

PRACTICE TEST

Biology

High School

Student Name

School Name

District Name

High School Biology PRACTICE TEST

This practice test contains 29 questions.

Directions







Read each question carefully and then answer it as well as you can. You must record all answers in this Practice Test Booklet.

For some questions, you will mark your answers by filling in the circles in your Practice Test Booklet. Make sure you darken the circles completely. Do not make any marks outside of the circles. If you need to change an answer, be sure to erase your first answer completely.

If a question asks you to show or explain your work, you must do so to receive full credit. Write your response in the space provided. Only responses written within the provided space will be scored.

If you do not know the answer to a question, you may go on to the next question. When you are finished, you may review your answers and go back to any questions you did not answer.

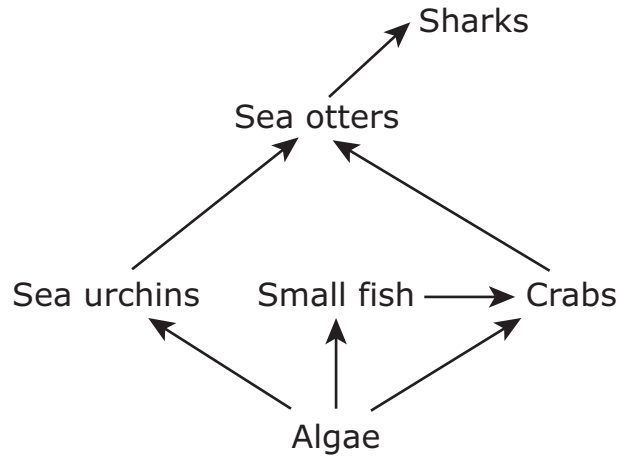
- 1 Images of the embryo and adult stages of three different organisms are shown.

| Organism | Embryo | Adult |
|-------------|---|---|
| Grasshopper |  |  |
| Spider |  |  |
| Centipede |  |  |

Which of the following is the best conclusion that can be drawn from this evidence?

- Ⓐ Having similar embryos indicates that these organisms eat the same types of food.
- Ⓑ Having similar embryos indicates that these organisms live in a similar environment.
- Ⓒ Having similar embryos indicates that these organisms share a recent common ancestor.
- Ⓓ Having similar embryos indicates that a certain protein controls how many legs the adult organisms will have.

- 2 A partial ocean food web is shown.



Select **two** changes that would most likely lead to a decrease in the size of the sea otter population in the area.

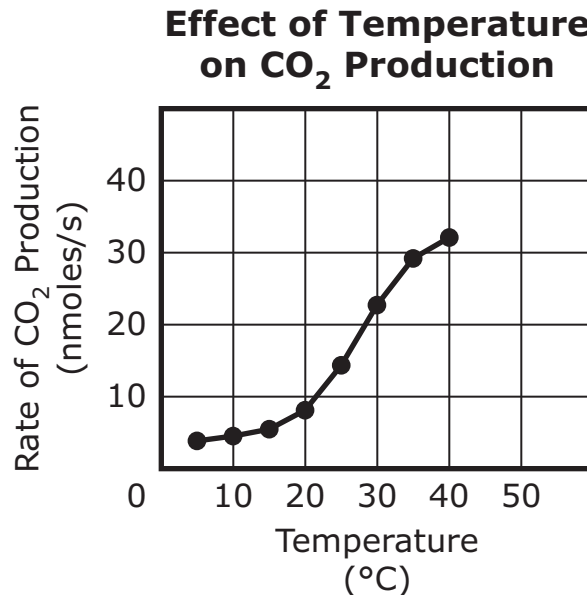
- Ⓐ A law is passed that results in less fishing in the area.
- Ⓑ Warmer ocean temperatures cause more algae to grow in the area.
- Ⓒ Chemical runoff from a factory kills many crabs and small fish in the area.
- Ⓓ An invasive species of sea star that preys on sea urchins moves into the area.

- 3 A small number of people have an inherited mutation that decreases the likelihood of heart disease. The mutation causes the amino acid cysteine to be replaced by arginine.

Which of the following is **most likely** responsible for this mutation?

