



MASSACHUSETTS DEPARTMENT OF
ELEMENTARY AND SECONDARY
EDUCATION

*Release of
February 2017
MCAS Biology
Test Items*

**March 2017
Massachusetts Department of
Elementary and Secondary Education**



This document was prepared by the
Massachusetts Department of Elementary and Secondary Education
Mitchell D. Chester, Ed.D.
Commissioner

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Commissioner's Foreword

Dear Colleagues:

The Massachusetts Department of Elementary and Secondary Education is committed to working in partnership with schools to support a system that will prepare all students to succeed as productive and contributing members of our democratic society and the global economy. To assist in achieving this goal, the Department regularly releases Massachusetts Comprehensive Assessment System (MCAS) test items to provide information about the kinds of knowledge and skills that students are expected to demonstrate. This publication contains all MCAS February Biology items on which student scores are based.

The Department has banked thousands of MCAS items that are currently posted on the Department website. These items, which are available at www.doe.mass.edu/mcas/testitems.html, will continue to be a rich resource for schools.

This publication is available only on the Department website. The test items can be printed from this site. I encourage educators to use the relevant sections of this document together with their test item analysis reports as guides for planning changes in curriculum and instruction that may be needed to support schools and districts in their efforts to improve student performance.

Thank you for your support as we work together to strengthen education for our students in Massachusetts.

Sincerely,

Mitchell D. Chester, Ed.D.
Commissioner of Elementary and Secondary Education

I. Document Purpose and Structure

Document Purpose and Structure

Purpose

The purpose of this document is to share with educators and the public the February 2017 MCAS Biology test items on which student results are based. Local educators will be able to use this information to identify strengths and weaknesses in their curriculum and to plan instruction to more effectively meet their students' individual needs.

This document is also intended to be used by school and district personnel as a companion document to test item analysis reports. The reports list, for the school accessing the report, the names of all enrolled students who took the February 2017 Biology test as well as information about how each student answered each common test item contained in this document. The reports also label each item as multiple-choice or open-response and identify the item's MCAS reporting category. Item numbers in this document correlate directly to the item numbers in the test item analysis reports.

Structure

Chapter II of this document contains information for the February 2017 Biology test and has three main sections. The **first section** introduces the chapter by listing the Massachusetts curriculum framework content strands assessed by the Biology MCAS test. These content strands are identical to the MCAS reporting categories under which test results are reported to schools and districts. The first section also provides the Web address for the *Science and Technology/Engineering Curriculum Framework* and the page numbers on which the learning standards assessed by the test items in the chapter can be found. In addition, there is a brief overview of the test (number of test sessions, types of items, and reference materials allowed).

The **second section** contains the test items used to generate February 2017 MCAS student results for Biology. The test items in this document are shown in the same order and basic format in which they were presented in the test booklet.

The **final section** of the chapter is a table that cross-references each item with its MCAS reporting category and with the *Framework* standard it assesses. Correct answers to multiple-choice questions are also listed in the table.

Materials presented in this document are **not** formatted **exactly** as they appeared in student test booklets. For example, in order to present items most efficiently in this document, the following modifications have been made:

- Some fonts and/or font sizes may have been changed and/or reduced.
- Some graphics may have been reduced in size from their appearance in student test booklets; however, they maintain the same proportions in each case.
- All references to page numbers in answer booklets have been deleted from the directions that accompany test items.

II. February 2017 Biology Test

February 2017 Biology Test

The February 2017 high school MCAS Biology test was based on learning standards in the Biology content strand of the Massachusetts *Science and Technology/Engineering Curriculum Framework* (2006). These learning standards appear on pages 54–58 of the *Framework*, which is available on the Department website at www.doe.mass.edu/frameworks/current.html.

Biology test results are reported under the following five MCAS reporting categories:

- Biochemistry and Cell Biology
- Genetics
- Anatomy and Physiology
- Ecology
- Evolution and Biodiversity

The table at the conclusion of this chapter indicates each item’s reporting category and the framework learning standard it assesses. The correct answers for multiple-choice questions are also displayed in the table.

Test Sessions

The MCAS high school Biology test included two separate test sessions, which were administered on consecutive days. Each session included multiple-choice and open-response items.

Reference Materials and Tools

The high school Biology test was designed to be taken without the aid of a calculator. Students were allowed to have calculators with them during testing, but calculators were not needed to answer questions.

During both Biology test sessions, the use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only. No other reference materials were allowed.

Biology

SESSION 1

DIRECTIONS

This session contains twenty-one multiple-choice questions and two open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet. You may work out solutions to multiple-choice questions in the test booklet.

1 Some bacteria produce cellulase, a substance that speeds up the breakdown of cellulose in plant cell walls. Cellulase is an example of which of the following?

