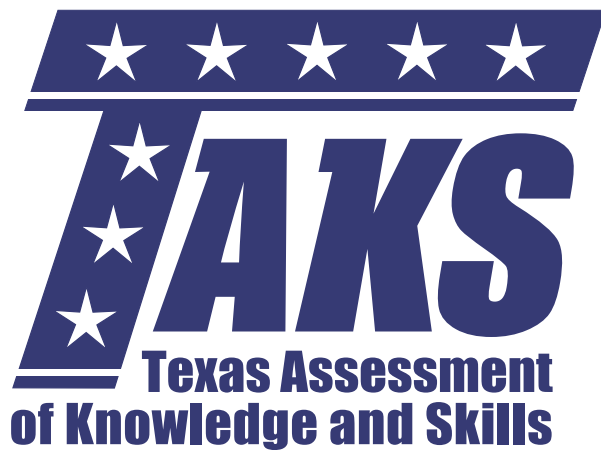


STUDENT NAME _____



**GRADE 10
SCIENCE**

Administered April 2009

SCIENCE

FORMULA CHART

Density = $\frac{\text{mass}}{\text{volume}}$	$D = \frac{m}{v}$
$\left(\begin{array}{c} \text{heat gained} \\ \text{or lost} \end{array} \right) = \left(\text{mass} \right) \left(\begin{array}{c} \text{change in} \\ \text{temperature} \end{array} \right) \left(\begin{array}{c} \text{specific} \\ \text{heat} \end{array} \right)$	$Q = (m)(\Delta T)(C_p)$
Speed = $\frac{\text{distance traveled}}{\text{time}}$	$v = \frac{d}{t}$
Acceleration = $\frac{\text{final velocity} - \text{initial velocity}}{\text{change in time}}$	$a = \frac{v_f - v_i}{\Delta t}$
Momentum = mass \times velocity	$p = mv$
Force = mass \times acceleration	$F = ma$
Work = force \times distance	$W = Fd$
Power = $\frac{\text{work}}{\text{time}}$	$P = \frac{W}{t}$
% efficiency = $\frac{\text{work output}}{\text{work input}} \times 100$	$\% = \frac{W_o}{W_i} \times 100$
Kinetic energy = $\frac{1}{2} (\text{mass} \times \text{velocity}^2)$	$KE = \frac{mv^2}{2}$
Gravitational potential energy = mass \times acceleration due to gravity \times height	$PE = mgh$
Energy = mass \times (speed of light) ²	$E = mc^2$
Velocity of a wave = frequency \times wavelength	$v = f\lambda$
Current = $\frac{\text{voltage}}{\text{resistance}}$	$I = \frac{V}{R}$
Electrical power = voltage \times current	$P = VI$
Electrical energy = power \times time	$E = Pt$

Constants/Conversions		
g = acceleration due to gravity = 9.8 m/s ²		
c = speed of light = 3×10^8 m/s		
speed of sound = 343 m/s at sea level and 20°C		
1 cm ³ = 1 mL		
1 wave cycle/second = 1 hertz (Hz)		
1 calorie (cal) = 4.18 joules		
1000 calories (cal) = 1 Calorie (Cal) = 1 kilocalorie (kcal)		
newton (N) = kgm/s ²		
joule (J) = Nm		
watt (W) = J/s = Nm/s		
volt (V)	ampere (A)	ohm (Ω)

Periodic Table of the Elements

Atomic number — 14
Symbol — Si
Atomic mass — 28.086
Silicon — Name

Group		1		2		3										4										5										6										7										8										9										10										11										12										13										14										15										16										17										18																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
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Mass numbers in parentheses are those of the most stable or most common isotope.

Lanthanide Series

Actinide Series

DIRECTIONS

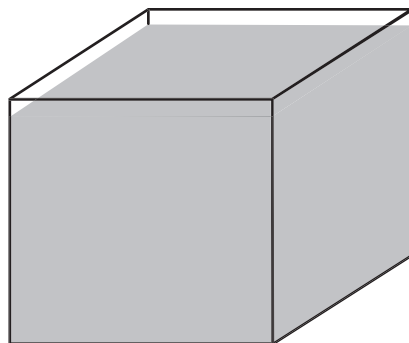
Read each question and choose the best answer. Then fill in the correct answer on your answer document.