- Ⓐ a large protein with a longer polypeptide chain
- Ⓑ the duplication of a chromosome in the genome
- Ⓒ the crossing over of a chromosome in the genome
- Ⓓ a substitution of one nucleotide in the DNA sequence

- 4 The graph shows the effect of temperature on the rate of carbon dioxide (CO_2) production in plant cells as a result of cellular respiration.



Based on the graph, select the response that correctly completes each statement.

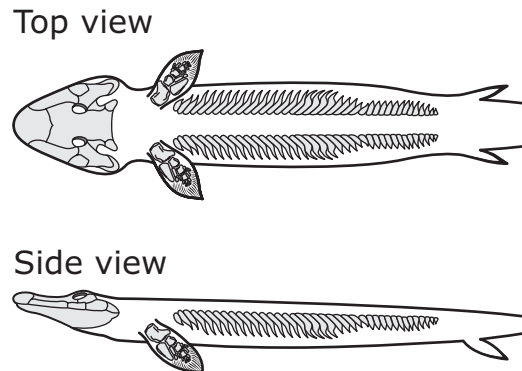
When temperature **increases**, the rate at which glucose is used by cells is expected to

- Ⓐ decrease.
- Ⓑ increase.
- Ⓒ stay the same.

When temperature **decreases**, the rate of ATP production by cells is expected to

- Ⓐ decrease.
- Ⓑ increase.
- Ⓒ stay the same.

- 5 Scientists discovered a 375-million-year-old fossil in Canada. The diagram below shows the top and side views of the fossil.



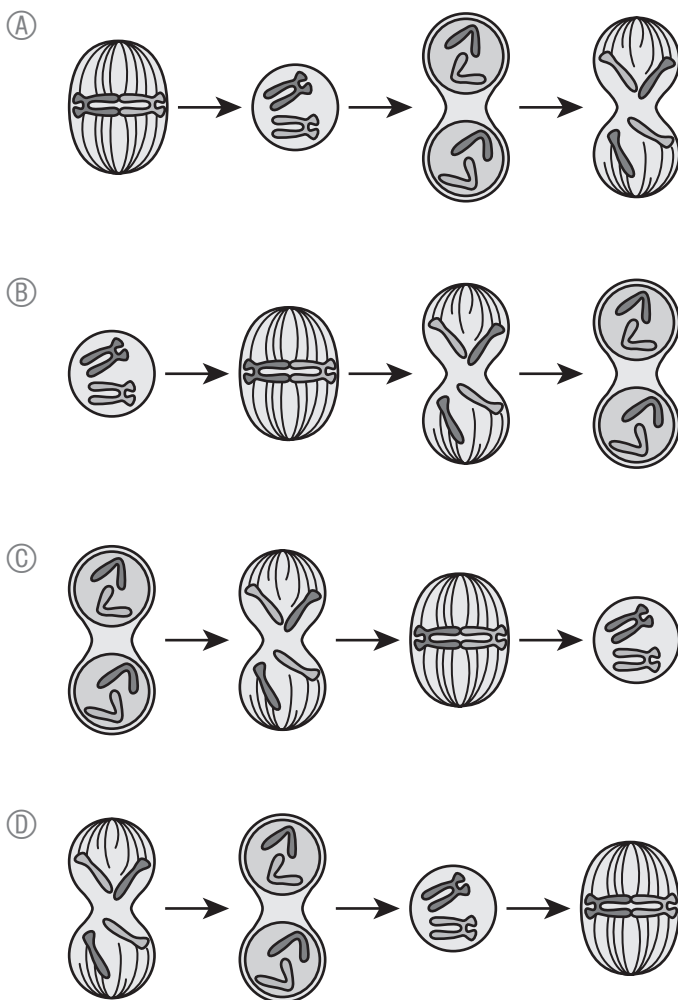
Which observation would **best** support the hypothesis that this organism was a transitional form between amphibians and fish?

- Ⓐ The fossil has a long body, which both modern amphibians and modern fish have.
- Ⓑ The fossil is larger than most modern amphibians, but smaller than most ancient fish.
- Ⓒ The fossil has some body structures that are similar to amphibians and some body structures that are similar to fish.
- Ⓓ The fossil was discovered near a lake, which shows that the organism needed water to reproduce, as do amphibians and fish.

