

Life Science
FCAT Preparation



SC.8.L.18.4 Cite evidence that living systems follow the Laws of Conservation of Mass and Energy.

SC.8.L.18.1 Describe and investigate the process of photosynthesis, such as the roles of light, carbon dioxide, water and chlorophyll; production of food; release of oxygen.

SC.8.L.18.2 Describe and investigate how cellular respiration breaks down food to provide energy and releases carbon dioxide.

SC.8.L.18.3 Construct a scientific model of the carbon cycle to show how matter and energy are continuously transferred within and between organisms and their physical environment.

Multiple Choice

Identify the choice that best completes the statement or answers the question.

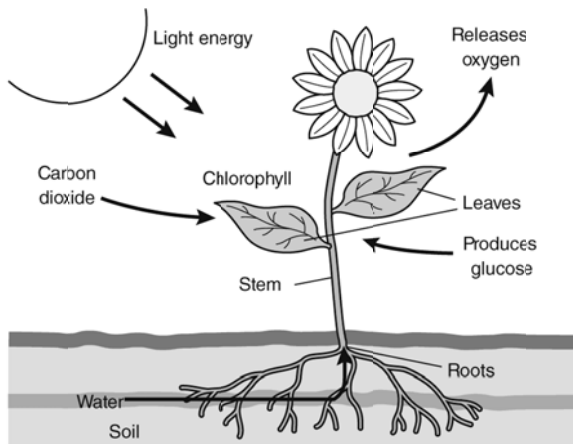
1. Worms break down dead plants in the soil to release nutrients. Which property of nutrients shows that they are matter?
 - A. Nutrients are warm.
 - B. Nutrients can do work.
 - C. Nutrients contain energy.
 - D. Nutrients have mass.
2. Biologists measure the length of a tagged sea turtle. They learn that the turtle is 2.3 cm longer than the last time it was measured. Where did the sea turtle get the nutrients it needed to grow?
 - A. from the jellyfish it ate
 - B. from sunlight it absorbed
 - C. from the oxygen it breathed
 - D. from nutrients it absorbed from the water
3. An alligator lives in a swamp with deer, birds, fish, trees, and other plants. The alligator eats a bird that eats the seeds and plants. What is the original source of the energy that the alligator gets from eating the bird?
 - A. the flowing water in the swamp
 - B. the energy that the bird creates
 - C. the sunlight that the plants absorb
 - D. the heat from the air in the swamp
4. One of the largest cypress trees in Florida has a tree trunk with a diameter of about 3.5 m. What is the source of **most** of the carbon in the cypress tree's trunk?
 - A. The carbon created by the tree during photosynthesis.
 - B. The carbon stored in tree seeds.
 - C. The carbon dioxide molecules the tree absorbed from the atmosphere.
 - D. The nutrients containing carbon that the tree absorbed from the soil.
5. A coral reef is damaged during a hurricane. The waves and currents move broken pieces of coral onto the beach. What happened to the matter in the broken pieces of coral?
 - A. It is still part of the coral reef ecosystem.
 - B. It was removed from the environment.
 - C. It became part of the beach ecosystem.
 - D. It was lost due to the energy in the waves.

6. The diagram below shows an energy pyramid. In a marine ecosystem, algae carry out photosynthesis. Barracuda eat snapper fish. Reef sharks eat barracuda.



Which organism would be at the top of the energy pyramid?

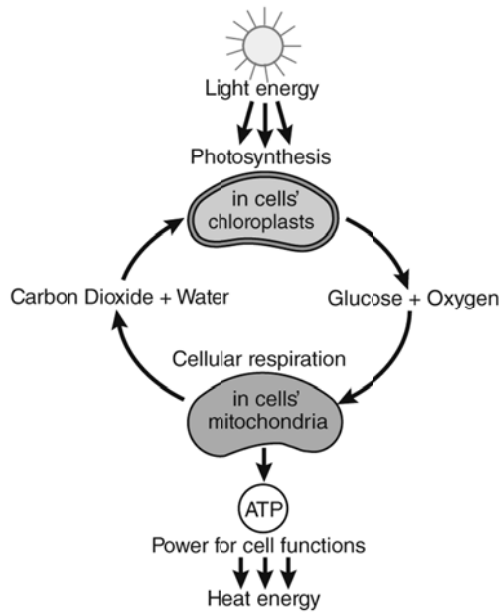
- A. algae
 - B. barracuda
 - C. reef shark
 - D. snapper fish
7. Saw grass takes in light energy during photosynthesis. What happens to **most** of this energy?
- A. It is stored as chemical energy.
 - B. It disappears as it is used up by the plant.
 - C. It is transferred to organisms that eat the grass.
 - D. It is used to help the saw grass grow and reproduce.
8. Plants perform photosynthesis and respiration. Dead plants are broken down and become part of the soil. Which of the following matter do plants help to cycle through ecosystems?
- A. carbon only
 - B. carbon and oxygen only
 - C. carbon, oxygen, and nitrogen only
 - D. carbon, oxygen, nitrogen, and water
9. Green plants produce their own food during photosynthesis. This image shows the process of photosynthesis.



Which of these substances is also a product of photosynthesis?

- A. carbon dioxide
- B. chlorophyll
- C. oxygen
- D. water

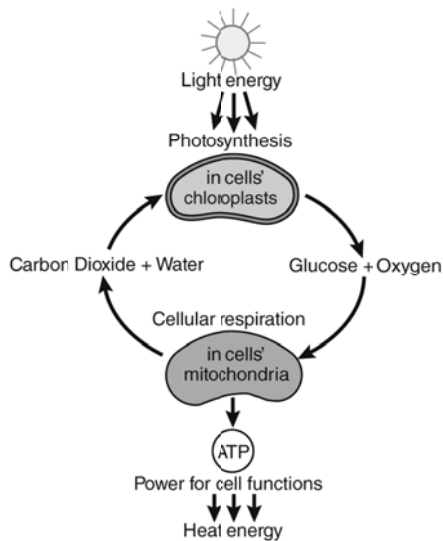
10. Plants can provide the materials that animals use in cellular respiration, and animals can provide some of the materials needed by plants for photosynthesis. This image shows the relationship.



According to the diagram, which of these materials does cellular respiration provide that plants can use in photosynthesis?

- A. ATP
- B. carbon dioxide
- C. chloroplasts
- D. mitochondria

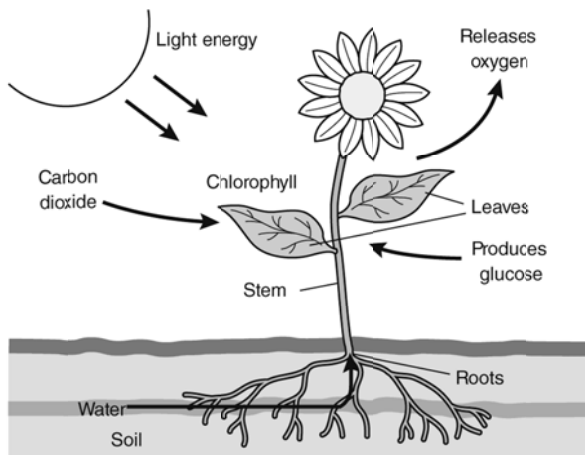
11. There is a connection between photosynthesis and cellular respiration. The products from one provide the raw materials for the other. This image shows the relationship between the two processes.



What products of photosynthesis are starting materials for cellular respiration?

- A. glucose and oxygen
- B. heat energy and ATP
- C. carbon dioxide and water
- D. light energy and chlorophyll

12. When sunlight strikes a plant, the leaves capture most of that energy to use for photosynthesis. The image below shows the process of photosynthesis in action.

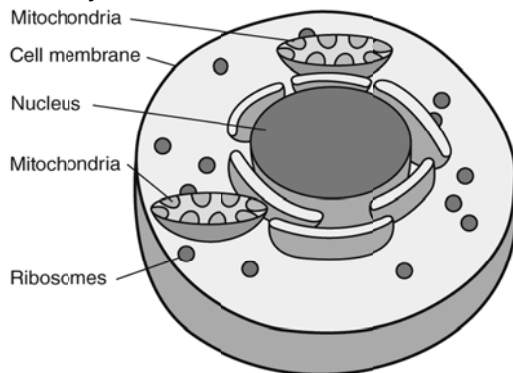


Which of these materials helps plants use energy from sunlight?

- A. chlorophyll
 - B. glucose
 - C. roots
 - D. soil
13. Living things can be grouped depending on how they get food. Some organisms get food from eating other organisms. Other organisms can make their own food. In which group do organisms that can make their own food belong?

- A. consumers
- B. decomposers
- C. predators
- D. producers

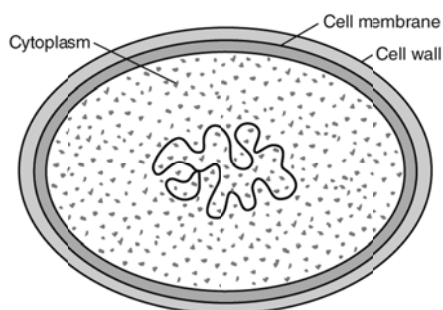
14. Cellular respiration takes place in both prokaryotic and eukaryotic cells. This diagram shows the different parts of a eukaryotic cell.



In which part of the cell does cellular respiration take place in eukaryotes?

- A. cell membrane
- B. mitochondria
- C. nucleus
- D. ribosomes

15. Bacteria are single prokaryotic cells that have no nuclei. The diagram below shows a prokaryotic cell.



Where in the prokaryotic cell does cellular respiration take place?

