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# SCIENCE ITEMS

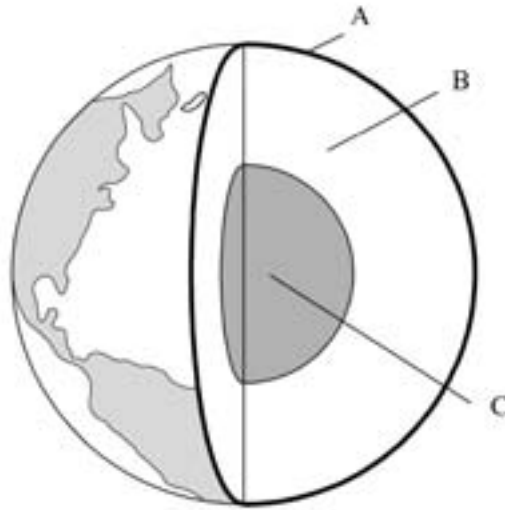
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## Guide to the Content and Layout of This Book

The *Science Items* book contains, in a ready-to-use form, the released TIMSS 1999 and TIMSS 2003 science assessment items that appeared in Book 5, *Science Concepts and Science Items*. Each item is presented on a separate page to facilitate printing.

The two books are designed to be used in tandem. The *Science Items* book is designed to facilitate the construction of sets of items tailored to the purpose of the user—most likely a classroom teacher. Users can select items for their own purpose based on their reading of the *Science Concepts and Science Items* book, print these and administer them to students. Student responses can be scored using the scoring instructions presented in the *Science Concepts and Science Items* book, and may be compared to the international benchmarks presented there.

The picture shows the three main layers of the Earth.

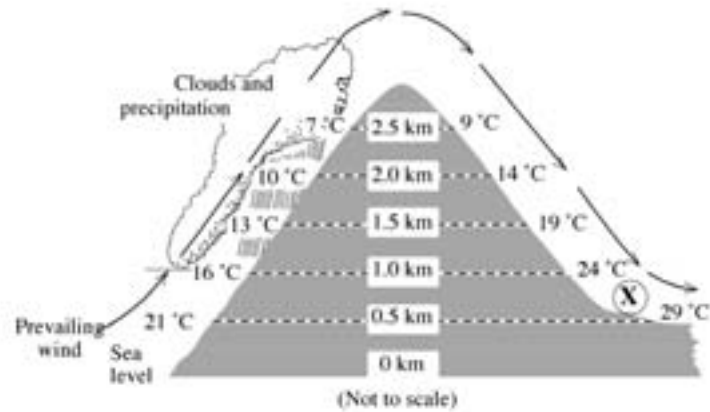


Where is it the hottest?

- A. Layer A
- B. Layer B
- C. Layer C
- D. All three layers are the same temperature.

Item Number: B01

The diagram below shows a mountain. The prevailing wind direction and average air temperatures at different elevations on both sides of the mountain are indicated.



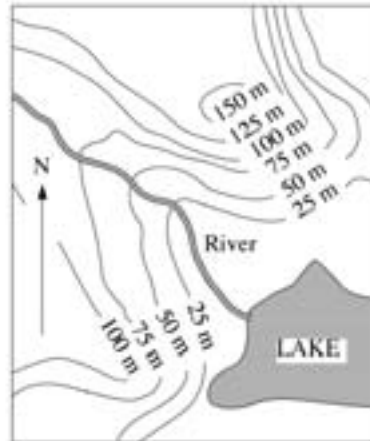
Which feature is probably located at the base of the mountain at location **X**?

- A. a dry region
- B. a jungle
- C. a glacier
- D. a large lake
- E. a rain forest

800011

Item Number: B05

On the diagram, hills and valleys are shown by means of contour lines. Each contour line indicates that all points on the line have the same elevation above sea level.



In which direction does the river flow?

- A. Northeast
- B. Southeast
- C. Northwest
- D. Southwest
- E. It is not possible to tell from the map.

Item Number: D03

Why do mountain climbers use oxygen equipment at the top of the world's highest mountains?

- A. There is less oxygen in the air at great heights.
- B. There is little nitrogen in the air at great heights.
- C. There is a hole in the ozone layer.
- D. There is no air at the top of very high mountains.

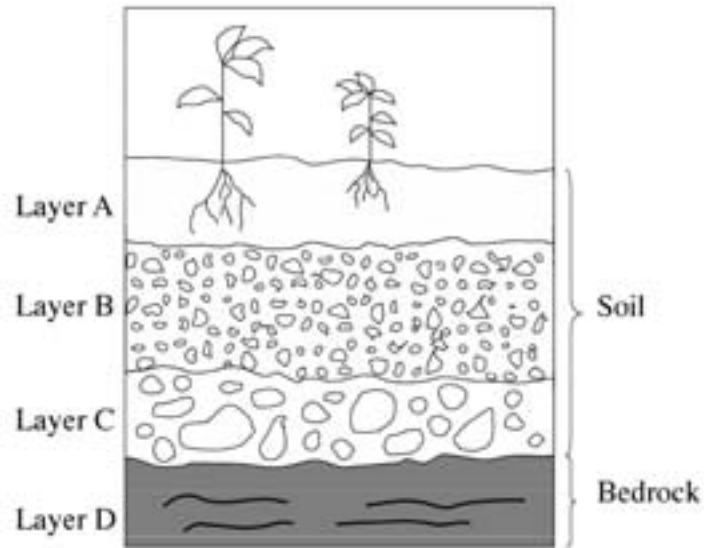
Item Number: F05

The Moon produces no light, and yet it shines at night. Why is this?

- A. The Moon reflects the light from the Sun.
- B. The Moon rotates at very high speed.
- C. The Moon is covered with a thin layer of ice.
- D. The Moon has many craters.

Item Number: H03

Which layer in the diagram contains the most organic material?



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

Item Number: H04

Which BEST describes the movement of the plates that make up Earth's surface over millions of years?

- A. They moved for millions of years but have now stopped.
- B. They stayed the same for millions of years but are now moving.
- C. They have been continually moving.
- D. They have never moved.

Item Number: J01



Which of the following is an important factor in explaining why seasons occur on Earth?

- A. Earth rotates on its axis.
- B. The Sun rotates on its axis.
- C. Earth's axis is tilted.
- D. The Sun's axis is tilted.

Item Number: J06

Diana and Mario were discussing what it might be like on other planets. Their science teacher gave them data about Earth and an imaginary planet Proto. The table shows these data.

	<b>Earth</b>	<b>Proto</b>
Distance from a star like the Sun	148 640 000 km	902 546 000 km
Atmospheric pressure at surface of planet	101 325 Pa	100 Pa
Atmospheric conditions		
• gas components	21% oxygen 0.03% carbon dioxide 78% nitrogen	5% oxygen 5% carbon dioxide 90% nitrogen
• ozone layer	yes	no
• cloud cover	yes	no

Write down one important reason why it would be difficult for humans to live on Proto if it existed. Explain your answer.

Item Number: J09

Jet aircraft typically fly at altitudes of approximately 10,000 meters. Atmospheric conditions at this altitude are different from those at ground level. Write down one difference that exists and explain why it must be controlled for in order for people to survive inside jet aircraft.

Item Number: R04

Draw a diagram to show how water from the sea can fall as rain on land.

Item Number: Z02

Immediately before and after running a 50 meter race, your pulse and breathing rates are taken. What changes would you expect to find?

- A. no change in pulse but a decrease in breathing rate
- B. an increase in pulse but no change in breathing rate
- C. an increase in pulse and breathing rate
- D. a decrease in pulse and breathing rate
- E. no change in either

Item Number: B04

Sensory messages are taken to the brain by

- A. arteries and veins
- B. arteries and hormones
- C. nerves and hormones
- D. muscles and veins

Item Number: D05

Seeds develop from which part of a plant?

A. Flower

B. Leaf

C. Root

D. Stem

Item Number: D06

A small animal called the duckbilled platypus lives in Australia. Which characteristic of this animal shows that it is a mammal?

- A. It eats other animals.
- B. It feeds its young milk.
- C. It makes a nest and lays eggs.
- D. It has webbed feet.

Item Number: F01



Humans interpret seeing, hearing, tasting and smelling in the

- A. brain
- B. spinal cord
- C. receptors
- D. skin

Item Number: F03

Which of these is NOT a function of the blood?

- A. Digesting food
- B. Protecting against disease
- C. Carrying waste materials away from the cells
- D. Carrying oxygen to different parts of the body

Item Number: H01

What are vitamins?

- A. Substances that break down food
- B. Bacteria that people get when they eat some foods
- C. Substances that people make from protein
- D. Substances that people need in small amounts in order for their bodies to function normally

Item Number: H02

What feature is shared by ALL insects?

- A. External skeleton
- B. Two pairs of wings
- C. Jumping legs
- D. Stinging mechanism

Item Number: J02

The BEST reason for including protein in a healthy diet is because it is the main source of

- A. energy for the body
- B. fiber for digestion
- C. raw materials for cell growth and repair
- D. vitamins for fighting disease

Item Number: J07

What is the primary function of the large leaves found on seedlings growing in a forest?

- A. To provide shade for the root systems
- B. To get rid of excess water that is entering through the roots
- C. To allow for leaf damage by insects
- D. To gather as much light as possible for photosynthesis

Item Number: L02

Which one of the following characteristics is most likely to be found in mammals that are preyed on by other mammals for food?

- A. Eyes on the sides of the head
- B. Teeth that are long and pointed
- C. Claws on the feet
- D. Ears that cannot move

Item Number: L03

When male wolves place their scent on trees, they most likely are doing this in order to

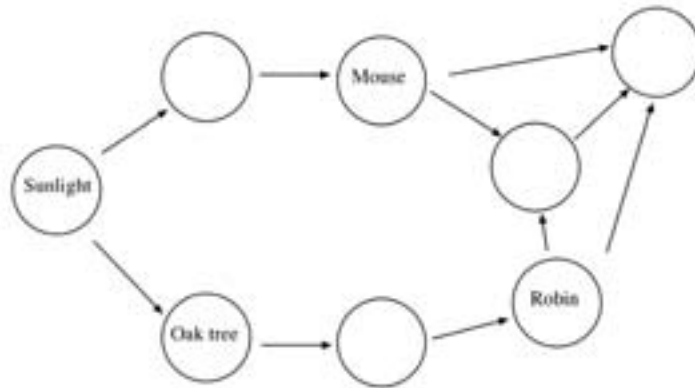
- A. attract female wolves
- B. attract prey
- C. mark their territory against other wolves
- D. mark the location of food supplies