SAMPLE A

When a 10% hydrochloric acid solution is heated in an open test tube, the test tube should always be pointed —

- A** so bubbles are visible
- B** at a 180° angle from the flame
- C** toward a ventilated area
- D** away from nearby people

SAMPLE B



Mass = 40 g

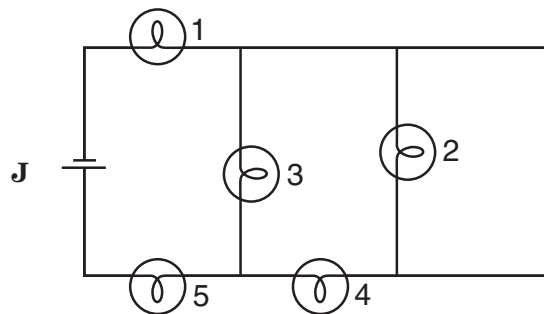
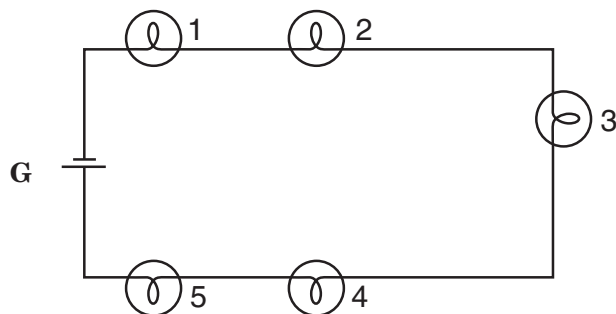
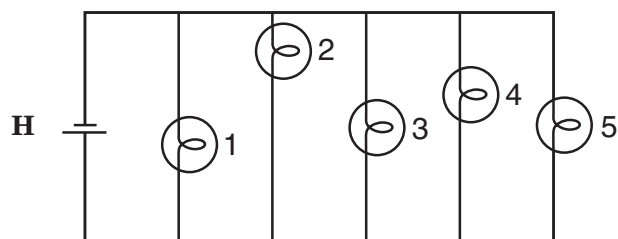
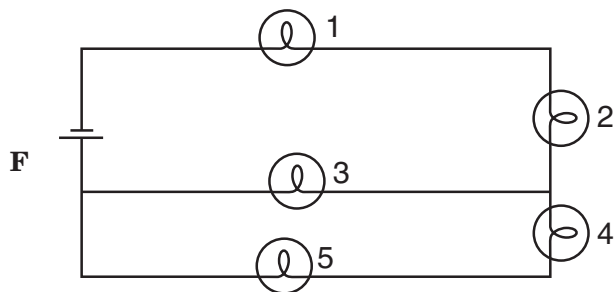
Volume = 20 mL

The picture shows a cube that contains 20 mL of a solution. The solution has a mass of 40 grams. What is the density in g/mL of this solution? Record and bubble in your answer on the answer document.



- 1 An experiment requires the use of a lab apron, goggles, and insulated mitts or beaker tongs. The purpose of these safety items is primarily to protect against —
- A release of hazardous gases
 - B hot materials and spills of harmful liquids
 - C contamination of chemicals and glassware
 - D staining of lab clothing

- 2 In which of the following circuits will all of the remaining lightbulbs continue to operate if the fifth lightbulb fails?



Site	Contaminant Yield (mg/kg)			
	Cadmium	Copper	Lead	Zinc
1	120	1475	67	291
2	2500	415	27	126
3	150	265	904	1320
4	75	29	1450	25

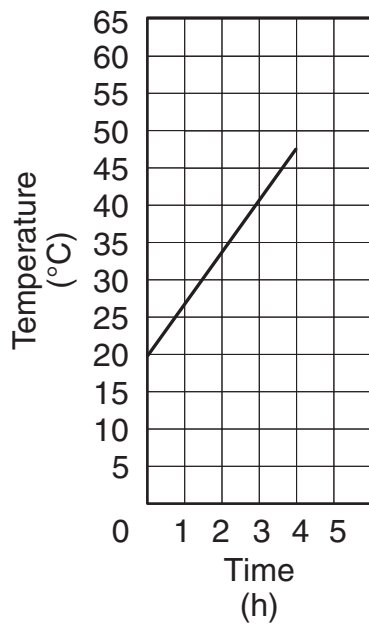
- 3 The table shows samples of contaminated soil from four different sites. In the sample from Site 3, which contaminant is present in the greatest concentration?

A Cadmium
B Copper
C Lead
D Zinc

1. THE CAT SAW THE FAT RAT
2. THE CAT SAW THE RAT

- 4 The change in Statement 1 to form Statement 2 is most similar to what type of mutation?

F Insertion
G Deletion
H Substitution
J Frameshift



- 5 The graph shows the interior temperature of a box with a heat lamp shining on its outside walls. The best estimate of the interior temperature after 5 hours is —

A 50°C
 B 55°C
 C 60°C
 D 65°C

- 6 How does using killed or weakened bacteria in an immunization help the body prevent infections?

F Antibodies are formed that fight those types of bacteria.
 G The body develops a fever that kills beneficial bacteria.
 H Bacterial reproductive cycles are disrupted.
 J Bacteria-fighting viruses are activated.

- 7 The *Pioneer 10* spacecraft was launched in March 1972 to explore the solar system. *Pioneer 10* has continued on its journey and is now traveling beyond the solar system. Which statement best explains why *Pioneer 10* continues to travel farther out into space?

A For every action force, there is an equal and opposite reaction force.
 B Objects in space accelerate at a greater rate than objects on Earth.
 C The force of the solar wind propels objects through space at a constant speed.
 D Objects in motion will remain in motion unless acted on by unbalanced forces.