- A. a carbohydrate
- B. an enzyme
- C. a hormone
- D. an organelle

2 A red-eyed male fruit fly is crossed with a heterozygous red-eyed female fruit fly. The expected results for the cross are shown in the table below.

Phenotype	Expected % of Males	Expected % of Females
Red-eyed	50%	100%
White-eyed	50%	0%

Which of the following describes this inheritance pattern and the allele that codes for red eye color in fruit flies?

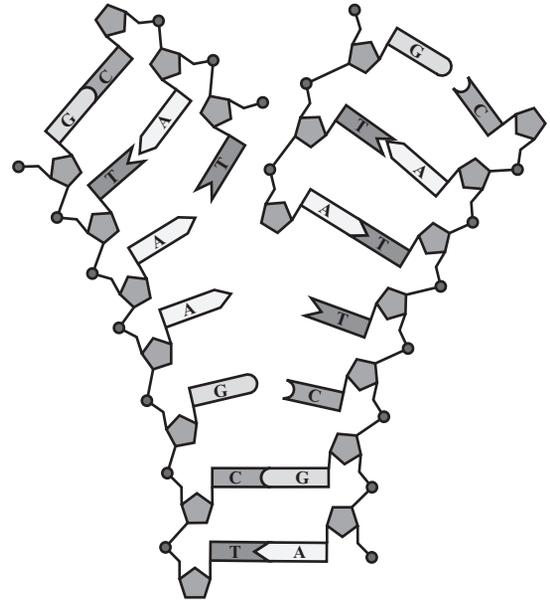
- A. The inheritance pattern is sex-linked, and the allele for red eye color is dominant.
- B. The inheritance pattern is sex-linked, and the allele for red eye color is recessive.
- C. The inheritance pattern is codominant, and the allele for red eye color masks the allele for white eye color.
- D. The inheritance pattern is codominant, and the alleles for red eye color and white eye color are expressed equally.

- 3 A botanist studied two groups of rice plants to determine how they are related. Both groups of plants have similar shapes, but one group has longer stalks. When the botanist cross-pollinated plants from one group with plants from the other group, the seeds produced did not sprout or grow.

Which of the following conclusions is **best** supported by this information?

- A. The two groups are the same species because the plants have similar shapes.
- B. The two groups are different species because they have differently sized stalks.
- C. The two groups are different species because the seeds produced cannot sprout or grow.
- D. The two groups are the same species because the plants were cross-pollinated and produced seeds.

- 4 The diagram below represents a biological process involving DNA.



What process is represented?

- A. fertilization
- B. mutation
- C. replication
- D. translation

5 The bacterium *E. coli* is a model organism used by many scientists for genetic and biochemical research. Which of the following statements helps explain why *E. coli* is so frequently used for research?

- A. It has a large nucleus and a long generation time.
- B. It has hundreds of chromosomes and a long lifespan.
- C. It has a simple cell structure and reproduces rapidly.
- D. It has many kinds of organelles and reproduces sexually.

6 Protein pumps actively transport ions across a cell's plasma membrane. What molecule directly supplies the energy required for this transport?

- A. ATP
- B. cholesterol
- C. oxygen
- D. tRNA

7 Scientists hypothesized that several species of frogs called tiger frogs evolved from a recent common ancestor. The hypothesis was based on fossil evidence and on physical similarities among living species.

Which of the following provides the **best** additional support for the scientists' hypothesis?

