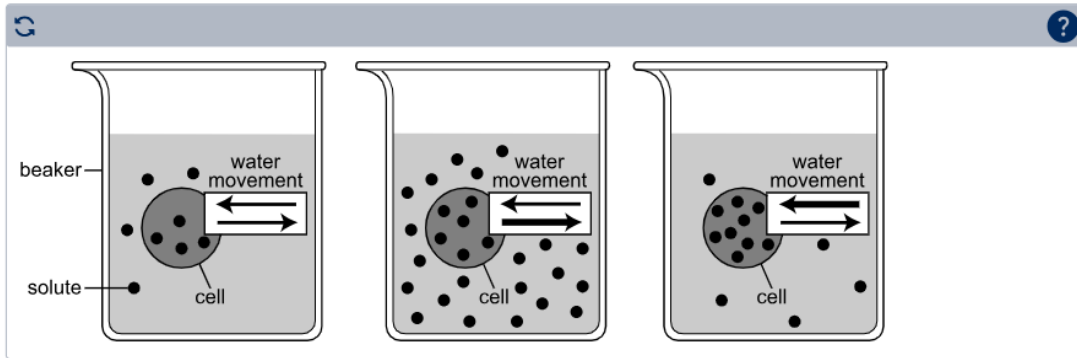


Biology Online Tools Training (OTT) ANSWER KEY 2024-2025

Question 1: Standard BIO.1D.2

The models below are set up to represent how a cell responds to imbalances in solute concentration. Drag a pair of arrows into each box to show how water will move into or out of the cell in each beaker for the solute conditions shown.

(Practice Hint: Drag the pairs of arrows from the right to the correct boxes in the diagram.)



Question 2: Standard BIO.5.1

A 350-acre area in central Mississippi called Old Cove has mature hardwood trees, birds, reptiles, amphibians, and many plant species. Students wrote three descriptions related to the Old Cove environment.

Descriptions Written by Students

1. all the wild turkeys living in Old Cove
2. an individual woodland salamander living in Old Cove
3. all the living organisms in Old Cove

Select one box in each row of the table below to match the correct level of organization represented by each description.

(Practice Hint: Select the blank spaces next to each description to add a check mark.)

	biome	community	organism	population
Description 1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Description 2	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Description 3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Question 3: Standard BIO.3B.1

In pea plants, smooth seeds (S) are dominant to wrinkled seeds (s). A parent pea plant with smooth seeds (SS) is crossed with a parent pea plant with wrinkled seeds (ss).

Drag a number into each box to provide the predicted phenotypic and genotypic ratios for the offspring of this cross. The numbers may not all be used, or some may be used more than once.

(Practice Hint: Drag the numbers from the right side to the correct locations in the ratios.)

↻		?			
Phenotypic Ratio		0			
<input type="text" value="4"/>	:	<input type="text" value="0"/>	1		
smooth seeds		wrinkled seeds			
		2			
Genotypic Ratio		3			
<input type="text" value="0"/>	:	<input type="text" value="4"/>	:	<input type="text" value="0"/>	4
SS		Ss		ss	

Please NOTE: When ratios are given based on Punnett squares for monohybrid crosses, the numbers in the ratio usually add up to 4. However, the ratio of 1:0 is equivalent to 4:0; so are 2:0 and 3:0.

Correct Answers for the Phenotypic Ratio could be 1:0, 2:0, 3:0, 4:0. For the Genotypic Ratio, Correct Answers can include 0:1:0, 0:2:0, 0:3:0, and 0:4:0.

Question 4: Standard BIO.1E.2

The mitotic spindle is a part of a cell that allows for the movement of sister chromatids to opposite poles of the cell during the later stages of mitosis. Which problem would **most likely** occur if the mitotic spindle stopped functioning in a cell?

- a) Newly produced cells would be twice their normal size.
- b) Newly produced cells would have too few or too many chromosomes.
- c) Newly produced cells would fail to form and pinch off from each other.
- d) Newly produced cells would contain new chromosomes not found in the parent cells.

