

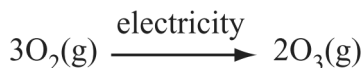
State Assessments Science Samples

- 1) Which of the following comparisons correctly describes subatomic particles?
- A. An electron has a negative charge and a mass larger than the mass of a proton.
 - B. A neutron has a negative charge and a mass smaller than the mass of a proton.
 - C. A neutron has a neutral charge and a mass larger than the mass of an electron.
 - D. A proton has a positive charge and a mass smaller than the mass of an electron.

- 2) Magnesium has two valence electrons. Oxygen has six valence electrons. What is the correct chemical formula for magnesium oxide?

- A. MgO
- B. MgO₂
- C. Mg₂O
- D. Mg₂O₃

- 3) The industrial preparation of ozone (O₃) uses oxygen gas (O₂), as shown in the equation below.



If 96.0 kg of O₂ gas actually yields 11.5 kg of O₃, what is the percent yield in this reaction?

- A. 3.10%
- B. 8.35%
- C. 12.0%
- D. 18.0%

- 4) Which sequence represents matter that is losing energy?

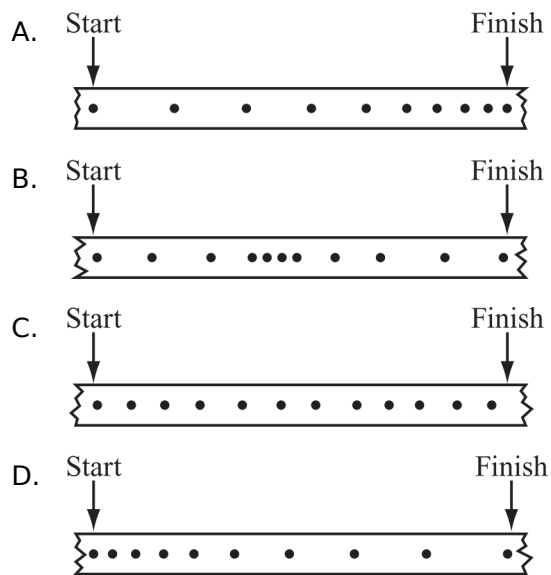
- A. solid → gas → liquid
- B. solid → liquid → gas
- C. gas → solid → liquid
- D. gas → liquid → solid

- 5) Which of the following is a scalar quantity?

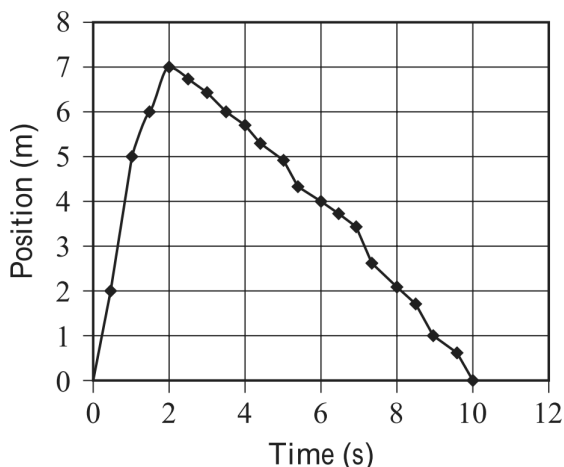
- A. the mass of a brick
- B. the velocity of a falling tennis ball
- C. the force required to lift a 10 kg mass
- D. the acceleration of a toy car over a 60 s period

- 6) A car has an oil drip. As the car moves, it drips oil at a regular rate, leaving a trail of spots on the road.

Which of the following diagrams of the car's trail of spots shows the car continuously slowing down?



- 7) The graph below illustrates the position and time for a dog that runs to catch a stick and then returns with it.



The dog caught the stick after 2 s. What was the dog's average speed as he returned with the stick?

- A. His average return speed was 0.7 m/s.
 B. His average return speed was 0.9 m/s.
 C. His average return speed was 2 m/s.
 D. His average return speed was 4 m/s.
- 8) Two workers are using a scaffold. One worker weighs 180 lbs. and the other weighs 200 lbs.

Impact effects are assumed to increase the live load of the workers' weight by 25 percent. What is the resultant maximum live load, in pounds, that can be expected from the two workers supported by the scaffold?

- A. 380 lbs. B. 475 lbs.
 C. 625 lbs. D. 950 lbs.

- 9) In order to balance a 100.-N force acting at $270.^\circ$ and a 100.-N force acting at $180.^\circ$. At what angle would a 140.-N equilibrium force point?

- A. 45.0° B. 90.0°
 C. $180.^\circ$ D. $270.^\circ$

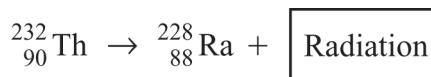
- 10) A diver with a mass of 80.0 kg dives off the 10.0 m platform. His velocity just before striking the water is 14.0 m/s. What is his kinetic energy at that moment?