Item Number: L05

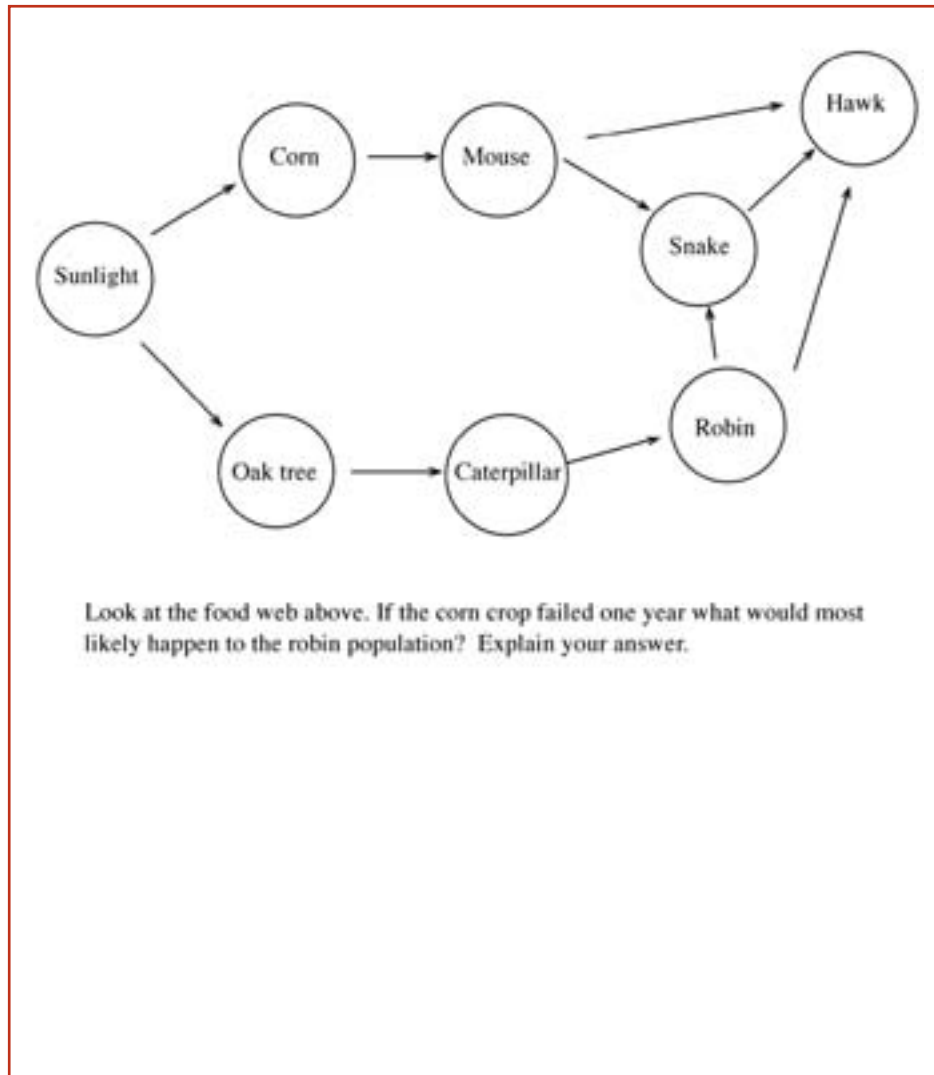


An incomplete food web has been drawn for you. Complete it by filling in each of the empty circles with the number of the correct animal or plant from the list. Remember that the arrows represent energy flow and go from the provider to the user.

- 1) Caterpillar
- 2) Corn
- 3) Hawk
- 4) Snake



Item Number: L08



Item Number: N02

Which of the following organisms are used to convert milk to yogurt?

- A. Bacteria
- B. Protozoa
- C. Viruses
- D. Algae

Item Number: N03

Some plants grow better if bone meal (ground-up bones) is spread around their roots. What does bone meal supply to plants that makes them grow better?

- A. Energy
- B. Minerals
- C. Vitamins
- D. Carbon dioxide
- E. Water

Item Number: N05

Tissues are found in living things. What is the definition of a tissue?

- A. A group of cells with similar structure and function
- B. A group of cells with different structure and function
- C. A group of organelles contained inside a cell
- D. A group of substances that make up the walls of a cell

Item Number: N06

Which statement best explains why mammals are found in very cold regions of the world but lizards are not?

- A. Both mammals and lizards are cold-blooded, but mammals have fur to keep them warm.
- B. Both mammals and lizards are warm-blooded, but lizards get too cold when they shed their skin.
- C. Since mammals, but not lizards, are warm blooded, their body temperature will adjust to match the external temperature.
- D. Since mammals, but not lizards, are warm-blooded, they will maintain their body temperature using heat from metabolic processes.

Item Number: N08

Ethan hammered a nail into the trunk of a young tree.  
Explain why the nail was still at the same height from the ground twenty years later even though the tree had grown to a height of 22 meters.

Item Number: P03

Animals hibernate to survive cold weather and poor food supplies. Which of the following occurs in animals when they hibernate?

- A. Their blood stops circulating.
- B. Their body temperature increases.
- C. Their body fat remains constant.
- D. Their rate of metabolism decreases.

Item Number: P04



What digestive substance is found in the stomach? What does it do?

Item Number: P06

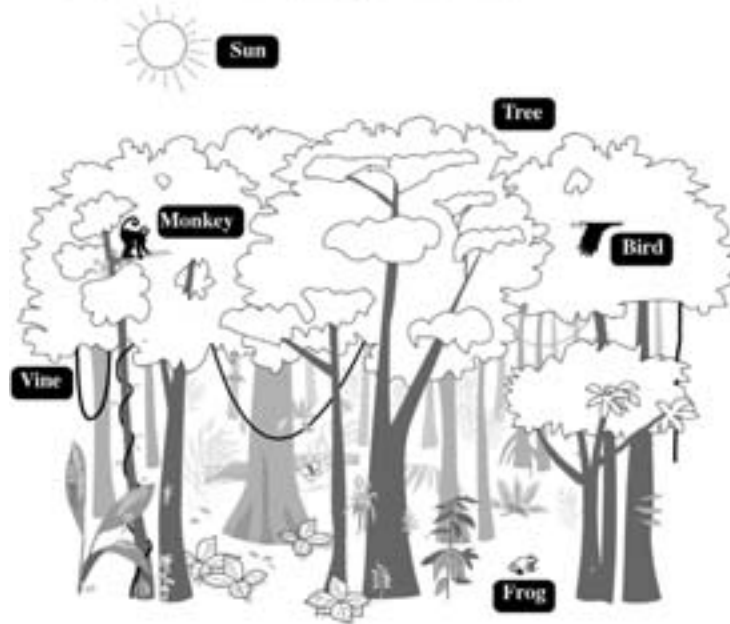
A new species of fish was released into a lake. State two unwanted outcomes that could arise from the introduction of this new species.

1.

2.

Item Number: R03D

In the picture of a rainforest, six objects have been labeled.

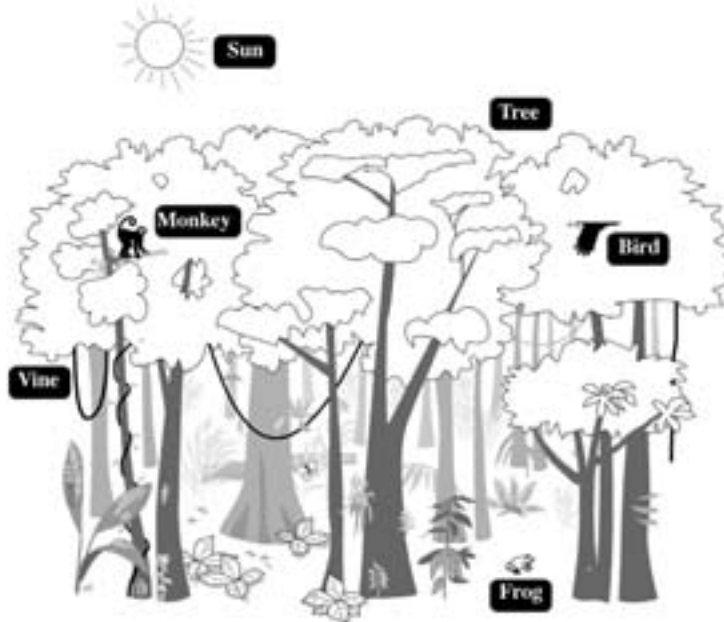


Explain why each of the following is important in maintaining the ecosystem in the rainforest.

- A. The Tree
  
- B. The Sun

Item Number: X02A

In the picture of a rainforest, six objects have been labeled.



Explain why each of the following is important in maintaining the ecosystem in the rainforest.

- A. The Tree
  
- B. The Sun

Item Number: X02B

Most of the chemical energy released when gasoline burns in a car engine is not used to move the car, but is changed into

- A. electricity
- B. heat
- C. magnetism
- D. sound

Item Number: B02

Which object listed in the table has the greatest density?

Object	Mass of Object	Volume of Object
W	11.0 grams	24 cubic centimeters
X	11.0 grams	12 cubic centimeters
Y	5.5 grams	4 cubic centimeters
Z	5.5 grams	11 cubic centimeters

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

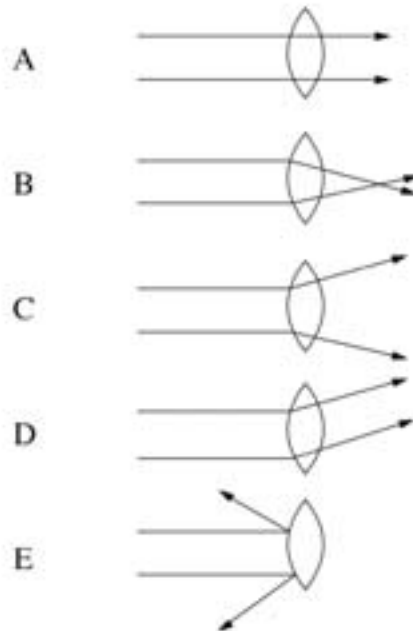
Item Number: B03

The walls of a building are to be painted to reflect as much light as possible. What color should they be painted?

- A. White
- B. Red
- C. Black
- D. Pink

Item Number: B06

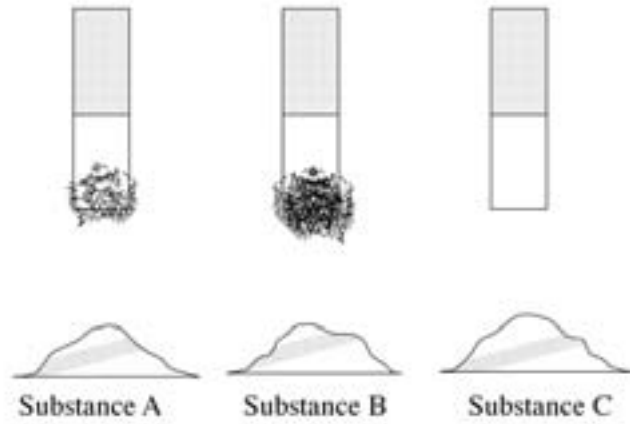
Which diagram best shows what happens when light passes through a magnifying glass?



Item Number: D01

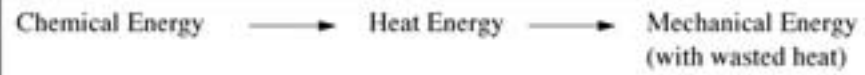


Each of the three magnets shown has been dipped into the substance below it. Which of the substances could be coffee?



- A. A only
- B. B only
- C. C only
- D. A and B only

Item Number: D02



The sequence of energy changes shown in the diagram explains which event?

- A. A flashlight is on.
- B. A candle burns.
- C. Gasoline burns to power a car.
- D. Electric current runs a refrigerator.

Item Number: D04

On a warm sunny day, you will feel cooler wearing light-colored clothes because they

- A. reflect more radiation
- B. prevent sweating
- C. are not as heavy as dark clothes
- D. let more air in

Item Number: F02

People get energy from the food they eat. Where does the energy stored in food come from?

- A. Fertilizer
- B. The Sun
- C. Vitamins
- D. The soil

Item Number: H05

A student put 100 mL of water in each of the open containers and let them stand in the sun for one day. Which container would probably lose the most water due to evaporation?

A.



B.



C.

