

LIVING ENVIRONMENT

Wednesday, June 14, 2017 — 1:15 to 4:15 p.m., only

Student Name _____

School Name _____

The possession or use of any communications device is strictly prohibited when taking this examination. If you have or use any communications device, no matter how briefly, your examination will be invalidated and no score will be calculated for you.

Print your name and the name of your school on the lines above.

A separate answer sheet for multiple-choice questions in Parts A, B-1, B-2, and D has been provided to you. Follow the instructions from the proctor for completing the student information on your answer sheet.

You are to answer all questions in all parts of this examination. Record your answers for all multiple-choice questions, including those in Parts B-2 and D, on the separate answer sheet. Record your answers for all open-ended questions directly in this examination booklet. All answers in this examination booklet should be written in pen, except for graphs and drawings, which should be done in pencil. You may use scrap paper to work out the answers to the questions, but be sure to record all your answers on the answer sheet or in this examination booklet as directed.

When you have completed the examination, you must sign the declaration printed on your separate answer sheet, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during the examination. Your answer sheet cannot be accepted if you fail to sign this declaration.

Notice ...

A four-function or scientific calculator must be available for you to use while taking this examination.

DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

Part A

Answer all questions in this part. [30]

Directions (1–30): For *each* statement or question, record on the separate answer sheet the *number* of the word or expression that, of those given, best completes the statement or answers the question.

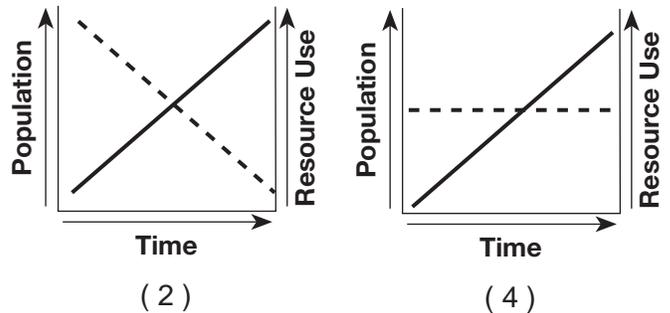
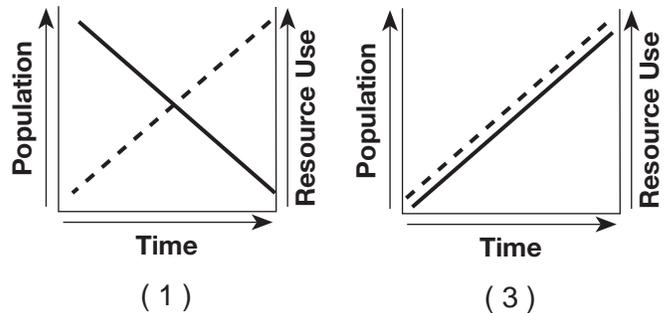
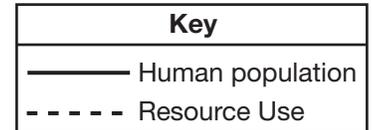
- 1 An example of recycling is
- (1) using a paper cup instead of a mug
 - (2) turning off the lights when leaving a room
 - (3) using plastic from a soda bottle to make a certain type of clothing
 - (4) using two paper towels rather than five to clean up a spill

- 2 One characteristic of a stable ecosystem is
- (1) a high number of predators
 - (2) an interdependence of organisms
 - (3) a lack of biodiversity
 - (4) an increase in human interference

- 3 According to scientists, ocean waves could be a source of energy. Devices are being designed to capture the energy from waves and supply electricity to coastal areas. A direct benefit of utilizing this technology to produce energy would be the
- (1) destruction of habitats near the devices
 - (2) decreased use of nonrenewable resources
 - (3) release of gases needed for photosynthesis
 - (4) increased use of finite resources

- 4 The emerald ash borer is an insect that is thought to have been accidentally brought to the United States from China in shipping containers. It attacks ash trees, eventually killing the trees, destroying an important part of the ecosystem. The presence of the emerald ash borer in the United States can be used as an example of how humans have
- (1) purposely introduced an insect to correct a problem in an ecosystem
 - (2) used an insect to remove one insect species and replace it with another
 - (3) worked to increase the biodiversity in a particular area
 - (4) altered the equilibrium in an ecosystem by introducing a new species

- 5 Which graph best shows the changes in global human population and natural resource use over the past 500 years?



- 6 The burning of fossil fuels has harmed the environment by
- (1) decreasing acid rain in the northeast United States
 - (2) adding carbon dioxide to the atmosphere
 - (3) increasing biodiversity in the lakes and ponds of the Adirondacks
 - (4) depleting the ozone shield directly over western New York State

7 Which method of collecting data would provide the most accurate information about how an ecosystem is being affected by human development?

- (1) The people in the neighborhood record the number of birds they see in the area both before and after the construction of a new building.
- (2) Deer in the area are identified before construction so that scientists can see where they go after the building is finished.
- (3) More trees are planted in the area around the construction site to allow the animals a new place to live.
- (4) The population size is recorded for each species present in the construction area before and after the building is completed.

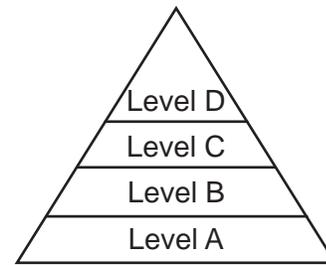
8 Natural selection produces changes most quickly in

- (1) species with short reproductive cycles
- (2) individual pathogens killed by antibiotics
- (3) complex multicellular organisms
- (4) individuals that produce a small number of offspring

9 As a result of habitat destruction, the size of the Florida panther population has been drastically reduced. It is estimated that there are only 100 to 160 Florida panthers in the wild. Which statement best explains why the Florida panther population may *not* continue to evolve?

- (1) There is no longer a chance of mutations occurring in the population.
- (2) There is a lack of competition for limited environmental resources.
- (3) There is no longer a chance of a trait providing a reproductive advantage to the population.
- (4) There is a lack of genetic variation for selection to act upon.

10 Which level of the pyramid below is correctly paired with the type of organism that would most likely be found at that level in an ecosystem?



- (1) Level A – producers
- (2) Level B – carnivores
- (3) Level C – herbivores
- (4) Level D – decomposers

11 Which statement best describes what is most likely to occur if an animal population grows larger than the carrying capacity of its environment?

- (1) The birth rate will increase.
- (2) Both the birth rate and death rate will decrease.
- (3) The death rate will increase.
- (4) Neither the birth rate nor the death rate will decrease.