This question has two parts.

6 Part A

Which of the following shows the stages of mitosis in the correct order?

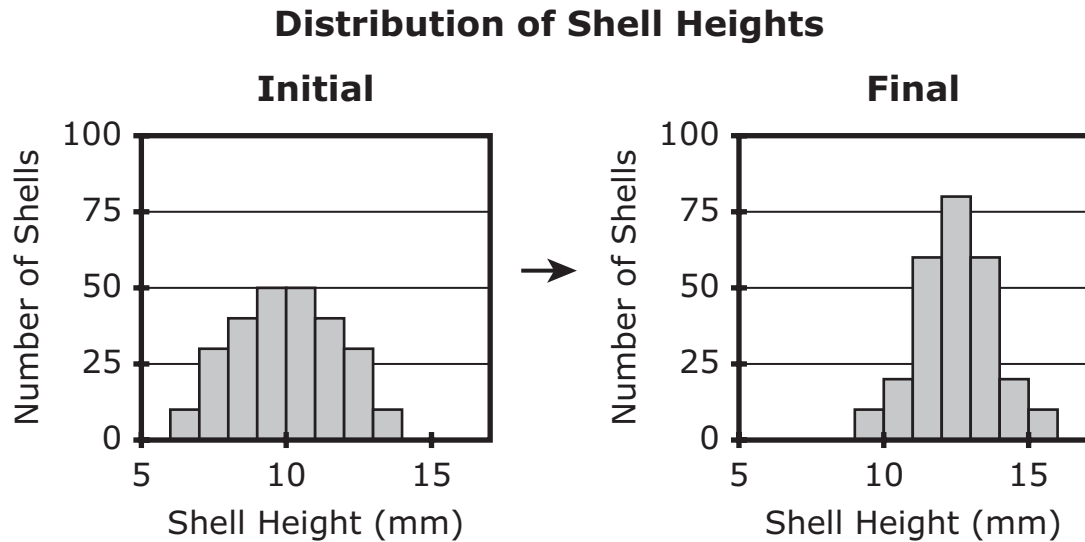


Part B

Which of the following best describes a result of mitosis?

- (A) organisms whose genetic diversity increases over time
- (B) daughter cells that are genetically identical to the parent cell
- (C) gametes with combinations of alleles absent in the parent cell
- (D) chromosomes that carry different genetic instructions to each cell

- 7 The distribution of shell heights in a population of snails changed over time, as shown.



Which of the following **best** explains what happened to the genetic diversity of this snail population in regard to shell height?

- Ⓐ Genetic diversity decreased because of selection pressure.
- Ⓑ Genetic diversity increased because of changes in food sources.
- Ⓒ Genetic diversity stayed the same because of equal birth and death rates.
- Ⓓ Genetic diversity increased because of the introduction of a new behavior.

- 8 A section of DNA is shown.

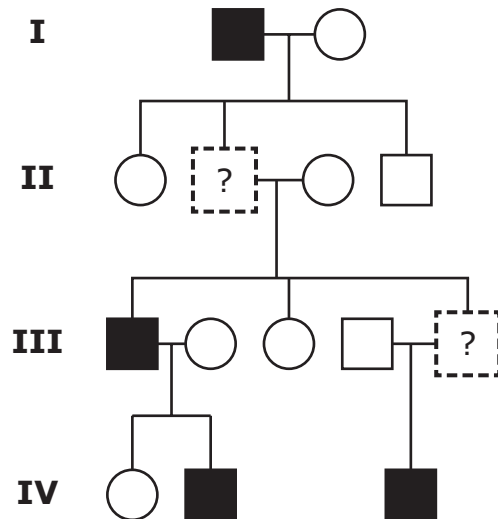
3'-TCG ATA TCC-5'

Which sequence best shows the result of transcription for the section of DNA?

- Ⓐ AGC TAT AGG
- Ⓑ UCG AUA UCC
- Ⓒ TCG ATA TCC
- Ⓓ AGC UAU AGG

- 9 An incomplete pedigree for a family with a genetic condition is shown. The genetic condition has an autosomal dominant inheritance pattern.