- A. 8.00×10^2 J B. 1.12×10^3 J
 C. 7.84×10^3 J D. 1.12×10^4 J

- 11) A sheet of paper is positioned to completely cover a bar magnet. Iron filings are then gently sprinkled on the paper. What does the pattern created by the iron filings indicate?

- A. the stronger of the two poles
 B. the distance between the two poles
 C. the midpoint of the area between the two poles
 D. the magnetic field created by the two poles

- 12) The equation below shows the radioactive decay of thorium (Th).



Which of the following particles is released in this reaction?

- A. alpha (${}^4_2\text{He}$) B. beta (${}^0_{-1}\text{e}$)
 C. neutron (${}^1_0\text{n}$) D. proton (${}^1_1\text{H}$)

13) **Tiny Bubbles**

Two students were doing an investigation in which they studied the effect of light intensity on the rate of photosynthesis of elodea, an aquatic plant. To determine the rate of photosynthesis, they counted the number of bubbles of oxygen (O₂) produced in the water. The results of their experiment are shown in the data table.

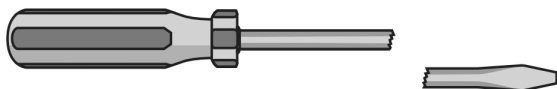
Data Table 1

Light Intensity (Candelas*)	Rate of Photosynthesis (Bubbles per Min)
0	0
400	1
800	2
1200	3
1600	4
2000	6
2400	6
2800	6
3200	6
3600	6
4000	6

*Candelas: The SI base unit of light (luminous) intensity.

Write an appropriate hypothesis for this investigation.

14) The figure below shows a screwdriver that broke while being used as a pry bar.

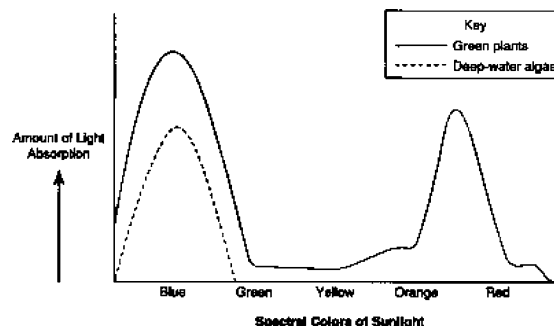
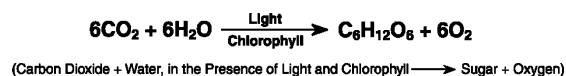


What does the break indicate about the material in the shaft of the screwdriver?

- A. It was too ductile.
- B. It was too brittle.
- C. It was too elastic.
- D. It was too dense.

15) **Photosynthesis**

The following equation represents the process of photosynthesis in green plants.



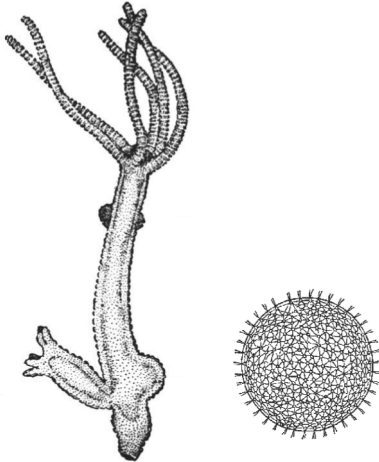
Based on the above graph, deep-water algae probably _____.

- A. have a higher rate of photosynthesis than green plants
- B. can appear to be green, yellow, orange or red
- C. reflect blue light
- D. absorb orange light

16) In some pea plant experiments, Mendel studied the inheritance patterns of two characteristics at once, such as seed shape and seed color. He did this to determine which of the following?

- A. the process by which mutations occur
- B. where genes are located within chromosomes
- C. whether characteristics are inherited together or separately
- D. the number of crosses necessary to cause physical changes in inheritance patterns

- 17) The organisms shown below are both found in aquatic environments.

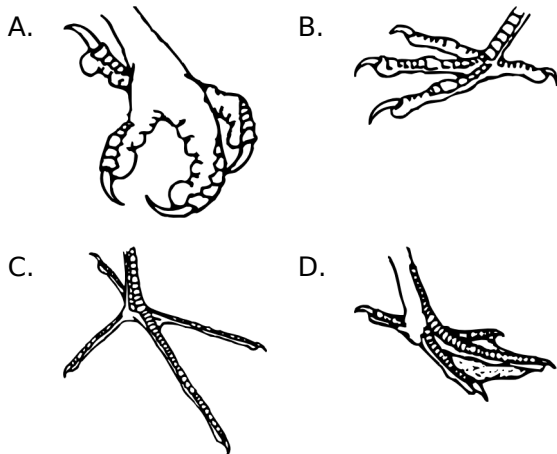


Hydra

Volvox

Which of the following is common to both of these organisms?