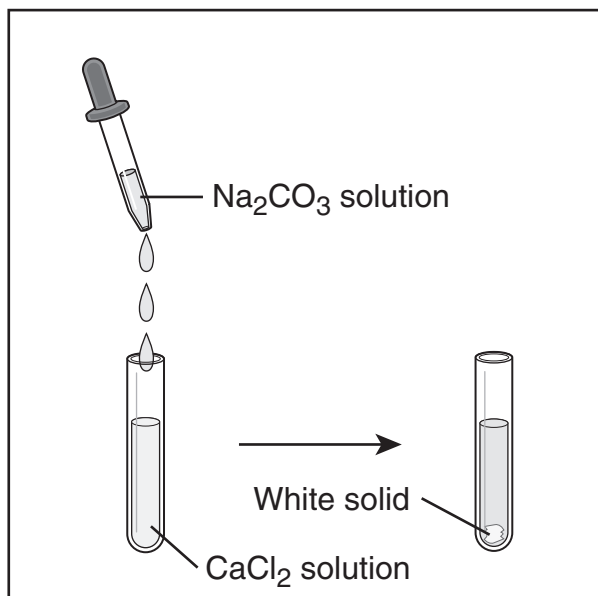
Magnet	Heating Time (h)	Average Mass of Iron Lifted (g)
1	24	16
2	48	12
3	96	10

8 Three identical magnets are heated to 50°C for different lengths of time. The strength of the magnets is determined by the mass of iron they attract and then lift to a height of 1 meter. The data obtained are shown in the table above. Which question is best answered by this investigation?

- F Does the elemental composition of a magnet determine its magnetic strength?
- G Will the mass of iron that is lifted be affected by the length of the magnet?
- H Does the amount of time a magnet is heated affect its strength?
- J Will an electric current heat a magnet?

9 One example of a genetic variation within a bird species is individual organisms having —

- A beaks of different lengths
- B broken wings
- C double-stranded DNA
- D pairs of chromosomes



- 10** A student added a small amount of sodium carbonate solution (Na_2CO_3) to a test tube containing calcium chloride (CaCl_2) solution. A white solid immediately appeared. What conclusion can be made from this experiment?

F Heat is generated by the chemical reaction.

G At least one product of the reaction is insoluble.

H Sodium carbonate is less soluble than calcium chloride.

J The chemical reaction requires energy to occur.

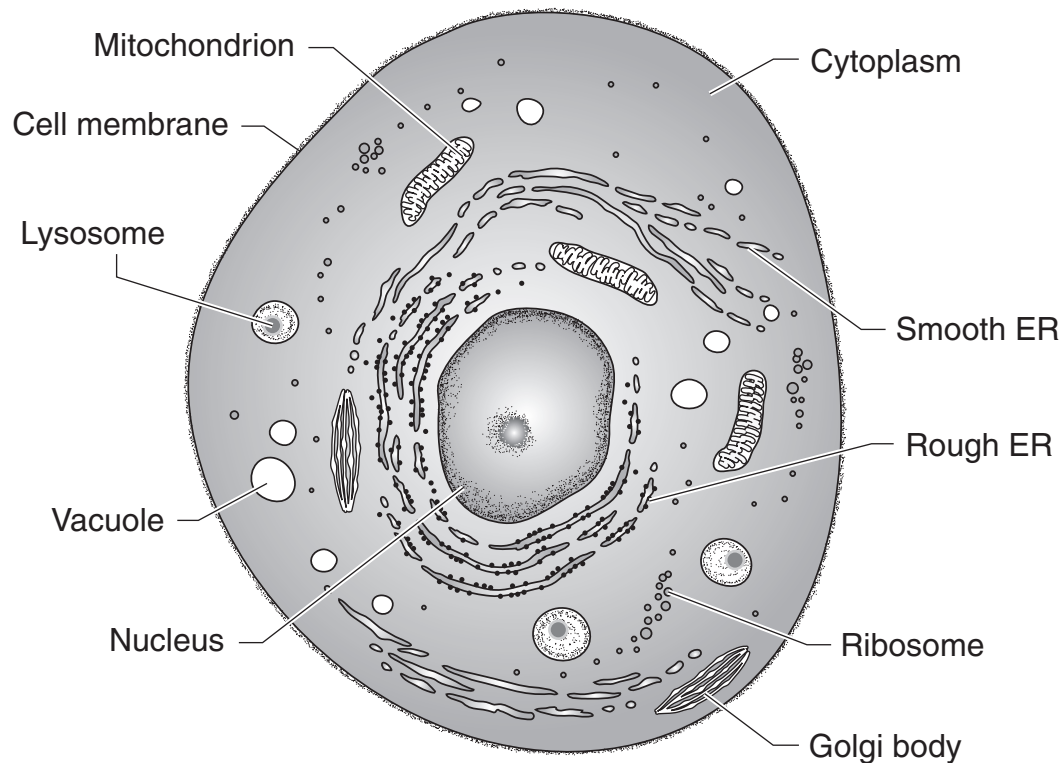
- 11** Some students are testing water samples from different ponds. Exactly 20 milliliters of water is needed for each test. Students should measure the samples using a —