12 Many biotic factors affect individuals in a population. An example of an organism being directly affected by a biotic factor is

- (1) a squirrel cannot find a mate
- (2) a flood washes away a maple tree
- (3) a plant is in a dark room
- (4) a chipmunk finds a rock pile to use for a home

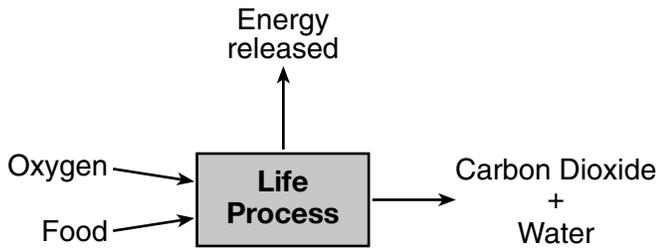
13 When people receive organ transplants, they often need to take medications that decrease immune responses because

- (1) transplanted organs contain antigens that can trigger white blood cell activity
- (2) hormones present in replacement organs prevent the synthesis of antibodies
- (3) transplanted organs produce their own antibodies
- (4) antigens present in these organs attack antibodies already present in the blood

14 Which structures regulate water loss and gas exchange in the leaves of plants?

- (1) vacuoles
- (2) chloroplasts
- (3) guard cells
- (4) mitochondria

15 Which life process carried out by a green plant is represented in the diagram below?



- (1) respiration
- (2) photosynthesis
- (3) digestion
- (4) replication

16 Scientists are developing a malaria vaccine that would most likely contain

- (1) weakened drugs used to treat the symptoms of malaria
- (2) white blood cells from the malaria-infected individuals
- (3) a weakened form of the malaria-causing organism
- (4) antibodies made from the malaria-causing organism

17 Proteins, starch, and DNA are similar in that they are all

- (1) organic compounds
- (2) parts of genes
- (3) made of amino acids
- (4) made of simple sugars

18 In response to an increasing blood glucose level, the human body will normally

- (1) store the glucose in cell nuclei
- (2) release a hormone that lowers the blood glucose
- (3) produce a hormone that destroys the glucose
- (4) use the excess glucose to make proteins

19 A kitten was born with black fur and green eyes. The fur and eye color of its parents are shown in the chart below.

Cat	Fur	Eye Color
Father	striped	green
Mother	black	yellow
Kitten	black	green

Which statement helps explain why the kitten has black fur?

- (1) Chromosomes present on the genes code for the characteristics of its fur.
- (2) Genetic mutations always cause the fur color and eye color to change.
- (3) Offspring receive genetic information from both parents.
- (4) Gene expression is changed in every generation, resulting in evolution.

20 Scientists have been investigating a way to recreate extinct species such as the saber-toothed cat illustrated below.



Source: <https://IGS.Indiana.edu>

Which technique would use DNA from an extinct species to recreate an organism of the species?

- (1) natural selection
- (2) differentiation
- (3) cloning
- (4) selective breeding

21 The sequence that best illustrates the flow of energy through an ecosystem is

- (1) sunlight → plant → wolf → rabbit
- (2) plant → sunlight → rabbit → wolf
- (3) sunlight → plant → rabbit → wolf
- (4) wolf → rabbit → plant → sunlight

- 22 Which cellular change in an organism could be inherited by the next generation?
- (1) a change in the ribosomes in the pancreas of a squirrel
 - (2) the deletion of a single DNA base in a sperm cell of a trout
 - (3) a decrease in the size of a vacuole in a rose leaf cell
 - (4) the transfer of a piece of a chromosome in the skin cell of a raccoon

23 A chemical was added to hand sanitizers and dish detergents to kill bacteria. Certain species of bacteria are no longer killed by this chemical. One likely reason for the decreased effectiveness of this chemical is that these bacteria have

- (1) slower metabolic rates
- (2) a mutation for resistance
- (3) been selectively bred for survival
- (4) an adaptation to a different niche

24 The hemlock wooly adelgid is an invasive insect species that is destroying native hemlock trees in New York State. These insects can upset natural ecosystems because they

- (1) provide food for native bird species
- (2) can carry diseases that can be spread to pets
- (3) increase biodiversity in New York State forests
- (4) disrupt habitats that native species depend upon

25 A shark and a dolphin have similarly shaped bodies and fins. However, these two organisms are not closely related: The shark is a fish, and the dolphin is a mammal. Some species may have similar body structures even if they are not related because they evolved in

- (1) similar environments and specific traits increased their chances of survival
- (2) similar environments and were exposed to factors that caused exactly the same mutations
- (3) different environments, but tried to adapt in the same ways so they could survive
- (4) different environments, but ate similar foods that affected their growth and development

- 26 A dog gave birth to the three puppies shown in the photograph below. One of the puppies has darker fur on its face than the other two.

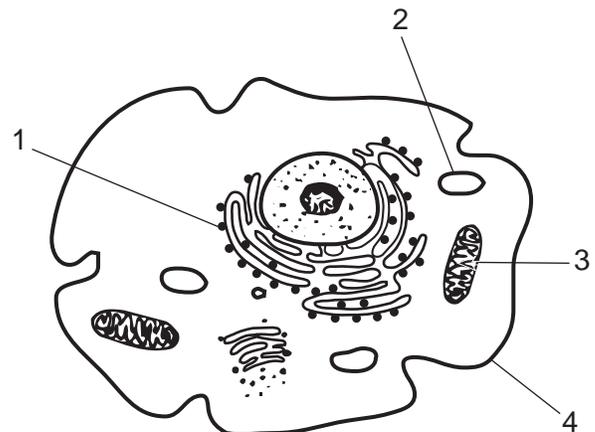


Source: <http://germanshepherdsatsdikennels.blogspot.com>

Which two biological processes account for this difference between the puppies?

- (1) meiosis and recombination
- (2) meiosis and cloning
- (3) mitosis and differentiation
- (4) mitosis and cloning

- 27 The diagram below represents a cell that produces digestive enzymes.



Which cellular structure would be the most likely location for the synthesis of these enzymes?