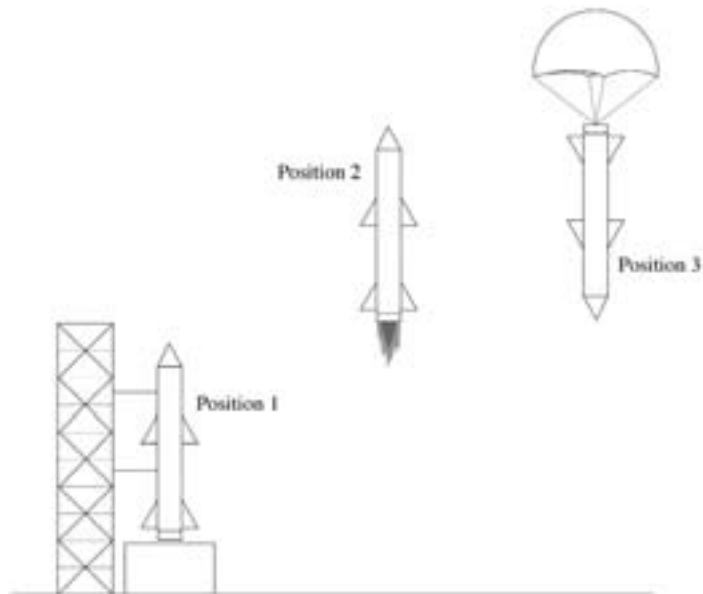


D.



Item Number: J04

The drawings show a rocket being launched from Earth and then returning.



In which of the three positions does gravity act on the rocket?

- A. 3 only
- B. 1 and 2 only
- C. 2 and 3 only
- D. 1, 2 and 3

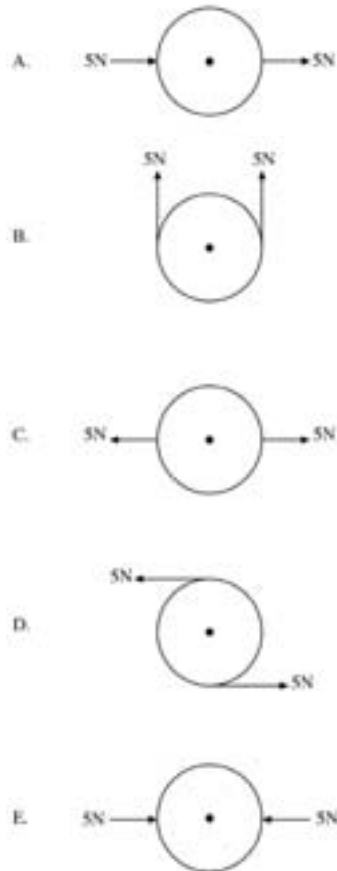
Item Number: J05

Sunscreen is used to protect the skin from exposure to which type of solar radiation?

- A. Visible
- B. X-rays
- C. Infrared
- D. Ultraviolet
- E. Microwaves

Item Number: J08

A uniform wheel is free to rotate on its axle at its center. It is acted on by two forces in the same plane. Each force has the same size, equal to 5N (Newtons). In which case will the wheel rotate?



Item Number: L01



Machine A and Machine B are each used to pump water from a river. The table shows what volume of water each machine removed in one hour and how much gasoline each of them used.

	Volume of Water Removed in 1 Hour (liters)	Gasoline Used in 1 Hour (liters)
Machine A	1000	1.25
Machine B	500	0.5

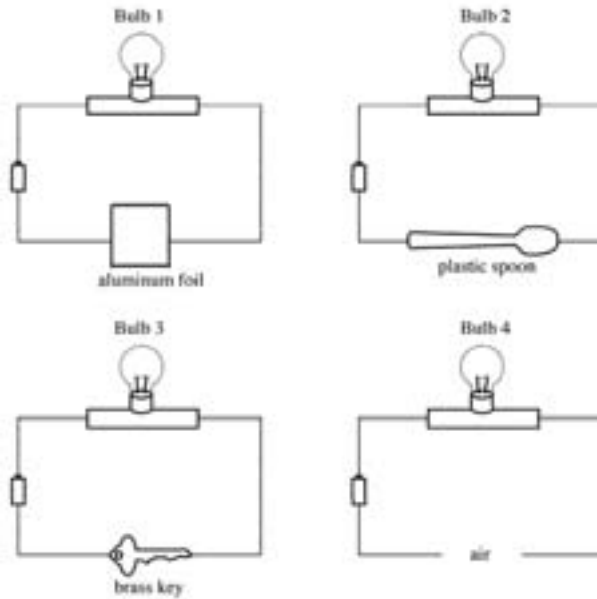
a) Which machine is more efficient in converting the energy in gasoline to work?

Answer: \_\_\_\_\_

b) Explain your answer.

Item Number: L04

The following diagrams show a battery and a bulb connected by wires to various materials.

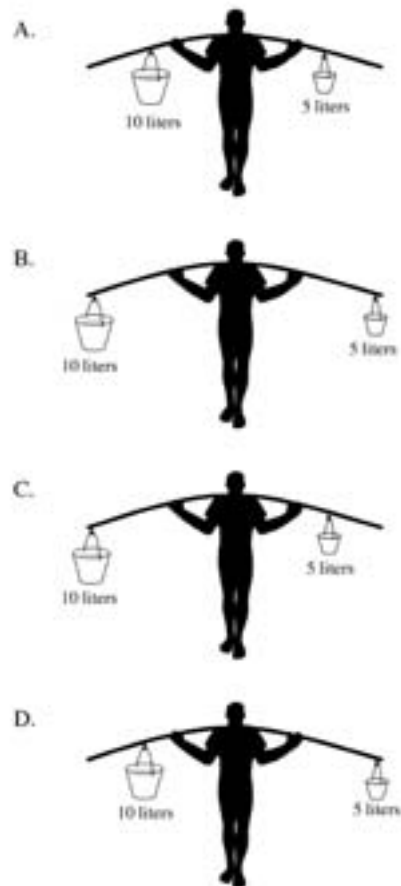


Which of the bulbs will light?

- A. 1 only
- B. 2 and 3 only
- C. 1 and 3 only
- D. 1, 3 and 4 only
- E. 1, 2 and 3 only

Item Number: N01

Which picture shows the best way for the man to balance a ten-liter bucket of water and a five-liter bucket of water?

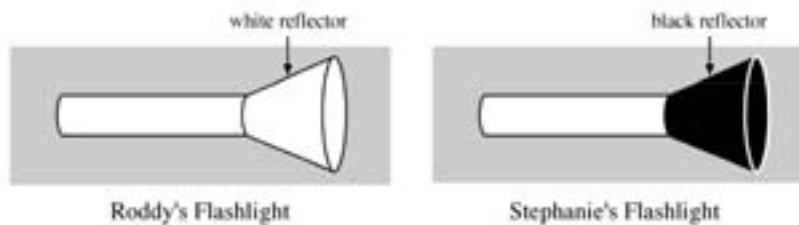


Item Number: N09

Roddy and Stephanie each make a flashlight using identical batteries and bulbs.



They then add cardboard reflectors to their flashlights as shown below. Roddy's reflector is made of white cardboard and Stephanie's reflector is made of black cardboard.



The flashlights are then switched on.

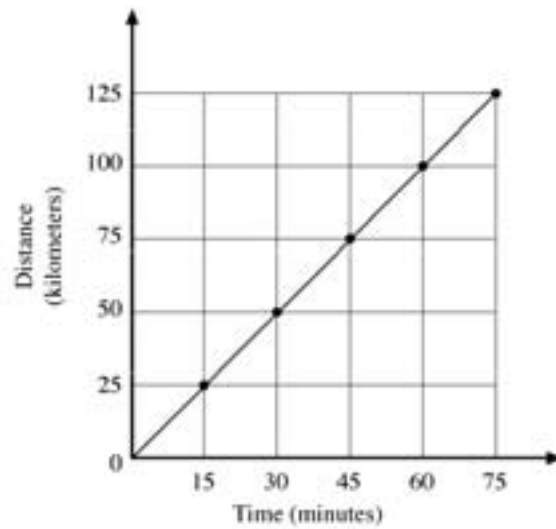
a) Which flashlight shines more light on a wall two meters away?  
(check one)

- Roddy's (white reflector)
- Stephanie's (black reflector)

b) Explain your answer.

Item Number: N10

The graph shows the progress made by a car traveling along a straight road.



What is the speed of the car?

- A. 25 kilometers per hour
- B. 50 kilometers per hour
- C. 75 kilometers per hour
- D. 100 kilometers per hour

Item Number: P01

James turns on a flashlight in his bedroom and shines it on his wall one meter away to produce a small circle of light. He then shines the flashlight on his ceiling two meters away to produce a larger circle of light.

a) Does more light reach the ceiling than the wall?  
(Check one)

Yes

No

b) Explain your answer.

Item Number: P02

As a play begins, white stage lights shine on an actress wearing a red dress. Suddenly, the lights go off and a green light is shone on the actress. The dress looks black. Why does the dress look black?

- A. The dress reflects the green part of light.
- B. The dress absorbs the red part of light.
- C. The dress absorbs the green part of light.
- D. The dress reflects the black part of light.

Item Number: R02

Electrical energy is used to power a lamp. How does the amount of electrical energy used compare to amount of light energy produced?

a) The amount of electrical energy used is:  
(Check one)

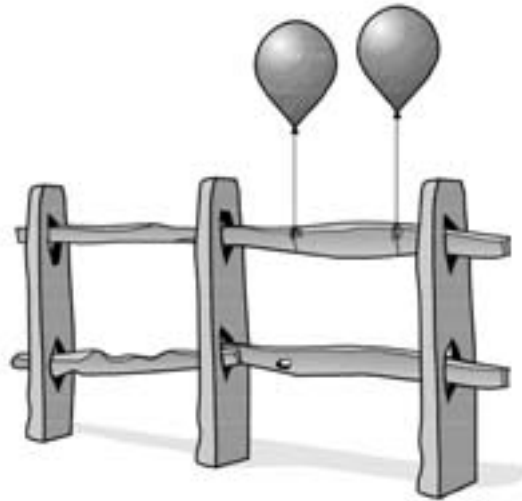
- more than the amount of light energy produced.
- less than the amount of light energy produced.
- the same as the amount of light energy produced.

b) Give a reason to support your answer.

Item Number: X01



Balloons filled with helium gas are taken outside on a hot, sunny day and tied to a fence as shown in the diagram.



Over a period of a few hours, the balloons increase in size.  
Explain why.

Item Number: Z03

Paint applied to an iron surface prevents the iron from rusting. Which ONE of the following provides the best reason?

- A. It prevents nitrogen from coming in contact with the iron.
- B. It reacts chemically with the iron.
- C. It prevents carbon dioxide from coming in contact with the iron.
- D. It makes the surface of the iron smoother.
- E. It prevents oxygen and moisture from coming in contact with the iron.

Item Number: F06

If you are burning wood, the reaction will

- A. release energy
- B. absorb energy
- C. neither absorb nor release energy
- D. sometimes release and sometimes absorb energy,  
depending on the kind of wood

Item Number: H06

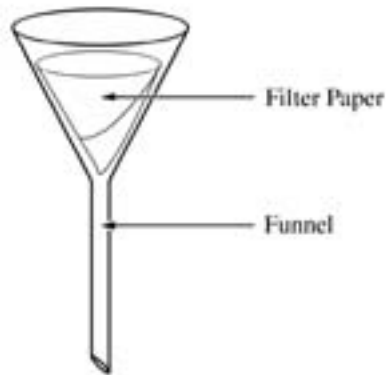
The words *organs*, *tissues*, and *cells* can be used in the following sentence:

Lungs are *organs* composed of *tissues* which are made up of *cells*.

Use the words *molecules*, *atoms*, and *compounds* to complete the following sentence:

Sugars are \_\_\_\_\_ composed of  
\_\_\_\_\_ which are made up of  
\_\_\_\_\_.

Item Number: J03



Filtration using the equipment shown above can be used to separate which materials?

- A. A mixture of salt and pepper
- B. A mixture of pepper and water
- C. A mixture of oxygen and water
- D. A solution of silver nitrate in water
- E. A solution of sugar in water

Item Number: L06

Which is an example of a chemical reaction?

