this ecosystem could not be sustained without the existence of at least one producer. Therefore, another organism that is not listed must be a producer.

B. Organism W is a secondary consumer in the marine ecosystem.

This answer is not correct. A secondary consumer eats primary consumers. There is no behavioral information about Organism W to suggest it eats a non-producer organism.

C. The role of Organism T in the marine ecosystem changes during its life.

This answer is not correct. Organism T is the top consumer in this marine ecosystem. Its role does not change during its lifetime.

D. This marine ecosystem does not have any producers.

This answer is not correct. The animal life in this ecosystem could not be sustained without the existence of at least one producer.

Biology I End-Of-Course Training Test Answer Key

Question 21

Reporting Category: Diversity, Genetics, and Evolution

Benchmark: SC.BS.5.1 Explain the theory of evolution and describe evidence that supports this theory

Answer Key: D

Which similarity in two mammals provides the *best* evidence that the mammals are closely related?

A. They have similar feeding mechanisms.

This answer is not correct. Similar feeding habits could be a result of convergent evolution—adaptations evolving separately in unrelated organisms.

B. They have similar methods of processing ATP.

This answer is not correct. All animals have similar methods of processing ATP.

C. They live in similar habitats.

This answer is not correct. A given habitat is home for many unrelated organisms.

D. They share similar DNA base pair sequencing.

This answer is correct. Organisms that share similar DNA share a common ancestor.

Biology I End-Of-Course Training Test Answer Key

Question 22

Reporting Category: Scientific Process

Benchmark: SC.BS.1.6 Engage in and explain the importance of peer review in science

Answer Key: D

Corals are marine organisms that have symbiotic algae living in their tissues. The algae make food using the energy from sunlight. Sometimes, “coral bleaching” occurs when the algae leave the coral tissues. It is believed that different factors such as a change in temperature or sediments blocking sunlight could cause this coral bleaching to occur.

A student plans to study the factors that could cause coral bleaching in the lab. The student plans to grow corals in five different aquariums with different water temperatures and amounts of light. The coral is collected from water that is 24 °C. The student’s setup is shown. During a peer review, the student’s classmate says that it is good that the student has a control, but advises him to change the setup before starting the experiment.

Coral Study Setup

Aquarium	Water temperature (°C)	Amount of light exposure
1	22	25% light
2	23	50% light
3 (control)	24	100%
4	25	50% light
5	26	25% light

Which statement *best* describes how the student should change the experiment?

- A. The student should expose Aquarium 3 to 25% light.

This answer is not correct. Aquarium 3 is the control in the study. It should not have the light blocked.

- B. The student should raise the temperature 2 degrees in Aquarium 3.

This answer is not correct. Aquarium 3 is the control in the study. It should not have the temperature raised.

Biology I End-Of-Course Training Test Answer Key

- C. The student should reduce the light and temperatures in the five aquariums.

This answer is not correct. The student should only test one variable at a time in an aquarium. It would be best to manipulate the temperature or the light, not both.

- D. The student should vary the temperatures and have 100% light in the five aquariums.

This answer is correct. *The student should only test one variable at a time in an aquarium. By only manipulating the temperature, the student could better test the effect of that variable.*

Biology I End-Of-Course Training Test Answer Key

Question 23

Reporting Category: Scientific Process

Benchmark: SC.BS.2.2 Compare the risks and benefits of potential solutions to technological issues

Answer Key: C

Farmers often spray chemicals on their fields to kill weeds. These chemicals may also harm the crops. Scientists have altered the DNA of some crops so that they will not be harmed by these chemicals. However, some of the weeds can cross-breed with the crops.

Which statement describes a negative consequence of altering the DNA of the crops?

A. The amount of chemical needed for the crop fields would increase.

This answer is not correct. This would not necessarily be a result of genetic engineering in crop plants. The amount of chemical needed may or may not increase.