- | | |
|-------|-------|
| (1) 1 | (3) 3 |
| (2) 2 | (4) 4 |

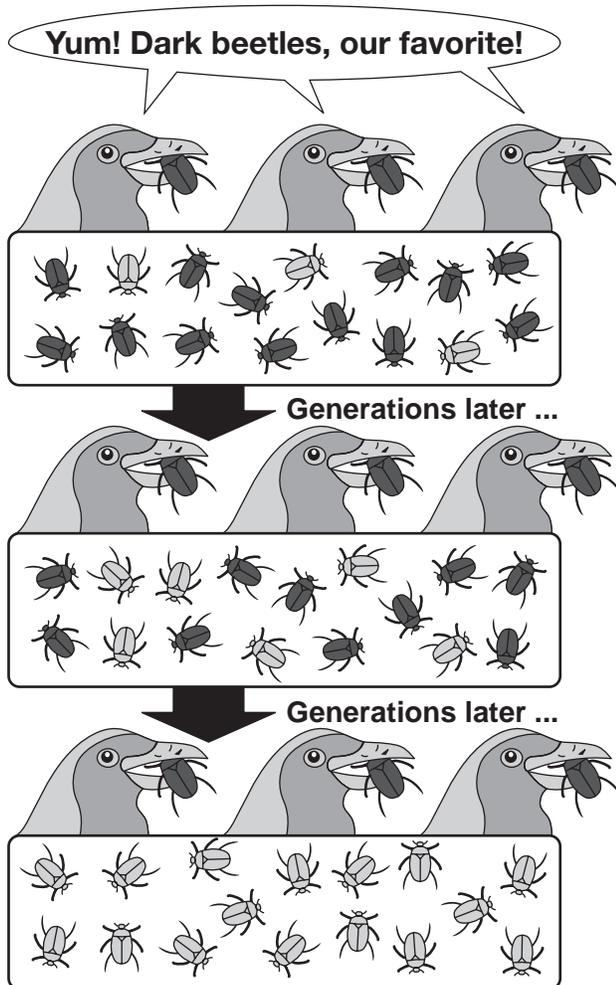
- 28 Energy drinks have become increasingly popular. Some of these drinks contain large amounts of caffeine, which is known to increase heart rates in most individuals. This effect on the heart rate can be dangerous because it can lead to
- (1) a disruption in the absorption of starch
 - (2) an increase in blood volume
 - (3) a decrease in oxygen levels
 - (4) an imbalance in homeostasis
- 29 The kidney is an organ that collects wastes and excess water from the blood and sends them to the bladder where they are stored before being removed from the body. Which two systems work together to perform this function?
- (1) immune and respiratory
 - (2) circulatory and excretory
 - (3) skeletal and nervous
 - (4) digestive and circulatory
- 30 Scientists have recently discovered a community of bacteria and clams living under an ice shelf in Antarctica. These organisms live under 600 feet of ice, in the absence of sunlight, and in temperatures considered too cold for most living organisms. The location where these organisms live is unusual because
- (1) only biotic factors control the size of the populations
 - (2) bacteria and clams are found in the same area
 - (3) of the abiotic factors found in their environment
 - (4) green plants make energy-rich compounds available
-

Part B-1

Answer all questions in this part. [13]

Directions (31–43): For each statement or question, record on the separate answer sheet the number of the word or expression that, of those given, best completes the statement or answers the question.

31 The diagram below represents an important biological concept.

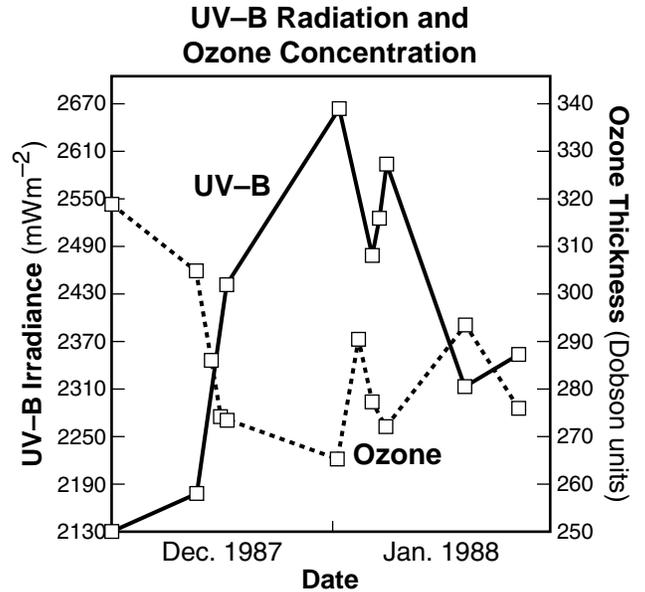


Adapted from: <http://evolution.berkeley.edu/evolibrary/>

The concept being represented is

- (1) overproduction
- (2) natural selection
- (3) homeostasis
- (4) ecological succession

32 The graph below shows levels of a form of ultraviolet radiation (UV-B) and ozone thickness in Australia during December 1987 and January 1988.

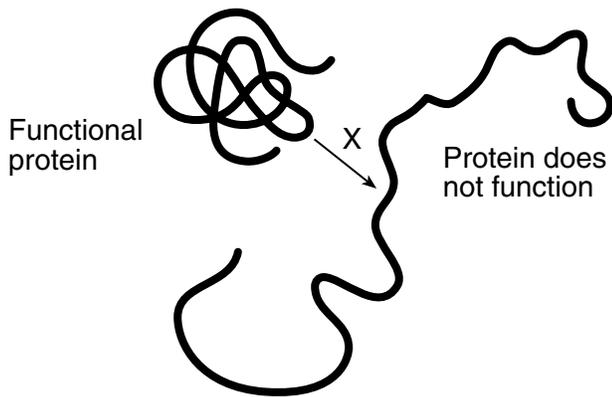


Adapted from: C. R. Roy, et. al., *Nature* 347:235, 1990

Which statement best describes the apparent relationship between ozone and UV-B?

- (1) When ozone levels are at 2550 Dobson units, the UV-B levels are at 250 Dobson units.
- (2) The increase in UV-B reduces the destruction of the ozone layer.
- (3) When the ozone layer is thinner, more UV-B gets through it.
- (4) If the ozone layer is thicker, UV-B levels on the ground increase.

