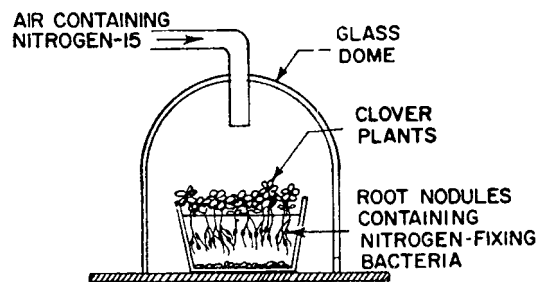


Name: \_\_\_\_\_

Date: \_\_\_\_\_

1. A variation causes the production of an improved variety of apple. What is the best method to use to obtain additional apple trees of this variety in the shortest period of time?
- A. selective breeding
  - B. natural selection
  - C. asexual reproduction
  - D. hormone therapy

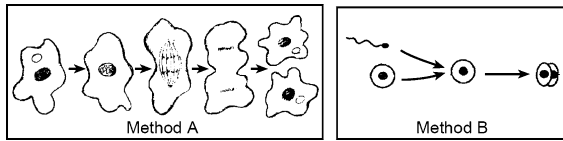
2. In the laboratory setup shown, clover plants containing nitrogen-fixing bacteria are cultured under a glass dome and receive air through an opening in the top. The air used contains nitrogen-15 in place of normal nitrogen. After two weeks, a grasshopper is allowed to feed on the clover plants.



When the grasshopper dies, its tissues will be decomposed. An immediate effect of this decay on the surrounding environment would be that

- A. less nitrogen is available than before the grasshopper's death
- B. ammonia is taken in by nitrogen-fixing bacteria
- C. animal protein is absorbed by clover plants
- D. nitrogen is available for further recycling by soil microorganisms

3. How does the type of reproduction shown in method A in the accompanying diagram differ from the type of reproduction shown in method B?



- A. Method A illustrates sexual reproduction, and method B illustrates asexual reproduction.
- B. Offspring produced by method B will be genetically alike, but offspring produced by method A will be genetically different.
- C. The two cells shown in the last step of method A are genetically alike, but the two cells shown in the last step of method B are genetically different.
- D. Offspring produced by method A will be genetically like the parent, but offspring produced by method B will be genetically different from the parents.

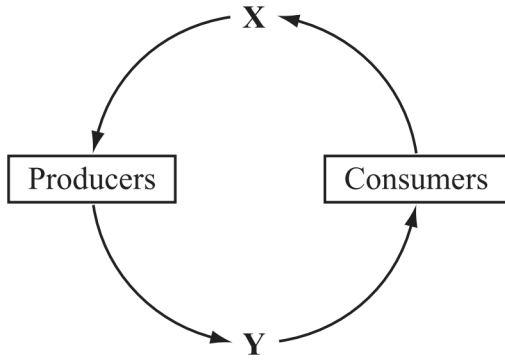
4. Information related to the organisms found on Earth during various geological time periods is represented in the accompanying chart.

Common Organisms				
	Time 4.6 (?) Billion Years Ago	600 Million Years Ago	200 Million Years Ago	60 Million Years Ago
	Period Precambrian (Simple Multicellular Organisms and First Protists)	Paleozoic (Age of Amphibians, Fishes, and Invertebrates)	Mesozoic (Age of Reptiles)	Cenozoic (Age of Mammals)
	Past ←————→ Geologic Time —————→ Present			

Which statement concerning the first appearance of the organisms over the time period represented in this chart is most likely correct?

- A. Life on Earth has remained the same.
- B. Life on Earth has changed from primitive organisms to more complex organisms.
- C. Life on Earth began with complex organisms and changed to more complex organisms.
- D. Life on Earth has changed rapidly.