- A. They contain blood.
 - B. They contain nerves.
 - C. They are both producers of food.
 - D. They are both composed of cells.
- 18) Which bird's foot below is best for grasping prey?



- 19) In humans, the appendix is small and is not needed for digestion. In rabbits, the appendix is well developed and is used in the digestion of plant fibers.

Which of the following provides the *best* scientific explanation for the presence of the appendix in both humans and rabbits?

- A. Rabbits and humans live in environments with similar conditions.
 - B. Rabbits and humans are both eukaryotes with similar cell structures.
 - C. The appendix is evolving into a new type of organ in rabbits and humans.
 - D. The appendix is inherited from a common ancestor of rabbits and humans.
- 20) The seasons of the year on Earth are determined by the _____.
- A. speed of the Earth's revolution
 - B. speed of the Earth's rotation
 - C. shape of the Earth's orbit relative to the sun
 - D. tilt of the Earth's axis relative to the sun

- 21) A student set up a terrarium, watered the soil, and covered the terrarium tightly with a lid. The next day, the student observed water droplets on the inside of the lid.

The droplets provide evidence that which of the following steps of the water cycle had occurred in the terrarium?

- A. runoff and evaporation
- B. precipitation and runoff
- C. evaporation and condensation
- D. condensation and precipitation

- 22) Fossils of warm-weather plants were found on an island in the Arctic Ocean. What can *best* be concluded from this discovery?
- Spores of plants drifted by air currents to the island.
 - Ocean currents carried the plants to the island.
 - The island drifted from a tropical region to its present location.
 - Seeds of plants have been carried to the island by migratory birds.
- 23) In which location along a river is erosion *most likely* to be the greatest?
- at the widest part
 - at the flattest part
 - at the place with the fastest flow
 - at the place with the fewest rocks
- 24) A student drops a cube of sugar that has a mass of 15 g into a 2.0 L sample of water at 20°C. The student then observes the rate at which the sugar dissolves.
- Identify two changes that the student could make to the materials to increase the rate at which the sugar dissolves in the water.
 - Explain why each of these two changes would increase the rate at which the sugar dissolves in water.
- 25) Which of the following *best* demonstrates kinetic energy?
- Light bulb
 - Bird in flight
 - Book on a shelf
 - Flashlight battery

- 26) The table below lists the positions of a free-falling ball.

Ball in Free Fall

Time (s)	Position of Ball (m)
0	0
1.0	5
2.0	20
3.0	45
4.0	80
6.0	?

- Construct a graph of the ball's position, z , in meters (m), as a function of time, t , in seconds (s). On the graph, mark the approximate position of the ball at 1.5 s.
- Calculate the position of the ball at 6.0 s.
- Briefly describe the motion of the ball during free fall.

You may include the terms listed below in your response to part (c).

- distance
- time
- force due to gravity
- acceleration

- 27) Which of the following is the *best* example of a transmitter functioning in a communication system?
- A fax machine prints out an image.
 - A satellite dish on the ground receives a video signal.
 - A computer processor translates a digital signal to an analog signal.
 - A cellular telephone tower sends information to a cellular telephone.

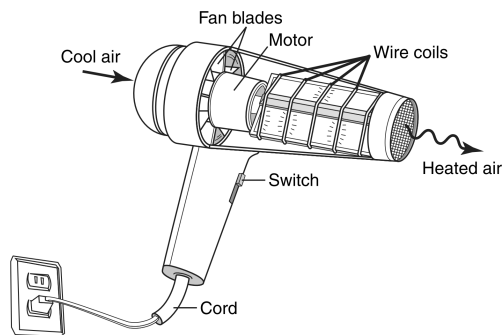
28) The table below shows the classifications of three different sea lions.

	California Sea Lion	Galapagos Sea Lion	New Zealand Sea Lion
Kingdom	Animalia	Animalia	Animalia
Phylum	Chordata	Chordata	Chordata
Class	Mammalia	Mammalia	Mammalia
Order	Carnivora	Carnivora	Carnivora
Family	Otariidae	Otariidae	Otariidae
Genus	<i>Zalophus</i>	<i>Zalophus</i>	<i>Phocarcotos</i>
Species	<i>californianus</i>	<i>wollebaeki</i>	<i>hookeri</i>

- Identify which two of the sea lions are most closely related.
- Justify your answer to part (a).
- Describe and explain two types of evidence scientists would have used to determine the proper classifications of these three sea lions.

29) Use the information below to answer the following question(s).

The hair dryer in the cross section diagram below transforms one type of energy into other types of energy.



What part of the hair dryer changes electrical energy into mechanical energy?

- motor
- switch
- wire coils
- fan blades

30) When a gas is heated in a closed container, the internal pressure increases. Which *best* describes the reason for the increase in pressure?