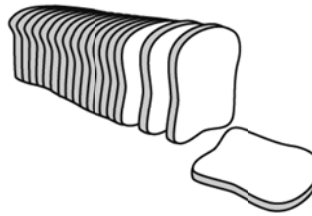
- A. the cytoplasm and the cell membrane
- B. the cell membrane only
- C. the cell wall only
- D. the cell membrane and the cell wall

16. People rely on the fermentation process to produce certain kinds of food. Which of these items is **most likely** made as a result of fermentation?

A.



B.



C.



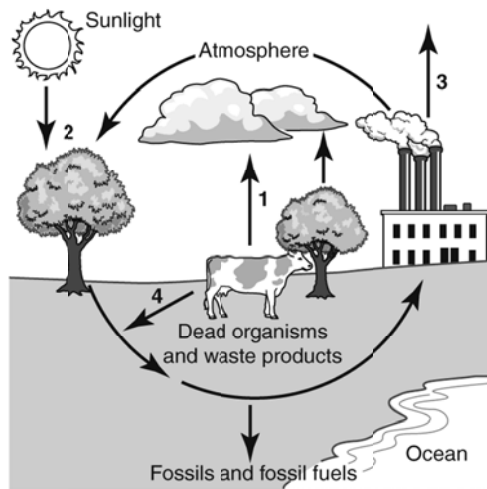
D.



17. Cellular respiration, or anaerobic respiration, occurs without oxygen. During anaerobic respiration, lactic acid is produced. When people do certain strenuous physical activities, the cells of their muscles may produce lactic acid. Which of these activities would **most likely** result in a buildup of lactic acid?

- A. bowling
- B. golf
- C. sprinting
- D. walking

18. Carbon exists in many forms on Earth. The diagram below shows part of the carbon cycle.



What is happening in Step 1?

- A. Animals are releasing energy into the environment and storing carbon.
- B. Animals are decomposing and releasing carbon into the soil.
- C. Animals are converting carbon dioxide from the atmosphere to oxygen.
- D. Animals are breaking down organic molecules and releasing carbon dioxide into the atmosphere.

19. A freshwater marsh is a type of ecosystem. Grasses, fish, wading birds, frogs, and alligators live together in freshwater marshes. Pieces of decaying material sink to the bottom of the marsh. In which of these places can carbon be found in the marsh?

- A. in the atmosphere and water only
- B. in living things only
- C. in living things and decaying materials only
- D. in the atmosphere, water, living things, and decaying materials

20. Kristine exercises regularly. The process of cellular respiration makes it possible for Kristine to run on the treadmill and to lift weights. What do her cells do during cellular respiration?
- A. convert kinetic energy into chemical energy
 - B. absorb light energy through the chlorophyll in their chloroplasts
 - C. combine water and carbon dioxide to produce oxygen and glucose
 - D. break down food molecules to release energy in the form of ATP

SC.7.L.15.2 Explore the scientific theory of evolution by recognizing and explaining ways in which genetic variation and environmental factors contribute to evolution by natural selection and diversity of organisms.

SC.7.L.15.1 Recognize that fossil evidence is consistent with the scientific theory of evolution that living things evolved from earlier species.

SC.7.L.15.3 Explore the scientific theory of evolution by relating how the inability of a species to adapt within a changing environment may contribute to the extinction of that species.

SC.7.L.16.1 Understand and explain that every organism requires a set of instructions that specifies its traits, that this hereditary information (DNA) contains genes located in the chromosomes of each cell, and that heredity is the passage of these instructions from one generation to another.

SC.7.L.16.2 Determine the probabilities for genotype and phenotype combinations using Punnett Squares and pedigrees.

SC.7.L.16.3 Compare and contrast the general processes of sexual reproduction requiring meiosis and asexual reproduction requiring mitosis.

SC.7.L.17.2 Compare and contrast the relationships among organisms such as mutualism, predation, parasitism, competition, and commensalism.

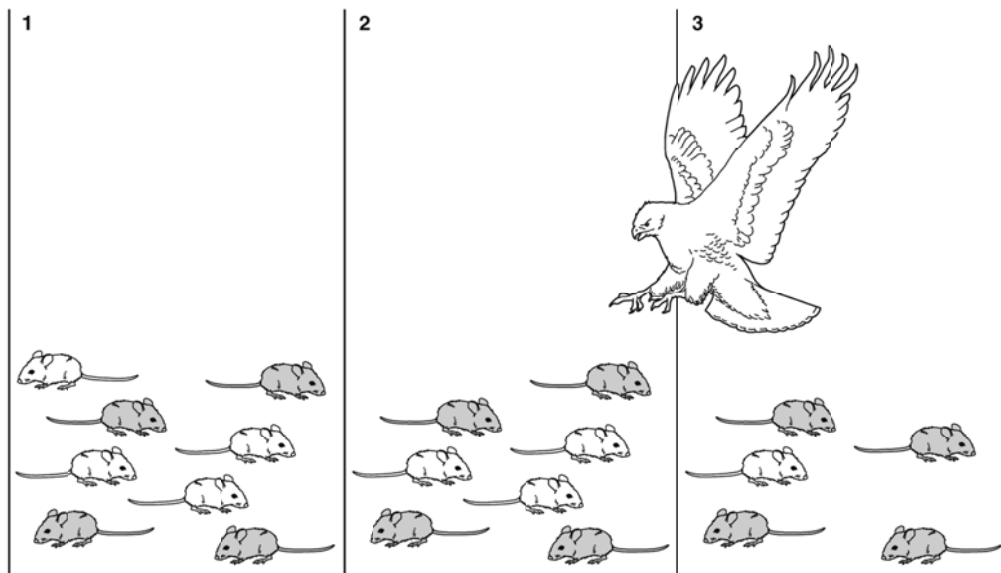
SC.7.L.17.1 Explain and illustrate the roles of and relationships among producers, consumers, and decomposers in the process of energy transfer in a food web.

SC.7.L.17.3 Describe and investigate various limiting factors in the local ecosystem and their impact on native populations, including food, shelter, water, space, disease, parasitism, predation, and nesting sites.

Multiple Choice

Identify the choice that best completes the statement or answers the question.

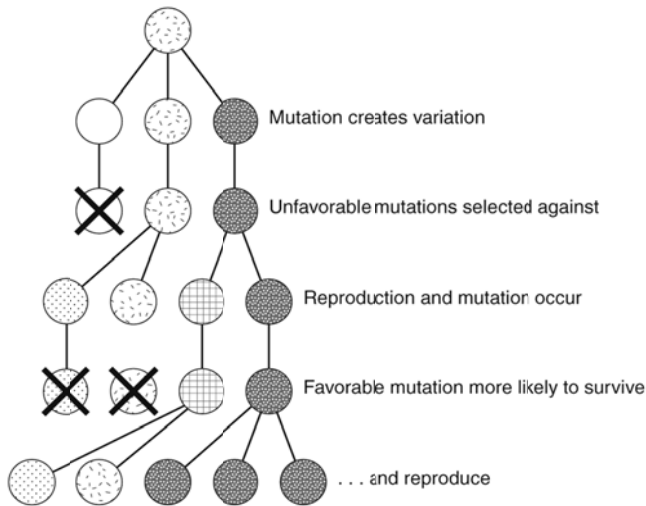
- Predation can influence which individuals survive, causing populations to evolve through natural selection. Many kinds of predators hunt mice as prey. The diagram below shows how hawk predation can affect a population of mice.



In panel 1, the population of mice has equal numbers of gray and white individuals. If a new species of hawk comes into this environment, the mice will be affected by the new predator. If this hawk species selectively attacks white mice, how will the mouse population change as it evolves through natural selection?

- The mouse population will become extinct due to predation.
- The mouse population will not change in response to hawk predation.
- The mouse population will eventually have more gray mice than white mice.
- The mouse population will eventually have more white mice than gray mice.

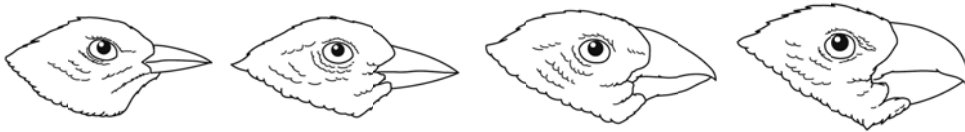
2. In the diagram below, each circle represents an individual. Each circle is connected by lines to other circles below it that represent offspring. So, each row is a separate generation of individuals that are related to each other. The pattern of each circle represents types of variation in the genes of these individuals.



The text to the right explains what is happening to each generation of individuals. What scientific process is represented by this series of events?

- A. natural selection
- B. species extinction
- C. primary succession
- D. individual development

3. The birds shown below live on a single island.



These four bird species are closely related, and all of them share a common ancestor with a single species. What environmental factor is **most likely** to have caused this diversity of species?

- A. When the ancestral species arrived at the island, there was only one food source, so the ancestral species left the island immediately.
 - B. When the ancestral species arrived at the island, there was only one food source available and no need for different beak shapes.
 - C. When the ancestral species arrived at the island, there were multiple food sources available, and different beak shapes evolved for the most efficient eating.
 - D. When the ancestral species arrived at the island, there were multiple food sources available, and the different beak shapes were equally efficient for eating different food sources.
4. In a certain population of birds, males are very colorful. Variation in these color patterns is under genetic control. Some males have orange feathers, some have yellow, and some have red. Females choose which males to mate with. Males chosen as mates have more offspring than males not chosen by females. If some females have offspring with mutations that affect their behavior so they are attracted to the color red, what could happen to the males in this population?
- A. Males that have no red feathers will suddenly develop red feathers.
 - B. Males that have red feathers will have more offspring, and red feathers will spread through the population.
 - C. Males that have no red feathers will have more offspring, and red feathers will disappear from the population.
 - D. Males that have red feathers will attract more mates, but the feather coloration of the population in general will not change.