A 25 mL graduated cylinder

B 25 mL beaker

C 50 mL measuring cup

D 50 mL flask

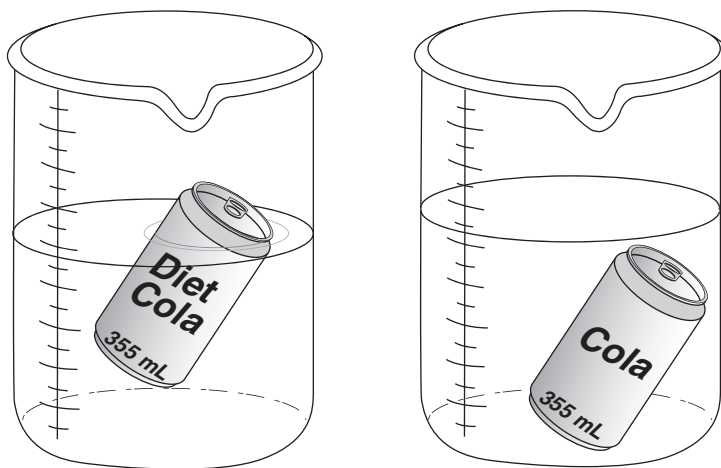


12 In animal cells like the one shown above, which organelle is used for storing water?

- F** Nucleus
- G** Mitochondrion
- H** Ribosome
- J** Vacuole

13 Liana plants are woody vines that grow on some trees in rain forests. These climbing plants are most likely adapted for —

- A** competing with other plants for oxygen
- B** preventing predators from eating beneficial insects
- C** growing through layers of foliage to reach available sunlight
- D** absorbing some of the nutrients found in the soil



14 A diet cola and a regular cola in identical cans are each placed in separate beakers containing water. Which of the following conclusions is the best for the experiment shown above?

- F** The diet cola is less dense than the regular cola.
- G** The diet cola has fewer calories than the regular cola.
- H** There is more buoyant force on the can of diet cola than on the regular cola.
- J** There is more liquid in the can of diet cola than in the regular cola.

15 Why will knowledge of the human genome enable scientists to better understand proteins involved in human diseases?

- A** DNA contains the information used to make proteins.
- B** Nucleic acid molecules have shapes similar to those of proteins.
- C** The bases that make up DNA are also present in RNA.
- D** Chromosomes can combine to form proteins.

16 When copper and oxygen chemically unite, they form —

- F** an ion
- G** a gas
- H** a compound
- J** a mixture



Magic Window Shade

Reflects 100% of sunlight yet allows you to see outside
without annoying light and glare in your room

ONLY \$19.95 per square meter

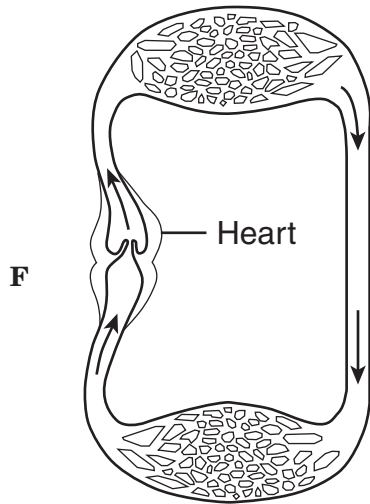
BUY TODAY!

17 The advertisement for the Magic Window Shade is inaccurate because —

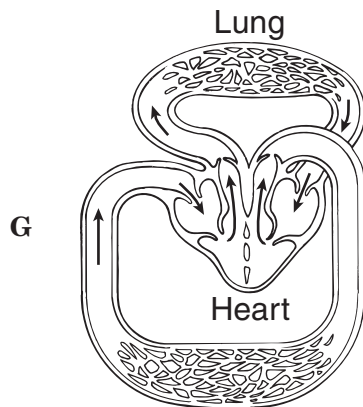
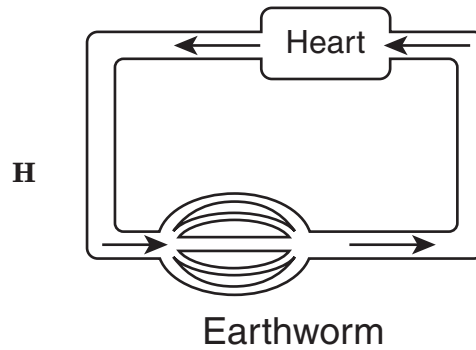
- A some light must enter a window in order for people to see out
- B few substances can block light from window glass
- C reflected light causes some unwanted light inside
- D unwanted light must be refracted in order to be blocked

- An open circulatory system is one in which the tissues in an organism are bathed directly in circulatory fluid that is not entirely contained in vessels.
- A closed circulatory system is one in which the blood flows through a network of vessels that form a closed loop.