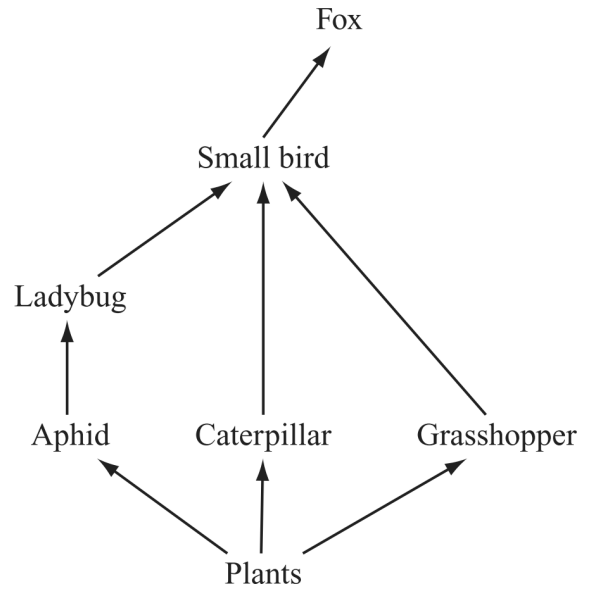
5. A simple diagram of nutrient cycling is shown below.



What substances do **X** and **Y** represent in this nutrient cycle?

- A. Substance **X** is salt and substance **Y** is water.
- B. Substance **X** is glucose and substance **Y** is starch.
- C. Substance **X** is nitrogen and substance **Y** is ammonia.
- D. Substance **X** is carbon dioxide and substance **Y** is oxygen.

6. A partial food web is shown below. The insect species in this food web are ladybugs, aphids, caterpillars, and grasshoppers.

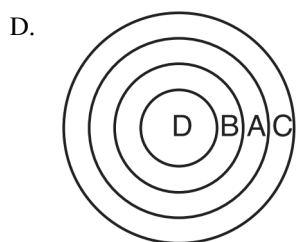
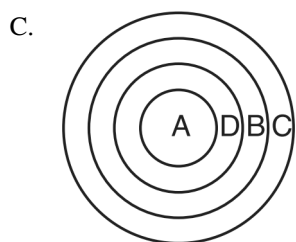
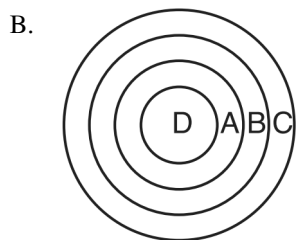
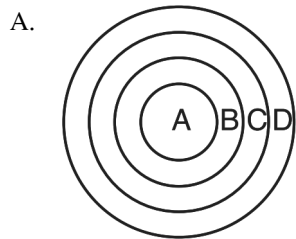


Which of the following statements describes what will *most likely* happen if another animal that preys on insects enters the community?

- A. The plant populations will decrease.
- B. The ladybug population will increase.
- C. The small bird population will decrease.
- D. The grasshopper population will increase.

7. Which diagram best represents the relative locations of the structures in the list below?

- A—chromosome
- B—nucleus
- C—cell
- D—gene



8. A scientist has discovered a new plant, Plant X. After comparing it to known carnivorous plants, she made the hypothesis that Plant X is a carnivorous plant. Study the chart below showing characteristics of two carnivorous plants and Plant X.

**Plant Characteristics**

Venus Flytrap	Pitcher Plant	Plant X
Grows in bogs lacking nitrogen in soil	Grows in bogs lacking nitrogen in soil	Grows in bogs lacking nitrogen in soil
White blossoms attract insects	Honey smell attracts insects	Pink blossoms attract insects
Leaves make digestive fluid	Leaves make digestive fluid	Leaves make digestive fluid
Traps insect by closing leaves	Drowns insects in water in leaves	

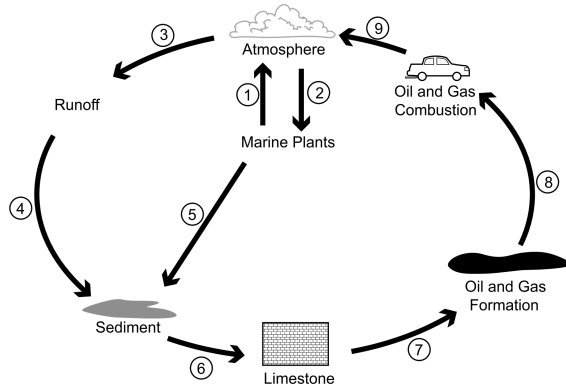
Which of the following facts noted by the scientist would complete the chart to prove her hypothesis?

- A. Many kinds of insects are in the area.
- B. Insects like to eat the plant's pink blossom.
- C. The plant has chlorophyll for photosynthesis.
- D. An insect is caught in the blossom's sticky fluid.

