State of Texas Assessments of Academic Readiness

Biology

Practice Assessment

BIOLOGY

DIRECTIONS

Read each question carefully. Choose the best answer to each question. For open-response questions, determine the best answer to the question.

1 A scientist is examining an unknown cell using an electron microscope.

Which observed structure would indicate that the cell is **MOST LIKELY** prokaryotic?

Ⓐ Mitochondrion

Ⓑ Free-floating DNA

Ⓒ Chloroplast

Ⓓ Membrane-bound nucleus

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2 Which environmental condition would **MOST LIKELY** result in the appearance of punctuated equilibrium in the fossil record?

Ⓐ An environment that remains in a state of stasis

Ⓑ An environment that undergoes steady changes over time

Ⓒ An environment that experiences rapid large-scale destructive change

Ⓓ An environment with many transitional fossils

3 A student is sweating after playing basketball.

Which body systems are **MOST DIRECTLY** interacting as a response to maintain homeostasis?

Ⓐ Digestive and circulatory systems

Ⓑ Immune and integumentary systems

Ⓒ Nervous and integumentary systems

Ⓓ Circulatory and nervous systems

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4 Ringworm is a common skin infection that appears as an itchy, red rash on exposed human skin. It is caused by approximately 40 different species of fungi called dermatophytes. These fungi require keratin, which is present in human skin, for growth and reproduction.

Which term describes the relationship between dermatophytes and humans?

Ⓐ Parasitism

Ⓑ Commensalism

Ⓒ Mutualism

Ⓓ Predation

5 A student makes a model to compare the process of transcription and translation to the process of using a grocery store that prepares orders for customers.

A customer makes a copy of a grocery list at home.

↓

The customer drives the grocery list to the grocery store.

↓

The customer gives the grocery list to a cashier at the store.

↓

A shopper picks up the items and brings them to the cashier.

↓

The cashier assembles the order and a shopping cart with the order is produced.

Based on the student's model and your knowledge of the biological process, which person or object represents tRNA?

Ⓐ The cashier

Ⓑ The grocery list

Ⓒ The shopper

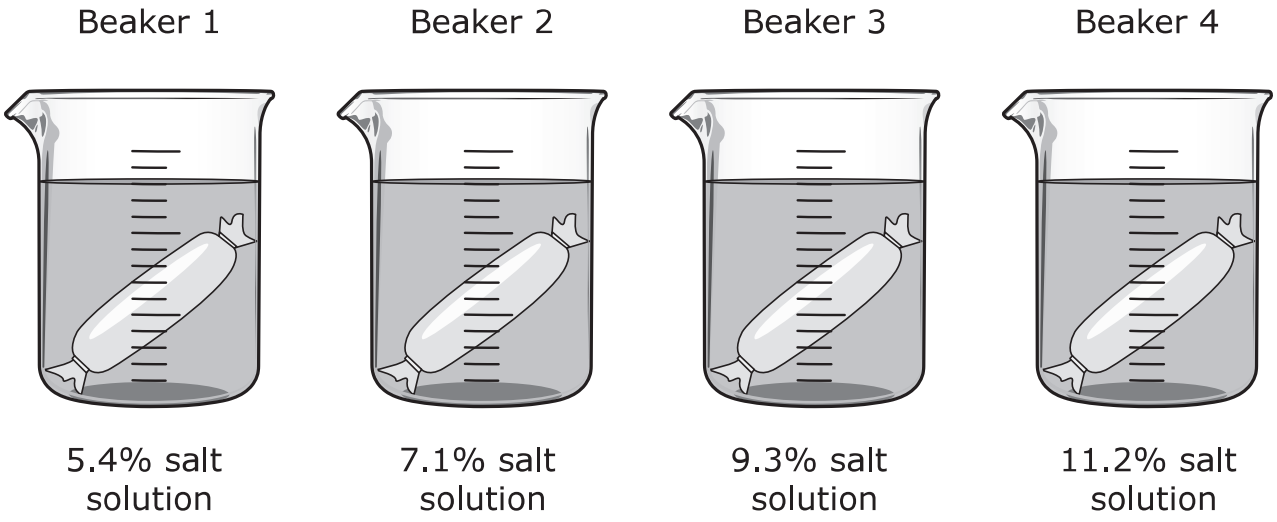
Ⓓ The shopping cart

6 Students investigate osmosis using dialysis tubing. Dialysis tubing is a semipermeable membrane that allows water molecules to pass through while preventing salt ions from passing through.

The students follow this procedure:

1. Mix salt into water to make a 7.1% salt solution.
2. Add equal amounts of this saltwater solution to four small bags made of dialysis tubing.
3. Fill four beakers with different salt solutions, as shown in the image.
4. Place each small bag into one of the four beakers.
5. Observe changes in the size of the bags.

The setup for the investigation is shown.



In which beaker will osmosis cause expansion of the dialysis tubing bag?

Ⓐ Beaker 1

Ⓑ Beaker 2

Ⓒ Beaker 3

Ⓓ Beaker 4

7 Leguminous plants, such as bean plants, share a mutualistic relationship with certain rhizobium bacteria. The plants develop harmless nodules on their roots, where the bacteria live. In return, the bacteria convert an important element from the atmosphere into a nutrient form that the plants can use.

What essential element is converted to a useable form by the rhizobium bacteria?

Record your answer in the space provided.

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8 Which organ and tissue interact **MOST DIRECTLY** to absorb and transport water and dissolved minerals inside a plant?

