

Student Name \_\_\_\_\_

# OHIO GRADUATION TESTS



## **Science**

### **Base Test**

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March 2005

This test was originally administered to students in March 2005. This publicly released material is appropriate for use by Ohio teachers in instructional settings. This test is aligned with Ohio's Academic Content Standards.

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**SCIENCE TEST**

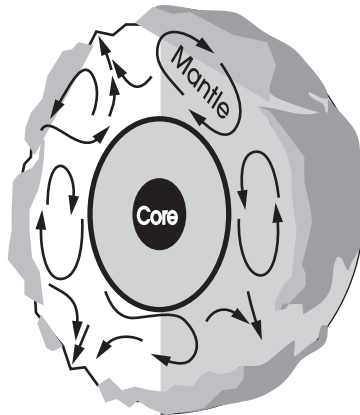
**Directions:** For multiple-choice questions, choose the correct answer then mark the corresponding circle in the Answer Document. If you change an answer, be sure to erase the first mark completely.

For written response questions a gridded area is provided. Using the grid may or may not be necessary to answer the question; however, your response should be written in the gridded area. Be sure to answer the question completely and show all your work in the Answer Document.

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Use the diagram to answer question 1.

**Earth's Cross Section**



1. Scientists believe that forces in Earth's mantle move Earth's crustal plates.

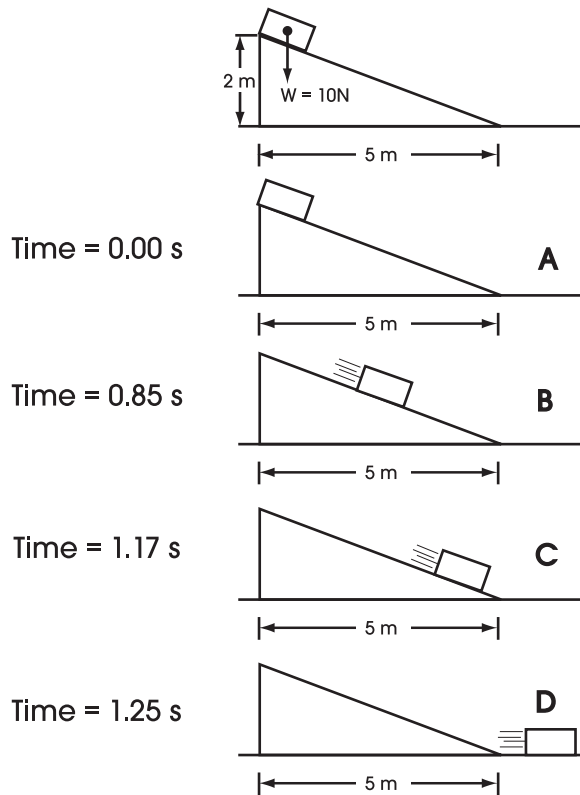
What do the arrows in the diagram represent?

- A. ocean currents
- B. gravity
- C. convection currents
- D. wind patterns

Use the following information to answer questions 2 – 6.

### Inclined Plane Experiment

In doing the following inclined plane experiment in “ideal conditions,” students assume that friction from the air, incline or floor is negligible. A stationary box at the top of a frictionless incline is released and is allowed to slide to the bottom. The figure below illustrates the box in four positions labeled A through D as it is sliding from the incline onto the level floor. As the box moves from the bottom of the incline to the floor, students assume that the box experiences no change in speed, only a change in direction.



2. At what time does the box have the greatest kinetic energy?

- A. 0.00 s
- B. 0.85 s
- C. 1.17 s
- D. 1.25 s

3. The total energy of the box is

- A. always the same.
- B. negative at point D.
- C. increasing with time.
- D. zero before the box is released.

4. Where is the potential energy of the box greatest?

- A. The potential energy is constant throughout the motion.
- B. The potential energy is greatest at the top of the incline.
- C. The potential energy is greatest midway along the incline.
- D. The potential energy is greatest at the bottom of the incline.

5. The weight of the box used in the experiment is 10 Newtons (N) as illustrated in the figure.

The weight of the box is a measure of the

- A. velocity of the box while sliding.
- B. friction between the air and the box.
- C. kinetic energy at the top of the incline.
- D. force acting on the box due to gravity.

