

VIRGINIA STANDARDS OF LEARNING

Spring 2007 Released Test

# END OF COURSE BIOLOGY

---

Form S0117, CORE 1

**Property of the Virginia Department of Education**

©2007 by the Commonwealth of Virginia, Department of Education, P.O. Box 2120, Richmond, Virginia 23218-2120. All rights reserved. Except as permitted by law, this material may not be reproduced or used in any form or by any means, electronic or mechanical, including photocopying or recording, or by any information storage or retrieval system, without written permission from the copyright owner. Commonwealth of Virginia public school educators may reproduce any portion of these released tests for non-commercial educational purposes without requesting permission. All others should direct their written requests to the Virginia Department of Education, Division of Student Assessment and School Improvement, at the above address or by e-mail to [Student\\_Assessment@doe.virginia.gov](mailto:Student_Assessment@doe.virginia.gov).

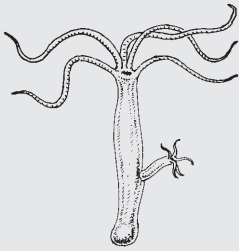
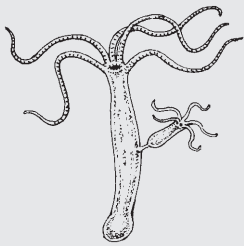
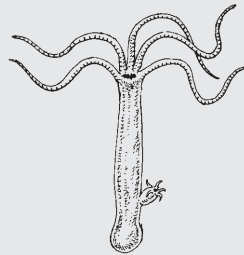
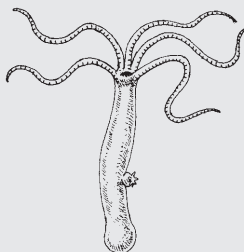


**Directions**

Read each question carefully and choose the best answer. Then mark the space on your answer document for the answer you have chosen.

**SAMPLE**

The following pictures show some stages during asexual reproduction of a hydra. Which picture shows the first step?

**A****B****C****D**

- 1 A student soaked 50 lima bean seeds and 50 green bean seeds in water for 24 hours. Then she planted the seeds in soil at a depth of two centimeters, using the same amount of water, light, and heat for each kind of seed. She measured every three days to determine which type of seed grew the fastest.**

**The paragraph describes —**

- A** an observation
- B** a hypothesis
- C** an experiment
- D** a conclusion

- 2 As the seasons change from summer to fall, there are fewer hours of daylight. Which is a typical response of a dogwood tree to this change?**

- F** Producing flowers
- G** Increasing its growth rate
- H** Dropping its leaves
- J** Shedding bark

- 3 Fungi, such as mushrooms and molds, get their nutrition *primarily* by —**

- A** producing food by chemosynthesis
- B** decomposing dead organic matter
- C** preying on other organisms
- D** parasitic relationships with plants

**4 Which discovery was essential to the concept that all life forms have cells as basic units?**

- F** Water is the chemical solvent involved in many cell processes.
- G** New cells are produced from the division of existing cells.
- H** Some substances in organisms exist outside of cells.
- J** Cells are dependent on energy and nutrients from external sources.

**5 The oxygen content in the atmosphere of the early Earth is thought to have increased significantly once which of these developed?**

- A** Amino acids
- B** Archaeobacteria
- C** Photosynthetic bacteria
- D** Mitochondria

**6 A lab activity requires students to insert potassium hydroxide (KOH) pellets into a narrow tube to absorb carbon dioxide (CO<sub>2</sub>). Pellets of KOH are very caustic and alkaline. Which is the safest way to put the pellets into the tube?**