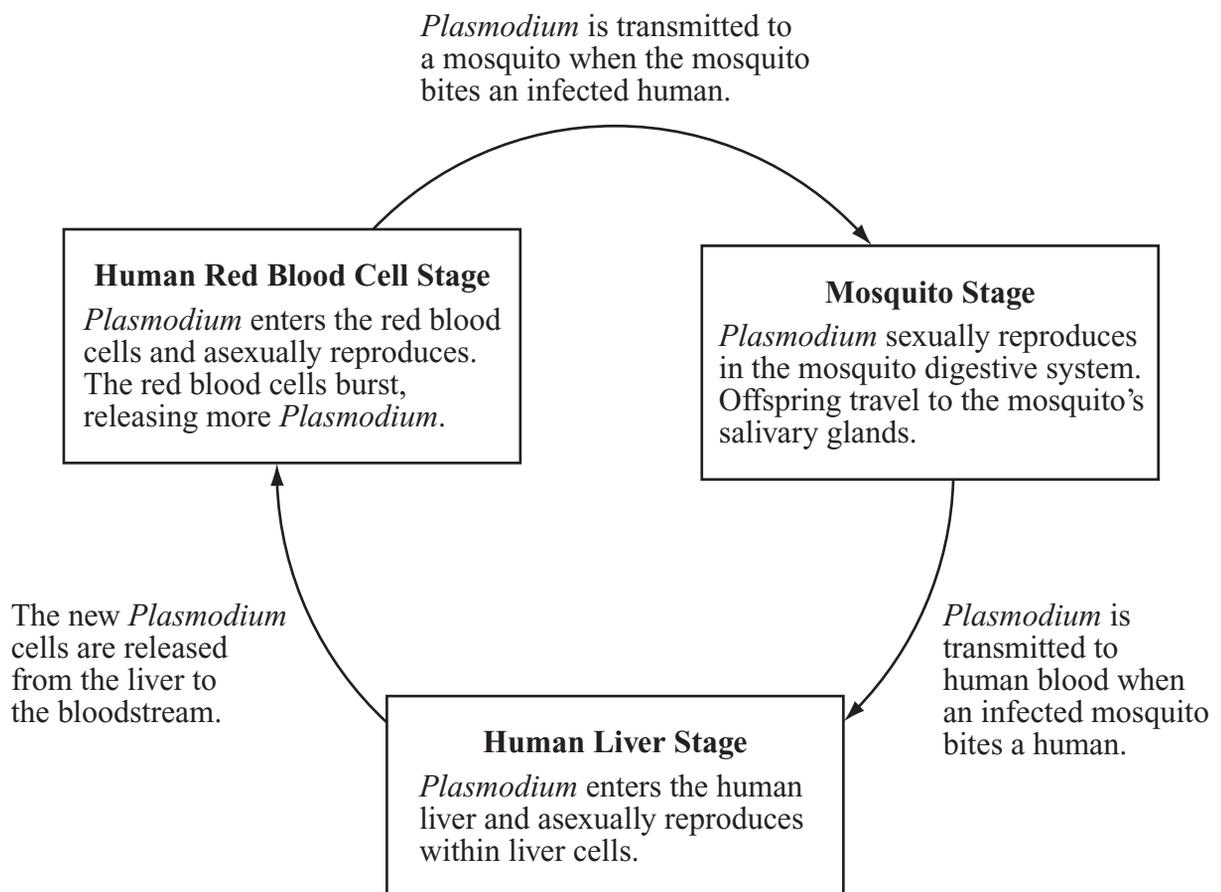
- A. Tiger frogs have longer life spans than other frog species.
- B. Tiger frogs have the same diet and all use enzymes to digest food.
- C. Tiger frogs live near each other and are all preyed upon by the same predator species.
- D. Tiger frogs have similarities in their mitochondrial DNA that are not shared by other frog species.

The following section focuses on malaria.

Read the information below and use it to answer the four multiple-choice questions and one open-response question that follow.

Plasmodium is a genus of organisms in the kingdom Protista. Four species of *Plasmodium* cause a disease called malaria in humans. *Plasmodium* uses both humans and female *Anopheles* mosquitoes to complete its life cycle. Mosquitoes carry *Plasmodium* and transmit it from one human to another. The diagram below represents a simplified life cycle of *Plasmodium*.

Life Cycle of *Plasmodium*



Humans experience malaria symptoms during the red blood cell stage. These include fatigue, high fever, and other flu-like symptoms. Malaria can be fatal if it is not treated. Some efforts to prevent malaria focus on eliminating mosquito populations, but a rise in the number of pesticide-resistant mosquitoes is making these efforts less effective.

Mark your answers to multiple-choice questions 8 through 11 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet, but you may work out solutions to multiple-choice questions in the test booklet.

- 8 What is the ecological relationship between *Plasmodium* and humans?
- A. commensalism
 - B. mutualism
 - C. parasitism
 - D. predation
- 9 Which of the following statements describes how reproducing asexually in humans is advantageous to *Plasmodium*?
- A. *Plasmodium* can greatly increase its genetic diversity.
 - B. *Plasmodium* can quickly produce many new copies of itself.
 - C. *Plasmodium* can change the number of chromosomes that it has.
 - D. *Plasmodium* can create zygotes that the immune system does not attack.
- 10 To treat malaria, doctors must know which species of *Plasmodium* is causing the disease. Which of the following statements best explains why doctors must identify the *Plasmodium* species involved before treating the disease?
- A. Each *Plasmodium* species has its highest rate of infection at a different time of the year.
 - B. Each *Plasmodium* species has evolved different levels of resistance to different medications.
 - C. Some *Plasmodium* species produce large numbers of gametes, and some *Plasmodium* species produce small numbers of gametes.
 - D. Some *Plasmodium* species have a prokaryotic cell structure, and some *Plasmodium* species have a eukaryotic cell structure.
- 11 Which of the following statements **best** explains why malaria causes fatigue in humans?
- A. Malaria destroys fat cells.
 - B. Malaria slows the digestive system.
 - C. Malaria reduces oxygen transport to cells.
 - D. Malaria increases activity in the nervous system.

Question 12 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 12 in the space provided in your Student Answer Booklet.