Question 5: Standard BIO. 5.4

The chart below provides information about four organisms that live in a Mississippi pond ecosystem.

(Practice Hint 1: Select the Highlighter button to turn on the Highlighter tool. Use the Highlighter tool to note important text. To remove highlighting and turn off the tool, select the Highlighter button and select Clear All.)

(Practice Hint 2: Select the Pointer button when you are ready to answer the question. Use the Pointer tool to select the correct answer.)

Organisms	Description
stoneflies	insects that swarm near the water's surface to feed
sunfish	small fish that swim in the pond water
algae	green organisms that float on the top of the water
herons	birds that fly and swoop down to the water's surface to feed on fish

Which model **best** shows the flow of energy between these organisms in the pond ecosystem?

- a sunlight → algae → stoneflies → sunfish → herons
- b herons → sunfish → stoneflies → algae → sunlight
- c sunlight → algae → herons → sunfish → stoneflies
- d herons → algae → sunfish → stoneflies → sunlight

Question 6: Standard BIO.1B.1

↑ More ↑
(Practice Hint 1: Press the Line Guide button to turn on the Line Guide tool. Use the Line Guide tool by dragging the blue handle on the right to help guide you as you read. Turn off the Line Guide tool by pressing the Line Guide button again.)

Proteins are organic compounds that play vital roles in living organisms. A single cell can contain thousands of proteins, each with a unique function. Although protein structure and function vary greatly, all proteins have similar building blocks.

(Practice Hint 2: Use the scroll bar on the right to access the information below.)

Role	Examples	Function
structure	keratin, collagen	build different structures in skin and hair
transport	hemoglobin	carry substances in blood
enzymes	amylase, lipase	control chemical activity of cells
hormones	insulin	coordinate activity of systems
defense	antibodies	provide protection from foreign substances

Collagen, lipase, and hemoglobin have totally different functions but are classified as proteins. Select the **two** characteristics that these proteins have in common.

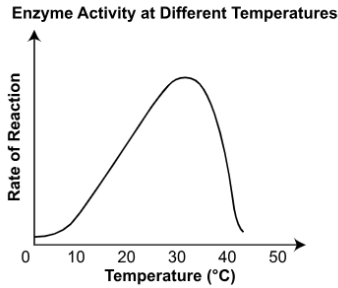
(Practice Hint 3: Eliminate answer choices by using the Cross-off tool. Select the Pointer button when you are ready to answer the question.)

- a They contain nitrogen.
- b They are made of disaccharides.
- c They are composed of amino acids.
- d They form by using fatty acids and glycerin.
- e They contain a base, sugar, and a phosphate group.

Question 7: Standard BIO.1B.2

Role	Examples	Function
structure	keratin, collagen	build different structures in skin and hair
transport	hemoglobin	carry substances in blood
enzymes	amylase, lipase	control chemical activity of cells
hormones	insulin	coordinate activity of systems
defense	antibodies	provide protection from foreign substances

Enzymes are a type of protein made by all living cells. They can affect cellular reactions. Each enzyme works best in its optimum environmental conditions.