- A. Water boiling
- B. Sugar dissolving
- C. Nails rusting
- D. Wax melting

*Item Number: N07*

A large log of wood will burn more slowly than the same log chopped into smaller pieces. Explain why.

Item Number: R05

A steel manufacturer uses a chemical process called 'galvanization' to protect the surface of steel beams that are used to construct high-rise buildings. It takes a crew of steel workers 8 hours to 'galvanize' a large batch of steel.

a) Why **MUST** the surface of the steel be protected?

b) A new 'galvanization' process is developed that shortens the procedure to 4 hours. Describe two consequences of the steel manufacturer switching to the shorter 'galvanization' process.

1.

2.

Item Number: Z01A



A steel manufacturer uses a chemical process called 'galvanization' to protect the surface of steel beams that are used to construct high-rise buildings. It takes a crew of steel workers 8 hours to 'galvanize' a large batch of steel.

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1.

2.

Item Number: Z01D

Rain and running water can wash away soil. From which area is soil most likely to be washed away?

- A. A sloping area with bushes
- B. A flat area with grasses
- C. A flat area that is barren
- D. A sloping area that is barren

Item Number: F04

Insecticides are used to control insect populations so that they do not destroy crops. Over time, some insecticides become less effective at killing insects, and new insecticides must be developed. What is the most likely reason insecticides become less effective over time?

- A. Surviving insects have learned to include insecticides as a food source.
- B. Surviving insects pass their resistance to insecticides to their offspring.
- C. Insecticides build up in the soil.
- D. Insecticides are concentrated at the bottom of the food chain.

Item Number: L07

What are two reasons why famine (a great shortage of food) occurs?

1.

2.

Item Number: P05D

What is predicted to be a result of global warming?

- A. Rising ocean level
- B. More severe earthquakes
- C. Larger volcanic eruptions
- D. Thinning ozone layer

Item Number: R06

Two open bottles, one filled with vinegar and the other with olive oil, were left on a window sill in the Sun. Several days later it was observed that the bottles were no longer full. What can be concluded from this observation?

- A. Vinegar evaporates faster than olive oil.
- B. Olive oil evaporates faster than vinegar.
- C. Both vinegar and olive oil evaporate.
- D. Only liquids containing water evaporate.
- E. Direct sunlight is needed for evaporation.

Item Number: N04

The primary reason scientists repeat the measurements they take during experiments is so that they can

- A. check that the equipment is working
- B. list all the results in a table
- C. estimate experimental error
- D. change the experimental conditions

Item Number: P07

Alexander Fleming noticed that bacteria growing on a plate of agar did not grow next to a mold that was growing on the same plate. He wrote in his laboratory report: "The mold may be producing a substance that kills bacteria." This statement is best described as

- A. an observation
- B. a hypothesis
- C. a generalization
- D. a conclusion

Item Number: R01



Suppose you want to investigate how long it takes for the heart rate to return to normal after exercising. What materials would you use and what procedures would you follow?

Item Number: X03

A solution of hydrochloric acid (HCl) in water will turn blue litmus paper red. A solution of the base sodium hydroxide (NaOH) in water will turn red litmus paper blue. If the acid and base solutions above are mixed in the right proportion, the resulting solution will cause neither red nor blue litmus paper to change color.

Explain why the litmus paper does not change color in the mixed solution.

Item Number: S032057

Fanning can make a wood fire burn hotter because the fanning

- Ⓐ makes the wood hot enough to burn
- Ⓑ adds more oxygen needed for burning
- Ⓒ increases the amount of wood there is to burn
- Ⓓ provides the energy needed to keep the fire going

Item Number: S012003

Some chemical reactions absorb energy, while others release energy. Of the chemical reactions in burning coal and exploding fireworks, which will release energy?

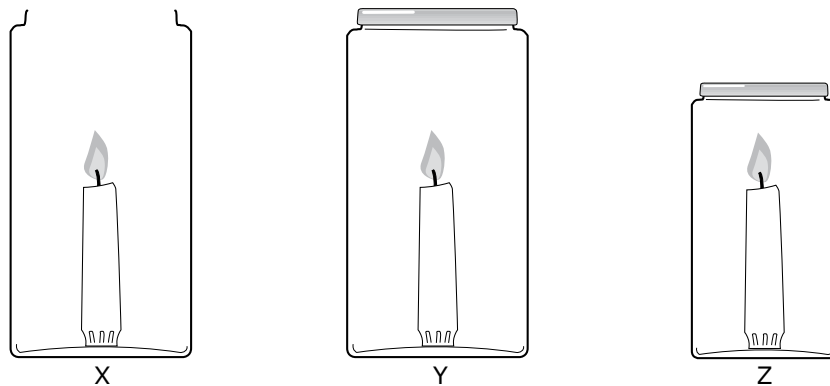
- Ⓐ Burning coal only
- Ⓑ Exploding fireworks only
- Ⓒ Both burning coal and exploding fireworks
- Ⓓ Neither burning coal nor exploding fireworks

Item Number: S022188

Which is a chemical change?

- (A) Element 1 is polished to form a smooth surface.
- (B) Element 2 is heated and evaporates.
- (C) Element 3 develops a white, powdery surface after standing in air.
- (D) Element 4 is separated from a mixture by filtration.

Item Number: S022198



Three identical candles are placed in the three jars shown above and lit at the same time. Jars Y and Z are then sealed with lids, and Jar X is left open.

Which candle flame will go out first (X, Y, or Z)? \_\_\_\_\_

Explain your answer.

Item Number: S022191

Which of the following is NOT a mixture?

- Ⓐ Smoke
- Ⓑ Sugar
- Ⓒ Milk
- Ⓓ Paint

Item Number: S022187

David makes a solution by dissolving 10 grams of salt in 100 ml of water. He wants a solution that is half as concentrated. What should he add to the original solution to obtain a solution that is about half as concentrated?

- Ⓐ 50 ml of water
- Ⓑ 100 ml of water
- Ⓒ 5 grams of salt
- Ⓓ 10 grams of salt

Item Number: S032564



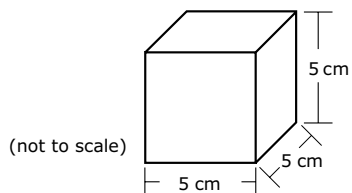
Oxygen, hydrogen, and water are substances.  
Which of these substances are elements?

- Ⓐ oxygen, hydrogen and water
- Ⓑ oxygen and hydrogen only
- Ⓒ oxygen only
- Ⓓ water only

Item Number: S032574

The scientists decided to compare the densities of the crown and a block of metal just like the original block. The density of a substance is the mass of a sample of the substance divided by its volume (density = mass/volume).

The scientists found the volume of the block and computed its density based on its known mass (2,400 g). The diagram below shows the dimensions of the block of metal that the scientists measured.



What is the density of the block of metal?

Answer: \_\_\_\_\_  $\text{g/cm}^3$

Item Number: S032709

A powder made up of both white specks and black specks is likely to be

- Ⓐ a solution
- Ⓑ a pure compound
- Ⓒ a mixture
- Ⓓ an element

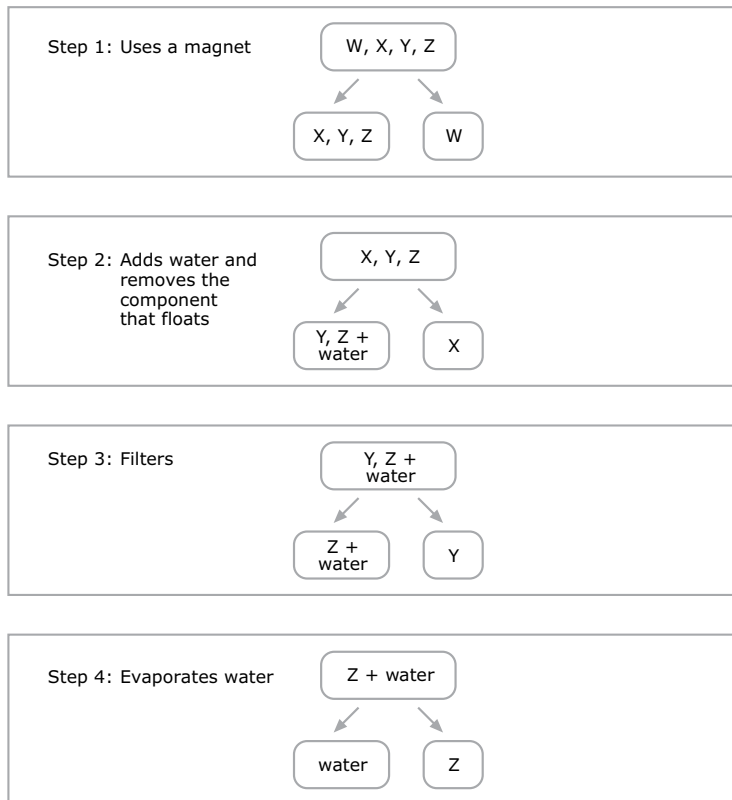
Item Number: S012016

When chlorine gas reacts with sodium metal, what type of substance is formed?

- Ⓐ A mixture
- Ⓑ A compound
- Ⓒ An element
- Ⓓ An alloy
- Ⓔ A solution

Item Number: S022206

Teresa is given a mixture of salt, sand, iron filings, and small pieces of cork. She separates the mixture using a 4-step procedure as shown in the diagram. The letters W, X, Y, and Z are used to stand for the four components but do not indicate which letter stands for which component.



Identify what each component is by writing *salt*, *sand*, *iron*, or *cork* in the correct spaces below

Component W is: \_\_\_\_\_

Component X is: \_\_\_\_\_

Component Y is: \_\_\_\_\_

Component Z is: \_\_\_\_\_

Item Number: S032562

The table below lists the density for different metals.

<b>Metal</b>	<b>Density (g/cm<sup>3</sup>)</b>
Platinum	21.4
Gold	19.3
Silver	10.5
Copper	8.9
Zinc	7.1
Aluminum	2.7

- A. Look at the density you computed for the block of metal. What was the block of metal most likely made of?

Answer: \_\_\_\_\_

Explain your answer.

- B. The density of the crown was found to be 12.0 g/cm<sup>3</sup>. What would you report to the king about what metal or mixture of metals the jeweler used to make the crown?

Item Number: S032713A

The table below lists the density for different metals.

<b>Metal</b>	<b>Density (g/cm<sup>3</sup>)</b>
Platinum	21.4
Gold	19.3
Silver	10.5
Copper	8.9
Zinc	7.1
Aluminum	2.7

- A. Look at the density you computed for the block of metal. What was the block of metal most likely made of?

Answer: \_\_\_\_\_

Explain your answer.

- B. The density of the crown was found to be 12.0 g/cm<sup>3</sup>. What would you report to the king about what metal or mixture of metals the jeweler used to make the crown?

Item Number: S032713B

If you took all of the atoms out of a chair, what would be left?

- (A) The chair would still be there, but it would weigh less.
- (B) The chair would be exactly the same as it was before.
- (C) There would be nothing left of the chair.
- (D) Only a pool of liquid would be left on the floor.

Item Number: S012040



The nucleus of MOST atoms consists of

- Ⓐ neutrons only
- Ⓑ protons and neutrons
- Ⓒ protons and electrons
- Ⓓ neutrons and electrons

Item Number: S012025

What is formed when a neutral atom gains an electron?

- Ⓐ A mixture
- Ⓑ An ion
- Ⓒ A molecule
- Ⓓ A metal

Item Number: S022202

The planet Jupiter is bigger than Earth's moon but it appears to be smaller when viewed from Earth. Why is this?