- 12 Some mosquitoes have genes that make them resistant to pesticides. This resistance makes it hard to control the spread of malaria.
- a. Identify a process that could cause a new pesticide-resistant gene to appear in a mosquito population.
 - b. Using the theory of natural selection, explain how this pesticide-resistant gene would spread through the mosquito population over time.
 - c. Describe one strategy for controlling the spread of malaria that would **not** lead to a pesticide-resistant mosquito population. Explain your answer.

Mark your answers to multiple-choice questions 13 through 22 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet, but you may work out solutions to multiple-choice questions in the test booklet.

- 13** Several parts of an animal cell are involved in the processes of protein synthesis, packaging, and export. Which of the following correctly places the cell parts in the order in which they are involved?

- A. nucleus → vacuole → cell membrane
- B. mitochondria → vacuole → cell membrane
- C. ribosome → endoplasmic reticulum → Golgi complex → cell membrane
- D. lysosome → endoplasmic reticulum → Golgi complex → cell membrane

- 14** Low blood pressure can be life-threatening. To help maintain a stable blood pressure, receptors in the heart detect changes in blood pressure. Information about blood pressure changes is then sent to the brain. If blood pressure is too low, the brain sends a message to the heart to beat faster.

Based on this information, which of the following systems are directly involved in keeping blood pressure stable?

- A. circulatory, muscular, nervous
- B. circulatory, immune, skeletal
- C. excretory, immune, muscular
- D. excretory, nervous, skeletal

- 15** The table below lists some problems associated with four organs of the human digestive system.

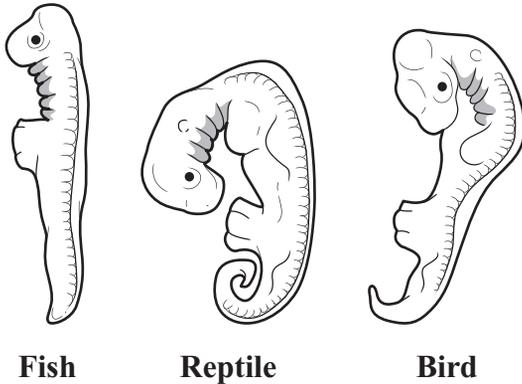
Organ	Problem
1	Acid inside this organ begins to dissolve some of its tissue lining.
2	An infection prevents the movement of nutrients through this organ's walls into the bloodstream.
3	Inflamed tissue prevents the smooth passage of food through this organ after swallowing.
4	Swelled-up veins make eliminating wastes from this organ difficult.

Which organ is most likely the stomach?

- A. organ 1
- B. organ 2
- C. organ 3
- D. organ 4

- 16 Six puppies from a single litter have the following genotypes for a certain trait: **AA**, **Aa**, **AA**, **aa**, **aa**, **Aa**. Which of the following describes how these alleles were passed on from parent to offspring?
- A. Each parent dog randomly passed on a dominant allele (**A**) or a recessive allele (**a**) to each offspring.
 - B. The male dog passed on a dominant allele (**A**) to each female offspring and a recessive allele (**a**) to each male offspring.
 - C. The female dog chose to pass on either homozygous dominant alleles (**AA**) or homozygous recessive alleles (**aa**) to each offspring.
 - D. One parent dog passed on a dominant allele (**A**) to each offspring, and the other parent dog passed on a recessive allele (**a**) to each offspring.
- 17 Carbon fixation is an important part of the carbon cycle. Carbon fixation is the conversion of carbon dioxide into organic compounds such as glucose. Which of the following organisms **cannot** fix carbon?
- A. grass
 - B. green algae
 - C. mushrooms
 - D. oak trees
- 18 Scientists compared levels of a particular chemical found in the blood of two groups of male birds. The average concentration of the chemical was significantly higher in one group of males than in the other group of males. It was determined that the chemical caused different mating behaviors depending upon its concentration in the blood. Based on the information, this chemical is **most likely** which type of compound?
- A. an antibody
 - B. a hormone
 - C. a nucleic acid
 - D. a sugar

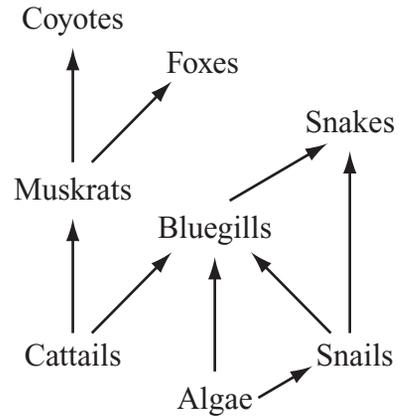
- 19 The illustrations below show the embryos of a fish, a reptile, and a bird at the same stage of development.



Which of the following can be concluded from the illustrations?

- A. All the embryos grow at the same rate.
- B. All the embryos will develop identical structures.
- C. All the organisms share a recent common ancestor.
- D. All the organisms will be the same relative size as adults.

- 20 A partial food web is shown below.



Which organisms in the food web are both primary **and** secondary consumers?