33 In the diagram below, X represents a process that causes a protein to unfold and stop functioning.



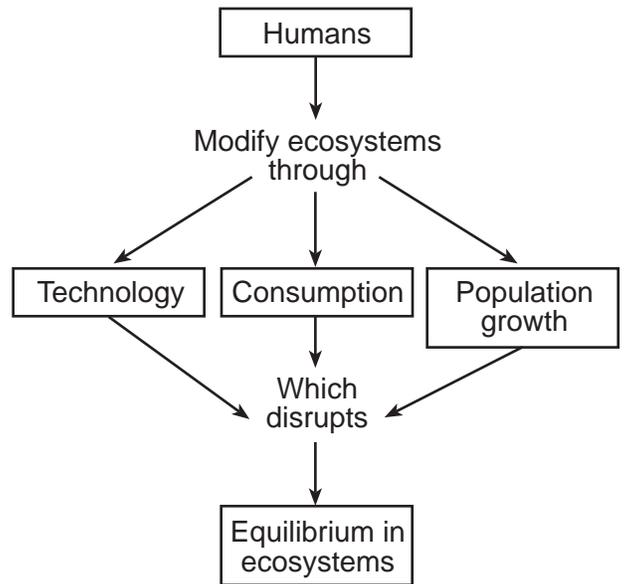
Process X is most likely caused by

- (1) the digestion of the amino acids that make up the proteins
- (2) the synthesis of a protein with different simple sugars
- (3) removal of the gene that codes for the production of the protein
- (4) an internal factor in the body, such as a temperature increase

34 Which statement is an example of how the external environment can influence gene expression?

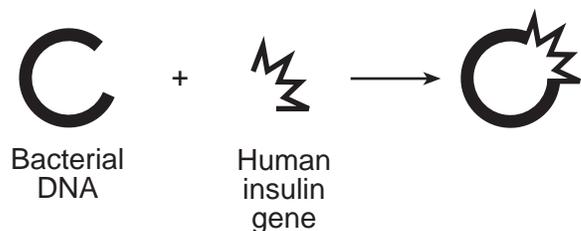
- (1) Some flowering plants that inherit a gene for white flowers and a gene for red flowers will produce pink flowers.
- (2) Some animals that inherit genes for brown fur will grow white fur if the outside temperature falls below a certain level.
- (3) In some breeds of cat, certain fur-color genes are found only in females.
- (4) A pea plant is short-stemmed only if it inherits the genes for the trait from both parents.

35 Which statement best illustrates a concept represented in the diagram below?



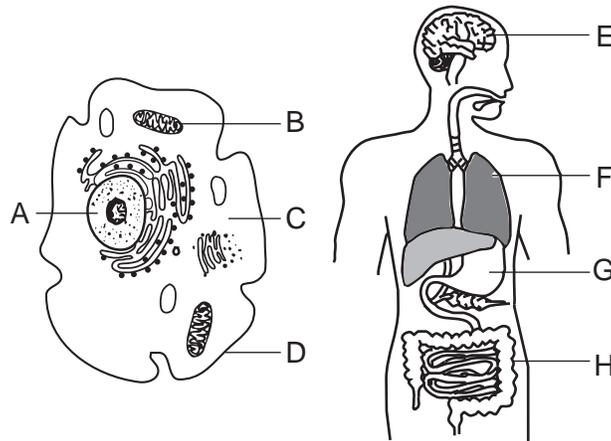
- (1) Tsunamis triggered by oceanic earthquakes cause widespread flooding that can lead to large scale environmental destruction.
- (2) Annual hunting laws determine the number of deer that can be hunted to ensure population stability.
- (3) More individuals are purchasing hybrid cars that use less gasoline and produce less carbon dioxide.
- (4) The increased use of electronics has led to increased mining for precious metals and minerals in developing countries.

36 The process shown below is used to



- (1) determine if a person has a genetic disease
- (2) produce human growth hormone
- (3) identify the father of a newborn
- (4) produce a hormone to regulate blood sugar

Base your answers to questions 37 through 39 on the diagrams below and on your knowledge of biology. The diagrams represent a single-celled organism and a multicellular organism.



37 Which statement correctly identifies the levels of organization for the structures indicated?

- (1) *A* and *B* are tissues; *E* and *G* are organs.
- (2) *A* and *B* are organs; *E* and *G* are systems.
- (3) *A* and *B* are tissues; *E* and *G* are organelles.
- (4) *A* and *B* are organelles; *E* and *G* are organs.

38 Cells from structure *E* and cells from structure *G* are similar in that they

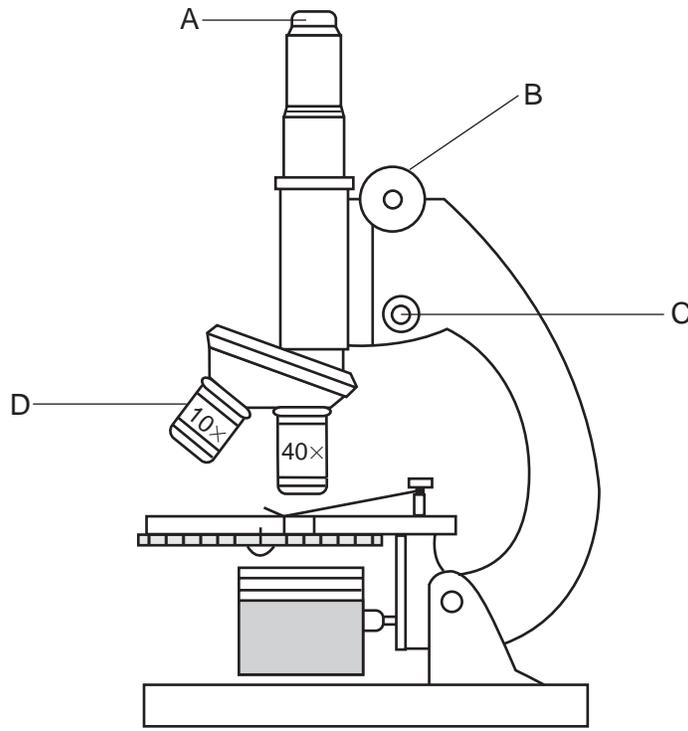
- (1) have the same structure and function
- (2) contain the same genetic material
- (3) are identical in structure, but different in function
- (4) contain only the genetic information needed for their specific job

39 Rotenone is an insecticide that is toxic to humans as well as to insects. Rotenone interferes with the process of ATP production in the cell. Which row in the chart below correctly identifies the structure where ATP is produced and the reason it is affected by rotenone?

Row	Structure	Reason Affected
(1)	A	It would be unable to store enzymes for ATP production.
(2)	B	Production of ATP would occur less efficiently.
(3)	C	The raw materials used for ATP production would be altered.
(4)	D	Absorption of the ATP would increase here.

Base your answers to questions 40 and 41 on the information and diagram below and on your knowledge of biology.

A student used a microscope like the one represented below to observe cell division in onion cells.