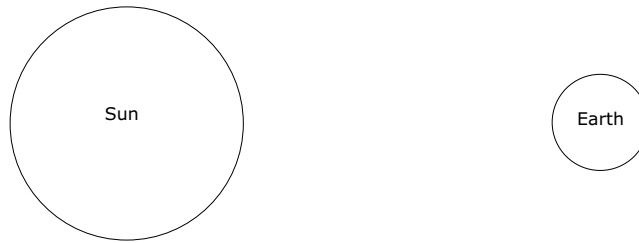
Item Number: S022283

The shape of the moon appears to change regularly during each month. Which of the following best explains why the shape of the moon appears to change?

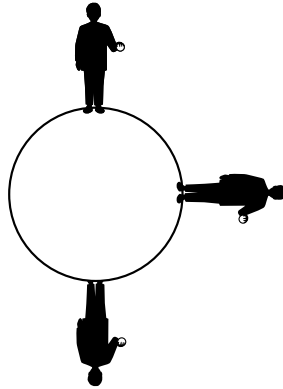
- (A) The Earth turns on its axis.
- (B) The Moon turns on its axis.
- (C) The Moon orbits around the Earth.
- (D) Clouds cover the Moon.

Item Number: S032437

Draw the position of the Moon on the diagram below to show what is meant by an eclipse of the Sun.

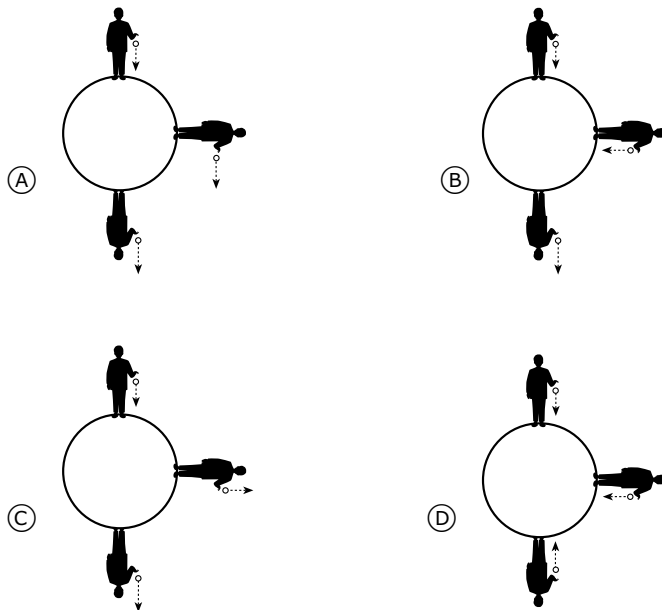


Item Number: S032532



The diagram above shows a person holding a ball standing at three different places on Earth. If the person drops the ball, gravity will make it fall.

Which of the following diagrams best shows the direction the dropped ball will fall at the three different positions?



Item Number: S032714

The Sun is an example of which of the following?

- Ⓐ comet
- Ⓑ planet
- Ⓒ galaxy
- Ⓓ star

Item Number: S032150

The table shows some information about the planets Venus and Mercury.

	Average Surface Temperature (°C)	Atmospheric Composition	Mean Distance from the Sun (millions of km)	Time to Revolve Around the Sun (Number of Days)
Venus	470	Mostly Carbon Dioxide	108	225
Mercury	300	Trace amounts of gases	58	88

Which of the following best explains why the surface temperature of Venus is higher than that of Mercury?

- (A) There is less absorption of sunlight on Mercury because of the lack of atmospheric gases.
- (B) The high percentage of carbon dioxide in the atmosphere of Venus causes a greenhouse effect.
- (C) The longer time for Venus to revolve around the Sun allows it to absorb more heat from the Sun.
- (D) The Sun's rays are less direct on Mercury because it is closer to the Sun.

Item Number: S032301



The pictures show two different mountains. The mountains in Picture A are rough and jagged. The mountains in Picture B are smooth and rounded.



Picture A

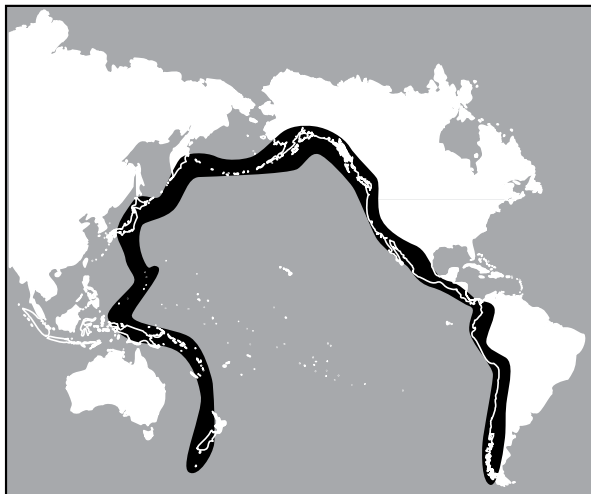


Picture B

Which statement about these mountains is probably true?

- Ⓐ The mountains in Picture A are older.
- Ⓑ The mountains in Picture B are older.
- Ⓒ The mountains are about the same age but were formed in different ways.
- Ⓓ The mountains are about the same age but are in different hemispheres.

Item Number: S012013



The diagram above shows the Pacific Ring of Fire. Earthquakes and volcanic activity occur along the Ring of Fire. Which of the following best explains why?

- (A) It is located at the boundaries of tectonic plates.
- (B) It is located at the boundary of deep and shallow water.
- (C) It is located where the major ocean currents meet.
- (D) It is located where ocean temperature is the highest.

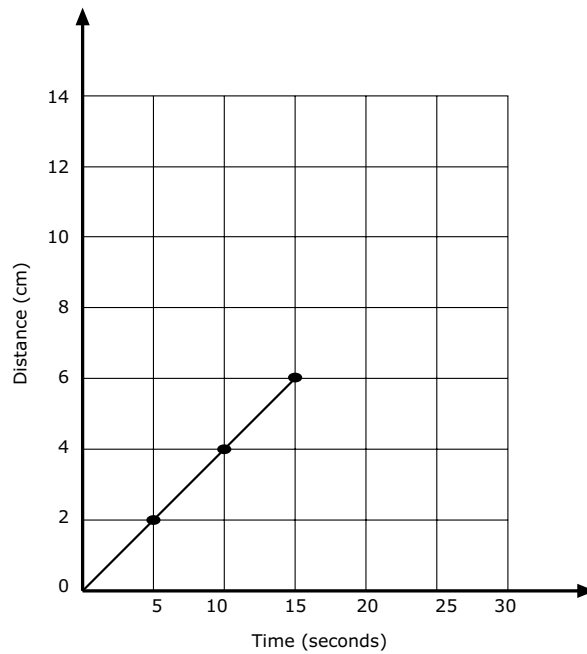
Item Number: S032656

Which is NOT a fossil fuel?

- (A) Coal
- (B) Oil
- (C) Wood
- (D) Natural gas

Item Number: S012018

The graph shows the progress made by a beetle moving along a straight line.



If the beetle keeps moving at the same speed, how long will it take to travel 10 cm?

- (A) 4 seconds
- (B) 6 seconds
- (C) 20 seconds
- (D) 25 seconds

Item Number: S012041

Fossil fuels were formed from

- Ⓐ volcanoes
- Ⓑ the remains of living things
- Ⓒ gases in the atmosphere
- Ⓓ water trapped inside rocks

Item Number: S022074

The table gives the temperature at a certain place at different times of the day for three days.

	6 a.m.	9 a.m.	12 noon	3 p.m.	6 p.m.
Monday	15°C	17°C	20°C	21°C	19°C
Tuesday	15°C	15°C	15°C	5°C	4°C
Wednesday	8°C	10°C	14°C	14°C	13°C

When did the wind become much colder?

- (A) Monday morning
- (B) Monday afternoon
- (C) Tuesday morning
- (D) Tuesday afternoon
- (E) Wednesday afternoon

Item Number: S012027

The diagram above shows a map of the world with the lines of latitude marked. Which of the following places marked on the map is most likely to have an average yearly temperature similar to location **X**?

- (A) location A
- (B) location B
- (C) location C
- (D) location D

Item Number: S032652

Most underground caves are formed by the action of water on

- Ⓐ granite
- Ⓑ limestone
- Ⓒ sandstone
- Ⓓ shale

Item Number: S012030



Three gases found in Earth's atmosphere are carbon dioxide, nitrogen, and oxygen. What is their order of abundance from greatest to least?

- (A) nitrogen, oxygen, carbon dioxide
- (B) nitrogen, carbon dioxide, oxygen
- (C) oxygen, nitrogen, carbon dioxide
- (D) carbon dioxide, oxygen, nitrogen

Item Number: S022275

A small, fast-moving river is in a V-shaped valley on the slope of a mountain. If you follow the river to where it passes through a plain, what will the river most likely look like compared with how it looked on the mountain?

- Ⓐ Much the same
- Ⓑ Deeper and faster
- Ⓒ Slower and wider
- Ⓓ Straighter

Item Number: S012006

The burning of fossil fuels has increased the carbon dioxide content of the atmosphere. What is a possible effect that the increased amount of carbon dioxide is likely to have on our planet?

- Ⓐ A warmer climate
- Ⓑ A cooler climate
- Ⓒ Lower relative humidity
- Ⓓ More ozone in the atmosphere

Item Number: S012017

One of the main causes of acid rain is

- (A) Waste from nuclear power plants
- (B) Spills from chemical manufacturing plants
- (C) Gases from burning fossil fuels
- (D) Gases from aerosol spray cans

Item Number: S022240

Which of these daily activities can most directly help reduce air pollution in a city?

- (A) turning down the volume on the television
- (B) using biodegradable materials
- (C) using public transportation instead of driving
- (D) recycling paper

Item Number: S032446

Oil is an example of a natural resource that is not renewable. Which is another example of a nonrenewable resource?

- Ⓐ Wood
- Ⓑ Seawater
- Ⓒ Sunlight
- Ⓓ Coal

Item Number: S012042

Write down one renewable energy source and describe one way that people make use of it.

Energy Source: \_\_\_\_\_

Use:

Item Number: S032242

Which group of energy sources are ALL renewable?

- Ⓐ coal, oil, and natural gas
- Ⓑ solar, oil, and geothermal
- Ⓒ wind, solar, and tidal
- Ⓓ natural gas, solar, and tidal

Item Number: S032422

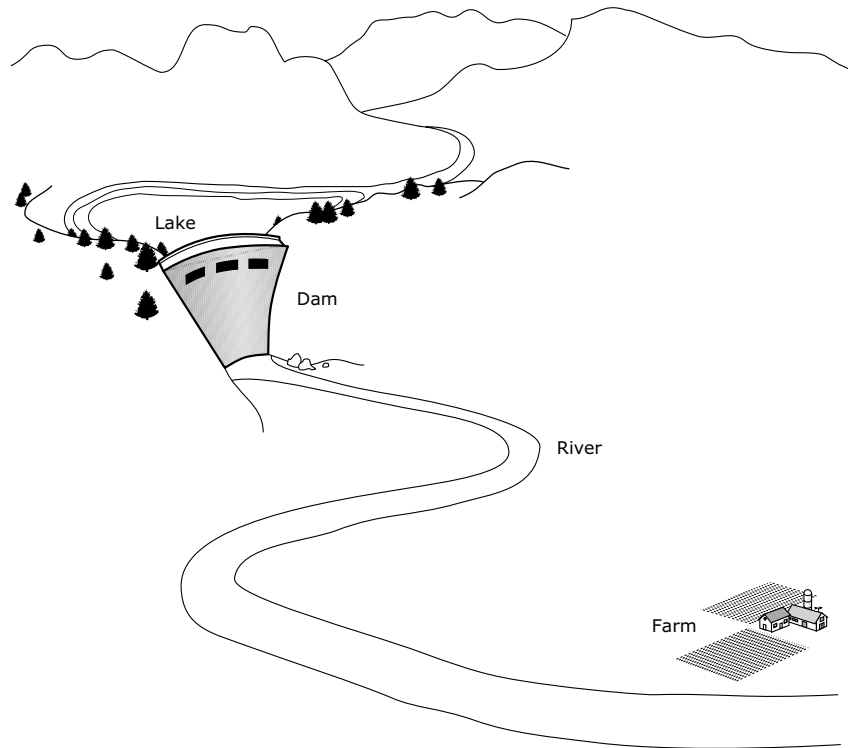


Overgrazing of land by livestock contributes to a major problem.  
That problem is

- Ⓐ depletion of ground water
- Ⓑ increased pollution
- Ⓒ erosion of soil
- Ⓓ acid rain

Item Number: S012005

The diagram shows a farm in a valley where a dam has just been built.