5. Cheetahs are a species of large wild cats that live in Africa. Their populations have very low levels of genetic variation. How could this affect a cheetah population's ability to evolve in response to changes in their environment, such as decreased numbers of a favorite prey?
- When populations have low genetic diversity, they will all adapt quickly to a changing environment.
 - When populations have low genetic diversity, they will be unable to gain variation through mutation.
 - When populations have low genetic diversity, they have high diversity in physical traits, and some individuals will probably find a new kind of prey to eat.
 - When populations have low genetic diversity, it is less likely that they will be able to adapt to changed environment and find a new kind of prey to eat.
6. Abby analyzed data to determine whether larger habitats have a higher diversity of organisms. She collected data about biodiversity of birds in temperate forests by counting the number of species that live in each of 5 habitats that differed in size. The table below shows her data.

HABITAT SIZE AND NUMBER OF BIRD SPECIES

	Number of Bird Species	Habitat Size (km²)
Habitat A	5	37
Habitat B	17	248
Habitat C	4	16
Habitat D	12	123
Habitat E	13	190

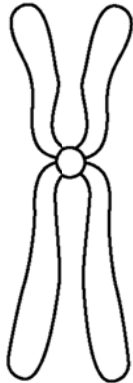
Based on the data, what can Abby conclude about the relationship between habitat size and diversity of birds?

- There is no relationship between habitat size and number of bird species.
 - As habitat size increases, the number of bird species in the habitat decreases.
 - As habitat size decreases, the number of bird species in the habitat decreases.
 - As habitat size decreases, the number of bird species in the habitat increases.
7. Linda owns an orchard of orange trees, and she is worried because she notices that many of her orange trees are unhealthy. They appear to have very little resistance to attack by a certain fungus that is destroying their leaves. She consults with some biologist friends, and they tell her that her orchard is threatened by low genetic diversity. How could she improve the ability of her orchard to resist disease in the future?
- She could spray a chemical that kills the fungus, so trees will not have to fight off the fungus attack.
 - She could introduce another species of fungus to the orchard, so the current damaging fungus has to compete in order to survive.
 - She could pollinate her trees with pollen from other trees in the orchard, so new trees will have the same sources of genetic variation.
 - She could pollinate her trees with pollen from trees from a different orchard, so new trees will have new sources of genetic variation.

8. Fruit flies reproduce quickly, so scientists can easily study changes that occur over generations of fruit flies as they adapt to an environment. Carlos was conducting an experiment to see how quickly different populations of fruit flies could evolve resistance to cold temperatures. He predicted that fruit flies from northern climates would evolve resistance to extreme cold more quickly than fruit flies from southern climates. To conduct his experiment, he completed these steps:
- 1) He raised fruit flies from 3 different northern climates in separate enclosed artificial environments. Some environments were set at extremely cold temperatures and some were set at normal temperatures.
 - 2) He calculated the percentage that died in each artificial environment.
 - 3) He let the survivors mate within their artificial environment.
 - 4) He then calculated the percentage of each population that died in each artificial environment the next generation and repeated steps 2 through 4 many times.
 - 5) He plotted the data on a graph and compared how the percentage of fruit flies dying in each generation differed between fruit flies in the extremely cold versus the normal temperature enclosures.
 - 6) He found that that there was no difference between the two conditions.
 - 7) He concluded that there is no difference in between northern and southern fruit fly populations' ability to adapt to cold temperatures.
- Carlos made a mistake when he designed the experiment. What is the flaw, and how could he improve his design?
- A. Carlos needs to compare fruit flies from a greater number of northern climates. He could use fruit flies from 6 instead of 3 different northern climates.
 - B. Carlos needs to focus on fruit flies from only one location. He needs to conduct the same experiment but use fruit flies from only one northern climate.
 - C. Carlos needs to compare fruit flies from northern and southern climates. He could conduct the same experiment with fruit flies from southern climates and compare the results.
 - D. Carlos needs to compare fruit flies to other organisms, such as grasshoppers, in order to make his conclusion. He could conduct the same experiment on grasshoppers and compare the results.
9. When a volcano erupted on a small island in the Pacific Ocean, the lava and ash covered much of the surrounding forest. The birds that lived in this forest were able to fly to safer parts of the forest, but they stayed on the island because it was too far to fly to other islands. As a result, the number of appropriate nest sites available for birds that already lived in the remaining forest was suddenly very limited. Which birds do you think would be **most likely** to survive after the volcano erupts?
- A. Competition for nesting sites would be too great for any of the birds to survive.
 - B. Birds that establish nesting sites after the time of year when most birds establish their nesting sites would survive.
 - C. Birds that establish nesting sites during the time of year when most birds establish their nesting sites would survive.
 - D. Birds that establish nesting sites before the time of year when most birds establish their nesting sites would survive.
10. Xavier was conducting a long-term study of two populations of butterflies. Both populations had the same number of individuals. Both populations lived in forests that were the same size. Population A lived in a forest that was full of milkweed, the favorite food of this butterfly species. Population B lived in a forest that had limited amounts of milkweed and other foods. Over many years, Xavier found that one of the populations was showing signs of evolutionary change. Their mouth parts were changing, and they could get food from new kinds of plants. Which statement explains why one population would be **more likely** to evolve in response to natural selection?
- A. Population B would be more likely to change because it has a ready supply of food, and only certain butterflies would be able to survive.
 - B. Population A would be more likely to change because it has a ready supply of food, and would be healthy enough to respond to natural selection.
 - C. Population A would be more likely to change because it has a limited amount of food, and some butterflies might be better able to get enough food, survive, and reproduce.
 - D. Population B would be more likely to change because those butterflies have a limited supply of food, and some butterflies might be better able to get enough food, survive, and reproduce.

11. Organisms pass hereditary information encoded in cellular structures from one generation to the next. Which list gives structures in order from the smallest unit of organization to the largest unit of organization?
- A. DNA, chromosome, gene
 - B. DNA, gene, chromosome
 - C. gene, chromosome, DNA
 - D. gene, DNA, chromosome

12. Nico and Lila are preparing a presentation about heredity and hereditary information. They are using the illustration below in their presentation.



What title should they use for this illustration?

- A. Figure 1. A gene
 - B. Figure 1. A nucleotide
 - C. Figure 1. A single strand of DNA
 - D. Figure 1. A replicated chromosome
13. Karim and Amal are researchers and are using a high-powered microscope to observe bacteria. The drawing below is a sketch of one bacterium they observe. They can see a structure that is involved in the passage of hereditary information from one generation to the next.



What does the circle inside the bacterium represent?

- A. a gene
 - B. the nuclear membrane
 - C. ribonucleic acid (RNA)
 - D. the bacterial chromosome
14. Lyn and Naomi are related and have many things in common. They both have dark brown eyes and dark brown hair, speak English and Japanese fluently, and have blood type A. Which of these similarities is NOT due to heredity?
- A. eye color
 - B. hair color
 - C. blood type
 - D. language fluency

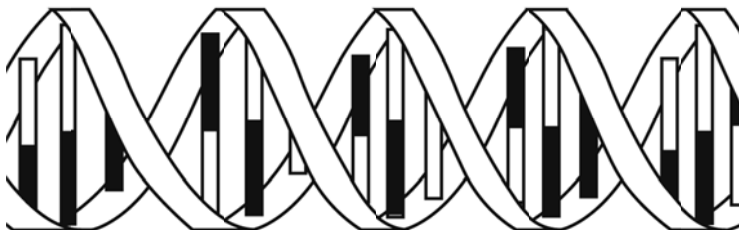
15. A group of researchers is studying watercress, a small flowering plant that lives in fresh water. They are studying the hereditary information (DNA) of watercress, to learn more about how different genes influence the growth of the plant. The researchers take tissue samples from plants of the same species of watercress that live in different parts of the United States. The tissue samples are taken from the petals, roots, or leaves of a plant. The researchers separated out the DNA from each sample. The samples taken are shown in the table below.

WATERCRESS TISSUE SAMPLES

	Petal	Root	Leaf
Plant 1	x		
Plant 2	x	x	
Plant 3		x	x
Plant 4			x

Which samples will contain identical DNA?

- A. samples from all parts of all four plants
 - B. samples from the petal of Plant 1 and the petal of Plant 2
 - C. samples from the root of Plant 3 and the leaf of Plant 3
 - D. samples from the petals of Plants 1 and 2, the roots of Plants 2 and 3, and the leaves of Plants 3 and 4
16. Hereditary information is passed from one generation to the next. Which two processes are responsible for the passage of hereditary information from generation to generation in mammals, birds, reptiles, fish, and other animals?
- A. meiosis and fertilization
 - B. mitosis and chromosomes
 - C. DNA replication and mitosis
 - D. asexual reproduction and DNA replication
17. An organism is made up of many millions of living cells. What portion of these living cells contains genes located in chromosomes?
- A. nearly all living cells
 - B. about half of all living cells
 - C. only a majority of reproductive cells
 - D. only a small portion of specialized cells
18. Living things are made up of many different types of molecules. One type of molecule contains hereditary information that is passed from one generation to another.