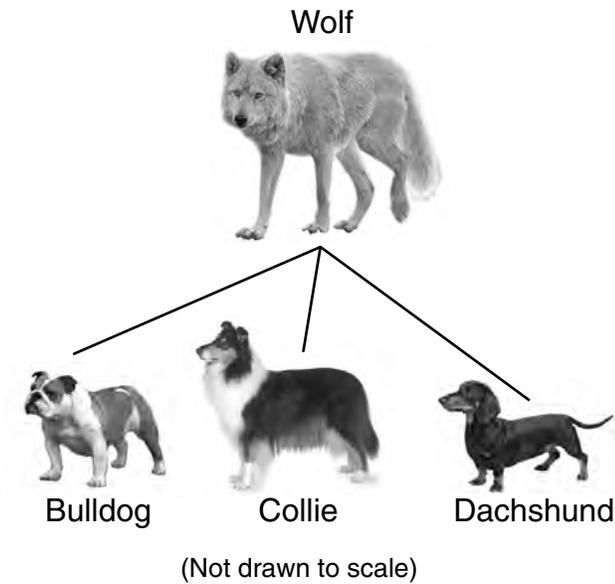
40 The part of the microscope that should be adjusted in order to better view the onion cells while using high power is

- (1) *A*
- (2) *B*
- (3) *C*
- (4) *D*

41 The student noticed that as the new cells formed, they contained rod-shaped chromosomes. It is necessary for onion cells to contain chromosomes because chromosomes

- (1) are composed of genes that contain the instructions for an organism's traits
 - (2) are made of carbohydrates and are needed as an energy source
 - (3) direct the production of inorganic molecules within the cell
 - (4) are composed of lipids that contain stored nutrients for the new cell
-

42 The diagram below indicates a few of the many varieties of domestic dogs thought to have originated from wolves that were domesticated thousands of years ago.

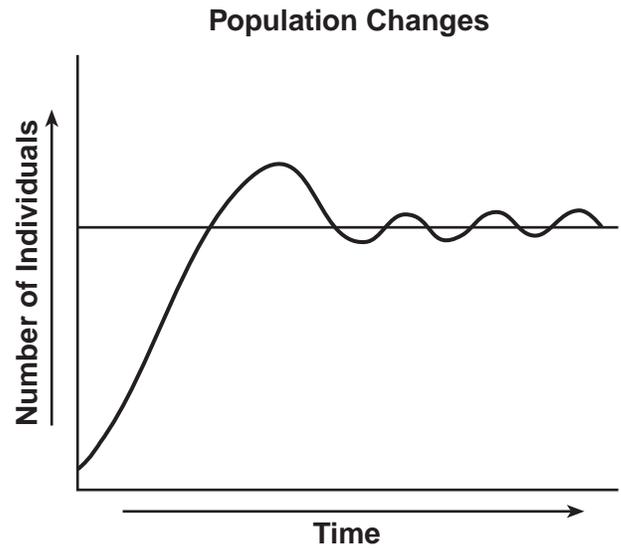


Adapted from: <http://evolution.berkeley.edu/evolibrary/article>

The many varieties of domesticated dogs were most likely produced as a result of

- (1) mutating the body cells of the dogs
- (2) selective breeding over many generations
- (3) genetic engineering with specific enzymes
- (4) cloning dogs with desirable traits

43 The graph below represents some changes in the number of individuals in a particular population in a stable ecosystem over a period of time.



Which statement best describes the trend shown in this graph?

- (1) Ecosystem conditions will eventually cause a population to become extinct.
- (2) In a stable ecosystem, the number of individuals in a population is usually maintained within a certain range.
- (3) The interactions between a population and various factors in an environment are always predictable.
- (4) In order for any ecosystem to maintain a balance, populations must be reduced to half their original number.

Part B–2

Answer all questions in this part. [12]

Directions (44–55): For those questions that are multiple choice, record on the separate answer sheet the *number* of the choice that, of those given, best completes each statement or answers each question. For all other questions in this part, follow the directions given and record your answers in the spaces provided in this examination booklet.

Base your answers to questions 44 through 47 on the information and data table below and on your knowledge of biology.

Illinois Greater Prairie Chicken on the Rise

As pioneers moved west in the mid-1800s, the greater prairie chicken population in Illinois was estimated to number in the millions. Since then, their population has drastically declined.

Evidence of the rapidly declining population was obtained from studying the number of eggs that hatched over several years. In Jasper County, Illinois, the number of prairie chickens fell from 2,000 to less than 50 in under 35 years. Researchers compared the DNA from feather samples from the living Illinois chickens to the DNA from feather samples dating from the year 1930 found in a museum. It was found that the living Illinois chicken population had a very low level of genetic diversity.

In 1992, researchers attempted to increase genetic variation by transporting more than 500 healthy prairie chickens into Illinois from the states of Minnesota, Kansas, and Nebraska. The data table below shows the changes in the percent of eggs that hatched from samples taken in different years. Researchers documented that this increase in the percent of eggs that hatched was not influenced by environmental events.

Prairie Chicken Egg Hatching

Years	Percent of Eggs Hatched
1970–1974	89
1975–1979	88
1980–1984	83
1985–1989	78
1990	38
1993–1996	94

Adapted from: <http://www.sciencedaily.com/releases/1998/11/981130045644.htm>

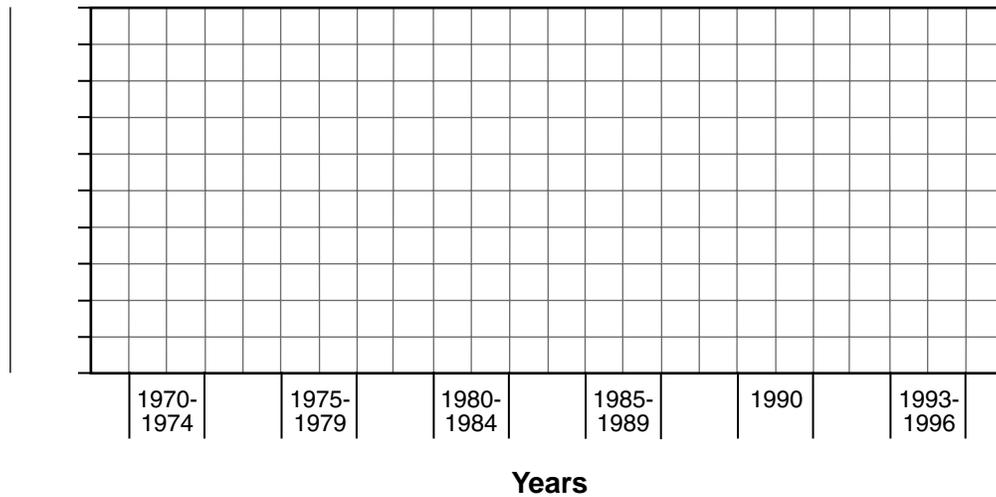
Directions (44–46): Using the information given, construct a bar graph on the grid following the directions below.