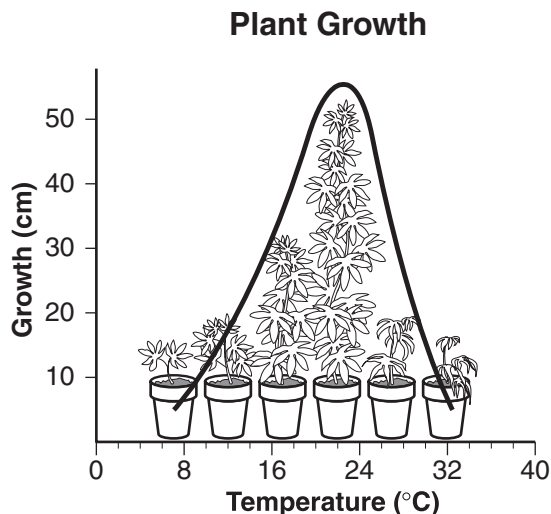
- F** Use fingers to transfer the pellets.
- G** Handle the pellets with paper towels.
- H** Use forceps to transfer the pellets.
- J** Pour the pellets directly from the supply bottle.

**7 Why does sexual reproduction result in greater diversity among offspring than does asexual reproduction?**

- A** Only mitosis must occur in sexual reproduction.
- B** New combinations of genes result from sexual reproduction.
- C** Sexual reproduction may occur at a faster rate.
- D** Mutations are more likely to occur in asexual reproduction.

**8 A scientist wants to study the behavior of bald eagles. Which of these plans should be used to study the hunting habits of bald eagles?**

- F** Analyze the eagles at a zoo for several months.
- G** Observe the eagles along the Potomac River for a year.
- H** Ask a national park ranger questions about eagles.
- J** Research hawks and make inferences about eagles.



Which of these would be the **best** conclusion regarding the experimental results shown?

- A** The tallest this species of plant will ever grow is 50 cm.
- B** This species of plant grew best between 18°C and 26°C.
- C** The ideal temperature for all plant growth is 26°C.
- D** Plants will not grow above 26°C.

**10** In 1847, a scientist noted that when physicians washed their hands before they had contact with their patients, there was a decreased number of infections. This was one of the first clues that —

- F** bacteria generate spontaneously on hands
- G** physicians deliberately infected patients
- H** bacteria are present in water
- J** substances such as bacteria may cause diseases

Island Species Distribution

Island	Number of species common to mainland and island	Number of species unique to island
1	82	2
2	16	84
3	4	98
4	53	11

Biologists surveyed four islands in a chain near a continent. They identified species found on the mainland and those species that were unique to each island. Based on these results, which island is probably farthest from the mainland?

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

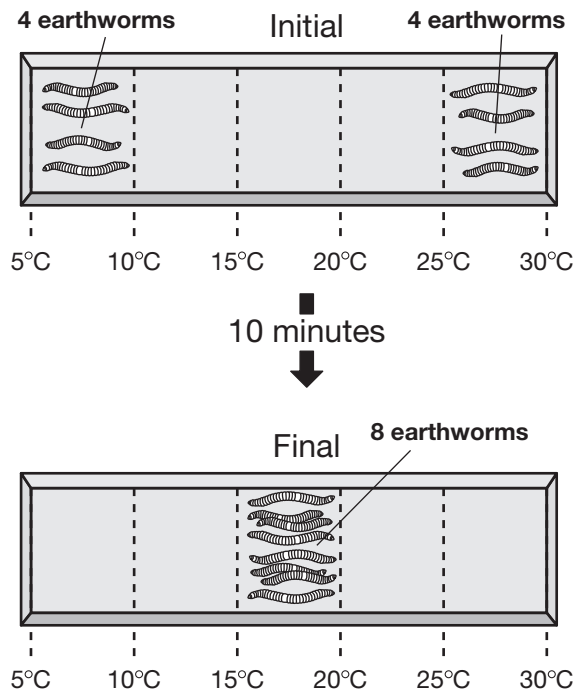




**Monarch butterflies are toxic to birds because monarch caterpillars eat milkweed. Viceroy butterflies closely resemble monarchs, but are not toxic since the caterpillars do not eat milkweed. This similarity in appearance developed because viceroy butterflies that closely resemble monarchs are —**

- F** less likely to be eaten by birds
- G** more likely to mate with monarchs
- H** more likely to eat milkweed
- J** less likely to produce offspring

### Earthworm Experiment



**In a student experiment, 4 earthworms were placed at each end of a compartment as shown. After 10 minutes, all of the earthworms were together in the same area. The students concluded that the earthworms had moved as far as they could in that period of time. Which alternative explanation is also supported?**

- A** The earthworms moved to their preferred temperature range.
- B** The earthworms needed to be with other earthworms for warmth.
- C** The earthworms preferred to be in protected corners.
- D** The earthworms moved randomly until they grouped together.