- A. bluegills
- B. cattails
- C. coyotes
- D. snakes

- 21 In four o'clock plants, the allele for red flower color is incompletely dominant to the allele for white flower color. As a result, plants that are heterozygous for flower color have pink flowers.

If two plants with pink flowers are crossed, what are the expected percentages of phenotypes in the offspring?

- A. 0% red, 100% pink, 0% white
- B. 25% red, 50% pink, 25% white
- C. 50% red, 0% pink, 50% white
- D. 50% red, 50% pink, 0% white

- 22 A scientist hypothesizes that a bird species on a particular island may be closely related to a species on a nearby island. Which of the following types of information would be **most** useful for determining how closely related the two bird species are?

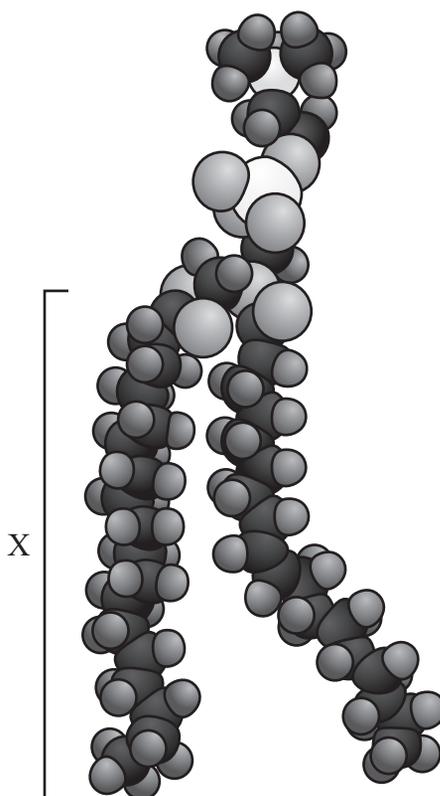
- A. the diets of the species
- B. the behaviors of the species
- C. the DNA sequences of the species
- D. the physical appearances of the species

Question 23 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 23 in the space provided in your Student Answer Booklet.

- 23** The diagram below shows the chemical structure of a type of lipid molecule called a phospholipid.



Atoms of five different elements make up the phospholipid molecule.

- a. Besides phosphorus, identify **two** other elements in the phospholipid molecule.

The building block (monomer) of lipids is labeled X in the diagram.

- b. Identify this building block of lipids.

Lipids have important functions in the body.

- c. Describe **two** functions of lipids in the human body.

Biology

SESSION 2

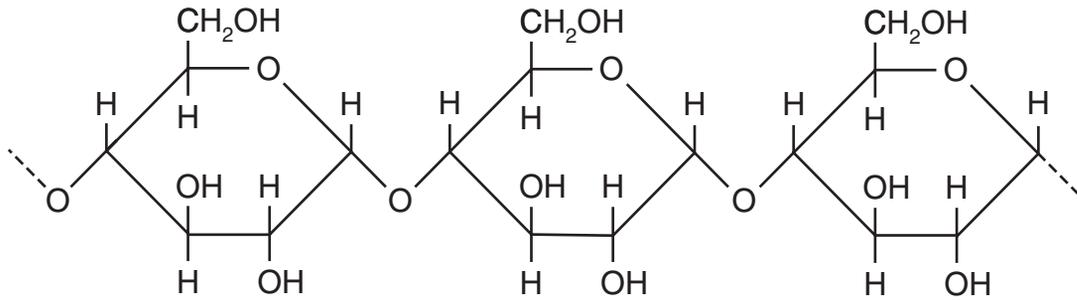
DIRECTIONS

This session contains nineteen multiple-choice questions and three open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet. You may work out solutions to multiple-choice questions in the test booklet.

- 24 Which of the following statements **best** describes the genetic characteristics of human males and females?
- A. Males have more genes than females.
 - B. Males and females have exactly the same 46 chromosomes.
 - C. Males and females both receive 23 chromosomes from each parent.
 - D. Female genes rather than male genes determine the sex of offspring.
- 25 The products of photosynthesis are carbohydrates and oxygen. Which process uses these substances as reactants?
- A. cellular respiration
 - B. fertilization
 - C. mechanical digestion
 - D. translation
- 26 Which of the following provides the **weakest** scientific evidence that two species have a common ancestor?
- A. comparing fossils
 - B. comparing food sources
 - C. comparing genetic information
 - D. comparing homologous structures
- 27 A plant breeder has a plant with the dominant phenotype for a single-gene trait. The breeder wants to figure out the plant's genotype by doing a testcross. The results of the testcross will be different depending on whether the plant is homozygous or heterozygous for the trait.
- In the testcross, the plant should be crossed with which of the following?
- A. a plant that has multiple genes for the trait
 - B. a plant that has never been crossed for the trait
 - C. a plant that is homozygous recessive for the trait
 - D. a plant that is homozygous dominant for the trait