Ⓐ Flower and phloem

Ⓑ Root and phloem

Ⓒ Flower and xylem

Ⓓ Root and xylem

9 Which type of mutation is **LEAST LIKELY** to result in a frameshift mutation?

Ⓐ Insertion

Ⓑ Translocation

Ⓒ Substitution

Ⓓ Deletion

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10 Which two components are **MOST LIKELY** found in both viruses and prokaryotic cells?

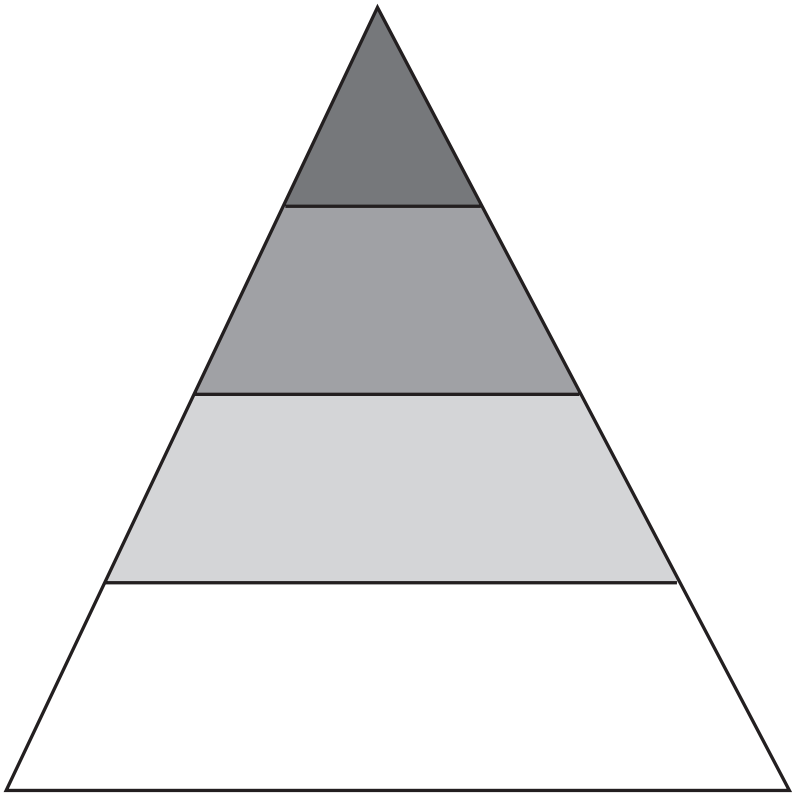
Ⓐ Nucleic acids and carbohydrates

Ⓑ Carbohydrates and lipids

Ⓒ Lipids and proteins

Ⓓ Proteins and nucleic acids

11 A student is drawing an energy pyramid.



Examine the diagram and answer these questions:

- What is the original source of all energy for the energy pyramid?
- How does the amount of energy available at each level of the pyramid change from the bottom to the top?

Think about the questions carefully. Then record your answers in the box provided.

GO ON

12 A population of organisms contains multiple alleles for a particular trait. A biologist assigns each allele a letter from M through T and tracks the frequency in a population. A small group of organisms travels to a new location and begins a new population.

The biologist tracked the allele frequency for the trait in the original population and the small group and recorded the data in the tables shown.

Allele Frequency in Original Population

Allele	Frequency (%)
M	11
N	21
O	7
P	13
Q	5
R	3
S	31
T	9

Allele Frequency in Small Population

Allele	Frequency (%)
M	0
N	12
O	0
P	25
Q	22
R	0
S	41
T	0

Which table shows the **MOST LIKELY** allele frequency of the new population?

Ⓐ

Allele Frequency in New Population

Allele	Frequency (%)
M	11
N	21
O	7
P	13
Q	5
R	3
S	31
T	9

Ⓒ

Allele Frequency in New Population

Allele	Frequency (%)
M	30
N	10
O	15
P	11
Q	16
R	9
S	7
T	2

Ⓑ

Allele Frequency in New Population

Allele	Frequency (%)
M	0
N	15
O	1
P	26
Q	20
R	0
S	36
T	2

Ⓓ

Allele Frequency in New Population

Allele	Frequency (%)
M	4
N	20
O	5
P	21
Q	27
R	0
S	21
T	2

13 Which of these is **MOST LIKELY** an indication that cells may have become cancerous?

Ⓐ Cells undergoing slower rates of mitosis

Ⓑ Cells with few or no mutations

Ⓒ Cells not responding to checkpoints in the cell cycle

Ⓓ Cells with decreased rates of protein synthesis

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14 Which statement **BEST** describes how genes are expressed in an organism?