Generation



| KEY | |
|--------|--------------------------|
| | Affected Unaffected |
| Male | |
| Female | |

Which symbol should be placed in the box in **Generation II**?



Which symbol should be placed in the box in **Generation III**?



- 10** Herbicides are chemicals that kill plants by interrupting important biological processes. Different herbicides affect different plant processes. The herbicide atrazine prevents the chemical reactions that use energy from sunlight.

A plant is sprayed with atrazine. Exposure to atrazine causes an immediate **decrease** in the production of two substances in the plant. Select the **two** substances.

- Ⓐ DNA
- Ⓑ carbon dioxide
- Ⓒ glucose
- Ⓓ phospholipids
- Ⓔ oxygen

- 11** Genetic engineering is a process used to introduce a new trait into an individual organism or into a population of organisms.

Inherited traits are passed from parents to offspring through

- Ⓐ genes.
- Ⓑ proteins.

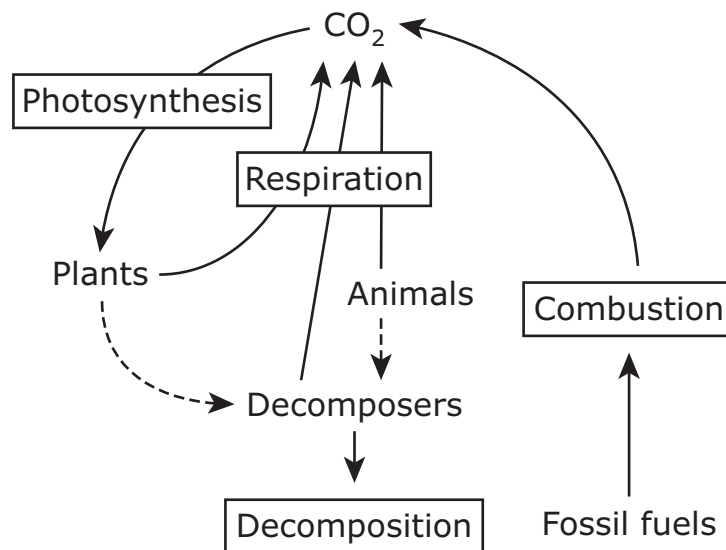
For a genetically engineered trait to be inherited by offspring, the genetically engineered DNA must be present in the parents'

- Ⓐ blood cells.
- Ⓑ gametes.
- Ⓒ saliva.
- Ⓓ skin cells.

This question has two parts.

12 Part A

The diagram shows part of the carbon cycle.



Which of the processes shown in the diagram is responsible for cycling carbon from the atmosphere to the biosphere?

- Ⓐ combustion
- Ⓑ decomposition
- Ⓒ photosynthesis
- Ⓓ respiration

Part B

Which of the following occurs during decomposition?

- Ⓐ Carbon is dissolved in water to form a solution.
- Ⓑ Carbon is stored in animals as complex carbon compounds.
- Ⓒ Carbon compounds are absorbed by plant roots from the soil.
- Ⓓ Carbon compounds are broken down into simpler substances.

- 13 The diagram shows a small part of an original strand of DNA and an incomplete new DNA strand.

| Original DNA Strand | G | T | A | T | C |
|-------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| New, Complementary DNA Strand | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |

Which of the following shows the complementary nucleotide bases for the new DNA strand?

- Ⓐ T G C G A
- Ⓑ C A U A G
- Ⓒ A C G C T
- Ⓓ C A T A G

The following section focuses on Polynesian crickets.

Read the information below and use it to answer the four selected-response questions and one constructed-response question that follow.

Male Polynesian field crickets typically “sing” to attract females by rubbing their wings together. When male field crickets sing, they not only attract female Polynesian field crickets, but they also attract female *Ormia* flies. When a female *Ormia* fly finds a male field cricket, she deposits larvae on the field cricket. The larvae burrow into and feed on the field cricket’s body, eventually causing the cricket to die. Field crickets are the main food source of *Ormia* fly larvae.