- 28 A student looks at a cell under a microscope. Which of the following observations would indicate that the cell is from a plant rather than an animal?
- A. a nucleus located inside of the cell
 - B. numerous cilia on the outside of the cell
 - C. chloroplasts in the cytoplasm of the cell
 - D. a thin membrane around the edge of the cell
- 29 Researchers have observed that the biodiversity of some mountainside rain forests is greater than the biodiversity of some lowland rain forests. Which of the following statements **best** explains why a high degree of biodiversity is observed in some mountainside rain forests?
- A. Some mountainside rain forests have high emigration rates.
 - B. Some mountainside rain forests have species with high reproductive rates.
 - C. Some mountainside rain forests have many different environmental niches at different elevations.
 - D. Some mountainside rain forests have increased numbers of producer species and reduced numbers of predator species.
- 30 Prolonged periods of drought in an area cause decreases in plant population sizes. Which of the following statements describes how the decreases in plant population sizes then affect other populations in the area?
- A. Omnivore population sizes increase, and herbivore population sizes increase.
 - B. Omnivore population sizes decrease, and carnivore population sizes increase.
 - C. Herbivore population sizes increase, and carnivore population sizes decrease.
 - D. Herbivore population sizes decrease, and carnivore population sizes decrease.

- 31 Part of a carbohydrate molecule is shown below.



What is the building block of this carbohydrate?

- A. oleic acid, a fatty acid
- B. leucine, an amino acid
- C. glucose, a monosaccharide
- D. cytosine, a nitrogenous base

Question 32 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 32 in the space provided in your Student Answer Booklet.

- 32 Four diseases and their main effects on the respiratory system are listed in the table below.

Disease	Main Effect
croup	swelling around the <u>larynx</u>
emphysema	damage to the <u>alveoli</u> walls
rhinoscleroma	infection and inflammation of the <u>nose</u>
tracheitis	infection of the <u>trachea</u>

The four parts of the respiratory system affected by these diseases are underlined in the table. Describe the specific role of **each** of these parts in the respiratory system.

Mark your answers to multiple-choice questions 33 through 43 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet, but you may work out solutions to multiple-choice questions in the test booklet.

- 33 The oceans have become increasingly acidic in recent years as the water absorbs more and more carbon dioxide from the atmosphere. This increased acidity interferes with the ability of corals to maintain their skeletons. In addition, an increase in water temperatures worldwide is causing coral bleaching, another condition that threatens the health of coral reefs. Based on this information, which of the following would **most** improve the health of coral reefs?
- A. reducing the use of fossil fuels
 - B. eliminating nuclear power plants
 - C. removing more natural gas embedded in rocks
 - D. replacing offshore oil drills with onshore oil drills

- 34 Juniper is a desert plant that produces toxins. Unlike most animals, a type of rodent called Stephen's woodrat is able to eat juniper plants. The woodrat has special liver enzymes to metabolize juniper toxins. Which of the following statements **best** explains why the special liver enzymes became common in the woodrats?
- A. The enzymes allow the woodrats to grow much larger.
 - B. The enzymes make the woodrats poisonous to their predators.
 - C. The enzymes reduce the genetic diversity and variety of traits of the woodrats.
 - D. The enzymes increase the ability of the woodrats to survive and pass on their genes.

- 35 Cattle normally have two separate toes on each foot. In a condition called mulefoot, a recessive allele causes the toes to fuse, resembling the foot of a mule. Two cattle, each with normal, separate toes, have a calf with mulefoot. What is the probability that the next calf born to these parent cattle will also have mulefoot?
- A. 0%
 - B. 25%
 - C. 75%
 - D. 100%

- 36 Pathogens cause disease in organisms. The table below shows characteristics of four pathogens.

Pathogen	Genetic Material	Presence of Nucleus	Outer Covering	Can Replicate Genetic Material by Itself
1	RNA	no	protein capsule	no
2	DNA	no	cell wall	yes
3	DNA	no	protein capsule	no
4	DNA	yes	cell wall	yes

Which of the pathogens are viruses?

- A. pathogens 1 and 2
- B. pathogens 1 and 3
- C. pathogens 2 and 4
- D. pathogens 3 and 4

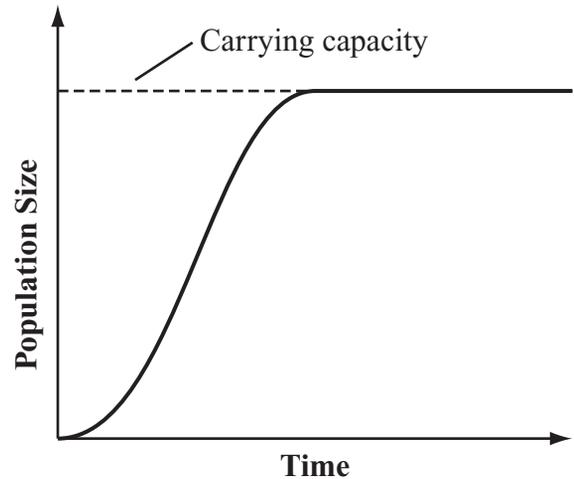
- 37 All six codons listed below code for the same amino acid during protein synthesis.