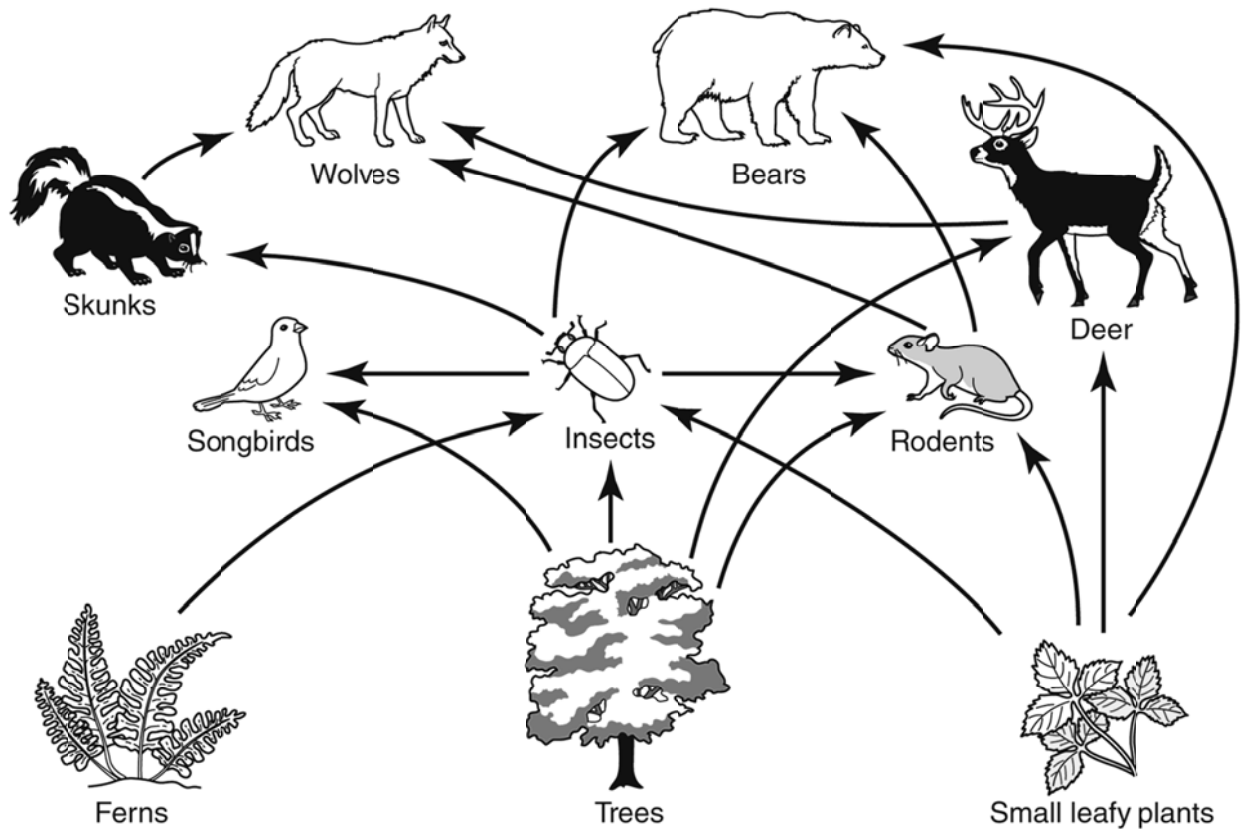


What type of molecule is shown in the illustration above?

- A. carbohydrate
- B. DNA
- C. lipid
- D. protein

19. Plant and animal cells are complex structures with many different internal compartments. Chromosomes contain genes, which are segments of hereditary information (DNA). In which part of a plant or animal cell are chromosomes found?
- cell membrane
 - cytoplasm
 - nucleus
 - vacuole
20. Genes, chromosomes, and DNA are important structures for processes related to heredity and reproduction. How are these three structures related?
- Genes are sections of DNA that make up a chromosome.
 - Many chromosomes make up a gene, and many genes make up DNA.
 - A chromosome is the same thing as a gene, and both are made of DNA.
 - DNA is made up of chromosomes, and chromosomes are made up of genes.

21. Study the diagram of various animals and plants below.

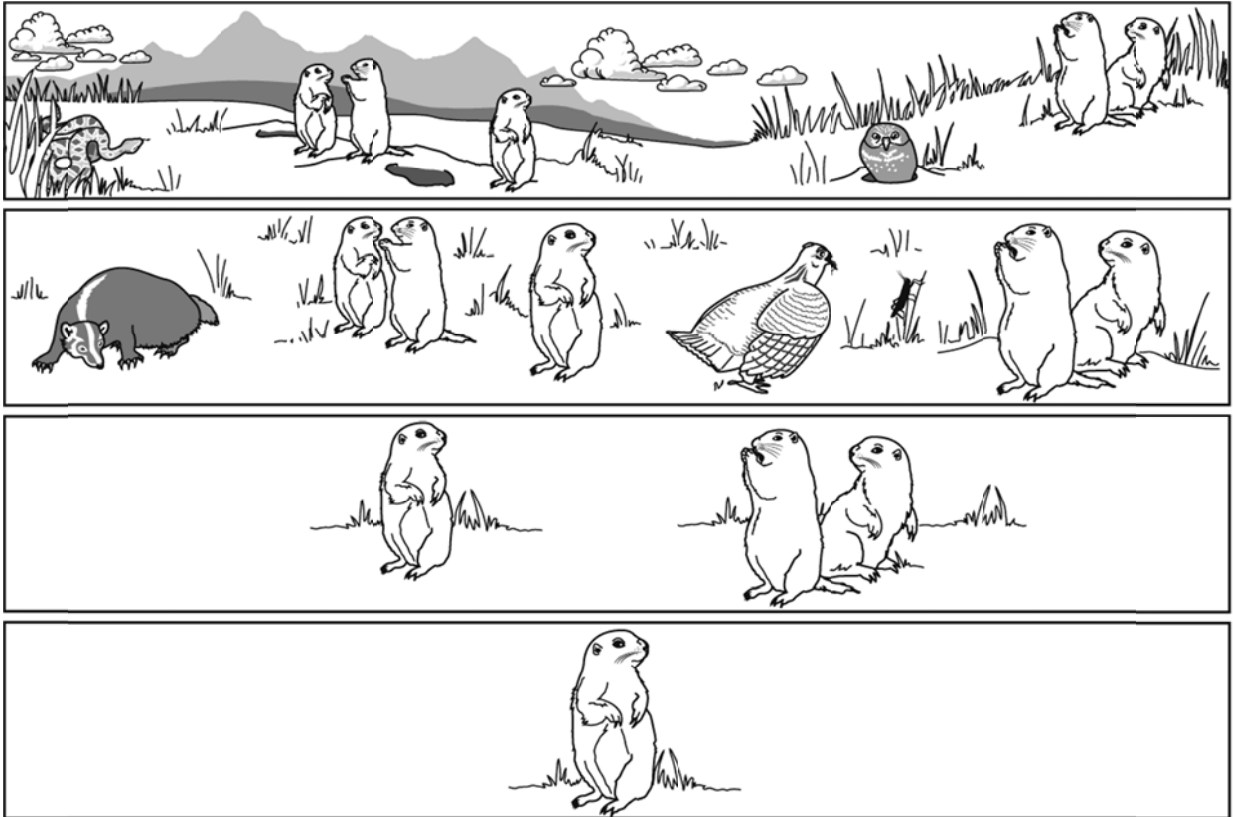


Which of the interactions among species are examples of predator-prey relationships?

- birds eat insects and insects eat ferns
- insects eat ferns and leaves from trees
- skunks eat insects and wolves eat skunks
- deer eat insects and small plants and wolves eat deer

22. The small clown fish lives among the poisonous tentacles of the anemone. The clown fish is immune to the poison and swims around the tentacles, cleaning the anemone. In turn, the anemone provides the fish with protection from predators. What kind of symbiosis do these two species show?
- A. parasitism
 - B. mutualism
 - C. commensalism
 - D. predator-prey relationships

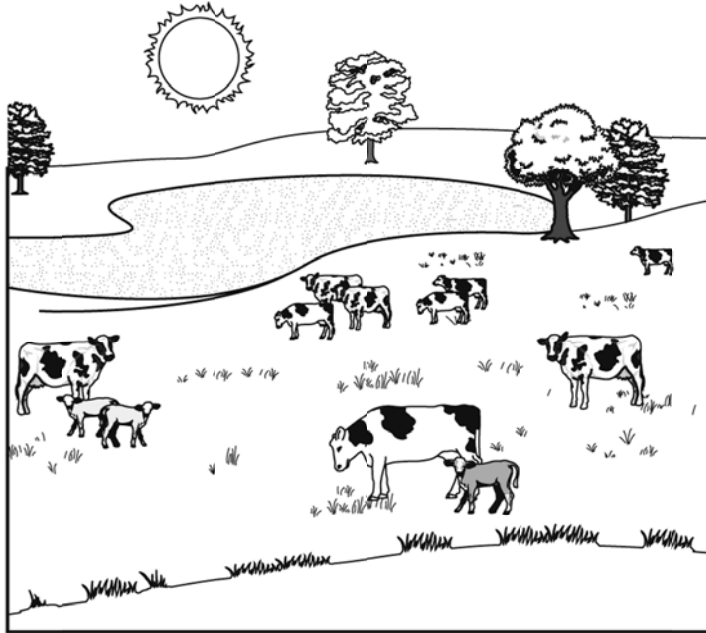
23. In the four panels of drawings below, each panel shows animals living in the same area at different times.



Going from the bottom to the top panels, what behavior likely increased among the animals?