6. Assume that the experiment will be repeated in less “ideal” conditions where the effects of friction on the motion of the box cannot be ignored. Predict the effect that significant friction would have on the acceleration of the box as it slides down the incline. Explain the cause of the predicted effect. Respond in the space provided in your **Answer Document**. (2 points)

Use the table to answer question 7.

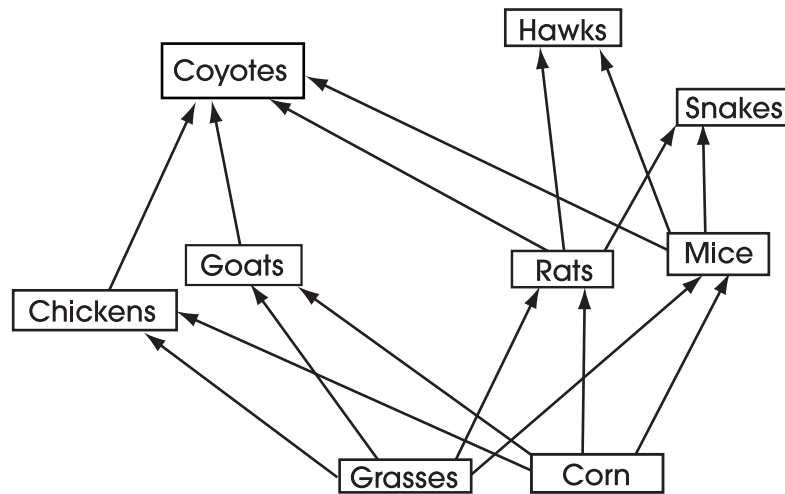
**Speed of Sound in Solids**

<b>Solids</b>	<b>Density (g/cm<sup>3</sup>)</b>	<b>Speed (m/s)</b>
cork	0.25	500
brick	1.80	3650
glass	2.24	4540
stainless steel	7.90	5000

7. For the solids listed in the data table, which seems to be true about the relationship between the speed of sound and density?
- A. The speed of sound decreases as density increases.
  - B. The speed of sound increases as density increases.
  - C. The speed of sound increases as density decreases.
  - D. There is no apparent relationship between density and the speed of sound.
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8. The early development of the theory of plate tectonics was supported by which of these observations?
- A. matching fossils on the continents of Africa and South America
  - B. glacier deposits far from existing continental glaciers
  - C. thick sediment layers at the mouths of rivers
  - D. sudden volcanic activity of long-dormant volcanoes

Use the farmland food web to answer question 9.

Farmland Food Web



9. Many people who raise chickens and other small farm animals consider coyotes to be pests. These people have decreased the coyote population in many parts of the United States.

Which of these is likely a result of the decrease in the number of coyotes in the area?

- A. The mouse population has increased.
- B. The hawk population has decreased.
- C. The grass population has increased.
- D. The goat population has decreased.

10. When a medical technician analyzes human body fluids such as blood, which safety precaution would **not** be necessary?

- A. protective gloves
- B. safety goggles/face shield
- C. closed-toed shoes
- D. lead-lined apron

Use the information to answer questions 11 - 14.