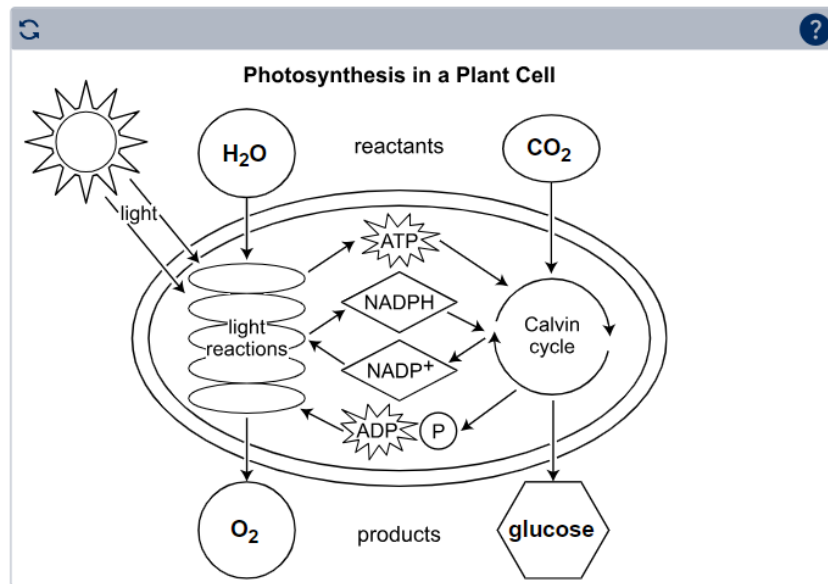
Based on the graph, what temperature range would be considered the optimum temperature for this enzyme?

- (a) between 0°C and 5°C
- (b) between 18°C and 28°C
- (c) between 28°C and 38°C
- (d) between 40°C and 50°C

Question 8: Standard BIO.2.2

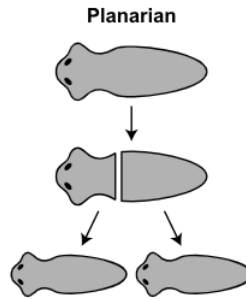
Drag the labels into the shapes in the diagram to show the major reactants and products of photosynthesis in a plant cell.

(Practice Hint: Use the Magnifier tool to view a larger image of the diagram. Use the bottom and right scroll bars to see the entire question. Select "off" on the Magnifier tool button or press the escape key to return to normal size.)



Question 9: Standard BIO.1.E.3

A planarian is a type of multicellular organism. A process that occurs in a planarian is represented in the model below.



Use the drop-down menus in the statements to **best** describe this process.

(Practice Hint: Select the drop-down arrows to see the lists of answer choices. Then, select the answer choices that best complete the statements.)

The model represents the process of . This process is a type of reproduction that is most similar to . The two organisms that result from this process contain DNA that is .

Question 10: Standard BIO.3B.3

A male child with wavy hair is born to a mother with curly hair and a father with straight hair.

Which type of inheritance **best** explains the child's hair type?

- (a) codominance because the child's hair type is a blend of the parental hair types
- (b) codominance because both the male and the female carry the gene for hair type
- (c) incomplete dominance because the child's hair type is a blend of the parental hair types
- (d) incomplete dominance because both the male and the female carry the gene for hair type

Question 11: Standard BIO.1A.4

The classification of viruses as living or nonliving entities has changed throughout history. Initially thought to be poisons, viruses have been classified over time as a specialized form of life and as a biological chemical. Today, their classification remains uncertain.

Drag each claim next to the **one** piece of evidence that **best** supports that claim.

Claim	Evidence
	Viruses replicate by simple mitosis.
	Most viruses are larger than common bacterial cells, such as <i>E. coli</i> .
Viruses are living.	Each virus has either RNA or DNA, compounds found in cells.
Viruses are nonliving.	Viruses must use living cells to produce additional viruses.
	Viruses infect only animal cells.

Question 12: Standard BIO.4.3

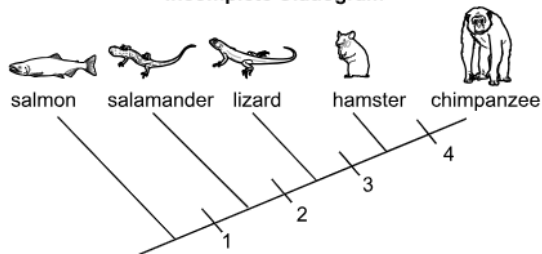
The chart below and the incomplete cladogram show the relatedness of five organisms.

(Practice Hint: Choose "Select to Enlarge" to view the chart. Drag the blue bar to move the chart around. Select the X to close the chart.)