- A. commensalism
 - B. parasitic relationships
 - C. mutualism between two species
 - D. competition for food and water
24. A tiny shrimp lives among the poisonous spines of a sea animal called the fire urchin. The spines provide the shrimp with protection from enemies. The fire urchin gains no benefit from the shrimp, but the shrimp causes it no harm. What term is used to describe this type of relationship?
- A. mutualism
 - B. competition
 - C. predator-prey
 - D. commensalism

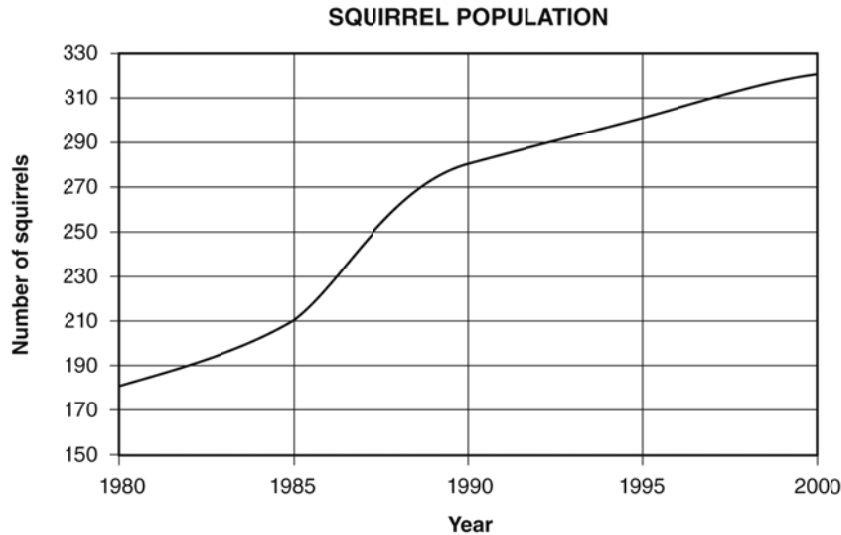
25. A tapeworm attaches to the intestines of a pig. The tapeworm eats partially digested food entering the pig's intestine. Without enough nutrients from the food, the pig could die. In this relationship, what is the tapeworm and the pig called?
- A. The pig is the host and the tapeworm is the parasite.
 - B. The pig is the host and the tapeworm is the predator.
 - C. Both the tapeworm and the pig are called competitors.
 - D. The tapeworm is a predator, the pig is prey, and both are competitors.
26. To feed their chicks, robins pull worms from the ground and gather insects. They eat some of the food and carry some back to the babies in the nest. During a spring season, when there is more rain than usual, the number of earthworms at the ground's surface increases. How might this increase in the worm population affect the robin population?
- A. There would be no effect on robins.
 - B. The robin population would become extinct.
 - C. The robin population would increase with more available worms.
 - D. The robin population would decrease because worms would drown in the rainwater.
27. This illustration shows cows and calves in a pasture.



Which two resources do the adult animals compete for?

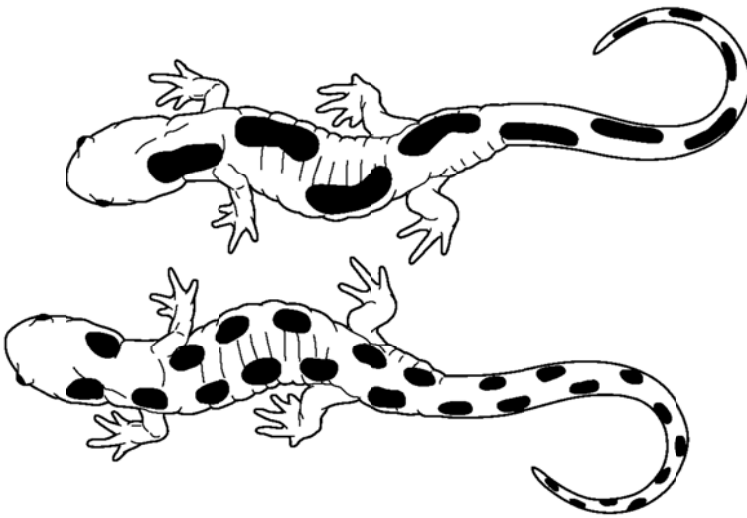
- A. milk and grass
- B. grass and water
- C. trees and grasses
- D. sunlight and water

28. The graph below records the number of individuals in a squirrel population between 1980 and 2000.



- How did the squirrel population change and what might be the reason(s) for this change?
- A. The squirrel population increased and decreased because of predators.
 - B. The squirrel population increased because the number of squirrel predators increased.
 - C. The population increased because the amount of food available for squirrels decreased.
 - D. The increasing squirrel population rose faster after 1990, because the number of predators decreased and the food supply increased.
29. Alligators in the Everglades are carnivores that compete with each other for food, mates, and places to live. Which term defines the organizational level of all the alligators in the Everglades?
- A. habitat
 - B. population
 - C. ecosystem
 - D. community
30. An herbivorous insect called the walking stick looks like a twig when it is standing still. How does this camouflage benefit the walking stick?
- A. It hides the insect from predators.
 - B. It helps the insect fight off predators.
 - C. It helps the insect lure prey to its nest.
 - D. It hides the insect as it hunts for prey.
31. Jacob was studying a timeline that represented the history of life. His assignment was to use logic to interpret the patterns he saw there. The timeline showed that during a period of time called the Cambrian period, many new species of multicellular animals suddenly appeared in the fossil record. Some of the multicellular animals that appeared in the fossil record **before** the Cambrian period shared similar traits with some of the new species that appeared in the fossil record during the Cambrian period. Which statement is a logical interpretation of these facts?
- A. The species that lived in the Cambrian period are still living today.
 - B. The species that lived in the Cambrian period were ancestors of the species that lived prior to that period.
 - C. The species that lived in the Cambrian period could have descended from the species that lived prior to that period.
 - D. The species that lived in the Cambrian period were unrelated to the species that lived prior to that period.

32. Sonesh worked at a museum giving tours. He loved showing guests the great halls full of fossilized dinosaurs. Guests often commented on how the dinosaur skeleton fossils looked like enormous lizards, and Sonesh would smile and explain that similarity between dinosaur fossils and living lizards indicates that dinosaurs and today's lizards are descended from a common ancestor. Sonesh explained that this generalization can be applied to understand other relationships between living organisms and fossils. Which of these fossils would come from an organism that is **most closely** related to elephants as we know them today?
- A. a fossil of a four-legged reptile that had a short tail
 - B. a fossil of a fish that had tusk-like whiskers growing from its face
 - C. a fossil of a tall four-legged mammal that had a very long neck, no tusks, and no trunk
 - D. a fossil of a tall four-legged mammal that walked on land, had four tusks, and a short trunk
33. Elizabeth worked in a lab that studied how salamanders respond to changing environments. She was comparing two species of salamanders that looked similar, but had different levels of genetic diversity.



The salamanders lived in the same forest, and both were threatened by a change in the environment. A local pet store had accidentally allowed several exotic turtles to escape, and the turtles made their way into a surrounding forest. The turtles were thriving in their new environment, and they were eating the salamanders. Elizabeth wanted to protect the salamanders from extinction, so she was studying their genetic diversity to predict their ability to adapt to the introduction of exotic turtles. She found that the smaller-spotted salamanders had very high genetic diversity, while the larger-spotted salamanders had very low genetic diversity. What can she conclude about how the turtle introduction will affect salamander populations?

- A. The larger-spotted salamanders would be in danger of extinction, because low genetic diversity means it is likely that the population could adapt over generations.
- B. The smaller-spotted salamanders would be in danger of extinction, because high genetic diversity means it is likely that the population could adapt over generations.
- C. The larger-spotted salamanders would be in danger of extinction, because low genetic diversity means it is unlikely that the population could adapt over generations.
- D. The smaller-spotted salamanders would be in danger of extinction, because high genetic diversity means it is unlikely that the population could adapt over generations.

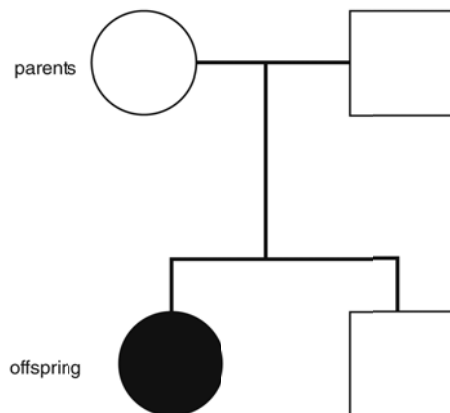
34. Ricardo wanted to understand what causes some species to become extinct, while others survive through environmental changes. He collected data from several studies about frog populations that were exposed to environmental changes. He compared how the speed of change, type of change, and population size related to how the frog populations responded to the change. His data is organized in the table below.

**POPULATION RESPONSE TO DIFFERENT KINDS
OF ENVIRONMENTAL CHANGE**

Population	Type of change	Speed of change	Population size	Population Response
A	habitat loss	slow	large	population decline with survival
B	introduction of a new predator	fast	small	population died out
C	habitat loss	fast	large	population died out
D	long period of draught	slow	small	population decline with survival
E	spread of a new disease	fast	small	population died out

Ricardo wanted to find patterns in the data that might explain why some species survive environmental changes and others do not. What pattern **best** fits the data he collected so far?

- A. Populations tend to survive when population size is small.
 B. Populations tend to die out when population size is large.
 C. Populations tend to survive when the speed of environmental change is slow.
 D. Populations tend to die out when the speed of environmental change is slow.
35. For a type of pea plant, round seeds (R) are dominant to wrinkled seeds (r). A pea plant with the genotype Rr is crossed with another pea plant with the genotype Rr. What **percent** of the offspring are expected to have wrinkled seeds?
- A. 100
 B. 75
 C. 50
 D. 25
36. Pedigree charts are often used to track a heritable condition or disease. A circle represents a female and a square represents a male. A shaded circle or square means that the person is affected by the disease.