- 14 The German physician Robert Koch provided evidence to support the germ theory of infectious disease. Koch isolated bacteria from a cow with anthrax, then injected the bacteria into a healthy mouse. To support germ theory, what must have happened to the healthy mouse?**
- F** It became sick.
  - G** It spread smallpox.
  - H** It produced antibiotics.
  - J** It became immune to viral infections.
- 15 Some fish travel from saltwater to freshwater or from freshwater to saltwater but still maintain the concentration of salt in their cells. This is an example of —**
- A** mutation
  - B** positive feedback
  - C** homeostasis
  - D** cellular injury
- 16 A researcher discovers two populations of birds that are similar. The two populations live in habitats that are different. What evidence might suggest to the researcher that the birds belong to different species rather than the same species?**
- F** Some birds appear to be hybrids of the birds in the two populations.
  - G** The birds in the two populations have different mating behaviors.
  - H** Birds in the two populations sometimes feed in different locations.
  - J** The two populations of birds feed at different times of the day.

**Amino-Acid Differences Compared  
with Human Hemoglobin**

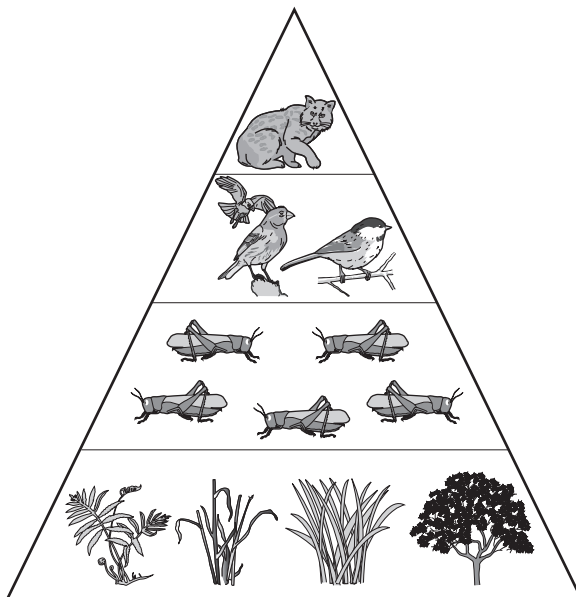
<b>Species</b>	<b>Number of amino-acid differences</b>
Lamprey	125
Frog	67
Dog	32
Macaque	8

The table indicates the number of amino acids that differ in the amino-acid sequence of the hemoglobin from selected organisms when compared to human hemoglobin. On the basis of this information, which organism would be classified as *most* closely related to humans?

- A** Lamprey
- B** Frog
- C** Dog
- D** Macaque

**18** Scientists can use genetic information to identify people because it is unique to each person. Which specific characteristic is unique to an individual?

- F** The shape of the DNA molecules in cells
- G** The number of chromosomes in each cell
- H** The sequence of DNA nucleotides in cells
- J** The size of each chromosome in a cell

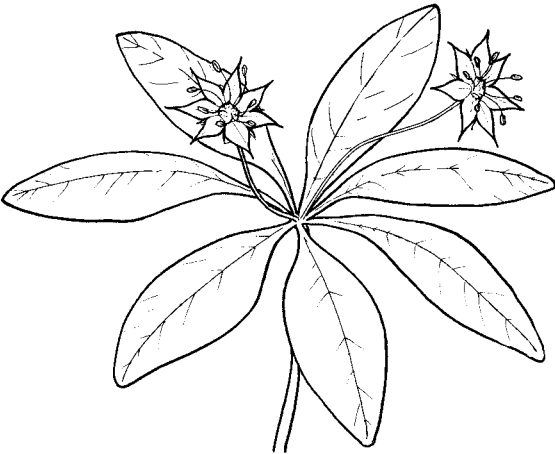


According to the energy pyramid, the *most* energy is present in organisms living at the same level as the —