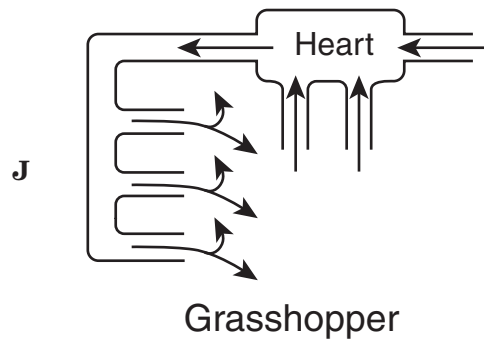
18 Which of the following shows an example of an open circulatory system?



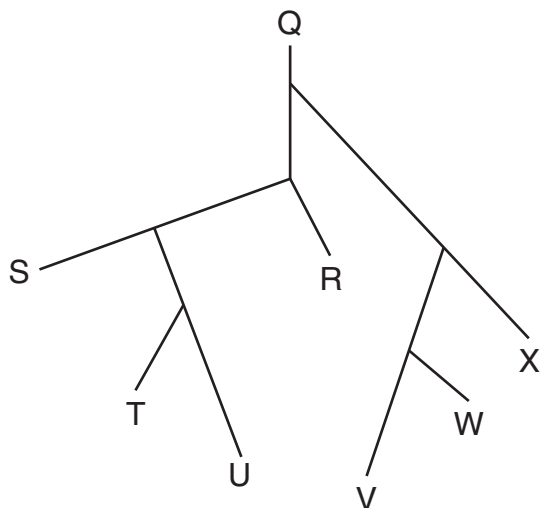
Fish



Amphibian



Phylogenetic Tree

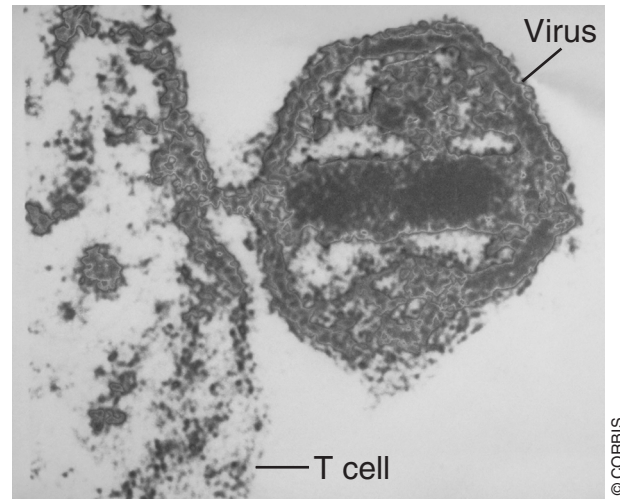


- 19** According to this phylogenetic tree, which organism is most closely related to Organism V?

A Q
B U
C W
D X

- 20** Which of the following would most increase the rate at which magnesium nitrate dissolves in a liquid solvent?

F Increasing the pressure on the liquid
G Keeping the liquid still and undisturbed
H Lowering the temperature of the liquid
J Breaking the crystals into smaller pieces



- 21** The photograph above shows a virus attacking a human T cell (immune cell). Which disease could result if many T cells are destroyed in this manner?

A AIDS
B Tuberculosis
C Chicken pox
D Multiple sclerosis

- 22** If a 2.0 kg mass is moving at a constant velocity of 15 m/s, what is its momentum in kg · m/s? Record and bubble in your answer on the answer document.

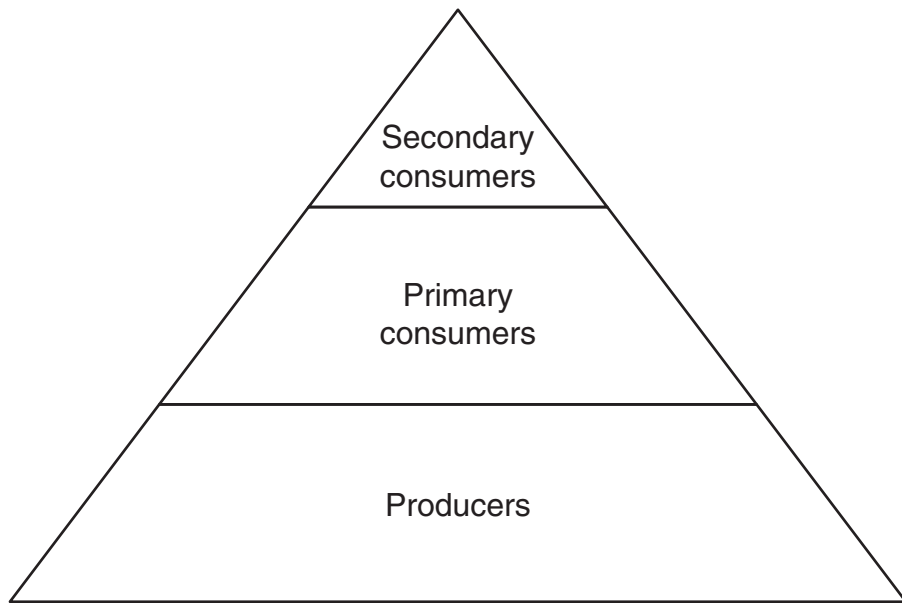
- 23** Two students added a piece of zinc to a solution of hydrochloric acid in an open beaker. The mass of the products was found to be less than the total mass of the reactants. Which of the following statements best explains the loss of mass?