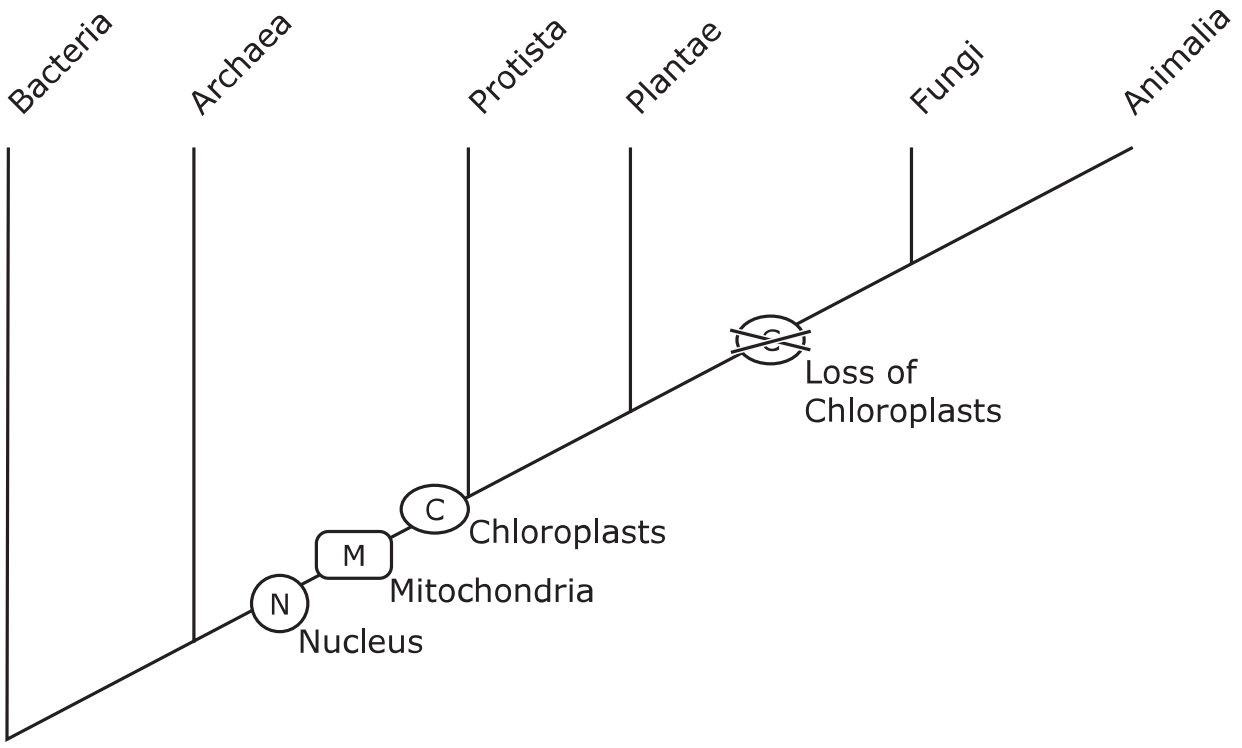
Ⓐ Genes are always off even when resources are available.

Ⓑ Genes are turned on and off in response to the environment.

Ⓒ Genes are continuously turned on and off at random intervals of time.

Ⓓ Genes are on until all the genes have been simultaneously expressed.

15 A cladogram for the six kingdoms of life is shown.



Based on the cladogram, which **TWO** kingdoms contain organisms with chloroplasts?

Ⓐ Fungi and Archaea

Ⓑ Archaea and Protista

Ⓒ Protista and Plantae

Ⓓ Plantae and Fungi

GO ON

16 Which statement **BEST** describes how enzymes affect the speed of a metabolic reaction?

Ⓐ Enzymes increase the concentration of reactants, which increases the speed of the reaction.

Ⓑ Enzymes decrease the energy needed to start a reaction, which increases the speed of the reaction.

Ⓒ Enzymes replace the reactants in a chemical reaction, which decreases the speed of the reaction.

Ⓓ Enzymes prevent products from being converted back into reactants, which decreases the speed of the reaction.

17 This question has two parts. First, answer Part A. Then, answer Part B.

The table shows the number of differences in the amino acid sequence of a protein called cytochrome C in three species of fungi.

Fungi	Differences in Cytochrome C
Candida albicans and *Saccharomyces cerevisiae*	27
Candida albicans and *Neurospora crassa*	43
Saccharomyces cerevisiae and *Neurospora crassa*	41

Part A

Based on the data, which two species of fungi are **MOST CLOSELY** related?

Ⓐ *Candida albicans* and *Saccharomyces cerevisiae*

Ⓑ *Neurospora crassa* and *Candida albicans*

Ⓒ *Saccharomyces cerevisiae* and *Neurospora crassa*

Part B

Which evidence **BEST** supports the answer to Part A?

Ⓐ The two species have anatomical similarities.

Ⓑ The two species have high molecular homology.

Ⓒ The two species are able to reproduce.

Ⓓ The two species are both fungi.

18 A student compares two different species of fox as shown in the table.

Arctic Fox vs. Fennec Fox

Arctic Fox (*Vulpes lagopus*)	Fennec Fox (*Vulpes zerda*)
• Lives in the arctic tundra	• Lives in the desert
• Thick fur that varies in color based on the season	• Tan fur
• Short ears, legs, and snout	• Large ears
• Dense fur on foot pads	• Slanted eyes

The student wants to explain why the two species are so different even though they have a common ancestor.

Which statement **BEST** explains the differences between the two species?

Ⓐ Different environments led to different adaptations.

Ⓑ The same environment led to different adaptations.

Ⓒ Each species developed the same adaptations to different environments.

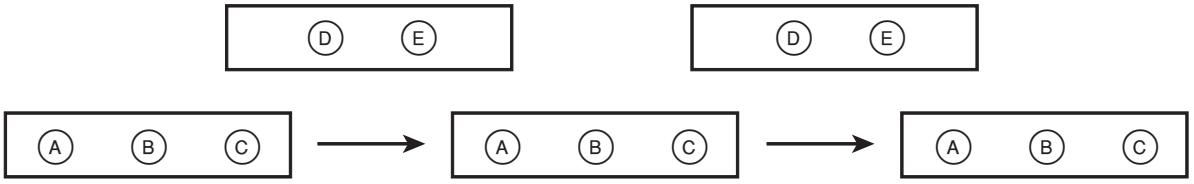
Ⓓ Each species migrated to environments that matched their adaptations.