- A bobcat
- B birds
- C grasshoppers
- D grass

Key to White Wildflowers

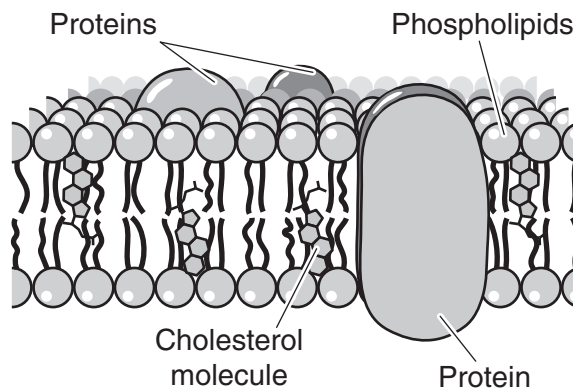
1a. Five petals .....	Go to 2
1b. Seven petals .....	Starflower ( <i>Trientalis borealis</i> )
2a. Petals single pieces .....	Go to 3
2b. Petals deeply divided .....	Chickweed ( <i>Stellaria media</i> )
3a. Wide round petals .....	Common strawberry ( <i>Fragaria virginiana</i> )
3b. Narrow elongated petals .....	Bowman's root ( <i>Gillenia trifoliata</i> )



This dichotomous key can be used to distinguish white wildflowers found in Virginia. According to this key, what type of flower is shown?

- F *Trientalis borealis*
- G *Stellaria media*
- H *Fragaria virginiana*
- J *Gillenia trifoliata*

### Fluid Mosaic Model



**Which is an important function of the cell structure in this model?**

- A** Controlling passage of materials
- B** Packaging cell products for export
- C** Transferring hereditary material to offspring
- D** Preventing a cell from bursting due to osmosis

**22 Fossil records can be studied to determine how organisms change through time. Which of the following methods for studying organisms could *least* likely be accomplished by studying the fossil record?**

- F** Comparing sleep patterns of organisms
- G** Dating organisms by the relative order of their fossils
- H** Comparing homologous structures of organisms
- J** Determining when extinction of species occurred

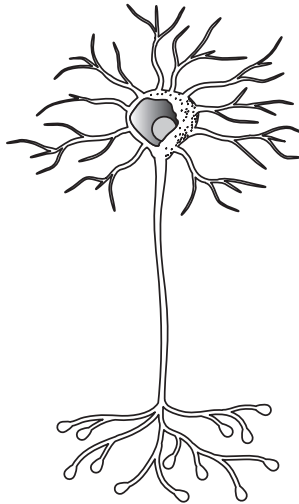
**Cell Structures and Functions**

Structure	Function
1	Protein synthesis
2	Support
3	Control of cell functions
4	Storage of water, wastes, and food

**Which is the name of structure 4?**

- A** Nucleus
- B** Ribosome
- C** Vacuole
- D** Cell wall





**The nerve cell shown has branches that develop during cell specialization. Which of these functions does a nerve cell's branches help the cell perform?**

- F** Communicating with other cells
- G** Moving from location to location
- H** Storing extra DNA
- J** Exerting force on non-nervous tissue

**25 Many marine invertebrates have body surfaces that are permeable to water but not to salt. Osmosis can change the pressure of their body fluids. Fortunately, the ocean is very stable in its salt content. What would happen if a jellyfish were placed in a very low-salt environment such as an estuary?**

- A** It would gain water from the environment.
- B** It would gain nutrients from the water in the environment.
- C** It would lose proteins into the water.
- D** It would lose salt into the water.