Scientists studied Polynesian field crickets and *Ormia* flies on the Hawaiian island of Kauai over several years. They collected data on the number of male Polynesian field crickets found in an area on Kauai. They also determined whether the field crickets had the ability to sing. The data the scientists collected are shown in the table.

| Year | Number of Males Found | Ability of Crickets to Sing |
|------|-----------------------|-----------------------------------|
| 1993 | 72 | Most had the ability to sing. |
| 1995 | 52 | Most had the ability to sing. |
| 1999 | 5 | Some had the ability to sing. |
| 2004 | 133 | Few had the ability to sing. |
| 2005 | 145 | Very few had the ability to sing. |

When the number of male field crickets began to increase, the scientists found that most male field crickets were not able to sing; instead, they were silent. The scientists called silent males “flatwing” and those that can sing “wild-type.” The flatwing trait is caused by a genetic mutation.

- 14** *Ormia* flies and Polynesian field crickets have different ecological roles.

Based on the information provided, what is the ecological relationship between the *Ormia* fly and the field cricket?

- Ⓐ commensalism
- Ⓑ competition
- Ⓒ mutualism
- Ⓓ parasitism

- 15** Within a few years of the introduction of *Ormia* flies on Kauai, over 90% of male field crickets had the flatwing trait. Which of the following most likely allowed the trait to spread so quickly in the field cricket population?

- Ⓐ Flatwing male field crickets preferred mating with wild-type females.
- Ⓑ Individual female field crickets became resistant to attacks from *Ormia* flies.
- Ⓒ Individual wild-type male field crickets lost the ability to sing and became flatwing field crickets.
- Ⓓ Female field crickets mated with males that had the flatwing trait and produced fertile offspring.

- 16** Wing phenotype in male field crickets can be an advantage or a disadvantage, depending on environmental conditions.

Select **three** sentences that correctly identify under which environmental conditions a wing phenotype in male field crickets is an advantage or a disadvantage.

- Ⓐ The flatwing phenotype is an advantage when *Ormia* flies are present.
- Ⓑ The flatwing phenotype is a disadvantage when *Ormia* flies are present.
- Ⓒ The wild-type phenotype is an advantage when *Ormia* flies are present.
- Ⓓ The wild-type phenotype is a disadvantage when *Ormia* flies are present.
- Ⓔ The wild-type phenotype is an advantage when *Ormia* flies are **not** present.
- Ⓕ The wild-type phenotype is a disadvantage when *Ormia* flies are **not** present.

This question has two parts.

- 17** The table in the introduction shows how the numbers of male field crickets changed over time.

Part A

Between 1995 and 1999, the size of the *Ormia* fly population on Kauai most likely

- Ⓐ decreased.
- Ⓑ increased.
- Ⓒ stayed the same.

Part B

Which of the following explains what most likely affected the population size of the *Ormia* fly between 1995 and 1999?

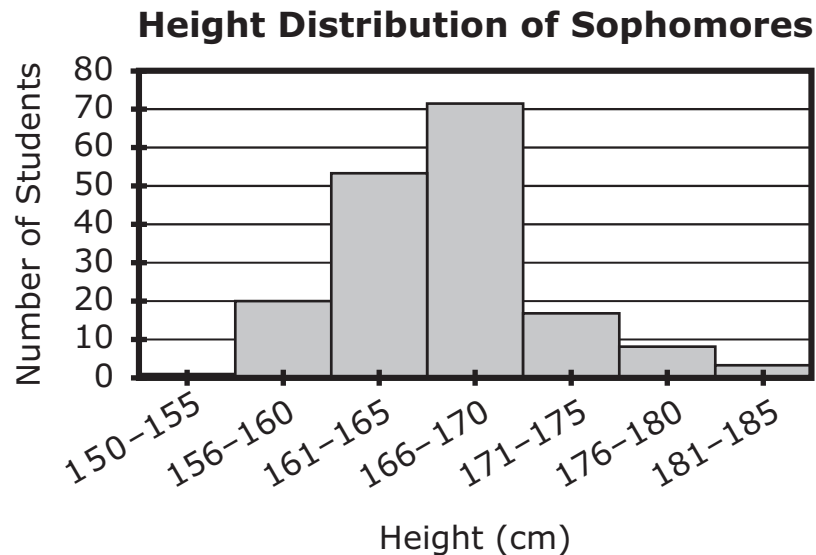
- Ⓐ The male flies were able to find more mates.
- Ⓑ The fly population reached its carrying capacity.
- Ⓒ The flies were able to feed on more field crickets.
- Ⓓ The amount of food available for the flies' larvae decreased.