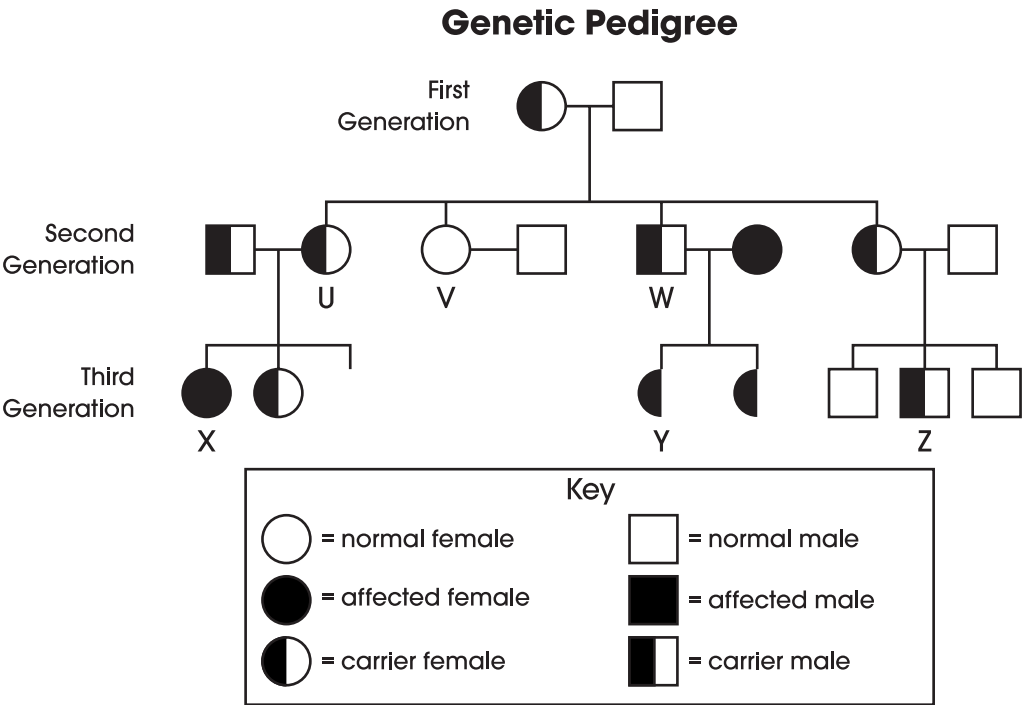
**Sickle cell Disease**

Sickle cell disease is a group of inherited disorders in which deoxygenated red blood cells become distorted and take on a shape like a sickle. There are two common alleles for this gene. One causes normally shaped red blood cells and the other allele causes the red blood cells to have a sickle shape. The sickled cells can lodge in the smallest blood vessels and reduce the circulation of blood to tissues.

The sickle cell allele is most common in areas where the disease malaria is a significant problem, and among people whose ancestors are from those areas. Evidence shows that having just one sickle cell allele makes a person resistant to malaria.

This genetic condition is a recessive trait. When an individual has only one allele for the sickle cell trait, the person is a carrier.

The pedigree below represents a family in which some members have the sickle cell allele.





11. In the genetic pedigree, person U and her husband are considering having another child.

What is the percent chance that this child will develop sickle cell disease?

- A. 25%
- B. 50%
- C. 75%
- D. 100%

12. Draw a Punnett square or comparable diagram for the couple in the first generation of the pedigree. Use **B** to represent the allele for normal red blood cells and **b** to represent the allele for sickle cell disease. How do the couple's actual children compare to the expected results shown in your Punnett square? Respond in the space provided in your **Answer Document**. (4 points)

13. Although sickle cell disease has negative effects on those who suffer from it, the allele is widespread in many parts of the world. This is because in areas where malaria is a significant danger, the sickle cell allele

- A. ceases to cause symptoms.
- B. attacks the parasite that causes malaria.
- C. spreads rapidly in people weakened by malaria.
- D. conveys a health advantage to those who carry the allele.