The base sequence of an RNA strand that complements this DNA base sequence is —

- F -TGCTA-
- G -ACGAT-
- H -ACGAU-
- J -UGCUA-

27 Organisms from which kingdom are *most* likely to chemically digest their food outside their bodies?

- A Fungus
- B Animal
- C Protist
- D Plant

28 Dutch Elm Disease is a destructive fungal infection that kills elm trees. Some elms are more resistant to the disease than other elms. Which *best* explains this difference?

- F Resistant trees form a symbiotic relationship with the fungus.
- G Resistant trees gain resistant properties from the soil.
- H Resistant trees have beneficial variations of some genes.
- J Resistant trees produce frequent mutations.

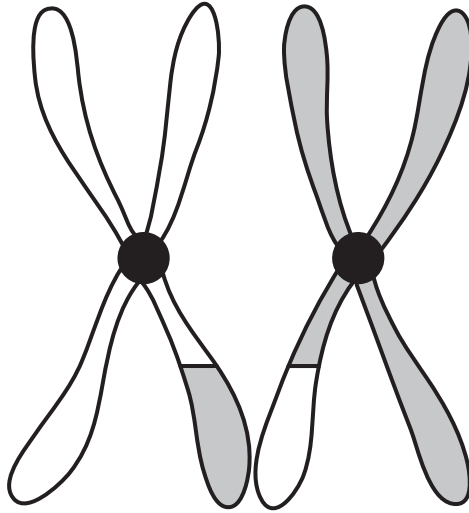
Alexander Oparin hypothesized that early life forms may have been formed by the action of the sun and lightning.

Miller and Urey found that methane, ammonia, and hydrogen gas react to produce amino acids when exposed to temperature fluctuations and electrical current.

Sidney Fox found that heating solutions of amino acids produces primitive "protocells."

**What did the work of these scientists contribute to the study of biology?**

- A** It disproved the theory of spontaneous generation.
- B** It supported hypotheses about the origin of life.
- C** It provided an alternative to the cell theory of life.
- D** It explained the method by which natural selection occurs.



**During meiosis, homologous chromosomes can exchange DNA in a process known as —**

- F** replication
- G** internal fertilization
- H** cytokinesis
- J** crossing over

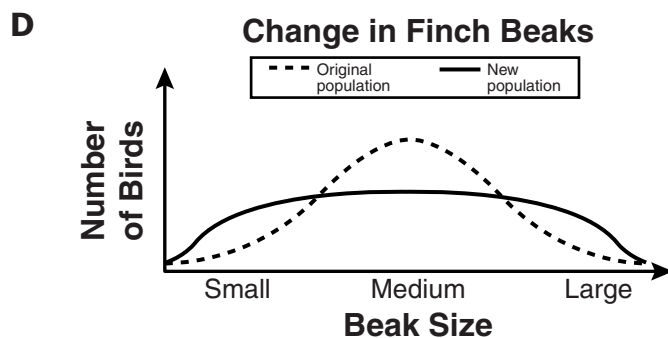
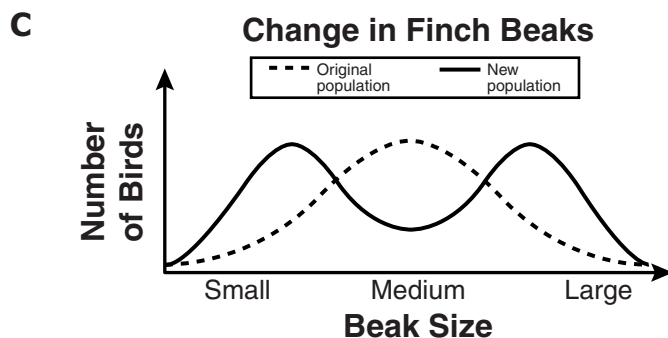
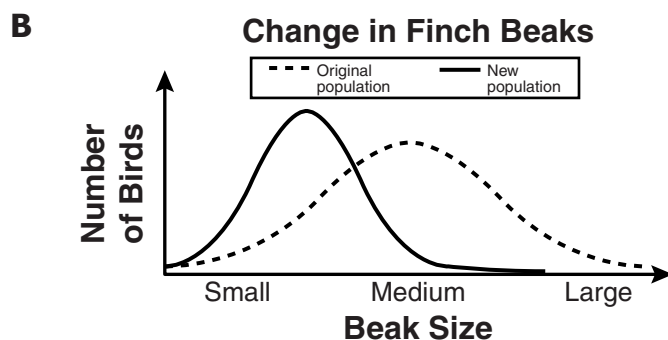
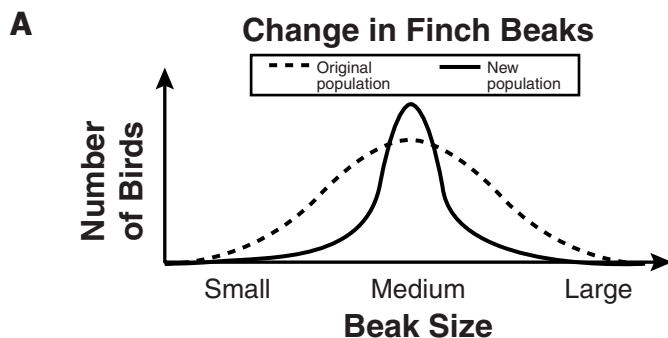
**31 Some snake embryos have small buds resembling limbs. These buds disappear at later stages of embryo development. These findings suggest that these snakes —**