B. The amount of crops grown in a field would decrease.

This answer is not correct. The crop yield would probably increase, with fewer crop plants dying due to herbicide application.

C. The weeds could become resistant to the chemicals.

This answer is correct. *When the weeds cross-breed with the genetically modified crop plants, the weeds could also become resistant to the chemicals, resulting in super weeds.*

D. The weeds could become smaller than the crops.

This answer is not correct. The weeds becoming smaller than the crop plants would not be considered a negative consequence.

Biology I End-Of-Course Training Test Answer Key

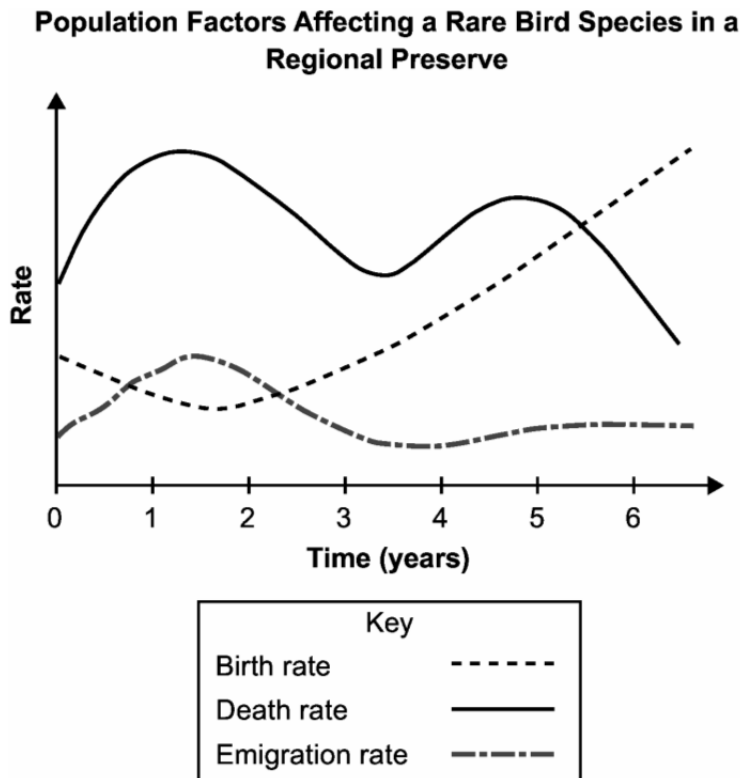
Question 24

Reporting Category: Organisms and the Environment

Benchmark: SC.BS.3.4 Explain dynamic equilibrium in organisms, populations, and ecosystems; explain the effect of equilibrium shifts

Answer Key: B

An ecologist studied a rare bird species within a regional wildlife preserve for several years. The graph shows the data the ecologist collected on the birth rate, death rate, and emigration rate for the bird species.



During which time period did the bird population experience the largest decline?

- A. Between Years 0 and 1

This answer is not correct. The death rate and emigration rate are lower and the birth rate is higher during this time period than during the period from Year 1 to Year 2.

- B. Between Years 1 and 2

This answer is correct. The overall death and emigration rates are higher and the overall birth rate lower during this time period than during any other shown on the graph. More birds are leaving the ecosystem than are being replaced.

Biology I End-Of-Course Training Test Answer Key

C. Between Years 3 and 4

This answer is not correct. The death rate and emigration rate are lower and the birth rate is higher during this time period than during the period from Year 1 to Year 2.

D. Between Years 4 and 5

This answer is not correct. The death rate and emigration rate are lower and the birth rate is higher during this time period than during the period from Year 1 to Year 2.

Biology I End-Of-Course Training Test Answer Key

Question 25

Reporting Category: Organisms and the Environment

Benchmark: SC.BS.3.1 Describe biogeochemical cycles within ecosystems

Answer Key: C

Which statement describes the potassium cycle?

- A. Potassium is eliminated from organisms by respiration and stored in the atmosphere.