Vertebrate Group	Basic Characteristics
Fish	obtain oxygen through gills; generally lay eggs; have scales and fins; live in water
Amphibians	develop in water with gills but breathe on land with lungs as adults; include frogs, toads, and salamanders; live in and around water
Reptiles	breathe with lungs; generally lay eggs, but some eggs hatch inside female; have scales or plates; include snakes, lizards, and turtles
Mammals	breathe with lungs; bear live offspring; have fur or hair; produce milk to feed young; may have opposable thumbs; include bats, dolphins, cats, dogs, possums, and primates

Select to Enlarge

Incomplete Cladogram

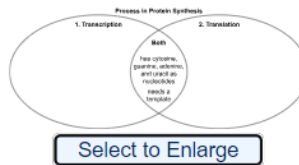


Select the **two** statements that **best** describe the cladogram.

- a The trait that separates salmon from the other organisms (1) is the development of lungs.
- b The trait that separates hamsters from chimpanzees (4) is the presence of fur and mammary glands.
- c The trait that separates salamanders from lizards (2) is the presence of opposable thumbs.
- d The trait that separates lizards from hamsters (3) is the presence of fur and mammary glands.
- e The trait that separates salmon from salamanders (1) is the presence of opposable thumbs.
- f The trait that separates chimpanzees from the other organisms (4) is the development of lungs.

Question 13: Standard BIO.3C.2

A student uses a Venn diagram to compare the mechanisms of transcription and translation during protein synthesis. The incomplete diagram is shown.



(Practice Hint: Use the pointer tool to select the response boxes below. Use the keyboard to enter responses.)

Record the number 1 or 2 next to each descriptor to identify whether it should be grouped with transcription (1) or translation (2) in the Venn diagram.

- | | |
|------------------------------|--------------------------------|
| has mRNA as a product | <input type="text" value="1"/> |
| occurs in ribosomes | <input type="text" value="2"/> |
| has polypeptide as a product | <input type="text" value="2"/> |
| occurs in the nucleus | <input type="text" value="1"/> |

Question 14: Standard BIO.4.6

Before the formation of the Grand Canyon, many years ago, a single species of squirrel lived in the area. As the canyon developed, the single species was separated into two habitats, one species on either side of the 10-mile-wide and 1-mile-deep canyon. Evidence also indicates that humans have inhabited the area in recent years.



Which set of statements **most likely** describes how the formation of the Grand Canyon affected the single squirrel species that once populated the area?

- (a) **Process:** speciation
Explanation: Humans brought new organisms to the canyon, including a squirrel species that successfully competed with the native species in the area.
- (b) **Process:** genetic variation
Explanation: Humans brought new organisms to the canyon, including a squirrel species that successfully competed with the native species in the area.
- (c) **Process:** speciation
Explanation: The single species was split into two distinct groups by the canyon, with each group adapting to its unique environment.
- (d) **Process:** genetic variation
Explanation: The single species was split into two distinct groups by the canyon, with each group adapting to its unique environment.

Question 15: Standard BIO.2.3

A student is developing a chart to compare aerobic respiration and anaerobic respiration in both plants and animals. The incomplete chart is shown.

Use the drop-down menus to complete the chart.

	Aerobic Respiration	Anaerobic Respiration (plants)	Anaerobic Respiration (animals)
Is oxygen required?	yes	no ▾	no
Is there glycolysis?	yes	yes ▾	yes
What is the ATP yield?	36	2	2
Is glucose completely broken down?	yes	no	no ▾
What end products are produced?	carbon dioxide and water	ethanol and carbon dioxide	lactic acid ▾

Question 16: Standard BIO.5.5

The table includes descriptions of four different types of relationships between organisms. Drag each relationship into the table to correctly identify which type of relationship each description represents.