- A** had a parent with limbs
- B** have functional limbs as adults
- C** will have offspring with limbs
- D** evolved from an ancestor that had limbs

**32 The main reason that eating salty foods makes a person thirsty is that additional fluid is needed to —**

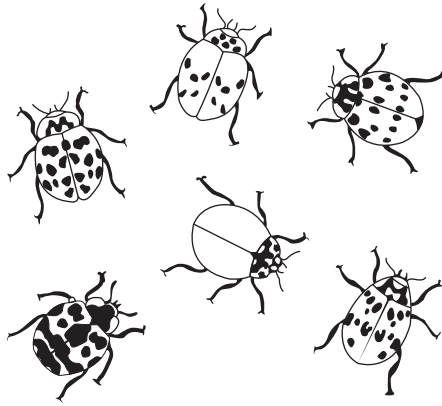
- F** increase the salinity of the blood
- G** dissolve salt crystals in the stomach
- H** maintain the fluid balance in the cells
- J** prevent damage to the lining of the throat

33 Which graph *best* illustrates the expected change in the finch population if the environment changes to favor small beaks?



- 34 A scientist observes that a species of insect appears to be more numerous during dry summers than during wet summers. Which is the next step to determine an explanation of this phenomenon?**
- F** Develop a hypothesis
  - G** Publish the observation
  - H** Observe the species in the winter
  - J** Present a theory in a scientific journal
- 35 A student is planning a field study of a pond in which a large increase in algae populations has been observed. Large numbers of dead fish have also been observed in the pond. To find out what caused the death of the fish, the student should do each of these EXCEPT —**
- A** test for chemicals that might poison fish and cause algae to grow
  - B** measure the dissolved oxygen content in pond-water samples
  - C** look for sources of pollution that may be affecting the pond
  - D** measure the amount of light at various levels in the pond
- 36 In a plant that has red flowers, red flower color,  $R$ , is completely dominant to white flower color,  $r$ . If the plant is heterozygous for flower color, which alleles will be carried by the gametes it produces?**
- F**  $R$  and  $r$
  - G**  $R$  only
  - H**  $r$  only
  - J**  $Rr$  only