CGU, CGC, CGA, CGG, AGA, AGG

Which of the following statements describes an advantage of having multiple codons for the same amino acid?

- A. The length of the protein chain will be reduced.
- B. The effect of mutations in the DNA could be reduced.
- C. The ribosome will more quickly read the order of the bases during translation.
- D. The cell could use the bases that are most available in the nucleus to assemble DNA.

- 38 A small population colonized an isolated island. Over time, the size of the population increased to its carrying capacity, as represented in the graph below.



Which of the following conditions will most likely keep the population at its carrying capacity?

- A. a death rate of zero
- B. a death rate that is half the birth rate
- C. a death rate equal to the birth rate
- D. a death rate that is twice the birth rate

39 Besides nitrogen, the DNA base guanine is made of which of the following elements?

- A. hydrogen, sulfur, and zinc
- B. oxygen, phosphorus, and iron
- C. carbon, hydrogen, and oxygen
- D. sodium, potassium, and carbon

40 In a certain species of bat, females normally produce sex cells containing 22 chromosomes. After successful fertilization, how many chromosomes should be present in the zygote?

- A. 11
- B. 22
- C. 44
- D. 88

41 Pheasants are a type of bird. Two male pheasants and six female pheasants were introduced onto an island with abundant food and few predators. Within six breeding seasons, the pheasant population increased from eight birds to two thousand birds. Over time, however, the growth rate of the population slowed.

Which of the following statements describes the most likely reason for this decrease in population growth rate?

- A. Females built smaller nests, which decreased the birth rate.
- B. Competition for resources increased, which increased the death rate.
- C. Large numbers of birds needed mates, which increased the immigration rate.
- D. Fewer eggs hatched each successive year, which decreased the emigration rate.

- 42 A researcher adds an enzyme to a sample of human DNA to see if the DNA changes. Which result would best support the conclusion that the enzyme had **no** effect on the DNA?
- A. The DNA has uracil bases.
 - B. The DNA has unpaired nitrogenous bases.
 - C. The DNA has a single strand with nucleotides and a sugar-phosphate backbone.
 - D. The DNA has a double helix shape with nucleotide pairs and sugar-phosphate backbones.

- 43 Two populations of fish live in separate water drainage systems in southeast Arizona. The populations are geographically isolated from one another, but the fish appear similar. Which of the following questions would be most useful to ask to help determine whether these two populations are the same species?
- A. Are the food sources the same for the two populations?
 - B. Do the two populations' habitats have the same water pH?
 - C. Do young fish in the two populations mature slowly or quickly?
 - D. Can individuals from the two populations successfully interbreed?

Questions 44 and 45 are open-response questions.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 44 in the space provided in your Student Answer Booklet.

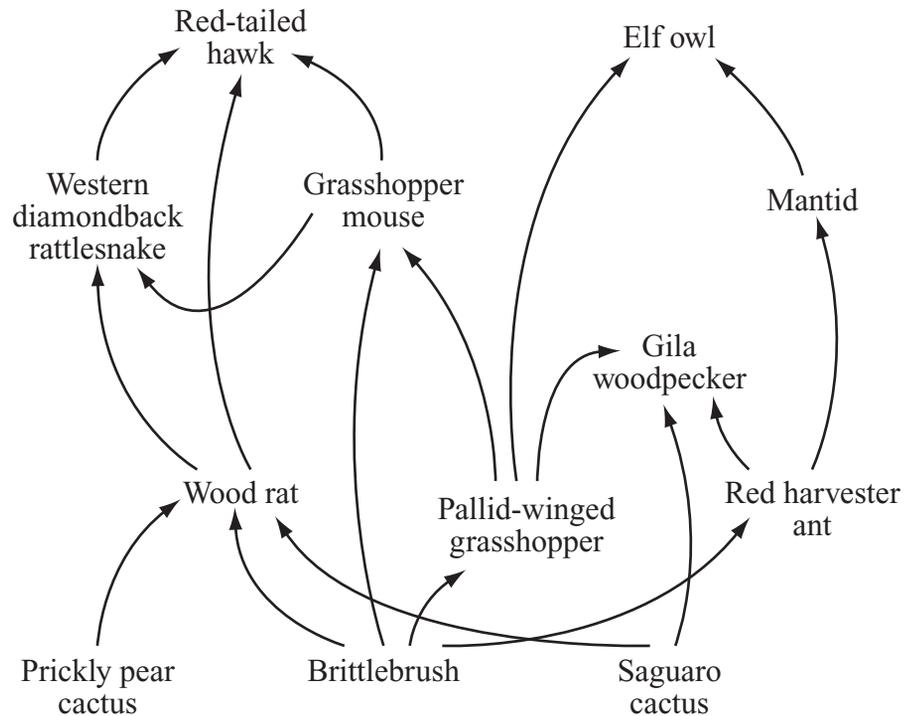
- 44 The American curl is a type of cat with curled ears. A single gene with two alleles codes for the ear-shape trait. The dominant allele (**R**) codes for curled ears, and the recessive allele (**r**) codes for straight ears.