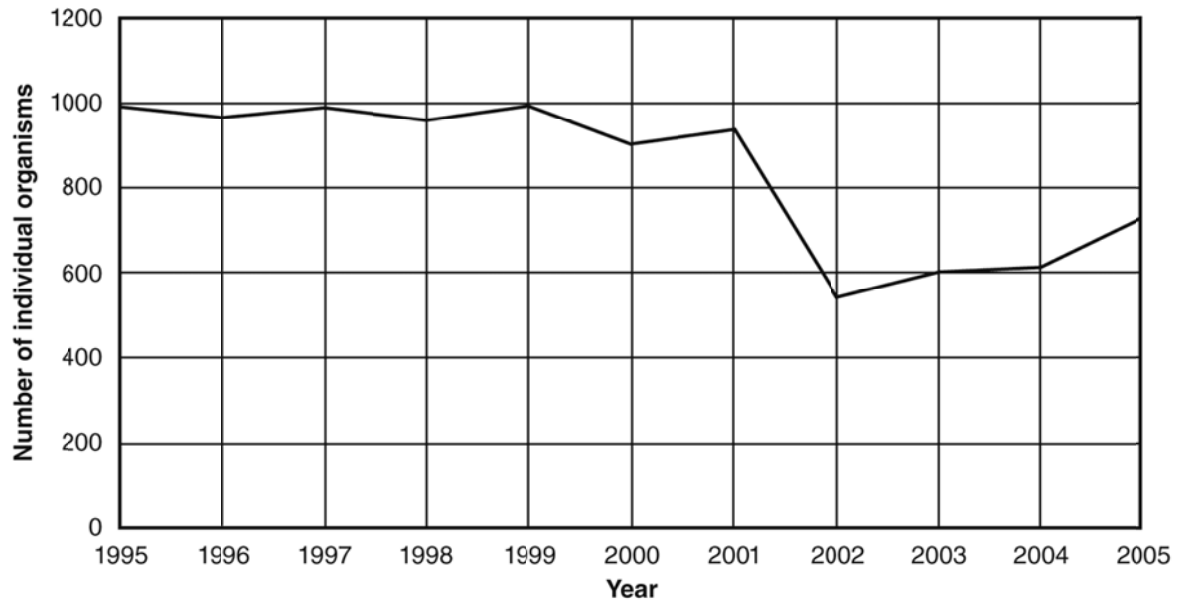
Based on the pedigree chart above, what can you conclude about the disease?

- A. Neither parent has the disease.
 B. Only males can get the disease.
 C. The disease is a dominant trait.
 D. Both offspring have the disease.

37. Different organisms reproduce in different ways. Some organisms are able to reproduce asexually while others are only able to reproduce sexually. What is one way that sexual reproduction is **different** from asexual reproduction?
- A. Sexual reproduction involves mitosis, while asexual reproduction does not.
 - B. Sexual reproduction involves meiosis, while asexual reproduction does not.
 - C. Sexual reproduction produces more offspring than asexual reproduction.
 - D. Sexual reproduction produces offspring with less variation than asexual reproduction.
38. Plants, fungi, and many single-celled organisms are able to reproduce asexually. What is a main characteristic of asexual reproduction?
- A. offspring that are genetically unique
 - B. offspring that are not able to reproduce
 - C. only one parent organism that is required
 - D. sperm and egg that join through fertilization
39. Energy gets transferred through the food web as plants that produce food are consumed by animals that consume plants. The energy is further transfer through animals that consume other animals. Which statement explains what happens to this energy when a plant dies before it is consumed?
- A. The energy disappears.
 - B. The energy must go to new plants that grow out of dead organisms.
 - C. The energy can only go to an animal scavenger that eats the dead organism.
 - D. Decomposers that break down the dead organism take in the stored energy.
40. Which statement correctly describes the role of an herbivore in a food web?
- A. An herbivore only consumes plants.
 - B. An herbivore eats both plants and animals.
 - C. An herbivore is a scavenger that feeds on dead animals.
 - D. An herbivore converts sunlight, water, and carbon dioxide into food.

41. Florida biologists noted that after 2001 the population of a small frog species declined along a section of the Kissimmee River. Once a year, beginning in 1995, a group of volunteers had counted the frogs in the area by listening for individual frog calls. The biologists used the data to make a graph.

POPULATION OF A SPECIES IN AN AREA



- After studying the trend in the graph, what was **most likely** the next step in the biologists' research on the problem?
- A. They counted the frogs once a month instead of once a year.
 - B. They increased the frogs' food supply by bringing insect larvae to the river.
 - C. They formed a hypothesis that there was a limiting factor on the frog population and set out to determine what it could be.
 - D. They formed a hypothesis that the count was not accurate and sent volunteers to get a more accurate count by looking for, rather than just listening for, frogs.
42. Blowing sand forms dunes along Florida's beaches. Trees do not grow on the dunes, but small plants do. The roots of small plants then hold the dunes in place. In what way is the sand a limiting factor on the size of plants that can grow on the dunes?
- A. Sand blows away before any plants can grow.
 - B. Sand cannot hold enough water for trees that grow on dunes.
 - C. Sand cannot provide enough support for plants that have large roots.
 - D. Sand does not have enough food for large plants that grow on the dunes.

SC.6.L.14.1 Describe and identify patterns in the hierarchical organization of organisms from atoms to molecules and cells to tissues to organs to organ systems to organisms.

SC.6.L.14.2 Investigate and explain the components of the scientific theory of cells (cell theory): all organisms are composed of cells (single-celled or multicellular), all cells come from preexisting cells, and cells are the basic unit of life.

SC.6.L.14.3 Recognize and explore how cells of all organisms undergo similar processes to maintain homeostasis, including extracting energy from food, getting rid of waste, and reproducing.

SC.6.L.14.4 Compare and contrast the structure and function of major organelles of plant and animal cells, including cell wall, cell membrane, nucleus, cytoplasm, chloroplasts, mitochondria, and vacuoles.

SC.6.L.14.5 Identify and investigate the general functions of the major systems of the human body (digestive, respiratory, circulatory, reproductive, excretory, immune, nervous, and musculoskeletal) and describe ways these systems interact with each other to maintain homeostasis.

SC.6.L.14.6 Compare and contrast types of infectious agents that may infect the human body, including viruses, bacteria, fungi, and parasites.

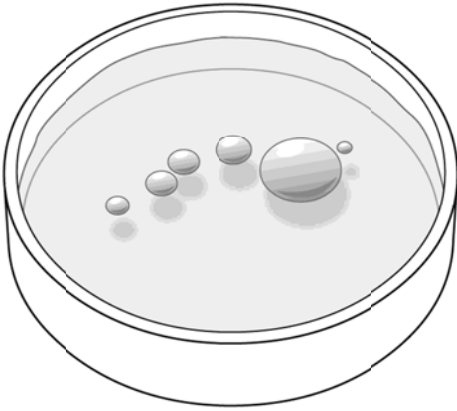
SC.6.L.15.1 Analyze and describe how and why organisms are classified according to shared characteristics with emphasis on the Linnaean system combined with the concept of Domains.

Multiple Choice

Identify the choice that best completes the statement or answers the question.

1. Luis is making a chart of compounds that are found in the human body. What is the **most** common compound found in the human body?
 - A. water
 - B. table salt
 - C. carbon dioxide
 - D. sodium bicarbonate
2. Kayla has a cat with blue eyes. The color of her cat's eyes is determined by deoxyribonucleic acid (DNA). The DNA directs which substance to construct these eyes?
 - A. lipids
 - B. water
 - C. proteins
 - D. carbohydrates
3. Carbohydrates are made up of three of the six major molecules found in living things. The general chemical formula for a carbohydrate is CH_2O . Which elements combine to make a carbohydrate?
 - A. copper and cobalt
 - B. chlorine and oxygen
 - C. carbon, helium, and oxygen
 - D. carbon, hydrogen, and oxygen
4. Ling is planning a long hike. To make sure his body has sufficient water, he packs two bottles of water. What happens to body cells that lose too much water?
 - A. The cells shrivel and die.
 - B. The cells swell and burst.
 - C. The cells are not affected.
 - D. The cells absorb nutrients more efficiently.

5. Alejandro is doing a science experiment. He is given a substance containing one of the four main molecules found in the cells of living things. He needs to find out what kind of molecule the substance is made of. He adds a few drops of the molecule to water



Based on the fact that it does **not** mix with water, what can Alejandro conclude about the molecule?

- A. It is a lipid.
- B. It is a protein.
- C. It is a nucleic acid.
- D. It is a carbohydrate.

6. Imagine a cell that has the shape of a cube with edges that are 3 cm long. Use the following equation below, to find the surface-area-to-volume ratio of this cell.

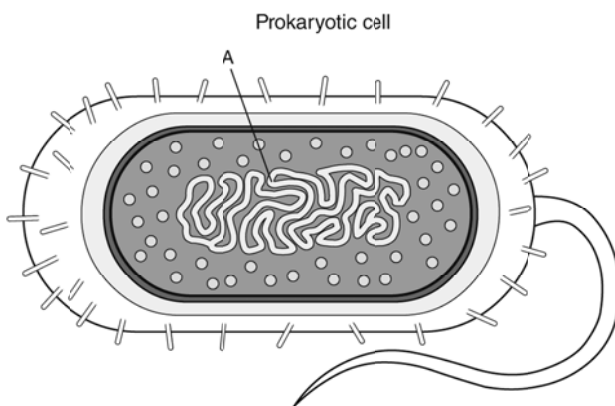
$$\text{surface-area-to-volume ratio} = \frac{\text{surface area}}{\text{volume}}$$

- A. 27 cm³
- B. 54 cm²
- C. 27 : 54
- D. 54 : 27

7. Eukaryotic cells and prokaryotic cells have some parts in common. Which of the following pairs of parts would you find in **both** types of cells?