14. Which person on the pedigree could not pass the allele for sickle cell disease to his/her offspring?

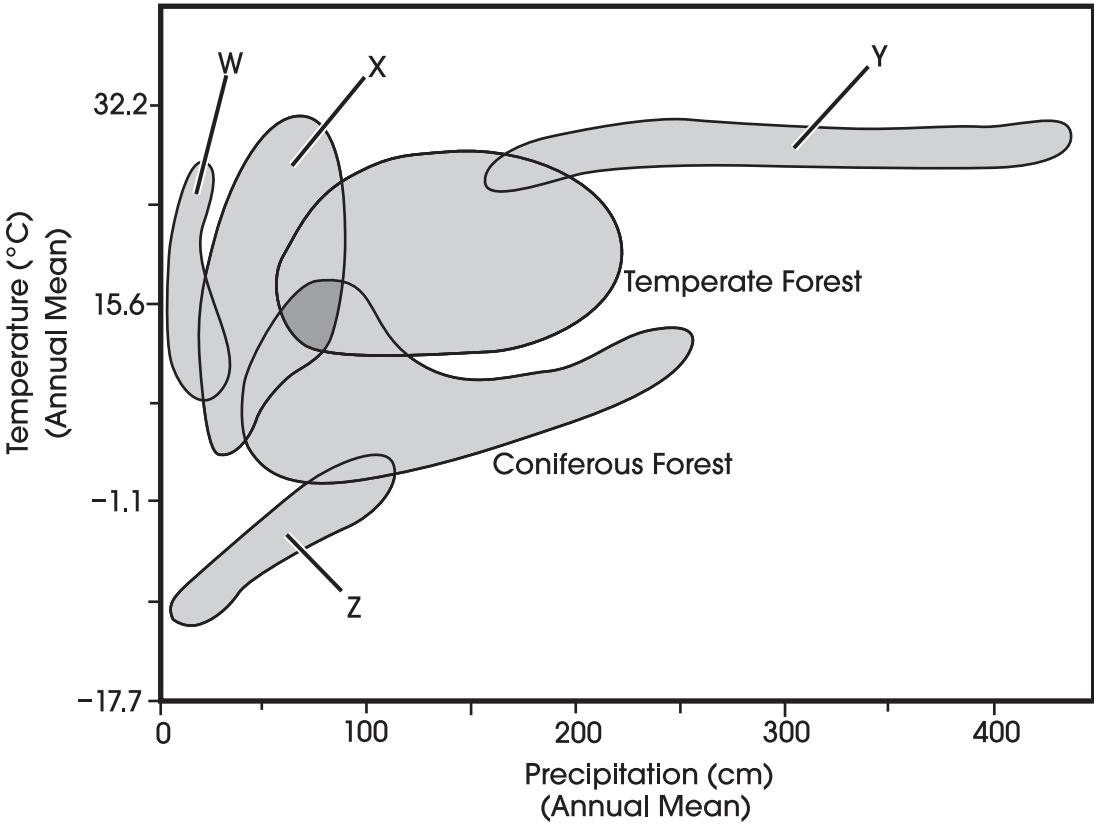
- A. V
- B. X
- C. Y
- D. Z

Use the information and graph to answer questions 15 - 19.

**Biomes**

The following graph shows the ranges of temperature and precipitation for six American biomes, two of which are identified by name.

**Selected North American Biomes**



15. Deserts are consistently the driest biomes in North America. They typically receive very little precipitation but have a wide variation in the mean annual temperature.

Which biome likely represents the deserts?

- A. W
- B. X
- C. Y
- D. Z

16. Based on the graph, what is the primary difference between biomes W and X?

- A. mean number of species
- B. mean annual temperature
- C. mean annual precipitation
- D. mean number of days with sunshine

17. Biome Z would likely be found in which of these locations?

- A. in a valley along the Pacific coast
- B. along a rocky shore in New England
- C. in the middle of the Midwestern plains
- D. above the tree line in the Rocky Mountains

18. Locate biome W and the temperate forest on the graph. Based on the information provided, describe one similarity and one difference between the climates of these two biomes. Respond in the space provided in your **Answer Document**. (2 points)

19. The tundra is the coldest of the biomes, having extremely low temperatures and little precipitation.

What other characteristics would be expected for this biome?

- A. low biotic diversity and sparse vegetation
- B. nutrient rich soil and a long growing season
- C. stable population numbers and high biotic diversity
- D. dense vegetation and large daily temperature fluctuations

20. What type of energy from the oceans is responsible for weather patterns?

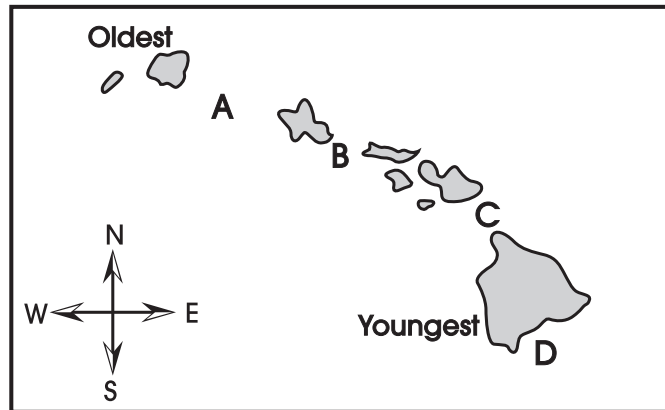
- A. electrical
- B. magnetic
- C. mechanical
- D. thermal

21. When dropped from the same height, why does a flat sheet of paper fall more slowly than the same sheet when it is tightly crumpled into a ball?

- A. The sheet of paper has less mass when it is flat than it does when it is crumpled.
- B. The sheet of paper weighs less when it is flat than it does when it is crumpled.
- C. The force of gravity has a greater effect on the crumpled paper than it does on the flat paper.
- D. The flat sheet of paper has greater surface area and encounters more air resistance than when it is crumpled.

Use the map to answer question 22.

Map of the Hawaiian Island Chain



22. The Hawaiian Islands are riding on the Pacific Plate as it moves northwestward. They are being formed as the plate moves over a hot spot in the mantle.