9. Scientists classify humans as omnivores, based on their teeth. As omnivores, humans eat

- A. only fungi
- B. mostly plants and animals
- C. only animals
- D. mostly bacteria and fungi

10. The diagram below shows carbon cycling associated with oil and gas consumption.

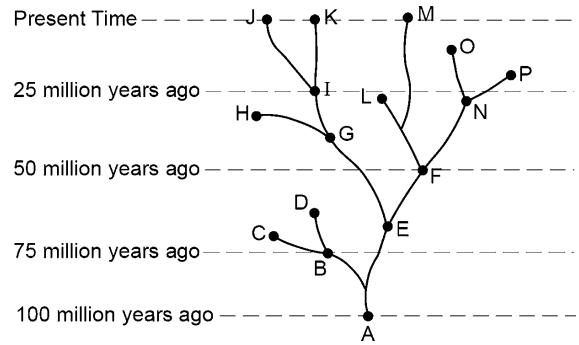


Which arrow on the carbon cycle diagram represents the process that takes the longest amount of time to occur?

- A. 1      B. 3      C. 5      D. 7
11. Evidence that best supports the theory of biological evolution was obtained from the

- A. investigation of environmental niches  
 B. study of fossil records  
 C. comparison of the number of cells in organisms  
 D. analysis of food chains and food webs

12. The diagram illustrates a proposed evolutionary path of certain organisms, based on the theory of evolution.



Which statement could best be inferred from the information in this diagram?

- A. Evolution does not involve gradual change.  
 B. Evolutionary changes can result in extinction.  
 C. Evolution begins with plants.  
 D. Evolution produces organisms that all fill the same niche.

13. DNA electrophoresis is used to study evolutionary relationships of species. The diagram below shows the results of DNA electrophoresis for four different animal species.

Species A	Species X	Species Y	Species Z
—	—	— —	—  —
—	— —	—	— —
—	—	— —	— —
—	—	—	—
—	—		—

Which species has the most DNA in common with species A?

- A. X and Y, only      B. Y, only  
C. Z, only              D. X, Y, and Z

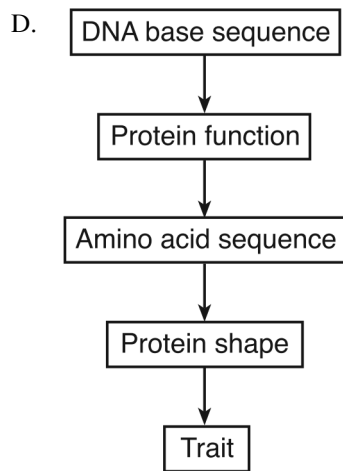
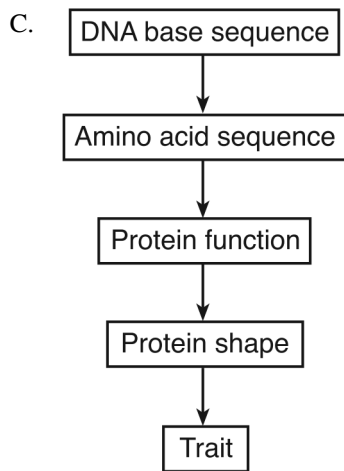
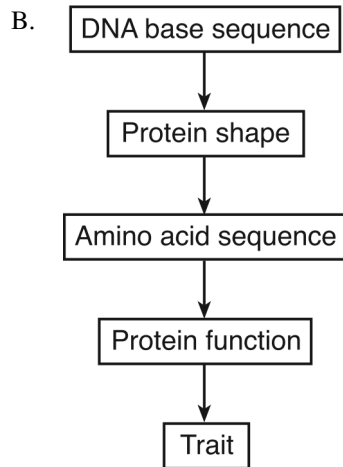
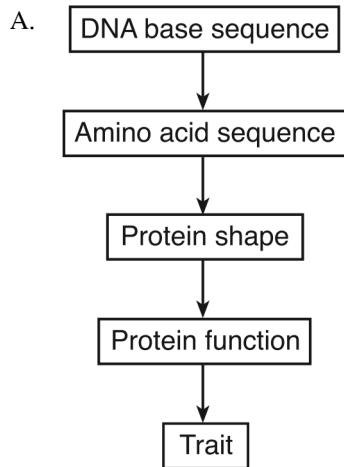
14. If 15% of a DNA sample is made up of thymine, T, what percentage of the sample is made up of cytosine, C?