- A. cytoplasm and nucleus
- B. cell membrane and cytoplasm
- C. DNA and membrane-bound organelles
- D. cell membrane and membrane-bound organelles

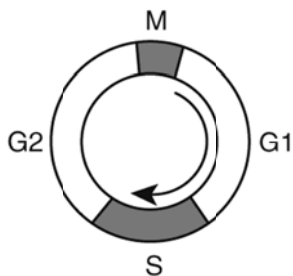
8. The following picture shows a prokaryotic organism.



What part of the organism is labeled A?

- A. DNA
- B. cytoplasm
- C. cell membrane
- D. membrane-bound organelle

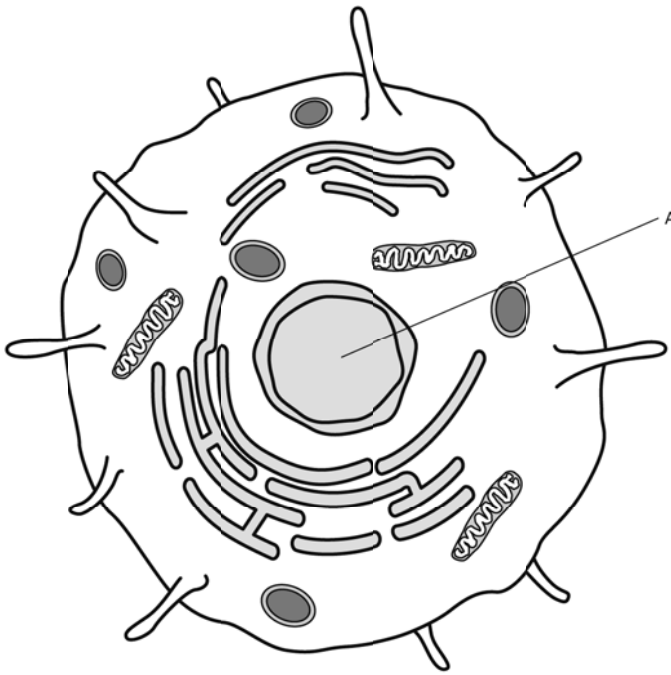
9. Eukaryotic cells and prokaryotic cells have some parts that are different. Which of the following would you find **only** in a eukaryotic cell?
- membrane-bound organelles and a nucleus
 - a nucleus and organelles without membranes
 - a cell membrane and organelles without membranes
 - membrane-bound organelles and DNA in cytoplasm
10. Some organisms have one cell. Other organisms have multiple cells. Which of the following is a characteristic of cells in a multicellular organism?
- All cells have the same function.
 - Every cell has a different function.
 - Different kinds of cells have the same function.
 - Different kinds of cells have different functions.
11. In multicellular organisms, cells form tissues. In turn, tissues form organs, and organs form organ systems. What is an important job of **all** of these tissues, organs, and organ systems?
- to maintain homeostasis
 - to make sugars for energy
 - to transport nutrients in the body
 - to take in nutrients and eliminate wastes
12. Some cells in multicellular organisms are constantly dividing. What is one reason why cells divide?
- so that an organism can eliminate wastes
 - so that an organism can grow by adding new cells
 - so that an organism can obtain the energy that it needs
 - so that an organism can exchange materials with its environment
13. Janine drew the following diagram to show a cell process. Notice that this process includes four stages, represented by labels G1, S, G2, and M. Label M indicates when mitosis happens during this process.



What process is Janine illustrating in her diagram?

- the cell cycle
- exocytosis
- endocytosis
- cellular respiration

14. Pedro examines a tissue sample under a high-powered microscope. He makes a sketch in his lab notebook of one of the cells he observes. His sketch is shown here.

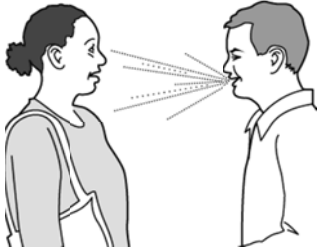


Which label should Pedro use for structure A?

- A. cytoskeleton
 - B. lysosome
 - C. mitochondrion
 - D. nucleus
15. Under a high-powered microscope, Dan sees a cellular organelle. The organelle has a double membrane, and the inner membrane is folded. He runs a test on the organelle and finds that it contains DNA. Which organelle does Dan see?
- A. endoplasmic reticulum
 - B. mitochondrion
 - C. nucleus
 - D. ribosome
16. Lisa and Vinay are studying cells under a microscope. They both notice a certain structure. Lisa concludes that this structure is rough endoplasmic reticulum, but Vinay concludes that it is the Golgi complex. Which of the following choices describes a way to support one of their conclusions?
- A. Lisa's conclusion would be supported if they observed that the structure contains DNA.
 - B. Lisa's conclusion would be supported if they observed ribosomes present on the structure.
 - C. Vinay's conclusion would be supported if they observed that the structure produces ATP molecules.
 - D. Vinay's conclusion would be supported if they observed that the structure carries out photosynthesis
17. Hakeem observes an organelle in a cell under a microscope. He notices that the organelle has a double membrane. Which of the following describes what Hakeem could have observed?
- A. He could have observed a cell wall or a vacuole.
 - B. He could have observed a chloroplast or a lysosome.
 - C. He could have observed a ribosome or a mitochondrion.
 - D. He could have observed a mitochondrion or a chloroplast.

18. Mariella is studying a new type of organism that she has found. She observes that the cells of the organism have ribosomes, mitochondria, and lysosomes. She also observes that the cells do not have a cell wall. What type of organism is Mariella **most likely** to have found?
- A. a plant
 - B. a fungus
 - C. an animal
 - D. a prokaryote
19. When virus particles enter a person's body, the body responds by following a specific pattern. Which of the following steps happens **earliest** in the fight against an invading virus?
- A. Viral particles are engulfed by macrophages.
 - B. B cells divide to make cells that can make antibodies.
 - C. Helper T cells recognize the viral antigens on macrophages.
 - D. Killer T cells recognize viral antigens and destroy the infected cells.
20. The male reproductive system produces and stores sperm cells. What is the function of the epididymis in this system?
- A. make sperm
 - B. store sperm
 - C. make testosterone
 - D. store testosterone
21. At puberty, hormones encourage the development of sexual characteristics. Hormones also aid in reproduction. Which of the following are female sex hormones?
- A. corpus luteum
 - B. gonads, gametes
 - C. estrogen, progesterone
 - D. androgens, testosterone
22. Jeff fell while playing basketball and dislocated his shoulder. Jeff's doctor told him that he had injured an important part of his skeletal system. But luckily, it will heal quickly. What part of the skeletal system is injured when a shoulder is dislocated?
- A. joint
 - B. spongy bone
 - C. bone marrow
 - D. compact bone
23. The human muscular system can suffer injury or disease. Which of the following is most likely caused by a person's heredity?
- A. tendonitis
 - B. muscular dystrophy
 - C. a muscle strain
 - D. a muscle tear

24. Study the following picture.



Which mode of infectious disease transmission does this picture show?

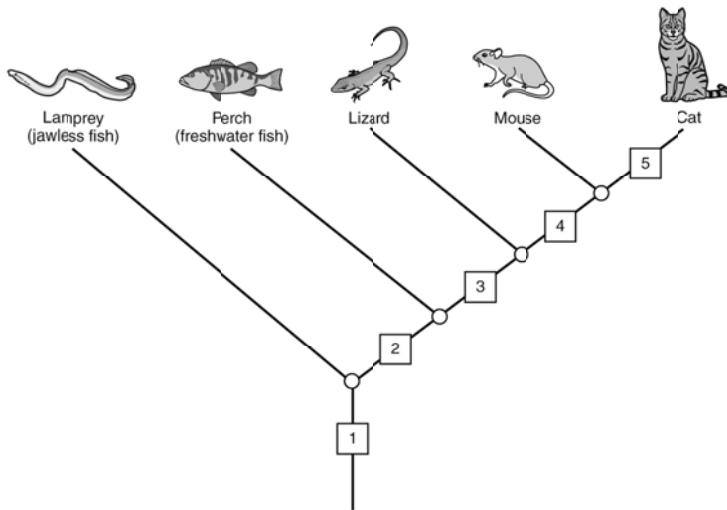
- A. animal to person
- B. person to person
- C. contaminated object
- D. contaminated water or food

25. Why is good personal hygiene important for limiting the spread of disease?

- A. Regular bathing makes it impossible for any bacteria to grow on the skin.
- B. Keeping the body clean and taking antibiotics every day can prevent a person from ever getting sick.
- C. Washing the skin removes all disease-causing bacteria and leaves beneficial bacteria in place.
- D. Showering and brushing the teeth reduce the number of bacteria and other pathogens in and on the body.

26. Joaquin’s teacher gives him a list and a branching diagram. She asks Joaquin to match the numbers on the diagram to the characteristics on the list.

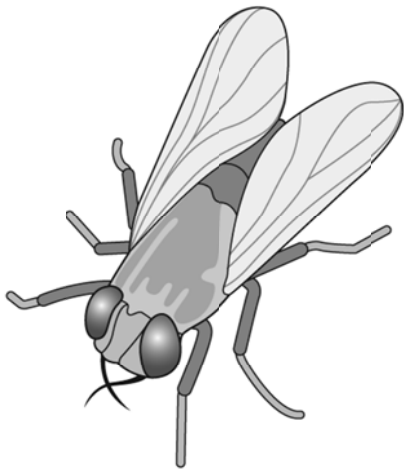
Joaquin’s list
spinal cord
teeth for eating meat
hair and mammary glands
jaws and vertebral column
eggs with internal membrane



What characteristic should appear at point 4?