This question has two parts. Write your response on the next page. Be sure to label each part of your response.

- 18** The *Ormia* fly was introduced by humans to the Hawaiian Islands and is considered an invasive species.
- A. Describe **two** characteristics of an organism, such as the *Ormia* fly, that would allow it to become an invasive species.
 - B. Explain why people are concerned about invasive species being introduced into an ecosystem.

18

- 19 A group of students measured the heights of all sophomores at their school. The data are shown in the graph.

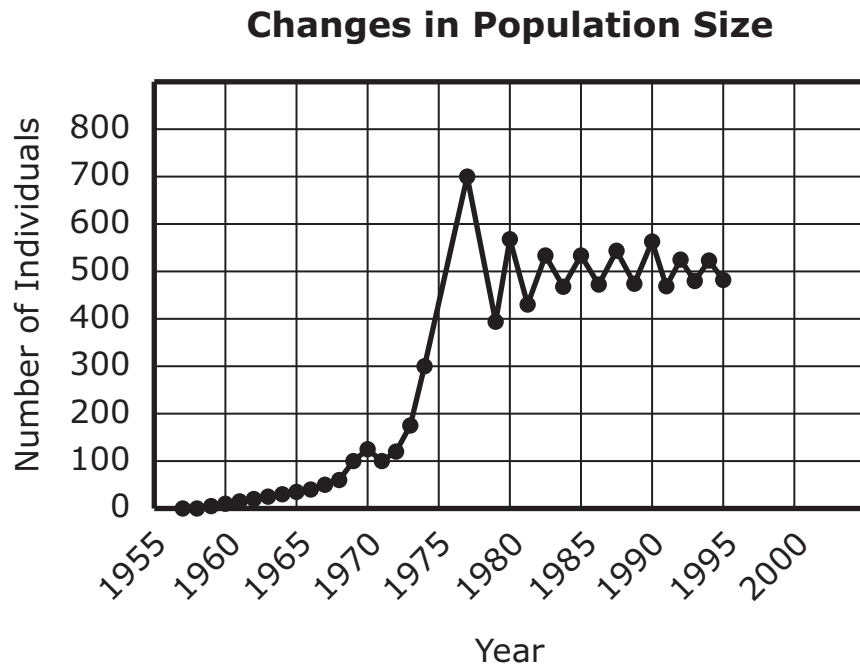


One of the students claims that many genes control height in humans.

Which of the following best describes the student's claim?

- Ⓐ The claim is correct because the data show a range of heights among the students.
- Ⓑ The claim is not correct because the data show a range of heights among the students.
- Ⓒ The claim is correct because the data show most students in one height range, with little variation.
- Ⓓ The claim is not correct because the data show most students in one height range, with little variation.

- 20 The graph shows the changes in the population size of a mammal species introduced onto an isolated island in 1957.



Which of the following conclusions is **best** supported by the data?

- Ⓐ Every year, more individuals were born than died.
- Ⓑ A predator of this mammal was removed from the island in 1990.
- Ⓒ The population decreases were the result of low immigration rates.
- Ⓓ In the 1980s, the mammal's population size stayed around its carrying capacity.

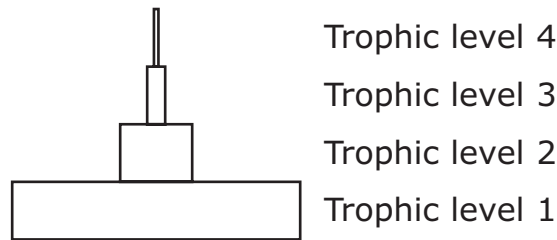
- 21 Some populations of Atlantic tomcod fish have an allele that makes the fish resistant to toxic pollutants called PCBs. Tomcod populations in several rivers were analyzed for the presence of this allele. Each river had varying levels of PCB pollution.