- A. 15%    B. 35%    C. 70%    D. 85%

15. A mutation occurs in the liver cells of a certain field mouse. Which statement concerning the spread of this mutation through the mouse population is correct?

- A. It will spread because it is beneficial.  
B. It will spread because it is a dominant gene.  
C. It will not spread because it is not in a gamete.  
D. It will not spread because it is a recessive gene.

16. Which sequence best represents the relationship between DNA and the traits of an organism?



17. The diagram below represents a segment of a gene on two chromosomes.

Normal gene

A	T	A	C	C	T
---	---	---	---	---	---

Mutated gene

A	T	G	C	C	T
---	---	---	---	---	---

The change in the gene sequence is an example of

- A. an insertion
- B. a deletion
- C. a substitution
- D. a replication

18. Which human activity has probably contributed most to the acidification of lakes in the Adirondack region?

- A. passing environmental protection laws
- B. establishing reforestation projects in lumbered areas
- C. burning fossil fuels that produce air pollutants containing sulfur and nitrogen
- D. using pesticides for the control of insects that feed on trees

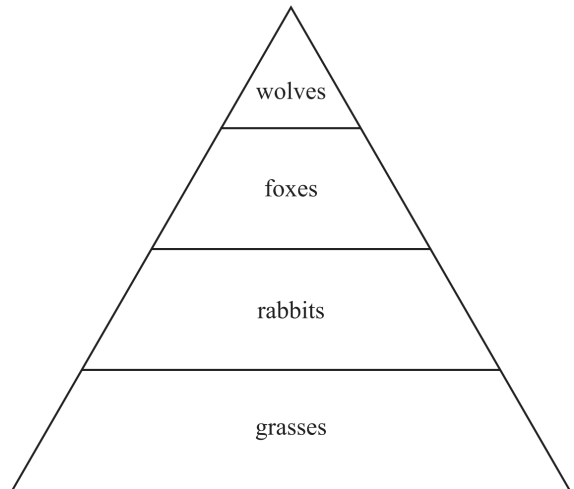
19. The data table below compares three features of four plants. The four plants are in the same plant family.

Plant Name	Flower Color	Stem Shape	Height (centimeters)
Common sage	Purple	Square	60
Clary sage	White	Square	100
Russian sage	Purple	Square	120
Lampwick plant	White	Square	150

What feature must a plant have to be grouped into this plant family?

- A. purple flowers
- B. square stems
- C. a height less than 90 centimeters
- D. a height greater than 90 centimeters

20. The picture below shows an energy pyramid.



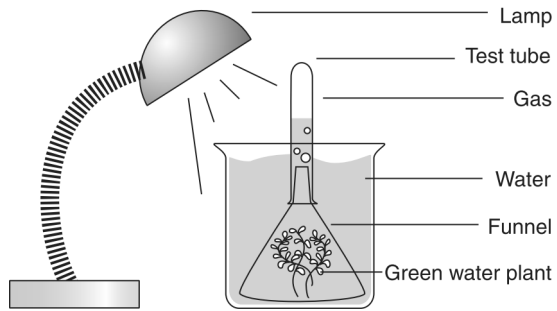
What will *most likely* happen to the foxes and the wolves if the rabbits are removed?

- A. The foxes will eat more wolves.
- B. The foxes will eat fewer wolves.
- C. There will be more foxes and wolves.
- D. There will be fewer foxes and wolves.



21.