19 A student makes a diagram to demonstrate how DNA encodes traits for organisms.

Complete the diagram to accurately show the relationship among the structures and processes.

Select the correct answer for each box. Not all answers can be used in all boxes.

A Protein **B** DNA **C** mRNA **D** Transcription **E** Translation



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20 There are different types of human blood cells. Depending on what type they are, some blood cells either carry nutrients throughout the body or destroy foreign substances in the body.

Which statement explains how genes control the differentiation of different types of blood cells?

Ⓐ Different genes are expressed in the different types of blood cells.

Ⓑ Some genes are deleted in one type of blood cell, changing the type of cell it is.

Ⓒ Specific genes in blood cells are expressed only in response to an external environmental change.

Ⓓ Genes found in all blood cells can change the cell to perform any function needed.

21 Microorganisms are known to be present in some food products such as yogurt. One student claims that microorganisms in food always have a negative effect on human health, while a second student disagrees. The second student claims that some microorganisms in food can have a positive effect on human health.

Which statement **BEST** supports the second student's claim?

Ⓐ Microorganisms can destroy any pathogens that affect the immune system.

Ⓑ Microorganisms reproduce too slowly to affect the immune system.

Ⓒ Microorganisms known to be in food are no longer living and would not affect the digestive system.

Ⓓ Microorganisms can aid in the absorption of nutrients from food within the digestive system.

22 A bacteriophage uses the lysogenic cycle to replicate itself. Describe the bacteriophage's replication process. Be sure to include information about what happens to the host cell during and as a result of this cycle.

Think about the questions carefully. Then record your answer in the box provided.

GO ON

23 A large population of rock pocket mice with various fur colors lives in a designated area. Soon after a volcanic eruption, the number of mice with dark-colored fur in the population increased.

Which statement **BEST** describes the reason for the change in fur color?

Ⓐ Mutations for dark-colored fur were passed down within the somatic cells, resulting in more mice with dark-colored fur.

Ⓑ Mice with light-colored fur selected mutations that allowed their fur to become darker.

Ⓒ The fitness of mice with dark-colored fur increased, so they became more abundant.

Ⓓ Mice with light-colored fur began feeding in the daytime to stimulate the release of a pigment for dark-colored fur.

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24 A student is making models of cells and uses the following materials:

- dried peas to represent ribosomes
- shelled peanuts to represent mitochondria
- uncooked noodles to represent DNA
- shoestrings to represent the cell membrane

Which material would be used in a model of a eukaryotic cell but **NOT** a prokaryotic cell?

Ⓐ Dried peas (ribosomes)

Ⓑ Shelled peanuts (mitochondria)

Ⓒ Uncooked noodles (DNA)

Ⓓ Shoestrings (cell membrane)

25 Which molecules are the building blocks of DNA?

Ⓐ Proteins

Ⓑ Fatty acids

Ⓒ Nucleotides

Ⓓ Chromosomes

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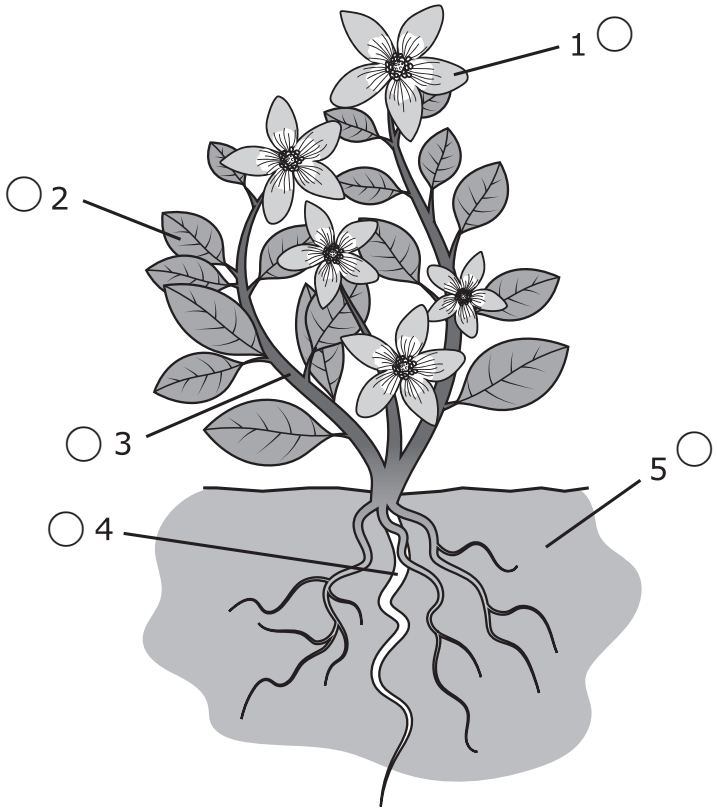
26 Which plant structures are **DIRECTLY** involved in the production and transport of glucose?

Select **TWO** correct answers.



GO ON

27 Since the 1900s, sea surface temperatures over the Great Barrier Reef have been gradually increasing. These rising ocean temperatures have caused coral bleaching. Coral bleaching occurs when corals lose the symbiotic algae that give them their coloring and are their main sources of energy. Severely bleached corals usually develop disease and eventually die.