### Lady Beetles



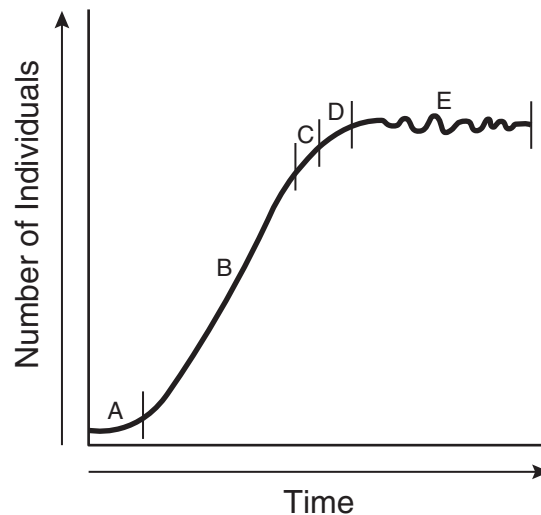
**Charles Darwin proposed his theory of evolution based on observations of nature. Which observation that contributed to his theory is illustrated by this population of beetles?**

- A** Environmental resources are limited.
- B** Populations remain stable over time.
- C** Individuals within a population may vary widely.
- D** Species produce more offspring than can survive.

**38** Many residents in a small town have developed a bacterial infection. Two students hypothesize that the bacteria are coming from the town's drinking water. They look for the bacteria in water samples from the lake that supplies 80 percent of the town's drinking water. When they find no bacteria, the students conclude that the town's residents are *not* getting the bacteria from their drinking water. Which is a source of error in the students' experimental design?

- F** Water from the lake was not tested for other possible pathogens.
- G** Residents of other nearby towns were not tested for the bacteria.
- H** The residents' genetic predisposition for getting ill was not determined.
- J** Other sources of drinking water were not tested for the bacteria.

**39**



Most populations introduced to a new ecosystem grow until factors such as lack of food and overcrowding limit their growth, as illustrated above. What does the portion of the graph labeled B represent?

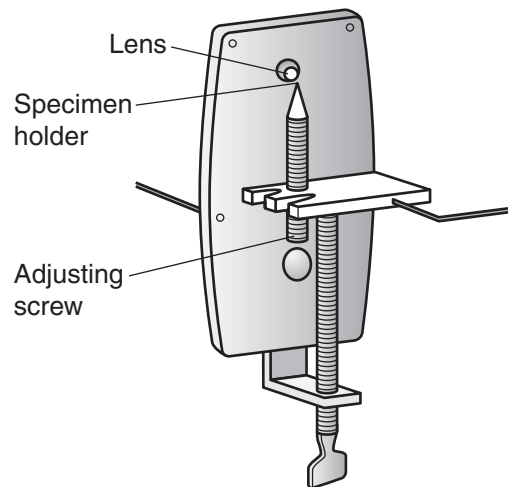
- A** Exponential growth
- B** Slowing growth
- C** Birthrate decrease
- D** Death rate increase



**40** A student plans to conduct an experiment to determine how a change in the pH of water affects the population growth rate of algae. To ensure that her experimental data are valid, she should —

- F** hold the acidity of the water constant
- G** vary the temperature of the water used
- H** control the final algae population sizes
- J** use the same species of algae in all trials

**41**



Using this tool, Anton van Leeuwenhoek was the *first* scientist to —

- A** use a telescope
- B** see microscopic organisms
- C** magnify plants
- D** observe light waves

**42 Viruses are made up of either DNA or RNA surrounded by a coating of protein. When the two main substances that make up a virus are broken into smaller fragments, these fragments are —**

- F** fatty acids and amino acids
- G** amino acids and simple sugars
- H** amino acids and nucleotides
- J** fatty acids and glycerol

**43 Which of these species is *most* closely related to *Felis rufus*?**

- A** *Acer rubrum*
- B** *Selasphorus rufus*
- C** *Felis concolor*
- D** *Canis rufus*

**44 Timothy has attached earlobes like his maternal grandfather. His mother and father both have free earlobes, which are dominant. Which statement *best* explains how Timothy inherited attached earlobes?**