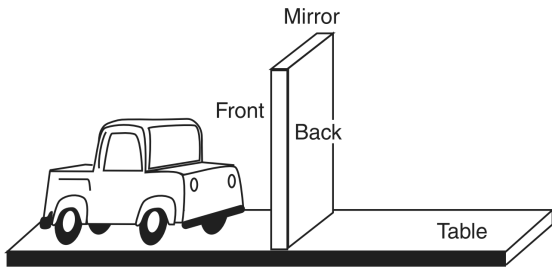
- The average kinetic energy of the gas molecules decreases.
- The potential energy of the gas increases.
- The average kinetic energy of the gas molecules increases.
- The potential energy of the gas decreases.

31) Which of the following provides evidence for plate tectonics?

- sea-floor topography
- ocean currents
- Coriolis effect
- atmospheric temperatures

- 32) Use the information below to answer the following question(s).

INVESTIGATING A PLANE MIRROR



Several students placed a toy truck on a table in front of a plane mirror and viewed the image of the truck in the mirror. Next, the students moved the toy truck to different positions and observed the reflected images of the truck from each position.

The students placed the toy truck 20 centimeters in front of the mirror.

The image of the truck will appear to be

- A. 0 centimeters from the mirror
- B. 10 centimeters in front of the mirror
- C. 20 centimeters behind the mirror
- D. 40 centimeters behind the mirror

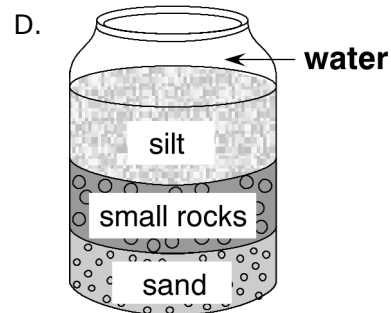
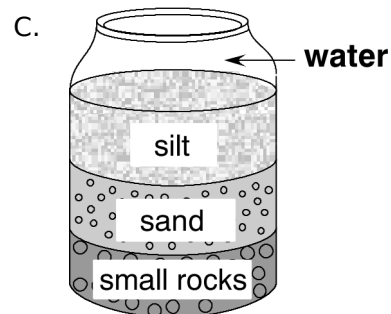
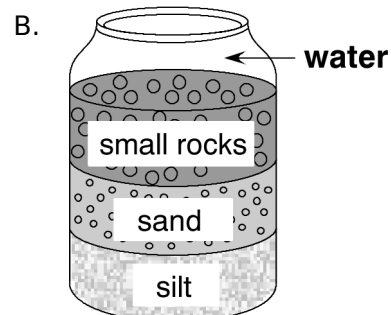
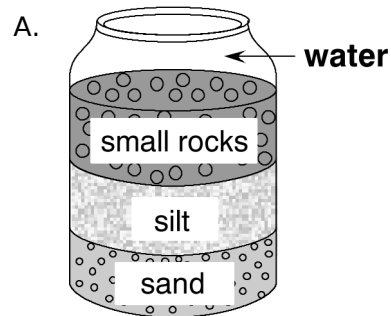
- 33) Use the information below to answer the following question(s).

A pair of laboratory mice are crossed to obtain offspring. Three alleles found in the female gamete are ABC. Three alleles found in the male gamete are Abc.

What is formed when a male gamete combines with a female gamete?

- A. zygote
- B. egg
- C. sperm
- D. chromosome

- 34) Your teacher has brought a sample of water to class. The sample contains a mixture of small rocks, sand, and silt (very fine soil) from the Mississippi River. After a few hours, the sample settles. Which diagram shows how the sample will settle?



Use the passage below to answer the following question(s).