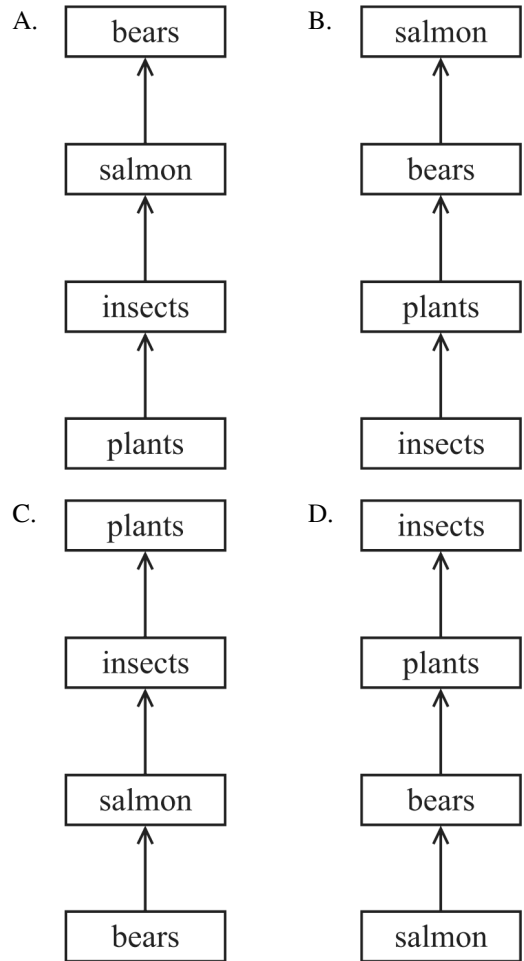
### Photosynthesis Experiment



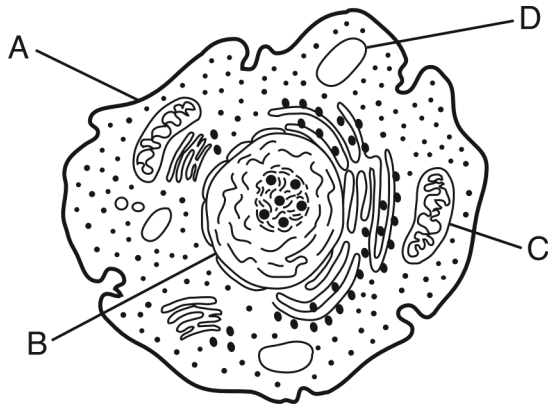
Which gas is forming in the test tube shown above?

- A. carbon dioxide
- B. hydrogen
- C. oxygen
- D. nitrogen

22. Which model *correctly* shows energy flow in a food chain?



23. The diagram below represents a cell.



Which statement concerning ATP and activity within the cell is correct?

- A. The absorption of ATP occurs at structure A.
- B. The synthesis of ATP occurs within structure B.
- C. ATP is produced most efficiently by structure C.
- D. The template for ATP is found in structure D.

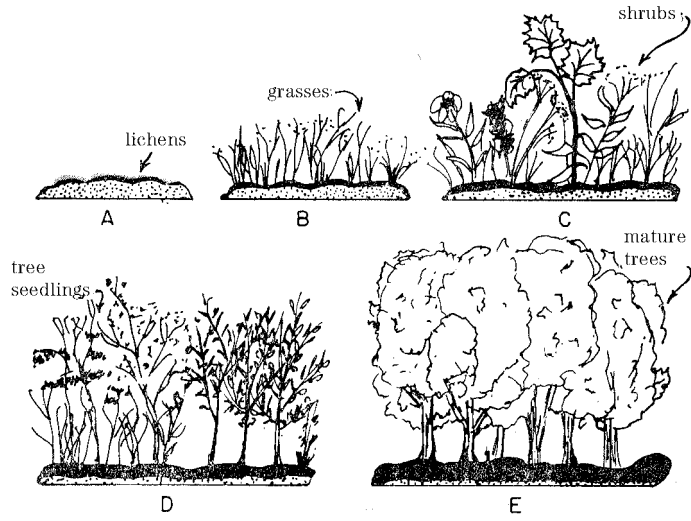
24. A scientist discovers a new organism that has the characteristics listed below.

- It is multicellular.
- It can make its own food.
- Each cell contains a nucleus.
- A cell wall made of cellulose surrounds each cell.

Into which group should this organism be classified?

- A. animals
- B. plants
- C. fungi
- D. bacteria

25. The sequence *A* through *E* represents stages of ecological succession in a given area.



In this sequence, which diagram represents a climax stage?