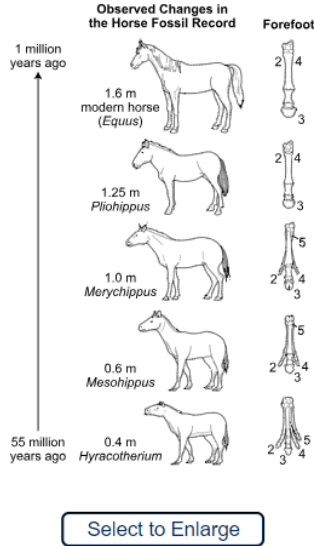


Description	Type of Relationship
A king snake stalks a small mouse before constricting it and eating it whole.	predation
A tapeworm enters a host's digestive system and feeds on digested food.	parasitism
An oxpecker bird lands on the back of a rhinoceros and feeds on parasites while being protected from predators.	mutualism
Barnacles grow on the skin of a whale, leaving it unharmed, while filtering food as the whale swims.	commensalism

OK

Question 17: Standard BIO.4.2

The fossil record contains evidence of physical changes in horses over time. The diagram shows some of the changes in horse height and number of toes per forefoot as observed in the fossil record.



Part A: Use the drop-down menus to **best** describe the changes observed in horse height and number of toes per forefoot over time.

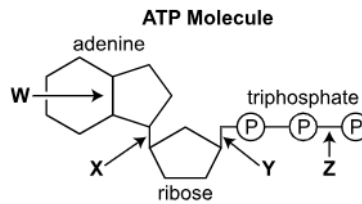
Compared to *Hyracotherium*, the height of modern horses has and the number of toes has .

Part B: Using the evidence shown, record the number to identify the toe that likely had the **most** impact on the evolution of the forefoot of horses.

(Practice Hint: Select the input response box below. Use the keyboard to enter a response.)

Question 18: Standard BIO.2.1

The diagram shows an ATP molecule with four bonds labeled.



Which statement **best** explains the structure and function of ATP?

- (a) When bond Z is formed, energy is released for cellular activities.
- (b) When bond Z is broken, energy is released for cellular activities.
- (c) When bond Y is formed, energy is stored for cellular activities.
- (d) When bond Y is broken, energy is stored for cellular activities.

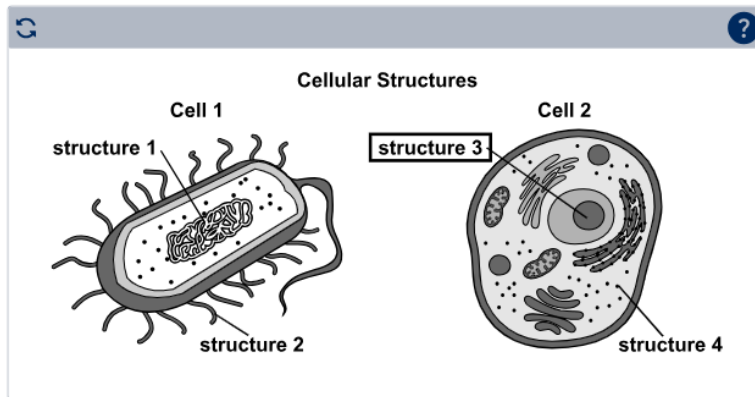
Question 19: Standard BIO.1C.2

All cells are either eukaryotic or prokaryotic.

Part A: Drag an option into each box in the table to show whether the characteristic describes a eukaryotic cell, a prokaryotic cell, or both types of cell. The options may be used once, more than once, or not at all.

Characteristics of Eukaryotic and Prokaryotic Cells		Options
Characteristic	Type of Cell	
has ribosomes	both	prokaryotic
has a cell membrane	both	eukaryotic
has DNA in the cytoplasm	prokaryotic	both
has membrane-bound organelles	eukaryotic	

Part B: The diagrams show a eukaryotic cell and a prokaryotic cell. On the diagram representing the eukaryotic cell, select the structure where the cellular DNA is stored.



Question 20: Standard BIO.4.1

The diagram shows an incomplete model of the evolution of heterotrophs and autotrophs.

Drag the descriptions into the boxes to correctly complete the model.