This answer is not correct. Potassium is mainly stored in the soil. It is removed through plant harvest and runoff. Carbon is eliminated from animals through respiration.

- B. Potassium is extracted from the atmosphere by animals and stored in the soil.

This answer is not correct. Potassium is mainly stored in the soil. Therefore, it cannot be extracted from the atmosphere.

- C. Potassium is leached from the soil by rain water and removed through crop harvest.

This answer is correct. Potassium is mainly stored in the soil. It is leached (removed/washed away) from the soil through rain water. It is also removed from the soil when plants that contain potassium are harvested.

- D. Potassium is taken out of plants by bacteria and added back through decomposition.

This answer is not correct. Potassium is mainly stored in the soil. It is removed through plant harvest and runoff. Carbon is removed from plants and added back to the atmosphere by bacteria.

Biology I End-Of-Course Training Test Answer Key

Question 26

Reporting Category: Scientific Process

Benchmark: SC.BS.1.1 Describe how a testable hypothesis may need to be revised to guide a scientific investigation

A student hypothesizes that feeding an adult goldfish more than once a day will make it grow larger. He keeps three adult goldfish in separate 40-liter tanks at 20 °C for four weeks. He feeds the first goldfish once a day, the second twice a day, and the third three times a day.

At the end of the experiment, the student concludes that more food does not make an adult goldfish grow larger. He decides to test a new hypothesis and redesign the experiment.

- A. Place a check mark next to **one** new hypothesis that the student could test.
- B. According to the hypothesis you chose, set up a new experiment by placing labels in the boxes for “Tank Size,” “Feeding Frequency,” and “Temperature.”
- Place only **one** label in each box.
 - You may use a label more than once.
 - There may be more than one correct answer.
 - You do **not** need to use all the labels.

Answer Key:

2 points

For this item, the response correctly:

- places a check mark next to the “Goldfish grow larger in warmer water” hypothesis
- AND
- designs a complete experimental setup that includes the same tank size volume and the same feeding frequency for each tank, but a different temperature for each tank.

OR

- places a check mark next to the “Goldfish grow larger in more spacious environments” hypothesis

AND

- designs a complete experimental setup that includes the same feeding frequency and the same temperature for each tank, but a different volume for each tank size.

Biology I End-Of-Course Training Test Answer Key

1 point

For this item, the response correctly:

- places a check mark next to the “Goldfish grow larger in warmer water” hypothesis

AND

- designs a complete experimental setup that includes the same feeding frequency and the same temperature for each tank, but a different volume for each tank size.

OR

- places a check mark next to the “Goldfish grow larger in more spacious environments” hypothesis

AND

- designs a complete experimental setup that includes the same tank size volume and the same feeding frequency for each tank, but a different temperature for each tank.

OR

- places a check mark next to the “Adult goldfish grow larger when fed more” hypothesis

AND

- designs a complete experimental setup that includes a tank size volume of 55 liters or 70 liters for each tank and a temperature of 20 °C or 22 °C for each tank, and the same feeding frequency for each tank (i.e., changes tank size and/ or temperature from the original experiment and the same feeding frequency).

0 points

The response is incorrect for all parts. The response does not select a new hypothesis to test and does not design a complete experimental setup (two controlled variables and one experimental variable).

Biology I End-Of-Course Training Test Answer Key

Sample Student Answer:

A student hypothesizes that feeding an adult goldfish more than once a day will make it grow larger. He keeps three adult goldfish in separate 40-liter tanks at 20 °C for four weeks. He feeds the first goldfish once a day, the second twice a day, and the third three times a day.

At the end of the experiment, the student concludes that more food does not make an adult goldfish grow larger. He decides to test a new hypothesis and redesign the experiment.

- A. Place a check mark next to **one** new hypothesis that the student could test.
- B. According to the hypothesis you chose, set up a new experiment by placing labels in the boxes for "Tank Size," "Feeding Frequency," and "Temperature."