A heterozygous male curl cat is crossed with a heterozygous female curl cat.

- Using the allele symbols above, identify the genotype of the parent cats.
- Determine the expected phenotype ratio of the offspring that result from the cross.
Draw a Punnett square to support your answer.
- Which of Mendel's laws, the law of segregation or the law of independent assortment, is demonstrated by the cross represented by the Punnett square you drew in part (b)?
Explain your answer.
- Do the four squares in the Punnett square represent gametes or body cells?
Explain your answer.

Write your answer to question 45 in the space provided in your Student Answer Booklet.

- 45 The diagram below shows a partial food web in a desert ecosystem.



- Identify the ecological role of the red-tailed hawk and the elf owl in the food web.
- Describe how an increase in the elf owl population size would most likely affect (decrease or increase) **three** other population sizes in the food web. Explain **each** of your answers.

A decrease in the wood rat population size could lead to either a decrease or an increase in the red-tailed hawk population size.

- Explain how a decrease in the wood rat population size could lead to a **decrease** in the red-tailed hawk population size.
- Explain how a decrease in the wood rat population size could lead to an **increase** in the red-tailed hawk population size.

Biology
February 2017 Released Items:
Reporting Categories, Standards, and Correct Answers*

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)
1	5	<i>Biochemistry and Cell Biology</i>	1.3	B
2	5	<i>Genetics</i>	3.4	A
3	6	<i>Evolution and Biodiversity</i>	5.2	C
4	6	<i>Genetics</i>	3.2	C
5	7	<i>Biochemistry and Cell Biology</i>	2.2	C
6	7	<i>Biochemistry and Cell Biology</i>	2.5	A
7	7	<i>Evolution and Biodiversity</i>	5.1	D
8	9	<i>Ecology</i>	6.3	C
9	9	<i>Biochemistry and Cell Biology</i>	2.6	B
10	9	<i>Evolution and Biodiversity</i>	5.3	B
11	9	<i>Anatomy and Physiology</i>	4.2	C
12	10	<i>Evolution and Biodiversity</i>	5.3	
13	11	<i>Biochemistry and Cell Biology</i>	2.1	C
14	11	<i>Anatomy and Physiology</i>	4.8	A
15	11	<i>Anatomy and Physiology</i>	4.1	A
16	12	<i>Genetics</i>	3.5	A
17	12	<i>Ecology</i>	6.4	C
18	12	<i>Anatomy and Physiology</i>	4.7	B
19	13	<i>Evolution and Biodiversity</i>	5.1	C
20	13	<i>Ecology</i>	6.3	A
21	14	<i>Genetics</i>	3.6	B
22	14	<i>Evolution and Biodiversity</i>	5.2	C
23	15	<i>Biochemistry and Cell Biology</i>	1.2	
24	16	<i>Anatomy and Physiology</i>	4.6	C
25	16	<i>Biochemistry and Cell Biology</i>	2.4	A
26	16	<i>Evolution and Biodiversity</i>	5.1	B
27	16	<i>Genetics</i>	3.4	C
28	17	<i>Biochemistry and Cell Biology</i>	2.3	C
29	17	<i>Ecology</i>	6.2	C
30	17	<i>Ecology</i>	6.2	D
31	18	<i>Biochemistry and Cell Biology</i>	1.2	C
32	19	<i>Anatomy and Physiology</i>	4.3	
33	20	<i>Ecology</i>	6.2	A
34	20	<i>Evolution and Biodiversity</i>	5.3	D
35	20	<i>Genetics</i>	3.6	B
36	21	<i>Biochemistry and Cell Biology</i>	2.8	B
37	22	<i>Genetics</i>	3.3	B
38	22	<i>Ecology</i>	6.1	C
39	23	<i>Biochemistry and Cell Biology</i>	1.1	C
40	23	<i>Biochemistry and Cell Biology</i>	2.7	C
41	23	<i>Ecology</i>	6.1	B
42	24	<i>Genetics</i>	3.1	D
43	24	<i>Evolution and Biodiversity</i>	5.2	D
44	25	<i>Genetics</i>	3.5	
45	26	<i>Ecology</i>	6.3	

* Answers are provided here for multiple-choice items only.