44 Label the y -axis on the line provided. [1]

45 Mark an appropriate scale, without any breaks in the data, on the y -axis. [1]

46 Construct vertical bars to represent the data. Shade in *each* bar. [1]

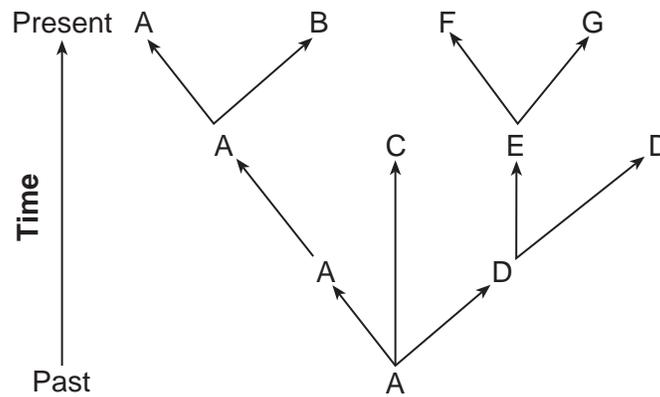
Hatching Rate



Note: The answer to question 47 should be recorded on your separate answer sheet.

- 47 The scientists transported prairie chickens from three different states into the state of Illinois in order to
- (1) decrease egg hatching rate
 - (2) increase genetic diversity
 - (3) increase egg fertilization
 - (4) develop different feather colors
-

Base your answers to questions 48 and 49 on the diagram below and on your knowledge of biology. The diagram shows the evolutionary history of several plant species.



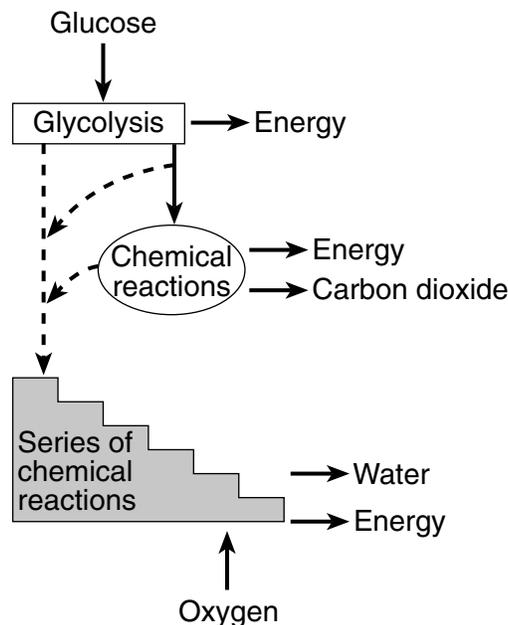
48 Identify *one* type of molecular evidence that could have been used to determine the evolutionary relationships illustrated in the diagram. [1]

Note: The answer to question 49 should be recorded on your separate answer sheet.

49 Which biological technique could be used to obtain some structural evidence that species A and B are closely related?

- (1) glucose testing
- (2) cloning
- (3) genetic engineering
- (4) dissection

Base your answers to questions 50 and 51 on the diagram below and on your knowledge of biology. The diagram illustrates the steps in a process that occurs in the cells of many organisms.



Adapted from: Biology: A Community Context,
W. H. Leonard and J. Penick, 1998

Note: The answer to question 50 should be recorded on your separate answer sheet.

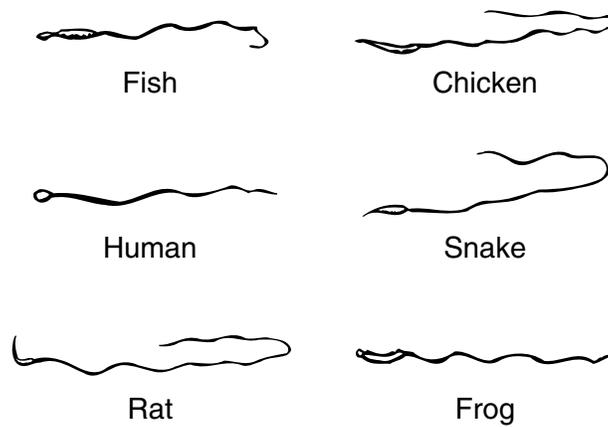
50 Based on the diagram, the process of glycolysis most likely

- (1) begins the breakdown of glucose
- (2) produces oxygen for organisms to use
- (3) stores energy in molecules of water and carbon dioxide
- (4) recycles glucose within the cells of simple organisms

51 Identify *one* specific molecule used to store the energy being released during this process. [1]

Molecule: _____

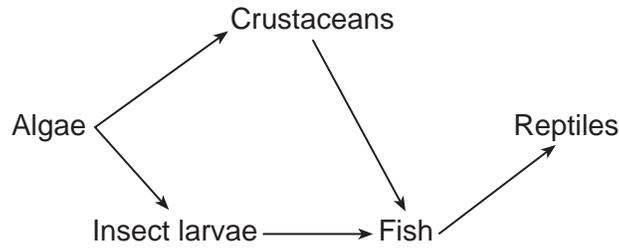
52 The diagram below represents male gametes from different animals.



(Not drawn to scale)

State *one* way, other than the fact that they all contain DNA, the genetic content of these gametes is similar. [1]

53 Part of a food web is represented below. It includes organisms located in a stream near farm fields.



Select *one* type of organism, other than the crustaceans, from the food web. State how the population of organisms you selected might be affected if the population of crustaceans in this food web were reduced due to the use of chemicals harmful to crustaceans in the fields near the stream. Support your answer. [1]

Organism: _____

Base your answer to question 54–55 on the information below and on your knowledge of biology.

Indian blue peacocks live in dense forests and scrubland. Males use their colorful eye-spotted tail feathers and strutting display along with a loud mating call to attract females. This behavior, known as a hoot-dash, is made by the male before dashing toward a female to mate. Few species of other animals use loud courtship calls as the call attracts predators and uses energy.

54–55 Discuss the use of the hoot-dash by male peacocks. In your answer, be sure to:

- state *one* advantage of the hoot-dash [1]
- state *one disadvantage* of the hoot-dash [1]

Part C

Answer all questions in this part. [17]

Directions (56–72): Record your answers in the spaces provided in this examination booklet.

Base your answers to questions 56 and 57 on the information below and on your knowledge of biology.

The placenta secretes progesterone and estrogen during pregnancy.
Progesterone is responsible for the following functions:

- maintains the lining of the uterus
- inhibits (interferes with) contractions of the uterus
- inhibits the production and release of eggs

56 Describe *one* likely result if the placenta became damaged and could *not* maintain progesterone levels. Support your answer. [1]

57 Explain how the release of additional eggs is prevented during pregnancy. [1]

Base your answers to questions 58 and 59 on the information below and on your knowledge of biology.