Where is the next volcano likely to form?

- A. A
- B. B
- C. C
- D. D

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23. When examining the red shift of galaxies outside our own, every galaxy appears to be moving away from the observer. This observation supports the Big Bang Theory because it indicates that

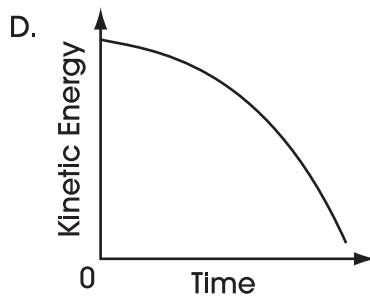
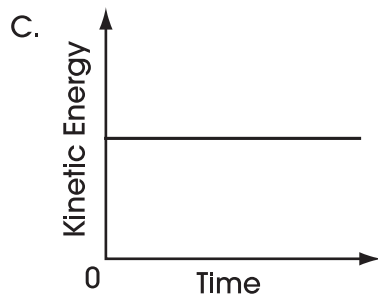
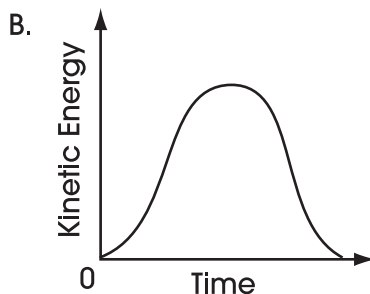
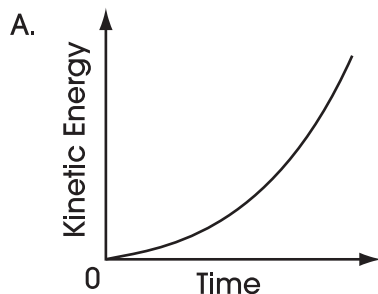
- A. our galaxy is not moving.
- B. the universe is expanding.
- C. most galaxies have the same mass.
- D. Earth is at the center of the universe.

## Science

24. In 1960, physicist Theodore Maiman constructed the first working laser. This design was improved upon by Bell Telephone Laboratories in 1961. Since then, lasers have been found to have a wide variety of applications. Identify one application of laser technology and explain how this application has impacted society. Respond in the space provided in your **Answer Document**. (2 points)

25. When a space shuttle is launched, it continues to accelerate for several minutes.

Which graph shows the kinetic energy of the space shuttle during the first few minutes of flight? (Launch time = 0)



26. Our solar system is thought to have formed from a nebula of dust and gas. Most of this nebula condensed to form the sun.

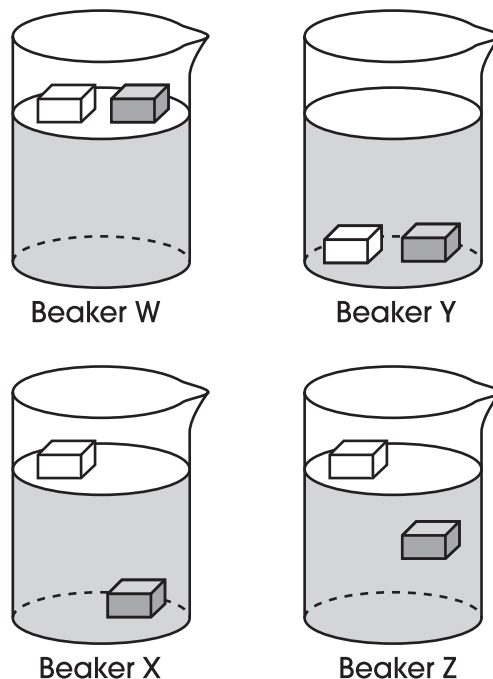
What is primarily responsible for causing these materials to condense?

- A. electrical attraction between charged dust particles
  - B. gravitational pull of nebula materials on each other
  - C. heat released by nuclear fusion at the center of the nebula
  - D. chemical reactions between hydrogen and other nebula gases
27. When methane ( $\text{CH}_4$ ) is burned in the presence of oxygen ( $\text{O}_2$ ), the two chemicals react together in a process called combustion.

Which of these compounds could be a possible product of this combustion reaction?