Making Fresh Water from Salt Water

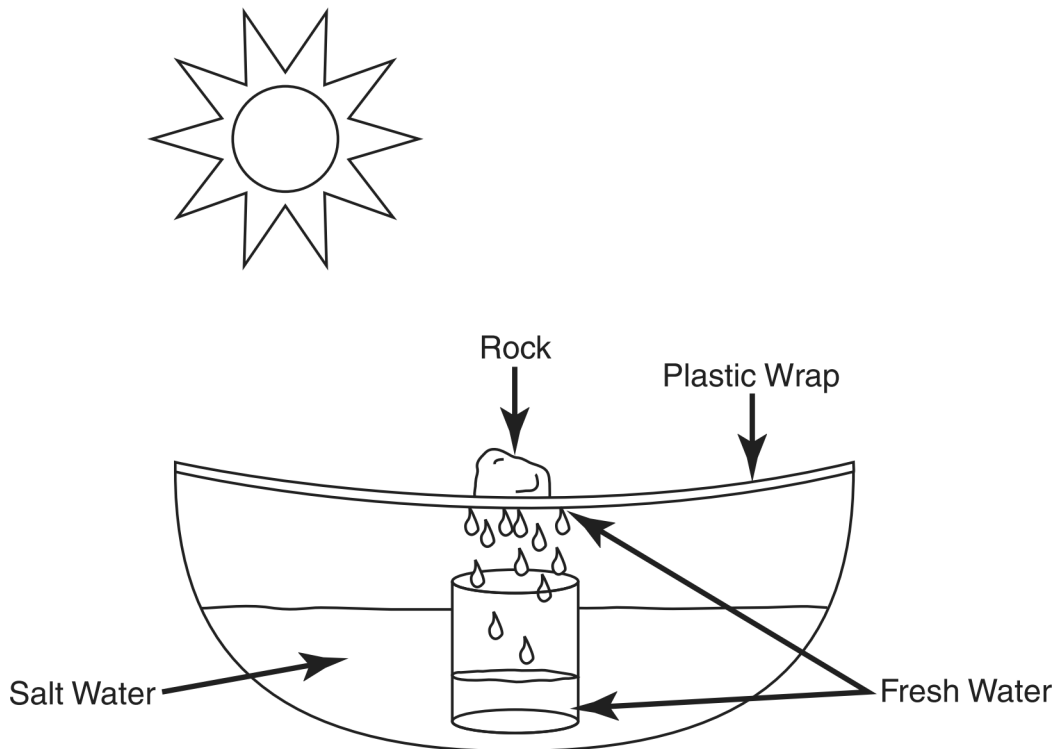
Although most water on Earth is salt water, humans can only live by drinking fresh water. Fresh water can be produced from salt water by separating the salt from the water.

One method of separating salt from water is distillation. During distillation, salt water is heated until the liquid changes to a vapor, or gas. When the water turns to a vapor, the salt is left behind. When the vapor cools and changes to a liquid, it is fresh water.

The steps for making a simple distillation device are described below:

1. Pour salt water in a bowl.
2. Place an empty cup upright in the middle of the bowl of salt water.
3. Cover the bowl and cup with plastic wrap.
4. Place a small rock on the plastic wrap directly over the cup so the plastic wrap is pushed down slightly.
5. Place the bowl in a sunny location.

The distillation device is pictured below:



Sunlight causes water to evaporate. The vapor collects in droplets on the inside of the plastic wrap and rolls toward the lowest part of the plastic wrap, where the rock pushes it down. The droplets drip into the cup, filling it with fresh water. The salt stays in the bowl.

- 35) A student repeated the distillation investigation but forgot to put the rock on the plastic wrap.

Describe the *most likely* result of this investigation. In your description, be sure to include

- the purpose of the rock
- how the results of this investigation compare with those of the original distillation

Write your answer in the space provided.

- 36) The table below shows the classifications of four animals.

Animal Classification				
Animal	Q	R	S	T
Kingdom	Animalia	Animalia	Animalia	Animalia
Phylum	Chordata	Chordata	Chordata	Chordata
Class	Mammalia	Mammalia	Mammalia	Mammalia
Order	Carnivora	Rodentia	Rodentia	Carnivora
Family	Canidae	Muridae	Muridae	Felidae
Genus and Species	<i>Canis familiaris</i>	<i>Mus musculus</i>	<i>Mesocricetus auratus</i>	<i>Felis sylvestrus</i>

According to their classification, which of the following animals are *most* closely related?

- A. Q and R B. S and T
C. Q and T D. R and S

- 37) An excess of hydrogen ions maintains the positive charge of the extracellular fluid surrounding plant cells. Plant cells use active transport to maintain this positive charge.

Why must cells use active transport to maintain a positive charge?

- A. ATP is required to move all charged particles.
B. The concentration of hydrogen ions is lower inside the cell.
C. The hydrogen ions are too large to move freely across the cell membrane.
D. Passive transport can only be used to move particles with a negative charge.

- 38) A classmate measures the temperature of pond water and the soil that surrounds it every hour for a period of five hours on a sunny day. The measurements are shown in the chart below.

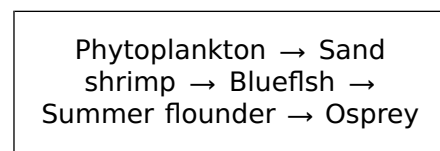
Time (Hours)	0	1	2	3	4	5
Water Temperature (°C)	16	17	18	19	21	23
Soil Temperature (°C)	16	16	19	21	23	26

The next day, at a nearby lake that has a shore of sandstone, you measure the temperature of the sandstone and water at 7 a.m. You find that both have a temperature of 13°C.

If it is sunny all day:

- What do the results of the experiment at the pond predict about the temperature of the sandstone and the lake water at noon?
- Explain your answer.
- Explain why your prediction, based on the data, might be incorrect.

- 39) The diagram represents feeding relationships in a Gulf ecosystem.



Based on the food chain shown above, what organism is *feeding* on a secondary consumer?