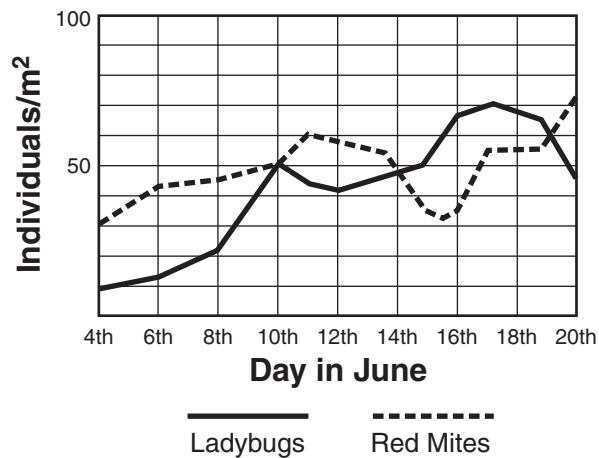
- F** He received a recessive allele from each parent.
- G** He received a dominant allele from each parent.
- H** He received a recessive allele from his mother and a dominant allele from his father.
- J** He received a dominant allele from his mother and a recessive allele from his father.

**45** Cells of a fungus and an animal were being studied. Which of these would be found in both of these cells?

- A** Cell wall
- B** Chloroplasts
- C** Mitochondria
- D** Cilia

**46**

**Ladybug and Red Mite Populations**



The graph shows the populations of ladybugs and the red mites on which they feed. On which date did the ladybug population begin to exceed the red mite population?

- F** June 6
- G** June 10
- H** June 14
- J** June 20

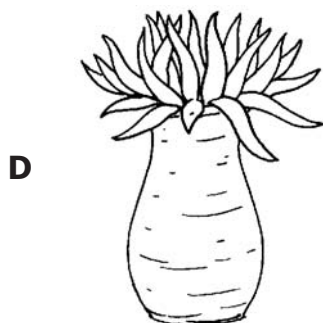
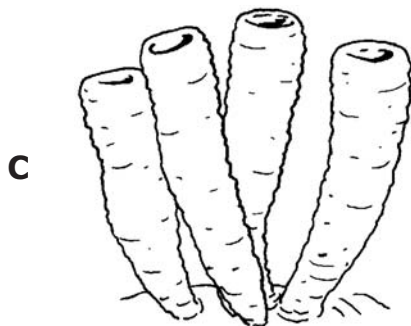
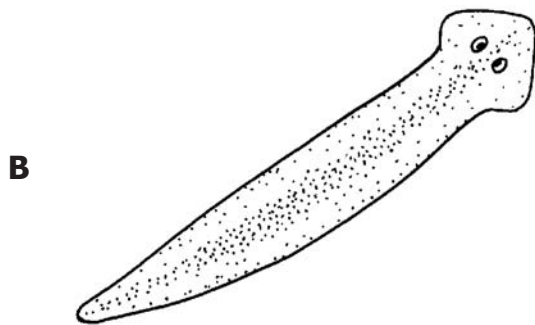
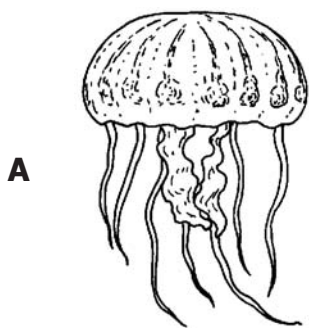
**47 The organisms at the beginning of a food chain are —**

- A** producers
- B** consumers
- C** decomposers
- D** omnivores

**48 The model of DNA used today was proposed by James Watson and Francis Crick in 1953. In this model, what sequence of bases would be complementary to A-G-C-T-A?**

- F** A-G-C-T-A
- G** C-G-C-A-T
- H** A-T-C-G-A
- J** T-C-G-A-T

49 Which of these animals has the same type of symmetry as a vertebrate?



**50 Gymnosperms (a group of plants including conifers) and angiosperms (flowering plants) share many traits but are classified in separate groups. Which is a difference between gymnosperms and angiosperms?**

- F** Only angiosperms form wood.
- G** Only gymnosperms reproduce with spores.
- H** Only angiosperms produce seeds within fruits.
- J** Only gymnosperms have vascular tissue.