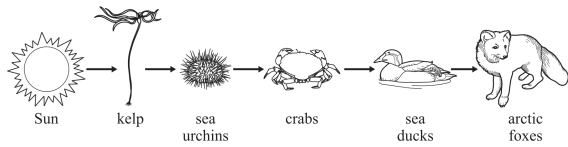
A. *E*

B. *B*

C. *C*

D. *D*

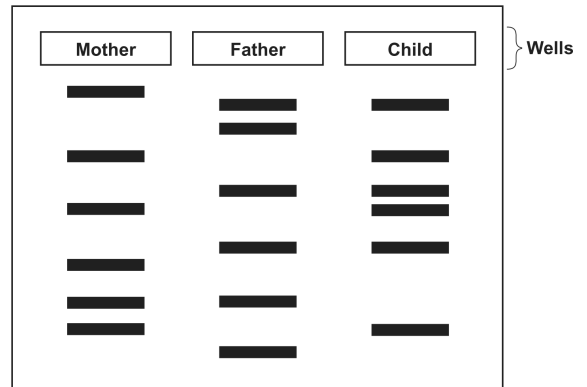
26. The picture below shows an ocean bay food chain.



Sea otters move into the ocean bay. They eat all the sea urchins. This change will cause the

- A. kelp to have less food.
- B. crabs to have more food.
- C. sea ducks to have less food.
- D. arctic foxes to have more food.

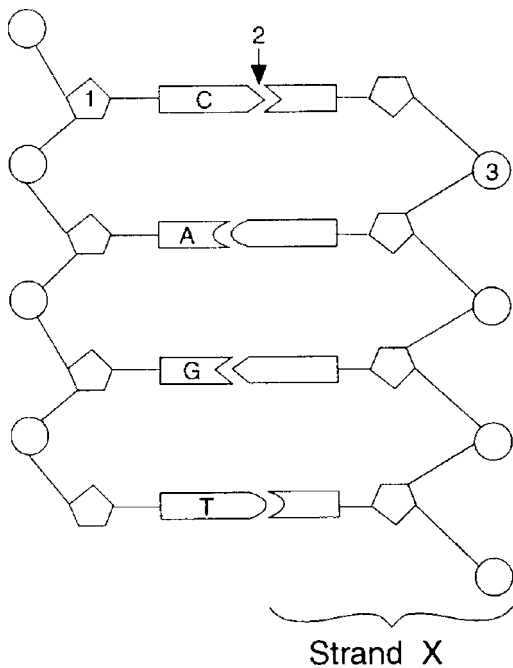
27. The parents of a new baby believe they brought the wrong child home from the hospital. Gel electrophoresis was performed using DNA samples from the parents and the child. A section of the gel electrophoresis results is shown below.



Which conclusion is valid based on the gel electrophoresis results?

- A. They have the correct child, because her genetic information is identical to that of the father.
- B. They have the wrong child, because her genetic information does not match that of either parent.
- C. They have the correct child, because her genetic information came from both parents.
- D. They have the wrong child, because her genetic information matches only that of the mother.

28. Base your answer(s) to the following question(s) on the diagram below of a DNA molecule and on your knowledge of biology.

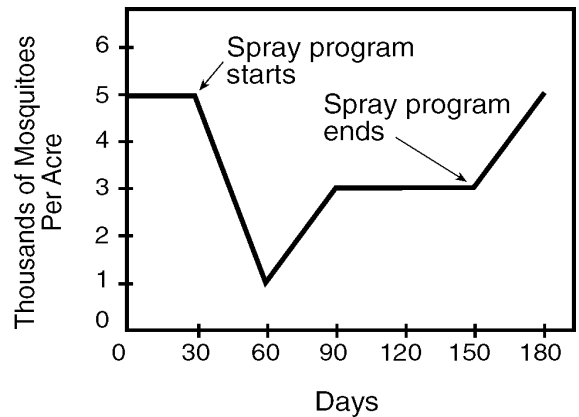


What is the base sequence of strand X?

- A. G-T-A-C                      B. T-G-C-A  
 C. G-T-C-A                      D. A-T-C-G
29. When a person's teeth are being x rayed, other body parts of this person are covered with a protective lead blanket to prevent
- A. loss of hair  
 B. increase in cell size  
 C. changes in DNA molecules  
 D. changes in glucose structure

30. Base your answer(s) to the following question(s) on the information below and on your knowledge of biology.

A small village was heavily infested with mosquitoes. The village was sprayed weekly with an insecticide for a period of several months. The results of daily counts of the mosquito population are shown in the graph below.



Which statement best explains the decreased effectiveness of the insecticide?

- A. The insecticide caused mutations that resulted in immunity in the mosquito.  
 B. Mosquitoes resistant to the insecticide lived and produced offspring.  
 C. The insecticide reacted chemically with the DNA of the mosquitoes and was destroyed.  
 D. All of the mosquitoes produced antibodies that activated the insecticide.