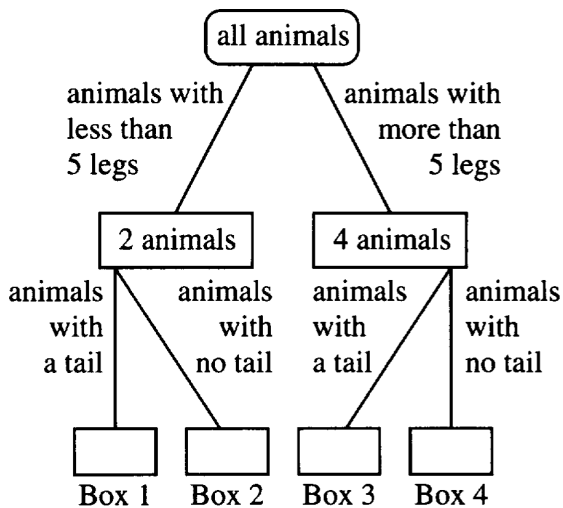
- A. Sand shrimp
B. Bluefish
C. Summer flounder
D. Osprey

- 40) The following question(s) are based on the passage and diagrams below.

Two scientists traveled to a remote island in the ocean. While on the island, they discovered several animals never before seen. The scientists identified and recorded several characteristics of each of the different animals. Those data are given in the table below.

Animal	Number of legs	Tail	Food	Habitat
A	4	yes	meat	mountain
B	4	yes	plants	jungle
C	6	yes	plants	jungle
D	6	no	plants	caves
E	8	no	meat	water
F	8	no	meat	water

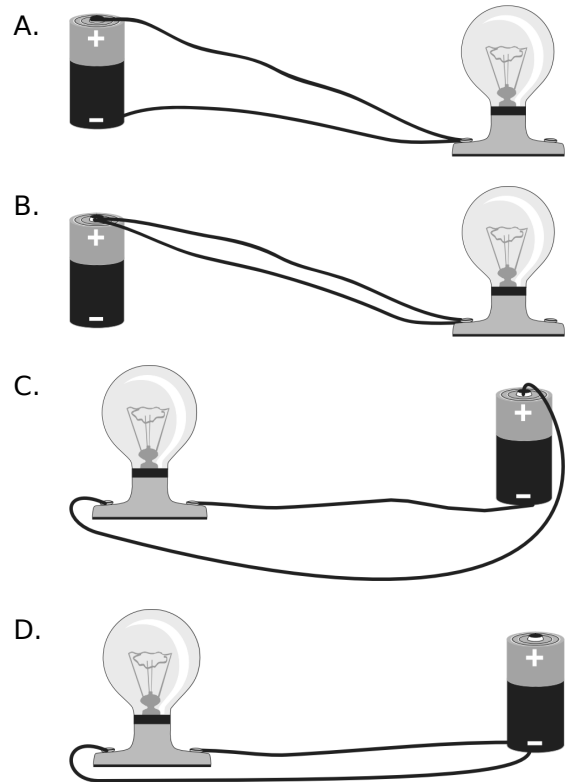
The scientists needed this information in order to group the organisms. One way to do this is to create a classification system such as that shown in the figure below.



Which of the following pairs of animals *cannot* be separated into two different categories in a classification system shown in the figure?

- A. animals A and C
- B. animals B and D
- C. animals C and F
- D. animals E and F

- 41) Which electric circuit produces light?



- 42) A botanist inserts a new gene sequence into a pink-flowering plant. He hopes that the genetically modified plant will now produce blue flowers.

In nature, which of the following processes would result in this kind of change?

- A. Grafting
- B. Mutation
- C. Photosynthesis
- D. Transpiration

43) Scientists in Mississippi have discovered that coyotes, bobcats, and raccoons hunt wild turkeys. Which of the following explains the relationship between these animals?

- A. The turkey is the producer for the three types of predators.
- B. The three predators help keep the turkey population controlled.
- C. The turkey population will not survive with three species hunting it.
- D. There are three producers in the food web, and the turkey is a consumer.

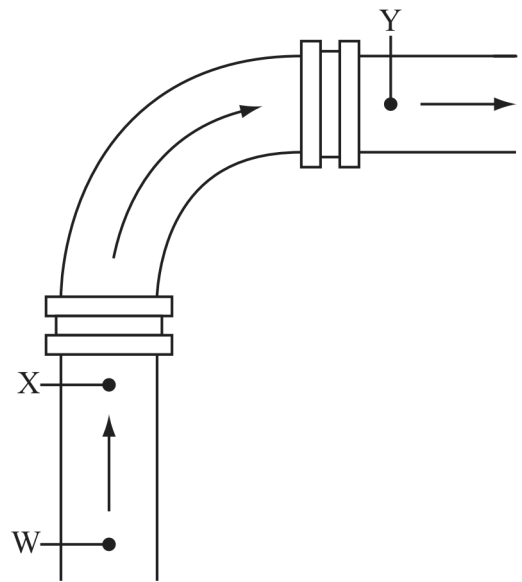
44) In six months, how far will Earth have gone in its orbit around the sun compared to how far the moon has gone in its orbit around Earth?