- A** Zinc metal is more dense than the acid.
- B** The chemical activity of the acid destroyed metal atoms.
- C** A gas was released during the reaction.
- D** Some of the zinc atoms failed to react.

Sample	pH
W	7.1
X	3.3
Y	5.2
Z	

- 24** A student records the pH values of three samples and is asked to predict the pH of a fourth sample. The student is told that Sample Z is less acidic than Sample X but more acidic than Sample Y. Which of the following is a valid conclusion about the pH of Sample Z?

- F** It is less than 3.3.
- G** It is between 3.3 and 5.2.
- H** It is between 5.2 and 7.1.
- J** It is greater than 7.1.



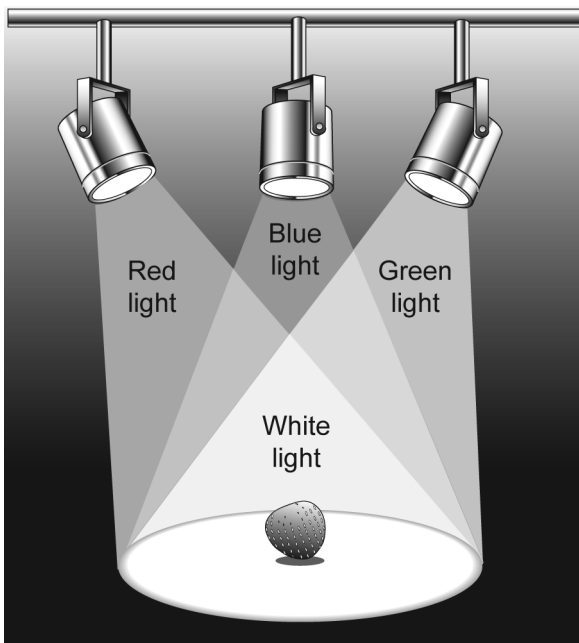
- 25** The diagram above shows a simplified food pyramid. The number of organisms is generally smaller at the top than at the bottom because organisms at the top usually —
- A** have more offspring
 - B** have more predators
 - C** adapt more quickly
 - D** require more energy

- 26** Some members of the pumpkin family produce roots capable of storing large amounts of water. Some of these roots have a mass of about 30 kg. In which type of environment are these plants most likely found?

F Aquatic
G Dry
H Cold
J Humid

- 28** Botanists cross a heterozygous (Pp) plant having purple flowers with a homozygous (pp) plant having white flowers. About what percentage of the offspring will have purple flowers?

F 0%
G 25%
H 50%
J 75%



- 27** What color will a ripe strawberry appear to be under these lights if no other light is present?

A Blue
B Green
C White
D Red

Use the information below and your knowledge of science to answer questions 29–31.

Cave Crickets

When acidic rainwater dissolves limestone over millions of years, weathering causes small openings in rock to become larger. A network of underground passages and caves forms. The type of landform resulting from this process is called karst topography.

Karst Cave



Courtesy of U.S. Fish & Wildlife Service

Karst caves in the Texas Hill Country provide habitats for many animal species, including frogs, salamanders, rattlesnakes, porcupines, and cave crickets. Cave crickets, which belong to the genus *Ceuthophilus*, live on the cave floors and lay eggs in the caves. Cave crickets exit the caves most nights to find food. These cave crickets consume a wide variety of food, including fungi, plant material, and dead insects.

29 How do cave crickets affect the food web to which they belong?

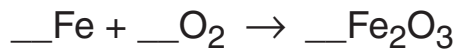
- A** Cave crickets increase the amount of abiotic resources.
- B** Cave crickets provide nutrients to other cave-dwelling organisms.
- C** Cave crickets reduce the number of predators in a cave.
- D** Cave crickets compete with producers.

30 A researcher wants to determine the average number of cave crickets that exit a certain cave in the first two hours after sunset. The best procedure for collecting precise data in this investigation is to count crickets exiting —

- F** the cave on several nights and calculate the average value
- G** the cave for 15 minutes on one night and multiply by 8
- H** the caves in the surrounding area on several nights and calculate the average value
- J** the cave during one night and use this value

31 The cells of cave crickets release energy through the process of —

- A** photosynthesis
- B** respiration
- C** DNA replication
- D** protein synthesis



- 32** Iron reacts with oxygen in the air to form iron oxide. The unbalanced equation for this reaction is shown above. What are the coefficients when this equation is balanced?

F 2, 2, 1
G 2, 3, 1
H 4, 3, 2
J 4, 2, 2

- 33** A mutation in a DNA molecule is passed to offspring only when the mutation occurs in a —

A neuron
B cell wall
C nuclear membrane
D gamete

An inventor claims to have created a wind turbine that can convert 1 kilogram of water into 1 kilogram of oxygen and 1 kilogram of high-energy hydrogen fuel.