How might coral bleaching affect ecosystem stability in the Great Barrier Reef?

Ⓐ Species that depend on the coral for protection and food will decline.

Ⓑ Predators will adapt and find alternative food sources.

Ⓒ Genetic and species diversity will increase.

Ⓓ Vulnerable species will migrate to environments with healthy corals.

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28 Which cellular components are the same in all living organisms?

Ⓐ Mitochondria

Ⓑ Nuclei

Ⓒ Nucleotides

Ⓓ DNA sequences

29 Which two biological processes would **MOST LIKELY** result in offspring genetically different from their parents?

Select **TWO** correct answers.

- ◯ DNA replication
- ◯ Independent assortment
- ◯ Mitosis
- ◯ Crossing-over
- ◯ Asexual reproduction

GO ON

30 This question has two parts. First, answer Part A. Then, answer Part B.

Two students give the following presentation to their classmates:

Student 1 starts the presentation by describing members of one species.

Student 2 adds information about members of another species and explains that members of both species interact with each other **AND** with the abiotic factors in their environment.

Part A

Which are the levels of the biological organization presented by Student 1 and Student 2 in this presentation?

Ⓐ Student 1: Organism
Student 2: Population

Ⓑ Student 1: Ecosystem
Student 2: Organism

Ⓒ Student 1: Community
Student 2: Population

Ⓓ Student 1: Population
Student 2: Ecosystem

Part B

Which statement **BEST** explains the answer to Part A?

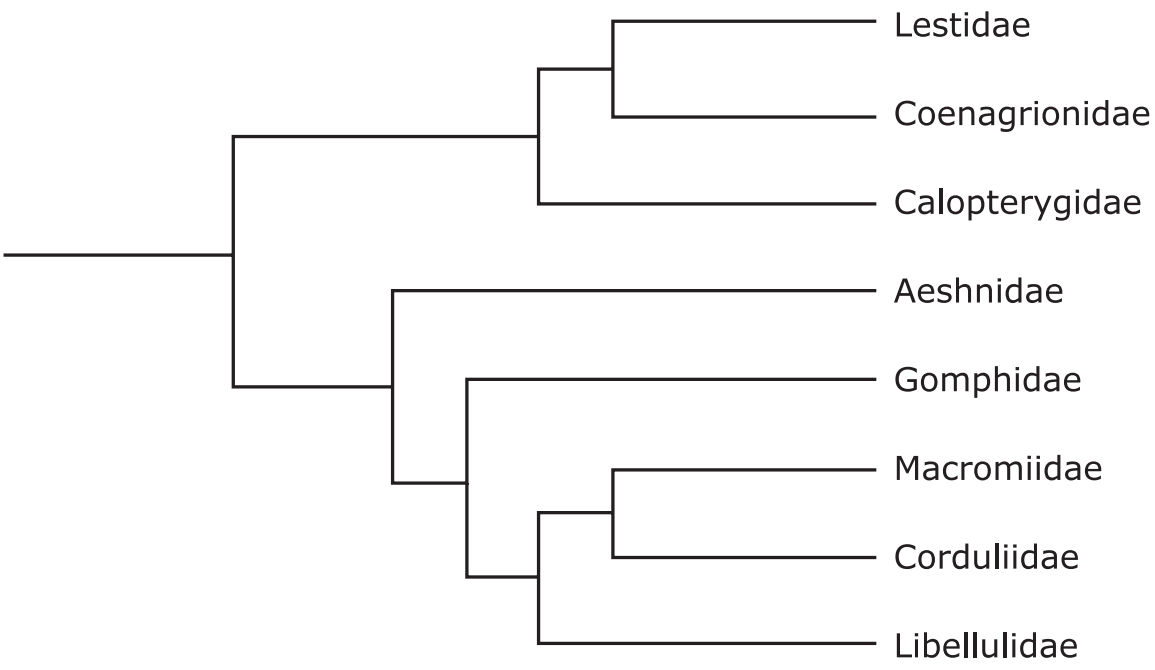
Ⓐ Ecosystems consist of all organisms living and interacting in a given area, and individuals are organisms.

Ⓑ An organism is a species, and many species living in the same area make up a population.

Ⓒ A population consists of a group of the same species, and ecosystems are communities interacting with abiotic factors.

Ⓓ Communities consist of organisms, and organisms interacting with living and nonliving factors in the environment make up a population.

31 A student draws the dragonfly family cladogram shown, based on anatomical features.



Which family of dragonflies shares the most recent common ancestor with the families Macromiidae and Corduliidae?

Ⓐ Family Calopterygidae

Ⓑ Family Aeshnidae

Ⓒ Family Libellulidae

Ⓓ Family Coenagrionidae

GO ON

32 A student goes on a hike over the weekend. The student notices that the path created by all the hikers is compressed dirt with little plant life.

The trail is shown in the image.

GO ON

Which table **BEST** describes the stage of succession occurring on the trail?