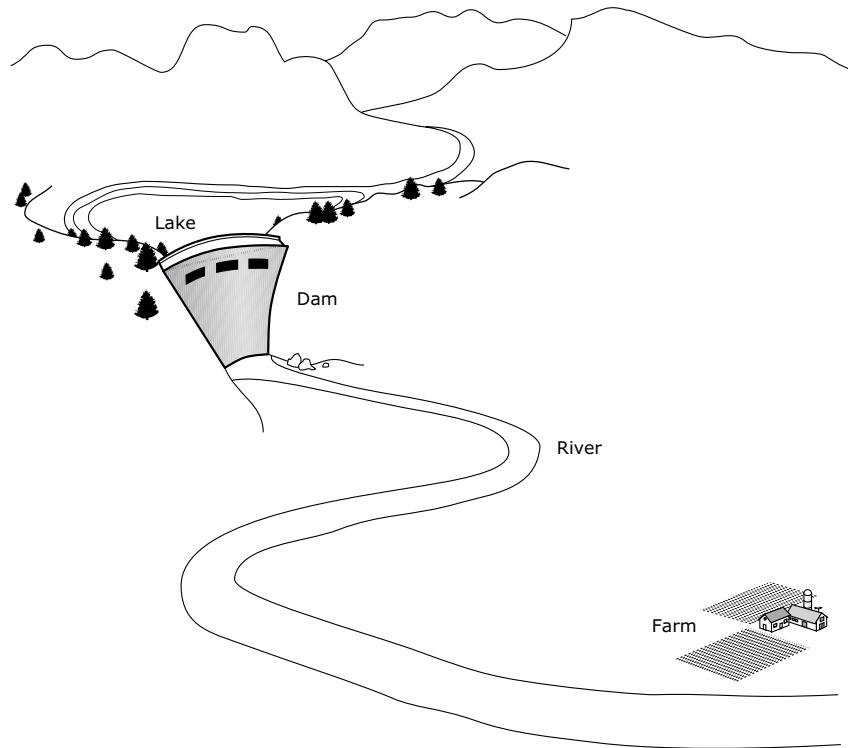
The presence of the dam can have both positive and negative effects on farming in the valley.

A. Describe one positive effect of the dam on farming.

B. Describe one negative effect of the dam on farming.

Item Number: S022088A

The diagram shows a farm in a valley where a dam has just been built.



The presence of the dam can have both positive and negative effects on farming in the valley.

A. Describe one positive effect of the dam on farming.

B. Describe one negative effect of the dam on farming.

Item Number: S022088B

Sea water contains dissolved salts and is not suitable for drinking.  
Describe a procedure that can be used to obtain a cup of drinking water  
from a bucket of sea water.

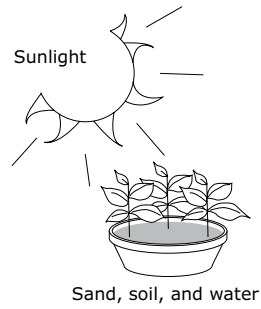
Item Number: S032063

What is the main function of red blood cells?

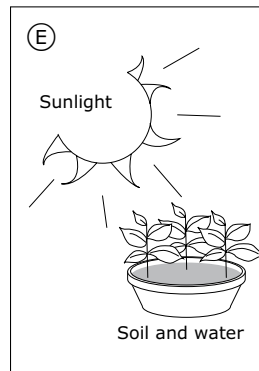
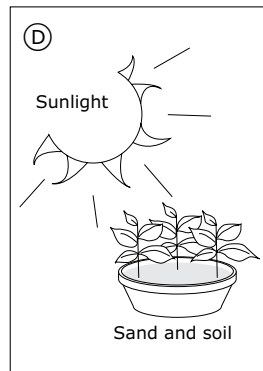
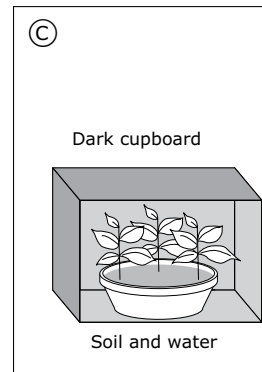
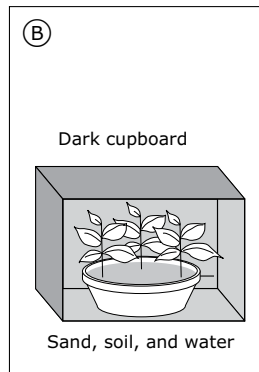
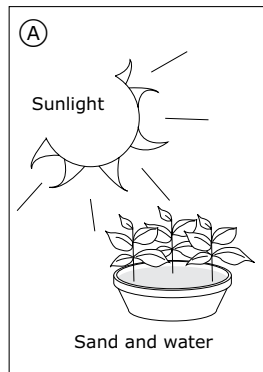
- Ⓐ To fight disease in the body
- Ⓑ To carry oxygen to all parts of the body
- Ⓒ To remove carbon monoxide from all parts of the body
- Ⓓ To produce materials which cause the blood to clot

Item Number: S012038

A girl has an idea that green plants need sand in the soil for healthy growth. In order to test her idea she uses two pots of plants. She sets up one pot of plants as shown below.



Which ONE of the following should she use for the second pot of plants?



Item Number: S022235

The fossils that are found in the oldest layers of sedimentary rock were formed from which types of organisms?

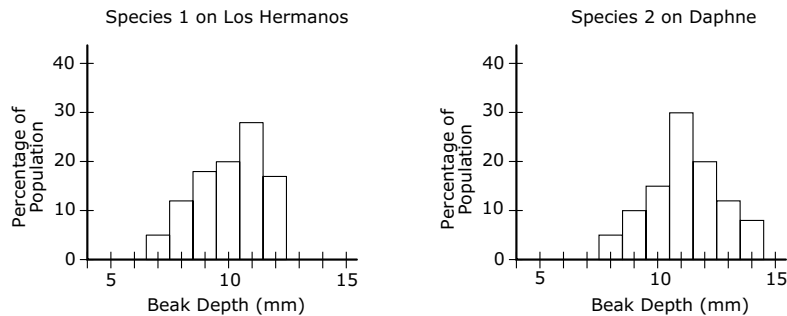
- Ⓐ only organisms that lived in the sea
- Ⓑ only organisms that lived on land
- Ⓒ only organisms that lived in the air
- Ⓓ organisms that lived on the land, in the sea and in the air

Item Number: S032083

The Galapagos Islands contain a number of different species of finches (birds) that are thought to have developed from one species. Some species of finches eat certain types of seeds depending on their beak depth. The diagram below shows the head of one species of finch and its beak depth.



Some of the islands have only one species living on them, while other islands have more than one species. Species 1 lives on Los Hermanos Island. Species 2 lives on Daphne Island. The two graphs below show the percentage of the population with different beak depths for each of the two species.



- A. How do the beak depths of Species 1 and Species 2 compare?
- B. A wide variety of seeds exist on the islands, and both Species 1 and Species 2 eat seeds. Based on the beak depths of the two finch species, what would you conclude about the size of seeds that each species eats?

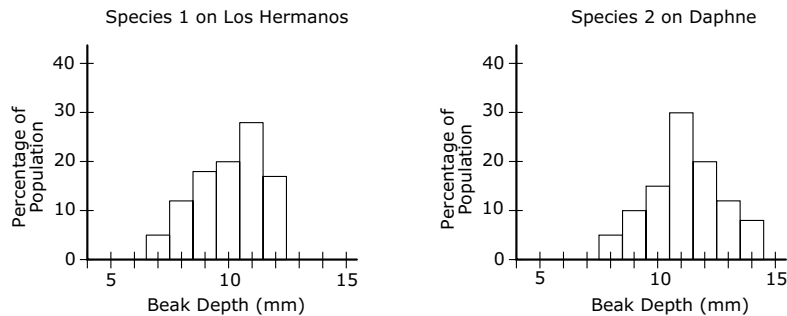
Item Number: S032706A



The Galapagos Islands contain a number of different species of finches (birds) that are thought to have developed from one species. Some species of finches eat certain types of seeds depending on their beak depth. The diagram below shows the head of one species of finch and its beak depth.



Some of the islands have only one species living on them, while other islands have more than one species. Species 1 lives on Los Hermanos Island. Species 2 lives on Daphne Island. The two graphs below show the percentage of the population with different beak depths for each of the two species.



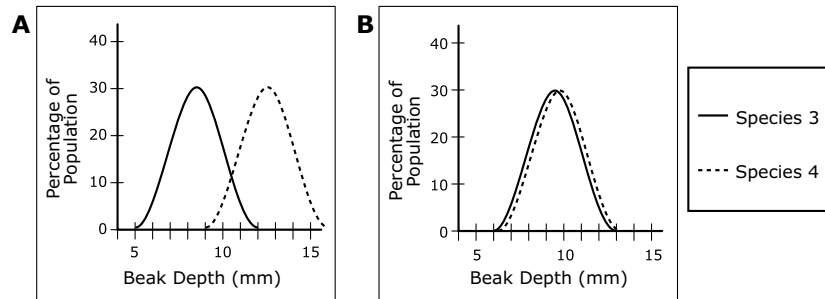
- A. How do the beak depths of Species 1 and Species 2 compare?
- B. A wide variety of seeds exist on the islands, and both Species 1 and Species 2 eat seeds. Based on the beak depths of the two finch species, what would you conclude about the size of seeds that each species eats?

Item Number: S032706B

Two other species (Species 3 and Species 4) live on Santa Maria Island, which also has a range of seed types.

Which of the following graphs shows a range of beak depths for Species 3 and Species 4 that would best insure the survival of both species on Santa Maria Island?

(Circle the letter by the correct graph.)



Explain why this range of beak depths would be best.

Item Number: S032707

Which organisms that live on land most likely inhabited the Galapagos Islands first?

(Check one box.)

Land plants

Land animals

Explain your answer.

Item Number: S032704

When settlers came to live on the Galapagos Islands, they brought with them a number of new animals such as cats and goats. Write down one effect the introduction of cats and goats could have on the animals and plants already living on the islands.

A. One effect of **cats**:

B. One effect of **goats**:

Item Number: S032705A

When settlers came to live on the Galapagos Islands, they brought with them a number of new animals such as cats and goats. Write down one effect the introduction of cats and goats could have on the animals and plants already living on the islands.

A. One effect of **cats**:

B. One effect of **goats**:

Item Number: S032705B

Animals and plants are made up of a number of different chemical elements. What happens to all of these elements when animals and plants die?

- Ⓐ They die with the animal or plant.
- Ⓑ They evaporate into the atmosphere.
- Ⓒ They are recycled back into the environment.
- Ⓓ They change into different elements.

Item Number: S032682



The diagram above shows a community consisting of mice, snakes and wheat plants.

What would happen to this community if people killed the snakes?

Item Number: S032202

Eating leafy vegetables is important for human health. This is because leafy vegetables are a good source of which of the following?