- A.  $\text{NH}_3$
- B.  $\text{SO}_2$
- C.  $\text{H}_2\text{O}$
- D.  $\text{CS}_2$

28. Gertrude cut two bars of different types of soap into four pieces each. She put one piece from each bar into each of four beakers, labeled Beaker W, Beaker X, Beaker Y and Beaker Z. Each beaker contained a different unknown liquid.



According to the results shown above, which beaker contained the liquid that was densest?

- A. Beaker W
- B. Beaker X
- C. Beaker Y
- D. Beaker Z

On the March 2005 Ohio Graduation  
Science Test, questions 29 – 34 are field  
test items that are not released.



Use the partial periodic table to answer question 35.

6	— Atomic number
C	— Symbol
Carbon	— Name
12.0107	— Average Atomic Mass

**Partial Periodic Table of the Elements**

IA 1	IIA 2	IIIA 13	IVA 14	VA 15	VIA 16	VIIA 17	VIIIA 18
1 H Hydrogen 1.00794	4 Be Beryllium 9.0122	5 B Boron 10.811	6 C Carbon 12.0107	7 N Nitrogen 14.0067	8 O Oxygen 15.9994	9 F Fluorine 18.9984	2 He Helium 4.0026
2 3 Li Lithium 6.941	12 Mg Magnesium 24.3050	13 Al Aluminum 26.98154	14 Si Silicon 28.0855	15 P Phosphorus 30.9738	16 S Sulfur 32.065	17 Cl Chlorine 35.4527	10 Ne Neon 20.1797
3 11 Na Sodium 22.9898	20 Ca Calcium 40.078	18 Ar Argon 39.948					
4 19 K Potassium 39.0983							

35. Suppose scientists discovered four new elements (W, X, Y, Z) while studying rock and soil samples brought back from a Mars mission. Which Lewis dot structure represents an element that should be placed in column VIIA (17) of the periodic table?

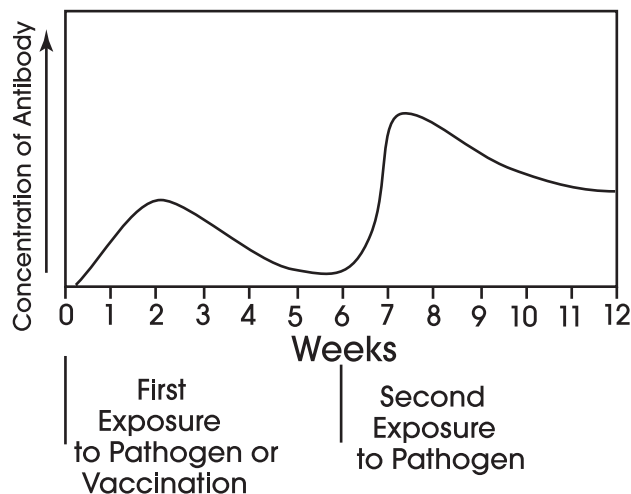


Use the following information and graph to answer question 36.

A medical researcher is investigating immune response in patients exposed to a specific pathogen. The graph below shows the concentration of a particular antibody in the bloodstream produced during the process of acquired immunity. One curve shows the primary immune response (after the first exposure to the pathogen), and the other curve shows the secondary immune response (after the second exposure to the pathogen).

A vaccination serves as the first exposure to a pathogen and triggers the body's primary immune response. Some vaccines contain weakened or inactive pathogens. Other vaccines contain highly similar but nonpathogenic forms.

Concentration of Antibody in Primary and Secondary Acquired Immune Response



36. Describe two benefits of receiving a vaccine, such as the polio vaccine, in protecting the body against disease, and include data from the graph to support each benefit. Respond in the space provided in your **Answer Document**. (4 points)

37. For many years scientists debated whether viruses should be considered living organisms.

Which statement could a scientist use to support the position that viruses are **not** living?

- A. Viruses have genes encoded in DNA.
- B. Viruses require a host cell in order to reproduce.
- C. Viruses infect both plant and animal cells.
- D. Viruses replicate to produce more viruses.