- 34** This claim is false because it —

F violates the principle of constant composition
G contradicts the law of conservation of matter
H ignores the strength of the theory of strings
J violates the rules of gravitational attraction

- 35** Which of these systems is directly responsible for maintaining the volume and the composition of most body fluids?

A Muscular system
B Skeletal system
C Excretory system
D Immune system

- 36** Which of these steps in the digestive process is a physical change?
- F** Water being absorbed in the large intestine
 - G** Enzymes breaking down proteins into amino acids
 - H** Saliva changing starches into sugars
 - J** Insulin metabolizing simple sugars

Amber is a type of fossil that formed from tree resin. As sticky resin ran down a tree, insects sometimes became trapped in it. Under certain conditions, ancient resin fossilized into amber with the insects preserved in it.

- 37** Which of the following is best supported by the information above?
- A** Tree resin makes good insect repellent.
 - B** Amber is a beautiful and valuable gemstone.
 - C** Trees can live for long periods of time.
 - D** Some insects lived on trees a long time ago.

- 38** A hypothesis that two organisms from different species are related to each other is best supported by —
- F** the presence of homologous structures
 - G** a similarity in diet
 - H** the presence of nitrogenous bases
 - J** a similarity in method of reproduction

- 39** Heat energy is transferred from the hot end of a metal wire to the cool end through —
- A** radiation
 - B** reflection
 - C** conduction
 - D** convection

Regional Energy Sources

Energy Source	Percentage of Use	
	Region Q	Region R
Oil	30%	30%
Coal	20%	15%
Nuclear	25%	10%
Solar	5%	10%
Hydroelectric	5%	15%
Wind	5%	10%
Biomass	10%	10%

- 40** Some students conducted a survey about various energy sources used in Regions Q and R. The data table above shows the results of the survey. Which of the following best supports the data?

- F** Region Q conserves more energy than Region R.
- G** Both regions spend the same on nonrenewable resources.
- H** Region Q uses a higher percentage of nonrenewable energy sources than Region R.
- J** Both regions use a higher percentage of renewable energy sources than nonrenewable sources.

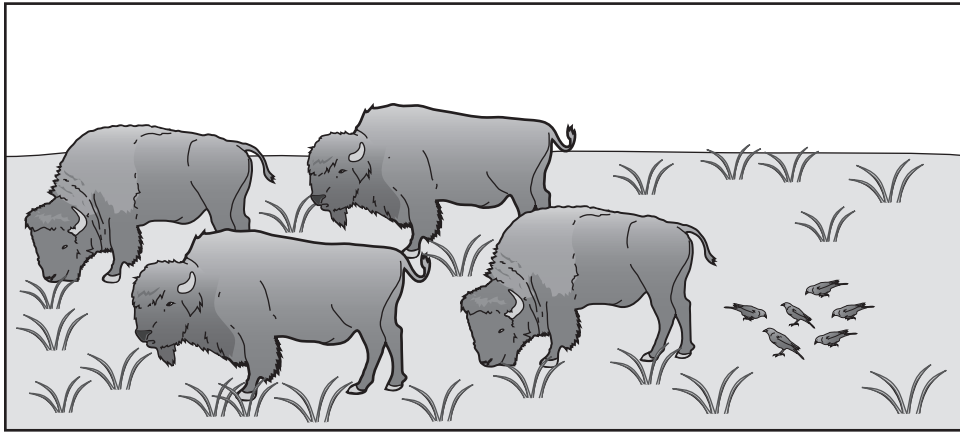
- 41** When a car suddenly stops at a red light, a book lying on the car seat slides forward. Why does the book continue to move forward?
- A** The book loses its backward momentum.
 - B** The car moves in reverse more rapidly than the book.
 - C** The friction of braking transfers energy to the book.
 - D** The book's inertia causes it to continue moving.

- 42** Which characteristic of water molecules makes water a good solvent?

- F** Mass
- G** Polarity
- H** Potential energy
- J** Chemical energy



- 43 Some bacteria in ground beef can cause illness when consumed. Based on the information in the label above, these bacteria can survive and rapidly multiply only —
- A on cutting-board surfaces
 - B for short periods of time
 - C inside a freezer
 - D within a specific temperature range



- 44 At one time large herds of bison roamed across the Great Plains. Brown-headed cowbirds often followed the bison, capturing and eating insects that scattered as the bison walked through the grasses. This relationship between the bison and the cowbird was —

F predatory
G competitive
H commensal
J parasitic

Question: Does the reaction of water and sodium hydroxide crystals give off heat?