- A.
 - Earth: completed one orbit of the sun
 - Moon: completed one orbit of Earth
- B.
 - Earth: completed six orbits of the sun
 - Moon: completed twelve orbits of Earth
- C.
 - Earth: completed half of one orbit of the sun
 - Moon: completed six orbits of Earth
- D.
 - Earth: completed a third of one orbit of the sun
 - Moon: completed three orbits of Earth

45) In which way do dams manage water resources?

- A. Prevent flooding by a river
- B. Prevent pollution from reaching a river
- C. Reduce soil erosion along sides of a river
- D. Reduce the runoff of fertilizers into a river

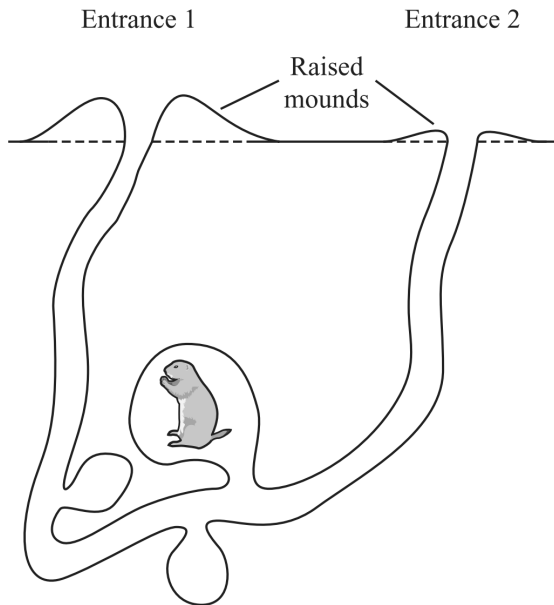
46) A section of a piping system is shown below.



Which of the following locations identifies where the resistance to water flow is the *greatest*?

- A. at point W
- B. at point Y
- C. between point X and point Y
- D. between point W and point X

47) A prairie dog burrow is shown below.

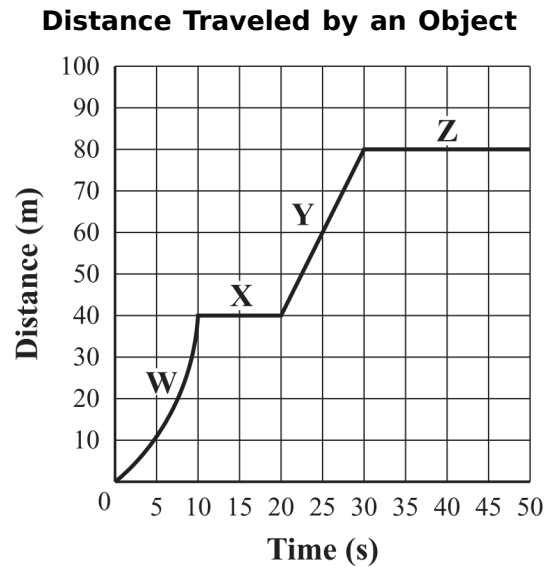


Prairie dogs build raised mounds around both entrances to their burrow. The mound around one entrance is taller than the mound around the other entrance. Because the mounds are at different heights, the air pressure at entrance 1 is lower than the air pressure at entrance 2 when the wind blows. This causes air to flow in at entrance 2 and out at entrance 1.

In theory, the ventilation in a prairie dog burrow relies on which of the following concepts?

- A. Bernoulli's principle
- B. conduction
- C. Ohm's law
- D. pneumatics

48) The graph below shows the distance an object traveled over time.



Which line segment represents the time interval during which the object was moving at a positive constant speed?

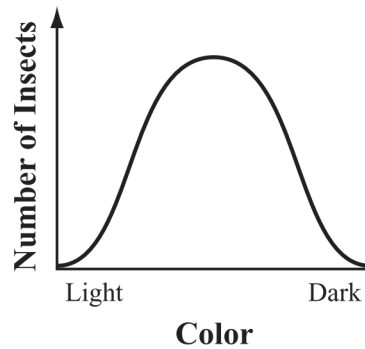
- A. segment W
- B. segment X
- C. segment Y
- D. segment Z

49) A 1,700-kg car moving at 16 m/s has 100 m of road to make a complete stop before hitting a wall.

- a) If it takes 7.0 s for the car to come to rest, what is the force required to stop the car? (Assume acceleration is constant.)
- b) Using Newton's laws of motion, explain if the force is enough to stop the car before it hits the wall.