Which of the following results would **best** support the conclusion that natural selection is influencing the presence of this allele in the tomcod populations?

- Ⓐ All of the tomcod in each of the rivers have this allele.
- Ⓑ The percentage of tomcod with this allele remains the same from year to year in each river.
- Ⓒ The rivers with high PCB levels have larger percentages of tomcod with this allele than the rivers without PCBs.
- Ⓓ Eggs from tomcod without this allele can hatch in rivers with or without PCBs, and eggs from tomcod with this allele can only hatch in rivers without PCBs.

This question has two parts.

- 22** The energy pyramid shows the amount of available energy at **each** trophic level of an ecosystem.



Part A

Which statement best explains the trophic levels in the energy pyramid?

- Ⓐ The trophic levels show how energy flows from level 4 to level 1.
- Ⓑ Only about 10% of the energy available at one trophic level is transferred to the next trophic level.
- Ⓒ At each trophic level, the energy available is directly proportional to the size of the organisms in that trophic level.
- Ⓓ At each trophic level, 10% of the energy is converted into matter and 90% of the energy is transferred up to the next level.

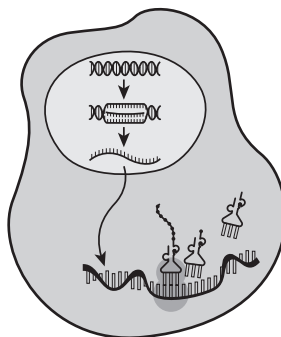
Part B

Which group of organisms obtains energy for life processes by converting sunlight into chemical energy?

- Ⓐ producers
- Ⓑ primary consumers
- Ⓒ secondary consumers
- Ⓓ tertiary consumers

This question has two parts.

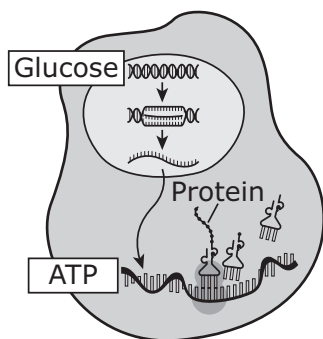
- 23** The enzyme lactase is needed for a person to be able to digest sugar in dairy products, such as cow's milk. The model shows how the enzyme lactase is produced by a cell.



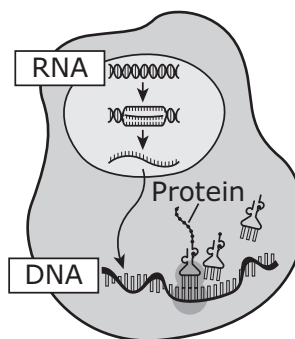
Part A

Which model correctly shows the two molecules involved in the formation of lactase?

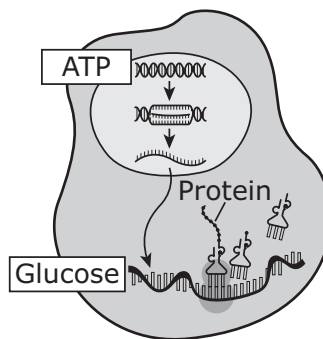
(A)



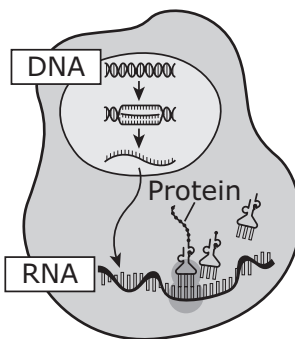
(B)



(C)



(D)



Part B

Based on the model, which of the following leads to the production of lactase?

- Ⓐ ATP is used to form lactase from glucose.
- Ⓑ Lactase is directly replicated from DNA using ATP.
- Ⓒ DNA is transcribed to form mRNA, and then mRNA is translated.
- Ⓓ DNA is translated to form a dairy sugar, and then mRNA is transcribed.

- 24 A person eats an apple, and it is broken down in the person's digestive system.

Which of the following shows the order in which the apple pieces travel through the digestive system?