- Place only **one** label in each box.
- You may use a label more than once.
- There may be more than one correct answer.
- You do **not** need to use all the labels.



40 liters

55 liters

70 liters

Once a day

Twice a day

Three times a day

18 °C

20 °C

22 °C

Delete

A. New Hypothesis

- Adult goldfish grow larger when fed more.
- Adult goldfish grow larger in warmer water.
- Adult goldfish grow larger in more spacious environments.

B. New Experimental Setup

	Goldfish 1	Goldfish 2	Goldfish 3
Tank Size:	55 liters	55 liters	55 liters
Feeding Frequency:	Once a day	Once a day	Once a day
Temperature:	18 °C	20 °C	22 °C

Explanation of Correct Answer:

In the student's original experiment, he keeps tank size and tank temperature constant while varying feeding frequency in order to determine whether feeding frequency will cause an adult goldfish to grow larger. At the end of the original experiment, the student concludes that varying feeding frequency does not make an adult goldfish grow larger, and he decides to test a new hypothesis. A new hypothesis would be whether warmer tank temperature will cause an adult goldfish to grow larger or a larger tank size will cause an adult goldfish to grow larger. To properly set up an experiment to test whether warmer tank temperature will cause an adult goldfish to grow larger, each tank must be a different temperature but the feeding frequency and tank size must be kept constant. To properly set up an experiment to test whether a larger tank size will cause an adult goldfish to grow larger, each tank must be a different volume but the feeding frequency and tank temperature must be kept constant.

Biology I End-Of-Course Training Test Answer Key

Simulation

A teacher assigns a group of students an investigation. The students are to observe several reactions and determine which indicator can be used to test for protein and starch in food.

Conduct several trials to determine which indicator can be used to test for protein in food and which indicator can be used to test for starch in food.

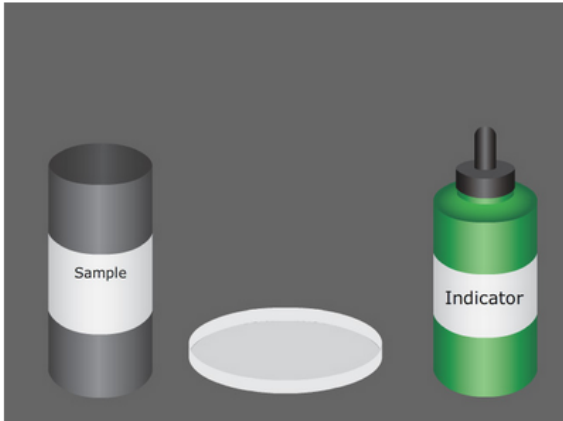
Indicators

1

Samples

Corn starch

Start



Sample	% Carbs	% Protein	% Lipid	% DNA	Indicator	Color Change

Explanation of How to Use Simulation:

The student can choose one of two indicators from the drop down menu:

- Indicator 1
- Indicator 2

The student can choose one of twelve samples from the drop down menu:

- Corn starch
- Potato starch
- Vegetable oil
- Dried egg whites
- Gelatin
- Whole wheat bread
- White bread
- Butter
- Jelly
- Yogurt
- White beans
- Pea plant DNA

Biology I End-Of-Course Training Test Answer Key

After choosing an indicator and a sample, the student presses the green “Start” button. An animation of the reaction plays and the output table populates with the information shown, depending on the indicator and sample chosen.