38. What gas does the process of photosynthesis release into the atmosphere?

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

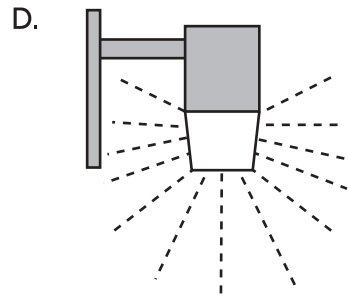
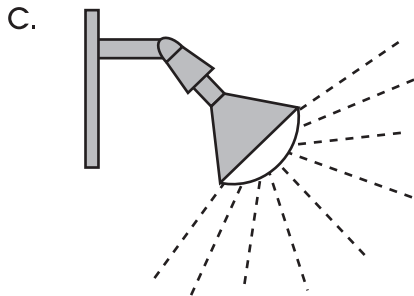
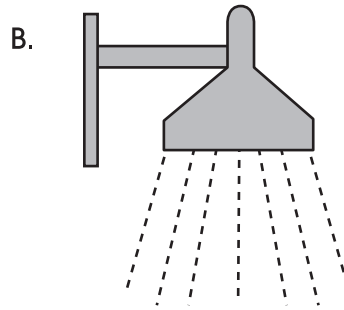
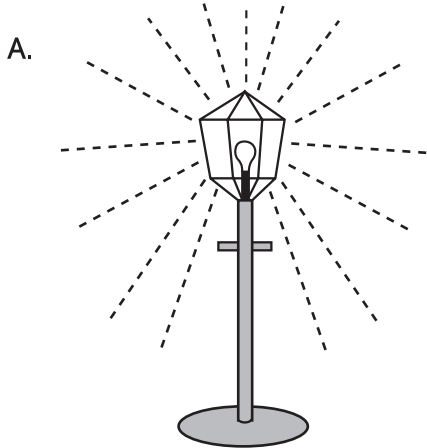
39. Aristotle was the first person to classify living organisms and did so using a two-kingdom system involving a plant group and an animal group. The system used today is much more useful to scientists because the two-kingdom system did **not**

- A. recognize the similarities within the plant group.
- B. separate living things based on characteristics and traits.
- C. allow for the placement of human beings in its classification.
- D. include many organisms such as those later discovered with microscopes.

40. Hydroelectric power is considered a “clean” energy source because it

- A. is available in most areas.
- B. increases the amount of power available.
- C. does not produce the pollutants that burning fossil fuels do.
- D. requires minimal investment in equipment.

41. Artificial light at night can negatively impact wildlife. Which outdoor light design minimizes the effect of the light on wildlife?



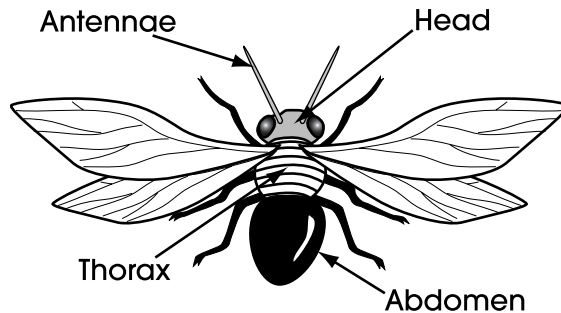
42. An agricultural scientist wants to determine the effect of fertilizers on corn plant growth. She selects a fertilizer to treat a soil plot where corn seeds have just sprouted. Describe an appropriate control she could use to determine whether the fertilizer affects growth of the corn plants. Explain why it is important to include this control. Respond in the space provided in your **Answer Document**. (2 points)

43. The chart below is a taxonomic key for the fictitious insect genus *Problematica*.

**Characteristics of the Genus *Problematica***

<b>1</b>	Thorax and abdomen entirely black	<i>Problematica alva</i>
	Thorax striped and abdomen black	Go to 2
<b>2</b>	Antennae curled	<i>Problematica brancus</i>
	Antennae straight	Go to 3
<b>3</b>	Wings longer than body	<i>Problematica cantrellis</i>
	Wings shorter than body	Go to 4
<b>4</b>	Wings white	<i>Problematica differensis</i>
	Wings black	<i>Problematica fortunatas</i>

A student has been asked to identify the following insect.



To which species does the insect belong?

- A. *Problematica alva*
- B. *Problematica brancus*
- C. *Problematica cantrellis*
- D. *Problematica differensis*

44. The water level in a graduated cylinder rises from  $10 \text{ cm}^3$  to  $35 \text{ cm}^3$  when a solid lead ball is added. What is the approximate volume of the lead ball?
- A.  $3.5 \text{ cm}^3$
  - B.  $25 \text{ cm}^3$
  - C.  $35 \text{ cm}^3$
  - D.  $45 \text{ cm}^3$

**Back Cover**