31. The puppies shown in the photograph below are all from the same litter.



The differences seen within this group of puppies are most likely due to

- A. overproduction and selective breeding
- B. mutations and elimination of genes
- C. evolution and asexual reproduction
- D. sorting and recombination of genes

32. How do nitrogen-fixing bacteria help cycle nitrogen through ecosystems?

- A. They release nitrogen into the atmosphere when they replicate their DNA.
- B. They convert sunlight into chemical energy which is then stored in the nitrogen.
- C. They convert ammonia from animal feces and urine into forms that plants can use.
- D. They capture nitrogen from the atmosphere and convert it into forms that plants can use.

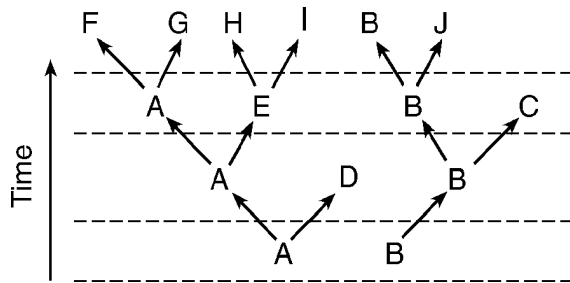
33. According to modern evolutionary theory, genes responsible for new traits that help a species survive in a particular environment will usually

- A. not change in frequency
- B. decrease gradually in frequency
- C. decrease rapidly in frequency
- D. increase in frequency

34. During photosynthesis in plants, what is the source of the carbon in the sugar molecule ( $C_6H_{12}O_6$ )?

- A. carbon dioxide in the air
- B. carbon monoxide in the air
- C. carbon particles in the soil
- D. carbon particles in water

35. Base your answer(s) to the following question(s) on the diagram and on your knowledge of biology. Letters A through J represent different species of organisms. The vertical distances between the dotted lines represent long periods of time in which major environmental changes occurred.



Which species appears to have been most successful in surviving changes in the environment over time?

- A. A      B. B      C. C      D. H

36. Carbon in the atmosphere is *most* often found as which of the following compounds?
- A. stratospheric ozone      B. fossil fuel  
C. carbon monoxide      D. carbon dioxide

37. Which sequence best represents sexual reproduction?

- A. mitosis → gametes → zygote → fertilization  
B. gametes → meiosis → mitosis → fertilization  
C. fertilization → gametes → meiosis → zygote  
D. meiosis → gametes → fertilization → zygote

38. What is the main function of a vacuole in a cell?

- A. storage  
B. coordination  
C. synthesis of molecules  
D. release of energy

MOCT EOCT Part I Section 2 5/3/2019

- |         |   |         |   |
|---------|---|---------|---|
| 1.      |   | 21.     |   |
| Answer: | C | Answer: | C |
| 2.      |   | 22.     |   |
| Answer: | D | Answer: | A |
| 3.      |   | 23.     |   |
| Answer: | D | Answer: | C |
| 4.      |   | 24.     |   |
| Answer: | B | Answer: | B |
| 5.      |   | 25.     |   |
| Answer: | D | Answer: | A |
| 6.      |   | 26.     |   |
| Answer: | C | Answer: | C |
| 7.      |   | 27.     |   |
| Answer: | B | Answer: | C |
| 8.      |   | 28.     |   |
| Answer: | D | Answer: | C |
| 9.      |   | 29.     |   |
| Answer: | B | Answer: | C |
| 10.     |   | 30.     |   |
| Answer: | D | Answer: | B |
| 11.     |   | 31.     |   |
| Answer: | B | Answer: | D |
| 12.     |   | 32.     |   |
| Answer: | B | Answer: | D |
| 13.     |   | 33.     |   |
| Answer: | C | Answer: | D |
| 14.     |   | 34.     |   |
| Answer: | B | Answer: | A |
| 15.     |   | 35.     |   |
| Answer: | C | Answer: | B |
| 16.     |   | 36.     |   |
| Answer: | A | Answer: | D |
| 17.     |   | 37.     |   |
| Answer: | C | Answer: | D |
| 18.     |   | 38.     |   |
| Answer: | C | Answer: | A |
| 19.     |   |         |   |
| Answer: | B |         |   |
| 20.     |   |         |   |
| Answer: | D |         |   |