Sample	%Carbs	%Protein	%Lipid	%DNA	Indicator	Color Change
Corn starch	91%	0%	0%	0%	1	Yes
Potato starch	90%	0%	0%	0%	1	Yes
Vegetable oil	0%	0%	98%	0%	1	No
Dried egg whites	2%	81%	0%	0%	1	No
Gelatin	0%	86%	0%	0%	1	No
Whole wheat bread	8%	13%	0%	0%	1	No
White bread	41%	8%	2%	0%	1	Yes
Butter	0%	1%	98%	0%	1	No
Jelly	99%	0%	0%	0%	1	No
Yogurt	0%	5%	1%	0%	1	No
White beans	2%	7%	0%	0%	1	No
Pea plant DNA	0%	0%	0%	99%	1	No

Sample	%Carbs	%Protein	%Lipid	%DNA	Indicator	Color Change
Corn starch	91%	0%	0%	0%	2	No
Potato starch	90%	0%	0%	0%	2	No
Vegetable oil	0%	0%	98%	0%	2	No
Dried egg whites	2%	81%	0%	0%	2	Yes
Gelatin	0%	86%	0%	0%	2	Yes
Whole wheat bread	8%	13%	0%	0%	2	Yes
White bread	41%	8%	2%	0%	2	No
Butter	0%	1%	98%	0%	2	No
Jelly	99%	0%	0%	0%	2	No
Yogurt	0%	5%	1%	0%	2	Yes
White beans	2%	7%	0%	0%	2	Yes
Pea plant DNA	0%	0%	0%	99%	2	No

Biology I End-Of-Course Training Test Answer Key

Question 27

Reporting Category: Structure and Functions in Organisms

Benchmark: SC.BS.4.5 Describe the components and functions of a variety of macromolecules active in biological systems

Four different macromolecules are shown.

Place a check mark in the blank box under each macromolecule that can be identified using Indicator 1.

- Place only **one** check mark in each box.
- There may be more than one answer.
- You may use the check mark more than once.

Answer Key:

1 point

For this item, the response correctly:

- places a check mark in the Molecule B box;
- AND
- no other check marks in any of the other boxes.

0 points

The response is incorrect for all parts. The response does not place a check mark in the blank box under the macromolecule that can be identified using Indicator 1.

Biology I End-Of-Course Training Test Answer Key

Sample Student Answer:

Four different macromolecules are shown.

Place a check mark in the blank box under each macromolecule that can be identified using Indicator 1.

- Place only **one** check mark in each box.
- There may be more than one answer.
- You may use the check mark more than once.

✓

Delete

Molecule A:

Molecule B:

Molecule C:

Molecule D:

Explanation of Correct Answer:

After running trials in the simulation the student is able to determine that Indicator 1 reacts with corn starch, potato starch and white bread. Each of those samples contains a large amount of carbohydrates. Based on the molecular structures given, the student is able to identify Molecule A as DNA, Molecule B as a carbohydrate (starch), Molecule C as a peptide and Molecule D as a lipid.

Biology I End-Of-Course Training Test Answer Key

Question 28

Reporting Category: Structure and Functions in Organisms

Benchmark: SC.BS.4.5 Describe the components and functions of a variety of macromolecules active in biological systems

The percent of each macromolecule in dry milk is shown.

Non-fat Whole Dry Milk

%Carbs	%Protein	%Lipid	%DNA
51%	36%	1%	0%

Based on the results of the investigation, which indicator will change color when added to the dry milk?

A. Indicator 1

This answer is not correct. Indicator 1 identifies starch in food. The carbohydrate in non-fat whole dry milk is lactose. Therefore, Indicator 1 would not react with the carbohydrate in non-fat whole dry milk.

B. Indicator 2

This answer is correct. Indicator 2 identifies protein in food. Non-fat whole dry milk is 36% protein. Therefore, Indicator 2 will change colors when added to non-fat whole dry milk.

C. Indicators 1 & 2

This answer is not correct. Based on the results from the simulation, no sample reacts with both indicators. Furthermore, the carbohydrate in non-fat whole dry milk is lactose. Therefore, Indicator 1 would not react with the carbohydrate in non-fat whole dry milk.

D. Neither Indicator

This answer is not correct. Indicator 2 identifies protein in food. Non-fat whole dry milk is 36% protein. Therefore, Indicator 2 will change colors when added to non-fat whole dry milk.