Ⓐ

Stage of Succession	Primary
Evidence	Soil was created. Lichens are present.
Biodiversity	Less than in the forest

Ⓑ

Stage of Succession	Secondary
Evidence	Soil and new land was created. Rocks are present.
Biodiversity	More than in the forest

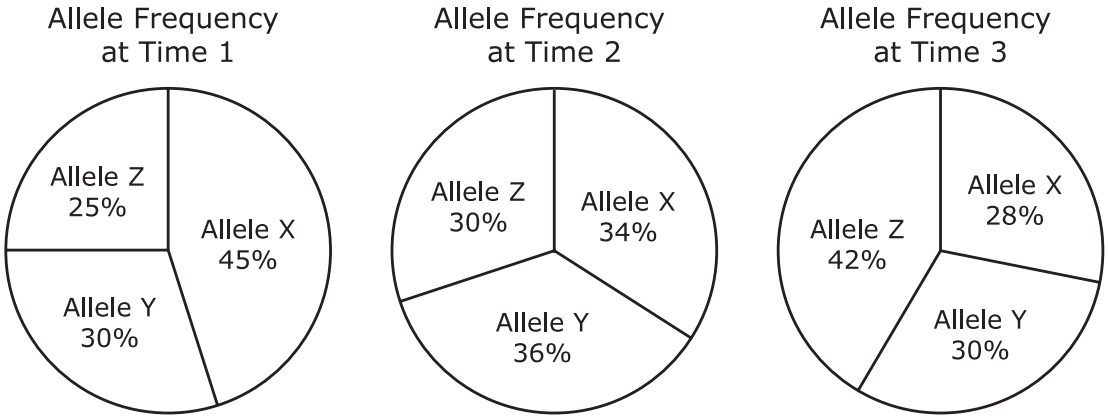
Ⓒ

Stage of Succession	Secondary
Evidence	Human destruction caused the path to form. Grasses and small plants are present.
Biodiversity	Less than in the forest

Ⓓ

Stage of Succession	Primary
Evidence	Human destruction caused the path to form. Fungi and rocks are present.
Biodiversity	More than in the forest

33 The graphs show changes in allele frequencies in a population at three points in time as a drought becomes more severe.



Which statement best describes how natural selection affects alleles?

Ⓐ Natural selection always affects how the same allele influences an organism's reproductive success.

Ⓑ Natural selection affects alleles randomly, leading to small changes in allele frequencies.

Ⓒ Natural selection affects allele frequencies in individuals, not in populations.

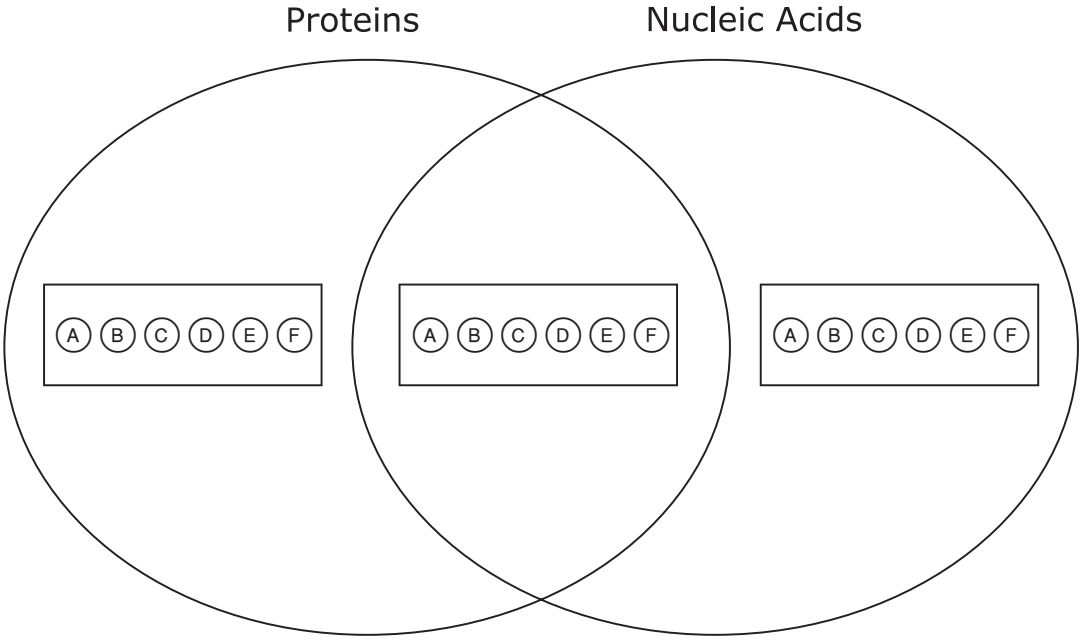
Ⓓ Natural selection affects allele frequencies differently depending on how helpful an allele is to an organism's fitness for its environment.

34 A Venn diagram comparing the functions of proteins and nucleic acids is shown.

Which functions **BEST** complete the Venn diagram?

Select the correct answer for each box. Not all answers will be used.

A Provide energy	**B** Are involved in translation	**C** Encode genetic information
D Transport substances	**E** Provide insulation	**F** Are stored as glycogen



GO ON

35 A student sees a red wolf at the zoo and wants to research specific information about the animal.

Which levels of taxonomy are **BEST** to use when researching specific information about the red wolf?

Ⓐ Kingdom and species

Ⓑ Kingdom and genus

Ⓒ Genus and species

Ⓓ Species and family

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36 Which scenario will **MOST LIKELY** result in a change to the nitrogen cycle that negatively affects plant growth?

Ⓐ Increasing the variety of legumes within a field

Ⓑ Planting crops that do not need nitrogen for survival

Ⓒ Decreasing the amount of nitrogen-fixing bacteria in the soil

Ⓓ Regulating the amount of fertilizers used on farms

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37 A genetic sequence undergoes a mutation. The original sequence, the mutated sequence, and a codon chart are shown.