- Ⓐ protein
- Ⓑ carbohydrates
- Ⓒ minerals
- Ⓓ fat

Item Number: S032637



Scott went to school with a cold. Several days later, half of his classmates also had colds. What is one likely reason some classmates had colds but others did not?

Item Number: S022154

A son can inherit traits

- Ⓐ only from his father
- Ⓑ only from his mother
- Ⓒ from both his father and his mother
- Ⓓ from either his father or his mother, but not from both

Item Number: S012026

Traits are transferred from generation to generation through the

- Ⓐ sperm only
- Ⓑ egg only
- Ⓒ sperm and the egg
- Ⓓ testes

Item Number: S012039

Why would male insects be treated to prevent sperm production?

- Ⓐ To increase the number of female insects
- Ⓑ To reduce the total population of insects
- Ⓒ To produce new species of insects
- Ⓓ To prevent insects from mating

Item Number: S022117

Which of the following takes place during fertilization in animals?

- Ⓐ production of sperm and egg
- Ⓑ joining of sperm and egg
- Ⓒ division of egg
- Ⓓ development of embryo

Item Number: S032008

What processes take place in the human body that prevent it from overheating during exercise?

Item Number: S022152

What is the advantage of having two ears to hear with rather than one ear?

Item Number: S022160

Which of the following organs is NOT situated in the abdomen?

- Ⓐ liver
- Ⓑ kidney
- Ⓒ stomach
- Ⓓ bladder
- Ⓔ heart

Item Number: S012001



When a person sees something, what carries the message from the eyes to the brain?

- Ⓐ arteries
- Ⓑ glands
- Ⓒ muscles
- Ⓓ nerves
- Ⓔ veins

Item Number: S012014

In humans, where does the absorption of food into the blood stream mainly take place?

- Ⓐ stomach
- Ⓑ mouth
- Ⓒ large intestines
- Ⓓ small intestines

Item Number: S032386

Which of the following organs in fish has the same function as the human lung?

- Ⓐ kidney
- Ⓑ heart
- Ⓒ gill
- Ⓓ skin

Item Number: S032607

Briefly explain how eyeglasses and contact lenses help some people to see more clearly.

Item Number: S022161

A person sorted some animals into the two groups listed on the table.  
Which characteristic of animals was used for the sorting?

- (A) Legs
- (B) Eyes
- (C) Nervous system
- (D) Skin

Group 1	Group 2
Humans	Snakes
Dogs	Worms
Flies	Fish

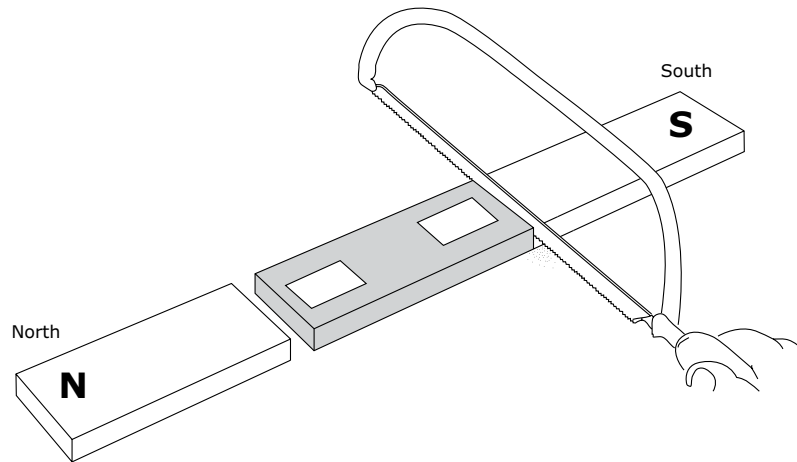
Item Number: S012028

Cats are most closely related to which of the following animals?

- Ⓐ crocodiles
- Ⓑ whales
- Ⓒ frogs
- Ⓓ penguins

Item Number: S032595

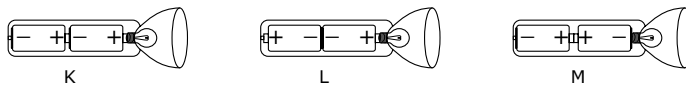
The diagram shows a bar magnet which is cut into three pieces with a hacksaw.



Write an "N" or an "S" in each box on the diagram to show the polarity of each end of the center piece.

Item Number: S022035

The diagrams show a flashlight and three ways to put batteries in it.

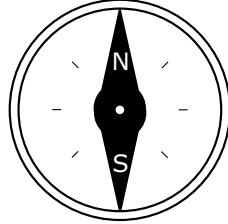


In order to make the flashlight work, which way must the batteries be placed?

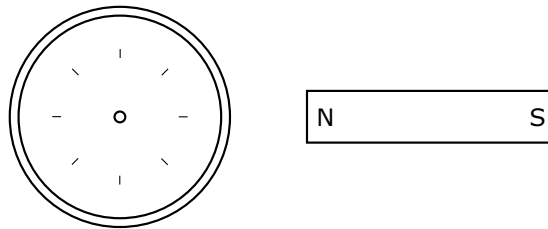
- (A) Only as in K
- (B) Only as in L
- (C) Only as in M
- (D) None of these ways would work.

Item Number: S012037



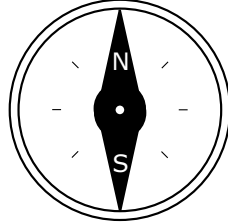


The diagram above shows a compass needle with its North and South poles labeled (N and S). It is placed next to a strong magnet as shown in the diagram below.

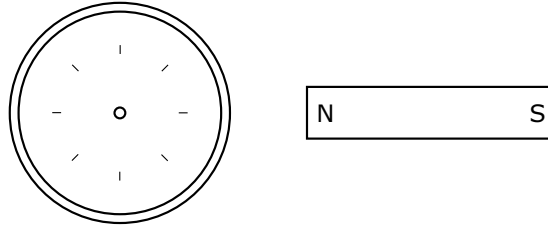


- A. Draw the compass needle in the circle on the diagram above.  
Label the North (N) and South (S) poles of the needle.
- B. Explain your answer using your knowledge of magnets.

Item Number: S032625A



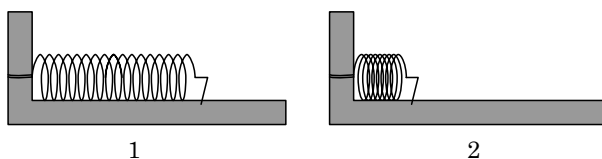
The diagram above shows a compass needle with its North and South poles labeled (N and S). It is placed next to a strong magnet as shown in the diagram below.



- A. Draw the compass needle in the circle on the diagram above.  
Label the North (N) and South (S) poles of the needle.
- B. Explain your answer using your knowledge of magnets.

Item Number: S032625B

Spring 1 and Spring 2 were the same. Then, Spring 1 was pushed together a little and clamped in place. Spring 2 was pushed together a lot and clamped.



Which spring has more stored energy?

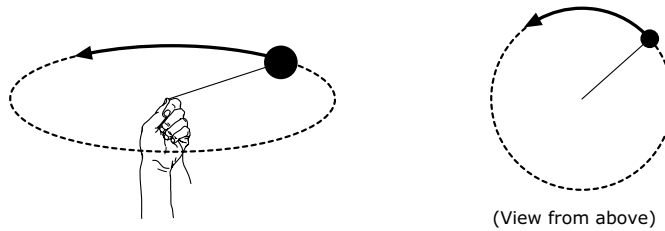
- (A) Spring 1
- (B) Spring 2
- (C) Both springs have the same energy.
- (D) You cannot tell unless you know what the springs are made of.

Item Number: S012002

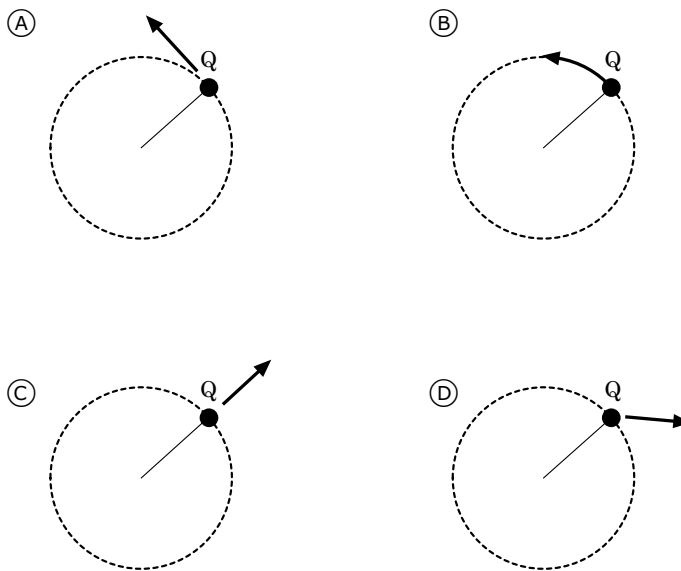
When a nail is pulled out of a wooden board, the nail becomes warm.  
Explain why.

Item Number: S032131

The diagram on the left shows a ball on the end of a string being whirled in a circle. The diagram on the right shows the whirling ball as viewed from above.



After several whirls, the string is released when the ball is at Q. Which of these diagrams shows the direction in which the ball will fly the instant the string is released?



Item Number: S022040

A balloon filled with helium gas is set free and starts to move upward.  
Which of the following best explains why the helium balloon moves upward?

- (A) The density of helium is less than the density of air.
- (B) The air resistance lifts the balloon up.
- (C) There is no gravity acting on helium balloons.
- (D) The wind blows the balloon upward.

Item Number: S032281

The scientists measured the volume of the crown five times. They computed the density for each volume measurement. Their results are shown in the table below.

<b>Trial</b>	<b>Volume of Crown (cm<sup>3</sup>)</b>	<b>Density of Crown (g/cm<sup>3</sup>)</b>
1	202	11.88
2	200	12.00
3	201	11.94
4	198	12.12
5	199	12.06

A. Why did the scientists measure the volume five times?

B. The scientists reported to the king that the density of the crown was 12.0 g/cm<sup>3</sup>. Show how the scientists used their results to obtain this value for the density.

Item Number: S032712A

The scientists measured the volume of the crown five times. They computed the density for each volume measurement. Their results are shown in the table below.

<b>Trial</b>	<b>Volume of Crown (cm<sup>3</sup>)</b>	<b>Density of Crown (g/cm<sup>3</sup>)</b>
1	202	11.88
2	200	12.00
3	201	11.94
4	198	12.12
5	199	12.06

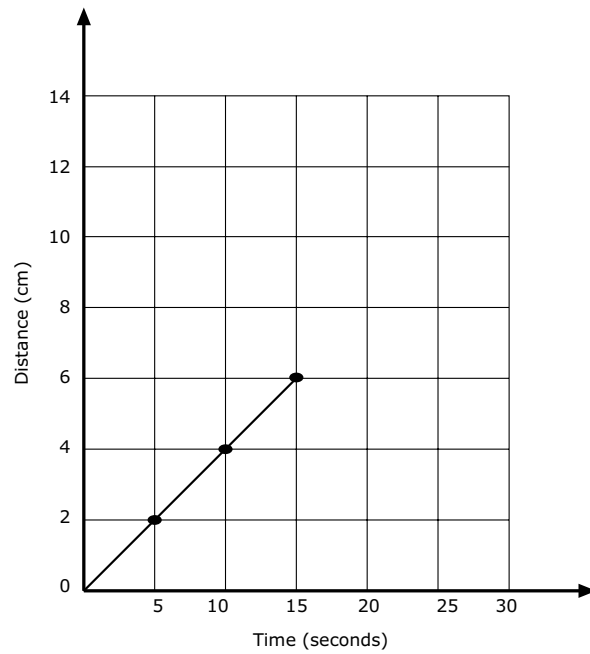
A. Why did the scientists measure the volume five times?