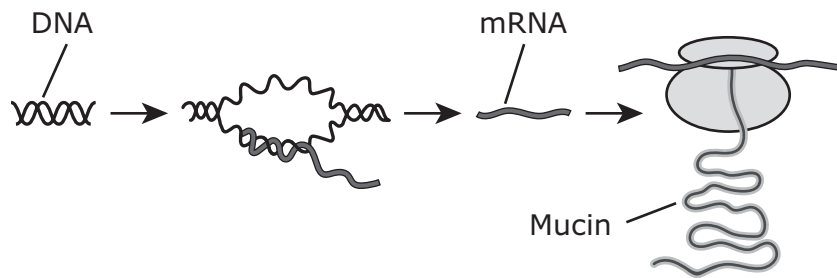
- Ⓐ mouth → liver → small intestine → large intestine
- Ⓑ mouth → large intestine → small intestine → liver
- Ⓒ mouth → stomach → small intestine → large intestine
- Ⓓ mouth → large intestine → small intestine → stomach

- 25 Fossilized remains of prehistoric mastodons show anatomical similarities to modern-day elephants. These similarities provided the first evidence that mastodons were related to modern-day elephants.

Which of the following is the **best** additional evidence that mastodons were related to elephants?

- Ⓐ Mastodons walked on four legs like modern-day elephants.
- Ⓑ Mastodons ate a diet similar to that of modern-day elephants.
- Ⓒ Mastodon fossils were found in the same area where modern-day elephants live.
- Ⓓ Mastodon tissues contained protein sequences similar to those of modern-day elephants.

- 26** The simplified diagram shows how the protein mucin is produced by lung cells.



Select **two** statements that best describe the relationship between the DNA and the protein mucin.

- Ⓐ The DNA is built from the mRNA of mucin.
 - Ⓑ The DNA folds at certain locations to shape mucin.
 - Ⓒ Sugars in the DNA can change the structure of mucin.
 - Ⓓ The DNA codes for the amino acid sequence that forms mucin.
 - Ⓔ Mutations to the DNA can change the structure and function of mucin.
- 27** Select **two** body systems that are **most directly** responsible for delivering oxygen to an animal's cells.
- Ⓐ circulatory system
 - Ⓑ digestive system
 - Ⓒ excretory system
 - Ⓓ nervous system
 - Ⓔ respiratory system

This question has three parts. Write your response on the next page. Be sure to label each part of your response.

- 28** Some plants in an area produce a toxin that protects them from being eaten by a variety of insect species. The toxin decreases reproductive rates in insects. Because of a genetic mutation, some fruit flies can detect the plant toxin and therefore avoid eating the plant.
- A. Describe how the number of fruit flies in the population that can detect the toxin will most likely change over the next 25 years.
 - B. According to the mechanism of natural selection, explain how the change you described in Part A will occur.
 - C. Based on the changes in the fruit fly population, describe what will most likely happen to the plants' production of the toxin. Explain your answer.

28

This question has four parts. Write your response on the next page. Be sure to label each part of your response.

- 29** In tomato plants, the allele for red fruit color (**R**) is dominant to the allele for yellow fruit color (**r**). The allele for round-shaped fruit (**F**) is dominant to the allele for pear-shaped fruit (**f**).

Two tomato plants, heterozygous for fruit color and fruit shape, are crossed. The Punnett square for this dihybrid cross is shown.

| | RF | Rf | rF | rf |
|-----------|-----------|-----------|-----------|-----------|
| RF | RRFF | RRFf | RrFF | RrFf |
| Rf | RRFf | RRff | RrFf | Rrff |
| rF | RrFF | RrFf | rrFF | rrFf |
| rf | RrFf | Rrff | rrFf | rrff |

- For this cross, identify all the possible phenotypes of the offspring.
- Considering only fruit color, determine the ratio of offspring with red fruit to offspring with yellow fruit predicted by the Punnett square.
- Considering only fruit shape, determine the ratio of offspring with round-shaped fruit to offspring with pear-shaped fruit predicted by the Punnett square.
- Explain what is meant by independent assortment **and** describe one way in which your answers to Parts A, B, and C support the conclusion that the genes for fruit color and fruit shape sort independently.

29