Original Sequence: 5′ AUG CCG GCG AUU ACA 3′
Mutated Sequence: 5′ AUC GCC GGC GAU UAC A 3′

Codon Chart

Second letter

First letter	U	C	A	G	Third letter
U	UUU, UUC: Phe UUA, UUG: Leu	UCU, UCC, UCA, UCG: Ser	UAU, UAC: Tyr UAA: Stop UAG: Stop	UGU, UGC: Cys UGA: Stop UGG: Trp	**U C A G**
C	CUU, CUC, CUA, CUG: Leu	CCU, CCC, CCA, CCG: Pro	CAU, CAC: His CAA, CAG: Gln	CGU, CGC, CGA, CGG: Arg	**U C A G**
A	AUU, AUC, AUA: Ile AUG: Met	ACU, ACC, ACA, ACG: Thr	AAU, AAC: Asn AAA, AAG: Lys	AGU, AGC: Ser ACA, AGG: Arg	**U C A G**
G	GUU, GUC, GUA, GUG: Val	GCU, GCC, GCA, GCG: Ala	GAU, GAC: Asp GAA, GAG: Glu	GGU, GGC, GGA, GGG: Gly	**U C A G**

How many amino acid changes can be identified from the mutated sequence shown?

Record your answer in the space provided.

GO ON

38 Which table correctly matches each type of biomolecule with its function in the cell membrane?

Ⓐ

Biomolecule	Function in Cell Membrane
Carbohydrate	Used by the immune system for self-identification
Protein	Helps transport substances
Lipid	Provides structural support

Ⓑ

Biomolecule	Function in Cell Membrane
Carbohydrate	Provides structural support
Protein	Used by the immune system for self-identification
Nucleic acid	Helps transport substances

Ⓒ

Biomolecule	Function in Cell Membrane
Carbohydrate	Regulates transportation of substances
Protein	Stores energy
Lipid	Used by the immune system for self-identification

Ⓓ

Biomolecule	Function in Cell Membrane
Carbohydrate	Provides energy to help with movement
Protein	Helps transport substances
Nucleic acid	Helps break down substances

GO ON

39 A population of birds follows swarms of army ants and eats insects as they move out of the way of the ants. The birds do not eat the army ants.

Which type of relationship between the birds and the army ants is **BEST** represented by this scenario?

Ⓐ Mutualism

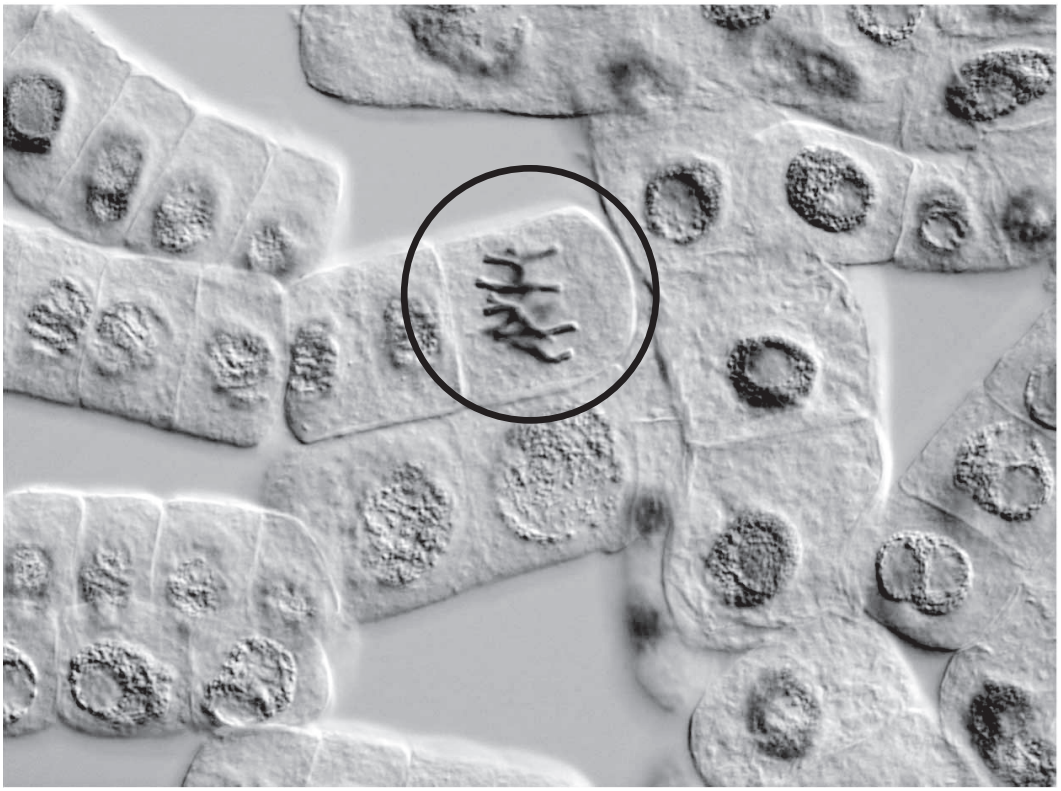
Ⓑ Commensalism

Ⓒ Parasitism

Ⓓ Competition

GO ON

40 A student studying mitosis captures an image of cells from an onion root tip with a camera mounted on a microscope.



Which events occur after the phase circled in the student's image?

Select **TWO** correct answers.