B. The scientists reported to the king that the density of the crown was  $12.0 \text{ g/cm}^3$ . Show how the scientists used their results to obtain this value for the density.

Item Number: S032712B



The graph shows the progress made by a beetle moving along a straight line.

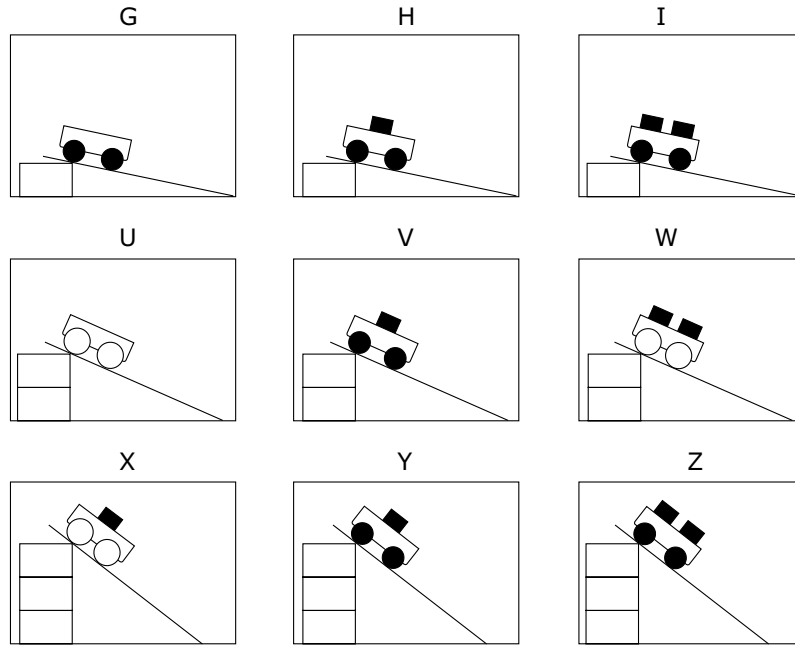


If the beetle keeps moving at the same speed, how long will it take to travel 10 cm?

- (A) 4 seconds
- (B) 6 seconds
- (C) 20 seconds
- (D) 25 seconds

Item Number: S022041

The diagrams show nine different trials Michael carried out using carts with wheels of two different sizes and different numbers of blocks of equal mass. He used the same ramp for all trials, starting the carts from different heights.



He wants to test this idea: The higher the ramp is placed, the faster the cart will travel at the bottom of the ramp. Which three trials should he compare?

- (A) G, H and I
- (B) I, W and Z
- (C) I, V and X
- (D) U, W and X
- (E) H, V and Y

Item Number: S022222

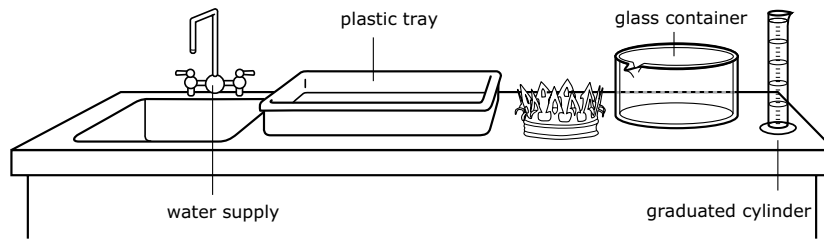
The table below shows the results of an experiment to investigate how the length of a spring changes as different masses are hung from it.

<b>Mass (grams)</b>	<b>Length of Spring (cm)</b>
0	5
10	7
20	9
30	11
40	12
50	13
60	13

Describe how the length of the spring changed as different masses were hung from it.

Item Number: S022286

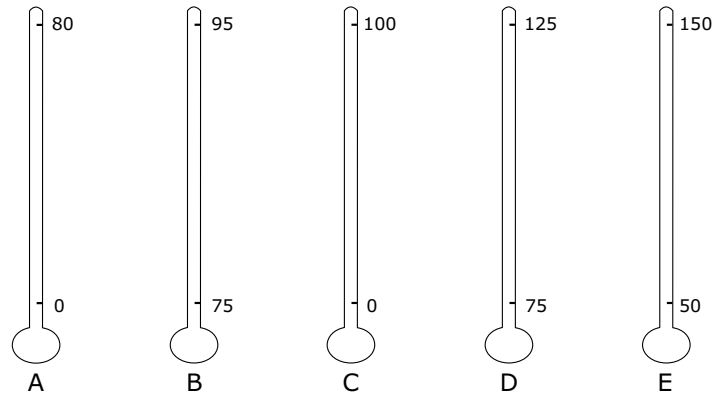
The scientists then needed to find the volume of the crown in order to determine its density. The following equipment and materials were available for them to use.



Describe a procedure that the scientists could use to find the volume of the crown using some or all of the equipment and materials shown above. You may use diagrams to help explain your procedure.

Item Number: S032711

At different altitudes, the boiling point of water ranges from about  $80^{\circ}\text{C}$  to  $100^{\circ}\text{C}$ . Which of the Celsius thermometers shown below would give the most accurate measurement of the boiling point of water at different altitudes?



Thermometers

- (A) Thermometer A
- (B) Thermometer B
- (C) Thermometer C
- (D) Thermometer D
- (E) Thermometer E

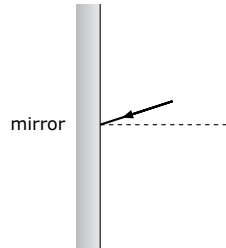
Item Number: S022225

A person in a dark room looking through a window can clearly see a person outside in the daylight. But a person outside cannot see the person inside. Why does this happen?

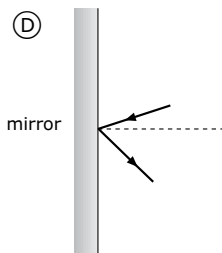
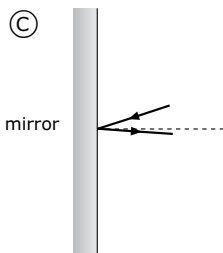
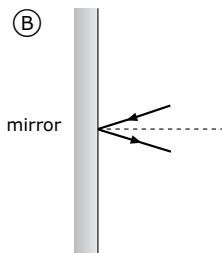
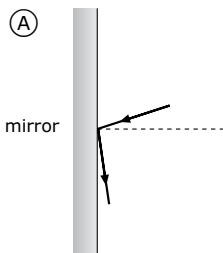
- Ⓐ There is not enough light being reflected off the person in the room.
- Ⓑ Light rays cannot pass through a window twice.
- Ⓒ Outside light does not pass through windows.
- Ⓓ Sunlight is not as intense as other sources of light.

Item Number: S012004

A ray of light strikes a mirror as shown.

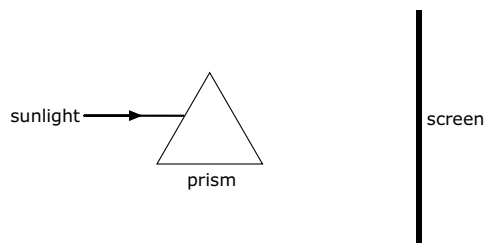


Which picture best shows the direction of the reflected light?



Item Number: S022058

The diagram shows a ray of sunlight entering a glass prism.



Describe what will be seen on the screen.  
(You may draw on the diagram to help explain your answer.)

Item Number: S032375

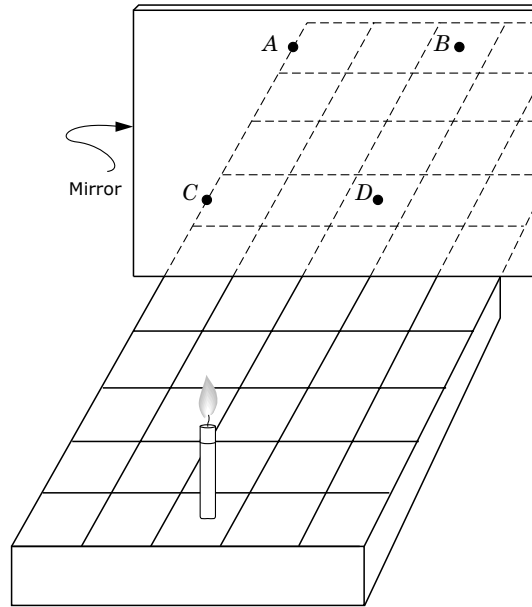


Mary was looking out her window on a stormy night. She saw lightning and then heard thunder a few seconds later.

Explain why she saw lightning before she heard thunder.

Item Number: S032626

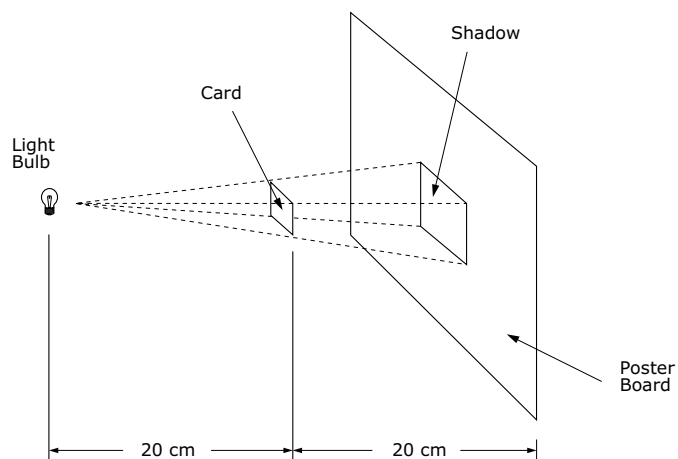
A candle is placed on a ruled grid in front of a mirror, as shown. At what point will the reflection of the candle appear to be?



- (A) Point A
- (B) Point B
- (C) Point C
- (D) Point D

Item Number: S012015

A tiny light bulb is held 20 centimeters to the left of a square card, which is in turn held 20 centimeters to the left of a poster board, as shown. The shadow of the card on the poster board has a side of 10 centimeters.

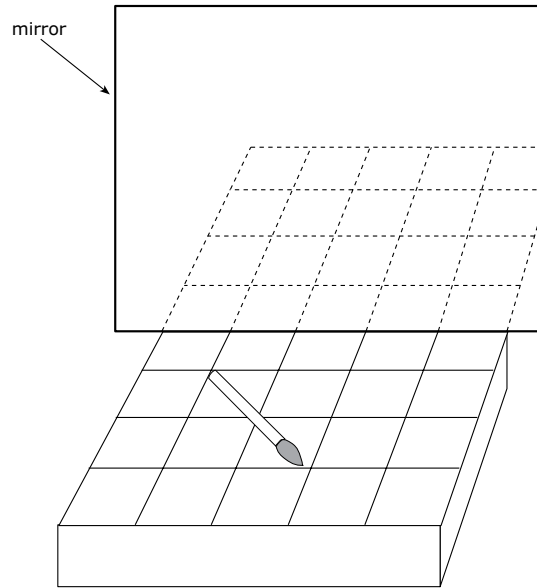


If the poster board is moved 40 cm further to the right so that it is 80 cm from the light, what will be the new side of the card's shadow on the poster board?

- (A) 5 cm
- (B) 10 cm
- (C) 15 cm
- (D) 20 cm

Item Number: S012029

The picture shows a paint brush that is lying on a shelf in front of a mirror. Draw a picture of the paint brush as you would see it in the mirror. Use the patterns of lines on the shelf to help you.



Item Number: S022279

A wet towel will dry when it is left in the Sun. Which process occurs to make this happen?

- Ⓐ melting
- Ⓑ boiling
- Ⓒ condensation
- Ⓓ evaporation

Item Number: S032055

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