“Cancer is a disease of genes gone wrong. When certain genes mutate, they make cells behave in odd ways. The cells divide swiftly, they hide from the immune system that could kill them and they gain the nourishment they need to develop into tumors....”

Source: Carl Zimmer, *NY Times*, February 6, 2014

58 Explain why the body of a person infected with HIV, the virus that causes AIDS, would have a different immune response to the presence of cancer cells than a person *not* infected with HIV. [1]

59 Explain why certain chemicals and radiation sources are risk factors for cancer. [1]

60 Scientists have learned that when a pregnant woman smokes, one of the chemicals absorbed, nicotine, can narrow the diameter of her blood vessels that lead to the placenta. Explain why narrowing the diameter of these blood vessels can result in low birth weight babies. [1]

Base your answers to questions 61 through 63 on the information below and on your knowledge of biology.

In an experiment to test the effectiveness of a new vaccine, 50 rats received an injection of equal doses of the vaccine and 50 other rats received an injection of equal doses of a weak salt solution. Two months later, all of the rats received injections that contained equal doses of live, disease-causing organisms.

The experimental results are shown in the chart below.

Effectiveness of a New Vaccine

Injection: 50 Rats Received	Number of Rats That Developed the Disease	Number of Rats That Did Not Develop the Disease
vaccine	7	43
weak salt solution	48	2

61 Was the vaccine effective in preventing the disease? Use the information in the data table to support your answer. [1]

62 State *one* possible reason why two of the rats did *not* get sick even though they did *not* receive the vaccine. [1]

63 Do the results of this experiment indicate that the vaccine is ready for human testing? Support your answer with information from the table. [1]

Base your answers to questions 64 through 66 on the information below and on your knowledge of biology.

Saving Florida Oranges

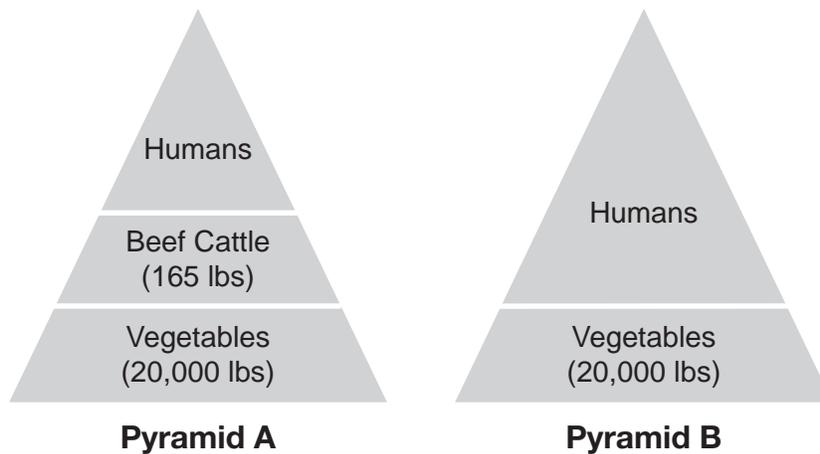
A disease that affects orange trees has led to the destruction of numerous orange trees in Florida. Orange growers have unsuccessfully tried to stop the spread of the disease by cutting down infected trees and using a variety of pesticides on the insects that spread the disease. The growers fear that if nothing further is done, entire crops could be wiped out in the near future. In hopes of saving Florida's orange industry, scientists are attempting to alter the DNA of orange trees by inserting DNA, that codes for disease resistance, from a different plant species.

64 State the name of the specific technique that is used to alter the DNA of orange trees. [1]

65 Explain why growing oranges with disease resistance is better for the environment than using pesticides to control the spread of the disease. [1]

66 Identify a trait, other than disease resistance, that the orange trees could have that would be beneficial to the growers. [1]

67 The diagram below represents two energy pyramids. Each pyramid represents the productivity of one acre of land.



Based on the concept of energy transfer, explain why one acre of land can produce more vegetables for human consumption than beef for human consumption. [1]

Base your answers to questions 68 through 72 on the information below and on your knowledge of biology.

Nature Will Have to Clean Up Hawaii Molasses Leak That Killed Thousands of Fish

A massive spill of thick molasses has turned Honolulu Harbor into a watery wasteland where thousands of fish have been suffocated – a disaster that officials say Mother Nature will have to clean up.

“There’s nothing alive there at all,” diver Roger White told NBC affiliate KHNL after making a seven-minute video of dead sea life blanketing the bottom of the harbor...

...“Unlike with an oil spill, it’s a sugar product so it will dissipate on its own,” Matson spokesman Jeff Hull told NBC News on Thursday. “There’s not an active cleanup.”

“The molasses is not toxic but it’s heavier than water so it’s spreading around on the sea floor, displacing the oxygen-rich water down there, and the fish are suffocating,” said Keith Korsmeyer, a professor of biology at Hawaii Pacific University.

The die-off also could lure predators like sharks, barracuda and eels to the harbor and neighboring Keehi Lagoon, experts warned...

...Korsmeyer said marine life would probably repopulate the harbor, after the low-oxygen water moves out, but that could take months or even years...

Source: <http://www.nbcnews.com/news/other/nature-will-have-clean-hawaii-molasses-leak-killed-thousands-fish-f8C11137030>

68 Explain how the molasses spill caused many of the animals to die off. [1]

69 State *one* reason why the die-off could attract sharks, barracuda, and eels to the harbor and lagoon. [1]

70 Identify *one* group of organisms responsible for the recycling of dead sea life that is *not* mentioned in the article. [1]

71 Explain why it is important to preserve the biodiversity of the Honolulu Harbor ecosystem. [1]

72 Predict what will most likely happen to this ecosystem in 20 years if no other disasters occur. [1]

Part D

Answer all questions in this part. [13]

Directions (73–85): For those questions that are multiple choice, record on the separate answer sheet the *number* of the choice that, of those given, best completes each statement or answers each question. For all other questions in this part, follow the directions given and record your answers in the spaces provided in this examination booklet.

Note: The answer to question 73 should be recorded on your separate answer sheet.

73 On various Galapagos islands, finch species have different diets: seeds, insects, flowers, the blood of seabirds, and leaves. This is evidence that each species has a different

- | | |
|----------------------|--------------|
| (1) mating behavior | (3) niche |
| (2) nesting material | (4) predator |

Note: The answer to question 74 should be recorded on your separate answer sheet.

74 A person's pulse rate generally goes down while sleeping. One reason for this decrease is

- (1) the body is producing more carbon dioxide when a person is sleeping
- (2) a person is not using energy while sleeping
- (3) a person requires less oxygen when sleeping
- (4) the body is using more nutrients while asleep

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Base your answers to questions 75 through 77 on the information below and on your knowledge of biology.