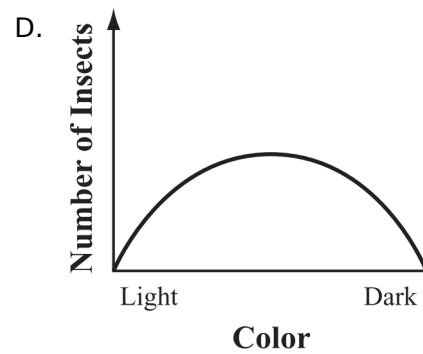
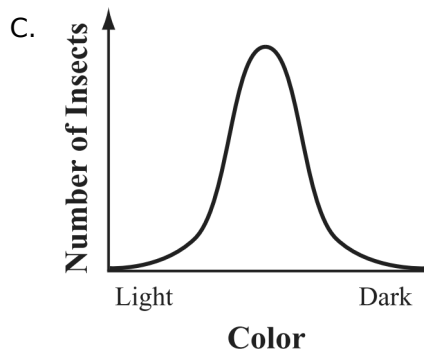
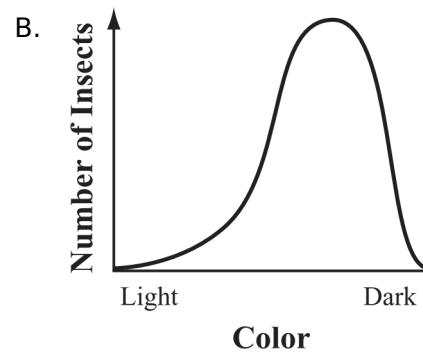
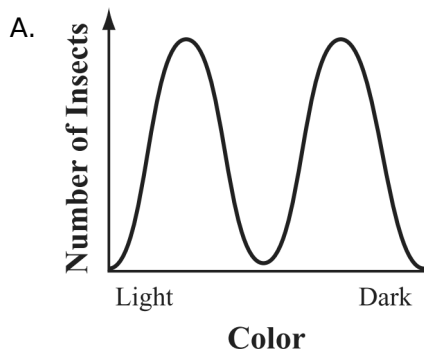
- 50) Insects that are camouflaged in their environment are less likely to be eaten by birds. The graph below shows the distribution of body color in a population of an insect species.

Distribution of Body Color in an Insect Population



The insects live on trees. A black fungus begins to grow on the trees where the insects live.

Which of the following graphs shows the *most likely* distribution of body color in the insect population after several years of fungus growth?



51) The smooth-skinned, leaf-tailed gecko lives on Madagascar, an island off the coast of Africa. The gecko hunts at night and sleeps on trees by day. The color and pattern of the gecko's body resembles leaves.

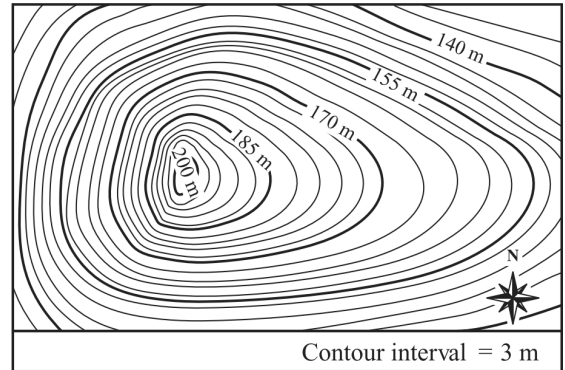
Which of the following statements *best* explains how the gecko's unique body color and pattern evolved?

- A. All the geckos needed to look like leaves in order to live in trees and therefore acquired the necessary trait.
- B. Individuals with bodies that looked the most like leaves interbred only with other green or brown lizard species.
- C. Gene sequences of all the geckos mutated to produce the leaf appearance when ancestral geckos moved from mud to trees.
- D. Individuals with bodies that looked the most like leaves were better able than other individuals to avoid predators and passed on the trait.

52) El Cajon Pass in California is becoming higher than the land around it at a rate of nearly 1 centimeter each year. Which statement is true about the area?

- A. Erosion is slower than uplift at El Cajon Pass.
- B. Plates are separating at El Cajon Pass.
- C. Mountain building is slower than erosion at El Cajon Pass.
- D. Erosion and uplift are balanced at El Cajon Pass.

53) The diagram below represents a portion of a contour map.



Which of the following *best* describes the physical feature represented by this contour map?

- A. a flood plain with creeks and streams
- B. a valley with two gently sloping sides
- C. a hill with slopes that vary in steepness
- D. a series of rivers flowing in concentric circles

54) Which of the following is the *most* efficient way to transport large amounts of coal from a mine in Kentucky to a power plant in Arizona?

- A. by ship
- B. by train
- C. by truck
- D. by airplane

55) The table below shows data for five Alaska volcanoes.

Alaska Volcanoes

Volcano	Approximate Height in Feet (2007)
Mt. Griggs	7,602
Mt. Denison	7,605
Mt. Shishaldin	9,373
Mt. Spurr	11,070
Mt. Wrangell	14,163

Give two correct conclusions based on these data.