- ◯ Spindle fibers form.
- ◯ Chromosomes condense.
- ◯ Paired chromosomes separate.
- ◯ The nuclear membrane disappears.
- ◯ Chromosomes attach to spindle fibers.
- ◯ The cytoplasm separates into two cells.

41 A student researches the average number of offspring that six species produce during their lifetime and creates the table shown.

Species	Average Number of Offspring
Orangutan	3
Tiger	15
Black-tailed prairie dog	24
Virginia opossum	108
European rabbit	360
Oriental fruit fly	1,350

Based on the data, which species will **MOST LIKELY** experience the highest rates of evolution?

Ⓐ Black-tailed prairie dog

Ⓑ Virginia opossum

Ⓒ European rabbit

Ⓓ Oriental fruit fly

42 Which statement **BEST** describes the roles of glucose and oxygen in photosynthesis?

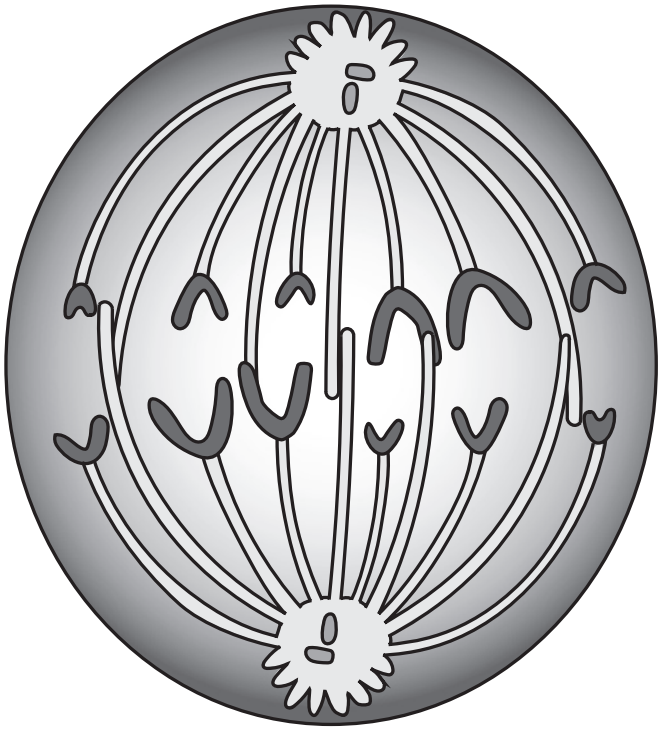
Ⓐ Glucose releases chemical energy during photosynthesis, and oxygen is a product of photosynthesis.

Ⓑ Glucose releases chemical energy during photosynthesis, and oxygen is a reactant in photosynthesis.

Ⓒ Glucose stores chemical energy during photosynthesis, and oxygen is a product of photosynthesis.

Ⓓ Glucose stores chemical energy during photosynthesis, and oxygen is a reactant in photosynthesis.

43 An image of a cell is shown.



Which phase of the cell cycle is this cell in?

Ⓐ G_0 phase

Ⓑ S phase

Ⓒ G_2 phase

Ⓓ M phase

GO ON

44 When crossed with the genotype *AaBb*, which genotype would result in a 50% chance of producing offspring with the alleles *AA*?

Ⓐ *AaBb*

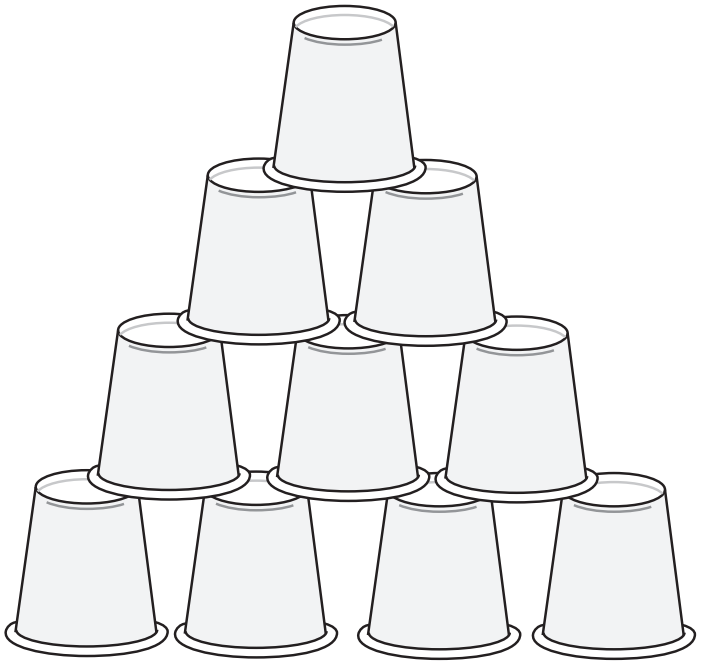
Ⓑ *AABb*

Ⓒ *Aabb*

Ⓓ *aaBB*

GO ON

45 A student makes a model of an energy pyramid by stacking cups as shown. The producers are represented by the bottom level of four cups.



How much energy will be obtained at the top of this energy pyramid if the cups representing the primary consumers have 37,000 kilojoules (kJ) of energy?

Ⓐ 37,000 kJ

Ⓑ 3,700 kJ

Ⓒ 370 kJ

Ⓓ 3.7 kJ

BE SURE YOU HAVE RECORDED ALL OF YOUR ANSWERS IN THE TEST BOOKLET.

STOP

STAAR Biology PRACTICE