Unique populations of giant tortoises live in the Galapagos Islands. This is the same group of islands where Darwin studied his famous finches. It is thought that the original ancestors of today's giant tortoises came from the mainland of South America. These animals left and drifted in the ocean to the islands where they began to live, reproduce, and evolve. Each of the islands has a different habitat. Each species varies in shell shape and body structure. Information about two of these species of giant tortoises and their habitats is found in the table below.

Giant Tortoises of the Galapagos Islands	
Tortoise Shell Type	Habitat and Body Description
<p>Dome-shaped</p> 	<ul style="list-style-type: none">• The island receives a lot of rain, and there is an abundant amount of available food (plant material).• The tortoises have shorter necks. They do not have to reach for food.
<p>Saddle-backed</p> 	<ul style="list-style-type: none">• The land on the island is dry, so there is limited available plant food.• The tortoises have long necks and legs, which allow them to reach for scarce food.

Adapted from: [BenchPrep.com/blog/AP Biology-evolution-part-1/](http://BenchPrep.com/blog/AP%20Biology-evolution-part-1/)

Note: The answer to question 75 should be recorded on your separate answer sheet.

75 Which statement best explains the differences observed in the tortoises on each island?

- (1) Each tortoise adapted to its environment during its lifetime.
- (2) Sudden mutations changed the appearance of all of the tortoises.
- (3) The tortoises grew different structures based on the available food.
- (4) Different adaptations gave some tortoises a better chance of survival.

Note: The answer to question 76 should be recorded on your separate answer sheet.

- 76 When the saddle-backed tortoises extend their long necks out of the shell, they are unprotected from attack. Scientists hypothesize that during the evolution of this tortoise, they had few predators. Which statement best supports this hypothesis?
- (1) Competition between the predators and the tortoises would have resulted in a greater number of long-necked tortoises.
 - (2) The number of predators was greater than the number of tortoises.
 - (3) Saddle-backed tortoises were not a part of the food chain.
 - (4) Predators would have killed the tortoises with long necks, leaving more tortoises with shorter necks.
- 77 If a group of saddle-backed tortoises were brought to an island inhabited by dome-shaped tortoises, could both species survive? Circle yes *or* no and support your answer. [1]

Circle one: Yes *or* No

- 78 During the laboratory activity *The Beaks of Finches*, you obtained food under two conditions: with competition and with no competition. State *one* way the results obtained from these two conditions differed when you did this activity. [1]

- 79 An investigation was carried out to determine the effects of exercise on the human body. Identify *one* body system, other than the circulatory system, that becomes more active as a result of exercise. State *one* change the system you identified will undergo as a result of becoming more active. [1]

Body system: _____

Change: _____

Base your answers to questions 80 through 82 on the information below and on your knowledge of biology.

A student designed an experiment to investigate a claim that athletes would have lower heart rates than nonathletes during exercise. After the students classified themselves as an athlete or a nonathlete, their resting pulses were determined. Then all the students performed the same exercise for four minutes and their heart rates were determined by recording the pulse rate in beats per minute. The students continued to measure their pulse rates for an additional four minutes. The average heart rate per minute for each group was determined. The data were recorded, as shown on the table below.

Average Heart Rate Response to Exercise (beats per minute)

	Time (minutes)	Athlete Students	Nonathlete Students
Resting Pulse	0	68	72
Exercising Period	1	76	78
	2	82	90
	3	95	115
	4	110	130
After Exercise	5	100	125
	6	95	120
	7	85	100
	8	68	95

80 State *one* appropriate hypothesis for this experiment. [1]

Note: The answer to question 81 should be recorded on your separate answer sheet.

81 Which statement is best supported by the data in the chart?

- (1) After exercise, the nonathletic students had a lower heart rate than the athletic students.
- (2) After exercise, the heart rates of the athletic students returned to resting pulse in four minutes.
- (3) During exercise, both groups of students had the same increase above their resting pulse.
- (4) During exercise, the athletic students had a higher heart rate than the nonathletic students.

Note: The answer to question 82 should be recorded on your separate answer sheet.

82 To improve the validity of the conclusion reached in this experiment, the students should repeat the experiment

- (1) disregarding any data that don't fit the hypothesis
- (2) with a larger number of athletes and nonathletes
- (3) comparing the heart rates and breathing rates of males and females
- (4) with the athletes doing different exercises than the nonathletes

Base your answer to question 83 on the information below and on your knowledge of biology.

A student added glucose indicator to a beaker of an unknown liquid. Starch indicator was added to a different beaker containing an equal amount of the same unknown liquid. The color of the indicator solutions before they were added to the beakers and the color of the contents of the beakers after adding the indicator solutions are recorded in the chart below.

Beaker	Solution	Color of Indicator Solution Before Adding to Beaker	Color of Contents of Beaker After Adding Indicator Solution
1	unknown liquid + glucose indicator	blue	blue (after heating)
2	unknown liquid + starch indicator	amber	blue-black

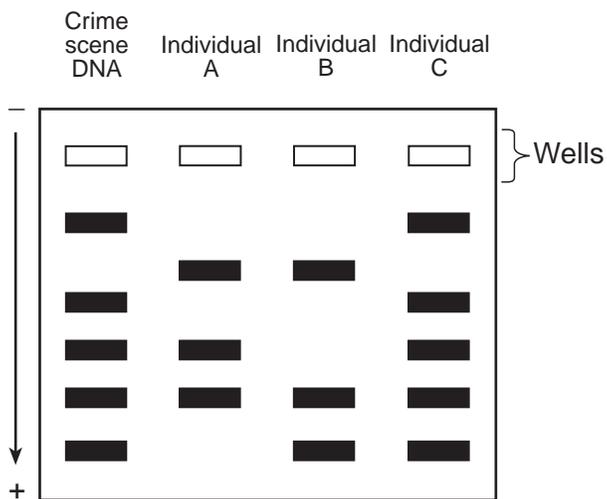
83 State *one* conclusion the student would make about the unknown liquid based on the results. Support your answer with information from the data table. [1]

84 While getting ready to perform the *Making Connections* lab, a teacher did not have enough of the old wooden clothespins she was handing out to the students to squeeze in the lab. The teacher opened a bag of new plastic clothespins and handed them out to the students who had not received a wooden clothespin.

Explain why using new clothespins for some students and not others was an error in the experimental procedure. [1]

Base your answer to question 85 on the information and diagram below and on your knowledge of biology.

An unknown sample of DNA found at a crime scene was compared to DNA samples taken from three individuals. The results of the technique used to compare the samples are represented below.



85 What factor causes the DNA fragments to move in this technique? [1]

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