45 Which of these lists the steps of this investigation in the correct order?

A

1. Add water to a beaker
2. Measure the temperature of the water
3. Add sodium hydroxide to the beaker
4. Stir until the solution has no crystals
5. Measure the temperature of the solution

B

1. Add sodium hydroxide to a beaker
2. Add water to the beaker
3. Measure the temperature of the water
4. Stir until the solution has no crystals
5. Measure the temperature of the solution

C

1. Add water to a beaker
2. Measure the temperature of the water
3. Add sodium hydroxide to the beaker
4. Measure the temperature of the solution
5. Stir until the solution has no crystals

D

1. Add sodium hydroxide to a beaker
2. Stir until the solution has no crystals
3. Add water to the beaker
4. Measure the temperature of the water
5. Measure the temperature of the solution

46 Fungi are different from plants in that fungi —

- F** secrete enzymes
- G** decompose organic waste
- H** contain DNA
- J** have cell walls

47 Which of the following is the proper method to dispose of a solid produced during a chemical reaction?

- A** Wrap the solid in paper, seal it in a bag, and throw it in the trash
- B** Dissolve the solid in a solvent and pour the solution down the drain
- C** Place the solid in the designated container for solid waste
- D** Carry out a reaction that will convert the solid into a gas under a fume hood

Output Type	Amount of Energy (kJ)
Heat	29,040
Friction	7,040
Electricity	1,760
Propulsion	?

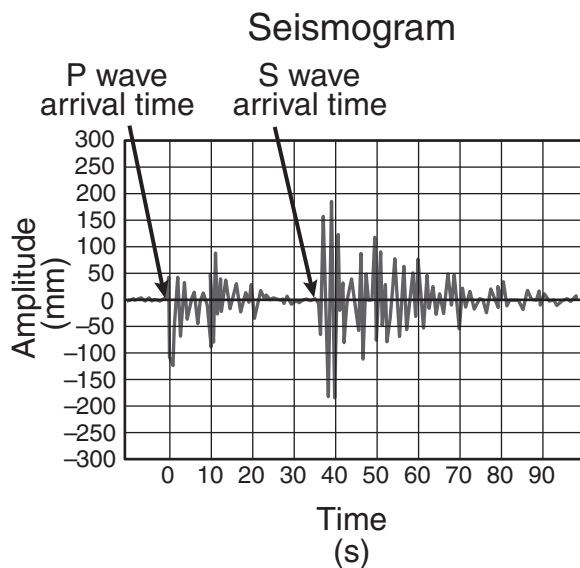
48 Gasoline containing a total of 44,000 kilojoules (kJ) of energy was burned in a car engine. The table above shows some information related to the energy output of the car from burning the gasoline. How much energy was used to move the car?

- F** 6,160 kJ
- G** 14,960 kJ
- H** 20,240 kJ
- J** 37,840 kJ

49 When the insecticide known as DDT was first introduced, it was highly effective. Which of these is the most likely reason that DDT became less effective as an insecticide?

- A** Rain caused DDT to be washed away in water runoff.
- B** Insects resistant to DDT survived and reproduced successfully.
- C** Biological magnification decreased the number of insect predators.
- D** Changes in the types of crops grown caused changes in the types of pests.

- 50 The velocity of a 40 kg object increases from 20 m/s to 30 m/s in 2 seconds. What is the acceleration of the object during these 2 seconds?
- F** 4 m/s²
G 5 m/s²
H 10 m/s²
J 50 m/s²



- 51 Earthquake waves are detected by an instrument called a seismograph, and the data are recorded visually on a seismogram. To determine the location of an earthquake, scientists must determine the amount of time between the first arrival of the P wave and the first arrival of the S wave at the location of the seismograph. According to the data in the seismogram shown above, how much time elapsed between the arrival of the P wave and the arrival of the S wave?
- A** 11 seconds
B 25 seconds
C 37 seconds
D 90 seconds

- 52 Which of the following terms best describes the eating habits of most humans?
- F** Insectivorous
G Herbivorous
H Carnivorous
J Omnivorous



- 53 The label on a health-care product is shown above. The label indicates that the product —
- A** has been scientifically tested
B contains fatty acids
C reduces inflammation immediately
D heals arthritis faster than other products do

Plant Growth in Soils with Different pH Values

Plant Group	pH of Soil	Average Plant Growth (cm)
1	6.0	25.4
2	6.2	33.0
3	6.4	50.8
4	6.6	53.3
5	6.8	53.3
6	7.0	30.5
7	7.2	22.9

- 54** Some students grew plants of the same species in soils with different pH values. Their data are shown in the table above. The students hypothesized that these plants grow best in soil with a pH of 6.4 to 6.8. According to the data, which of the following best supports the hypothesis?

- F** Plants in Groups 5 and 6 grew the most.
- G** Plants in Groups 1 and 2 grew the most.
- H** Plants in Groups 3, 4, and 5 grew the most.
- J** Plants in Groups 2, 3, and 4 grew the most.

- 55** The Bengal tiger is a species with fur that is usually orange with dark stripes. Sometimes orange Bengal tiger parents produce an offspring known as a white tiger, which has white fur. The trait for white fur is most likely caused by —

- A** parasites in the female parent
- B** malnutrition in the embryo
- C** recessive alleles in both parents
- D** unusual conditions in the environment

BE SURE YOU HAVE RECORDED ALL OF YOUR ANSWERS
ON THE ANSWER DOCUMENT.