- A. spinal cord
- B. teeth for eating meat
- C. hair and mammary glands
- D. jaws and vertebral column

27. During a laboratory project, Sunita and William use a dichotomous key to identify different insects. The dichotomous key and one of the insects they need to identify are shown in the following figure.

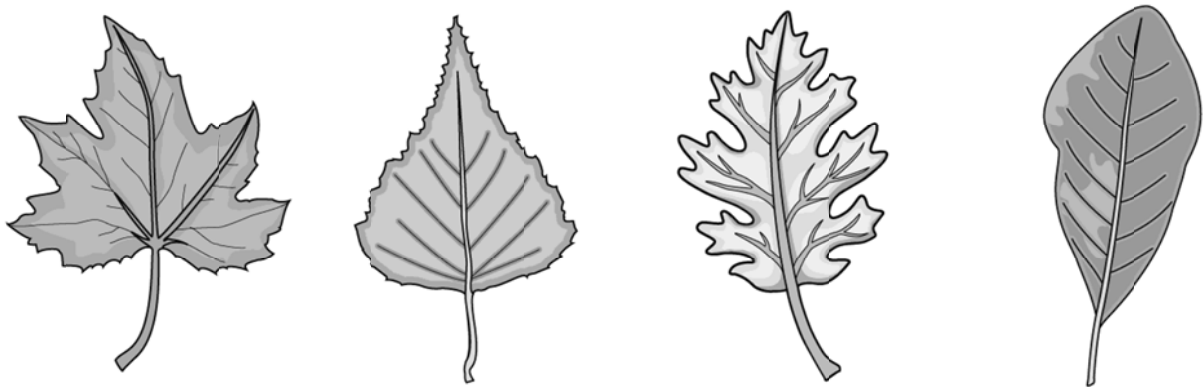


Simple Dichotomous Key for Insects

1	a. six legs b. eight legs	Go to Step 2 Go to Step 3
2	a. wings b. no wings	Go to Step 4 Go to Step 3
3	a. spins a web b. doesn't spin a web	Spider Tick
4	a. covered wings b. uncovered wings	Go to Step 5 Go to Step 6
5	a. long body b. round body	Grasshopper Ladybug
6	a. wings point to the side b. wings point backward	Dragonfly Housefly

In what step of the dichotomous key will Sunita and William identify the insect?

- A. step 1
B. step 2
C. step 5
D. step 6
28. During a field experiment, Thuy collects four different leaves, as shown in the following figure. After the trip, Thuy makes a dichotomous key to identify each of the trees from which the leaves were collected.



Which of the following pairs of statements would be the **best** first step in Thuy's dichotomous key?

- A. a. Leaf is large.
b. Leaf is small.
- B. a. Leaf has rough edges.
b. Leaf has smooth edges.
- C. a. Leaf has pointed lobes.
b. Leaf has rounded lobes.
- D. a. Leaf has one main vein.

b. Leaf has more than one main vein.

29. Selena’s teacher shows the class photographs of four different animals. The class has 1 min to write down the physical characteristics of an animal as they view its photo. Selena makes her notes in the following table.

Animal 1	Animal 2	Animal 3	Animal 4
<ul style="list-style-type: none">• has gills• has scales• has a vertical tail fin• has one large fin and one small fin on its back• has one set of paired fins• has two single fins on bottom• fins are spiny• is dark colored	<ul style="list-style-type: none">• has gills• has very shiny scales• has vertical tail fin• has one fin on its back• has one set of paired fins• has one fin on bottom• has saw-like ridges on back and bottom behind the fins	<ul style="list-style-type: none">• has one fin on its back• has flat tail• has one set of paired flippers• has smooth skin• has long, skinny nose• has blowhole in top of head• is gray colored	<ul style="list-style-type: none">• has fur• has four feet• has flipper like rear feet• has whiskers• has sharp teeth• is mostly black with lighter-colored head

Based on Selena’s notes, which two animals may be more closely related to each other than to the other animals?

- A. 1 and 2
B. 1 and 3
C. 2 and 3
D. 3 and 4
30. Hank discovers a new squirrel that lives near another group of squirrels. The new squirrels have very distinct fur colors and have slightly different ears and tails. Otherwise they look much the same physically as the other group of squirrels. How can Hank **best** determine if the new squirrels belong to the same species as the other group of squirrels?
- A. He could study their diets.
B. He could study their behavior.
C. He could study their genetic material.
D. He could study their internal physical structures.

Physical Science FCAT Preparation



Organized by Grade-level Benchmarks

SC.8.P.8.4 Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured; for example, density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points, and know that these properties are independent of the amount of the sample.

SC.8.P.8.3 Explore and describe the densities of various materials through measurement of their masses and volumes.

SC.8.P.8.5 Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.

SC.8.P.8.1 Explore the scientific theory of atoms (also known as atomic theory) by using models to explain the motion of particles in solids, liquids, and gases.

SC.8.P.8.6 Recognize that elements are grouped in the periodic table according to similarities of their properties.

SC.8.P.8.7 Explore the scientific theory of atoms (also known as atomic theory) by recognizing that atoms are the smallest unit of an element and are composed of sub? Atomic particles (electrons surrounding a nucleus containing protons and neutrons)

SC.8.P.8.8 Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts.

SC.8.P.8.9 Distinguish among mixtures (including solutions) and pure substances.

SC.8.P.9.2 Differentiate between physical changes and chemical changes.

SC.8.P.9.1 Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes.

SC.8.P.9.3 Investigate and describe how temperature influences chemical changes.

Multiple Choice

Identify the choice that best completes the statement or answers the question.

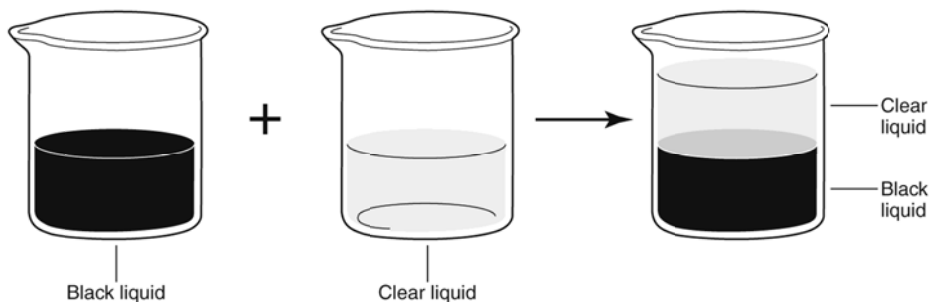
- All matter has both physical and chemical properties. A physical property is one that does not change the chemical nature of matter. Which of these choices is a **physical** property?
 - solubility
 - flammability
 - ability to rust
 - reaction with water
- The pictures below show four objects—a paper clip, a pair of scissors, a needle, and a horseshoe. Assume that each object is made of the same metal.



Which of these physical properties is **not** similar in all four of these objects?

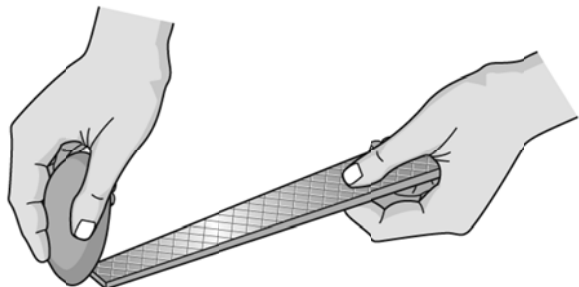
- mass
- magnetism
- specific heat
- electrical conductivity

3. Kavish mixes a black liquid and a clear liquid. He knows the two liquids do not mix well. Kavish allows the mixture to settle for 30 minutes.



Which of these statements is **true**?

- A. The clear liquid is less dense than the black liquid.
 - B. The clear liquid is less soluble than the black liquid.
 - C. The clear liquid is less reactive than the black liquid.
 - D. The clear liquid is less conductive than the black liquid.
4. All matter has physical and chemical properties. These properties can be used to identify the type of matter. Which of these choices describes a **chemical** property?
- A. flexibility
 - B. boiling point
 - C. reactivity with water
 - D. electrical conductivity
5. Esther is studying the physical and chemical properties of a solid object. She subjects the object to a number of tests and observations. Which of these statements describes a **chemical** property of the object?
- A. The object is white in color.
 - B. The object has a powdery texture.
 - C. The object's density is 2.11 g/cm^3 .
 - D. The object reacts with acid to form water.
6. All substances have properties we can use to identify them. Properties of matter are either physical properties or chemical properties. Which of these statements is **true** for chemical properties?
- A. Chemical properties include how dense an object is.
 - B. Chemical properties include measurements of an object's mass.
 - C. Chemical properties describe the state in which the substance exists.
 - D. Chemical properties describe how the substance reacts with other substances.
7. Cassandra is performing some tests on a rock she found outside her school. The picture below shows the rock sample being scratched with a metal file.



Which property of matter is Cassandra **most likely** testing?

- A. rock color, a physical property
- B. rock color, a chemical property
- C. rock hardness, a physical property
- D. rock hardness, a chemical property

8. Which of these choices is not a characteristic property of a substance?
- volume
 - melting point
 - specific heat
 - density
9. Sal is given a sample of an unknown liquid to test in the laboratory. Sal thinks the liquid might be water. Which of these physical properties would be **most** helpful for Sal to determine the identity of the liquid?
- its color
 - its mass
 - its volume
 - its boiling point

10. The element calcium (Ca) is located in the second group on the periodic table.

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn						

Metals
 Metalloids
 Nonmetals

Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

Elements in the same group as calcium have chemical properties similar to those of calcium. What else do these elements have in common?

- atomic number
- number of neutrons
- average atomic mass
- number of valence electrons

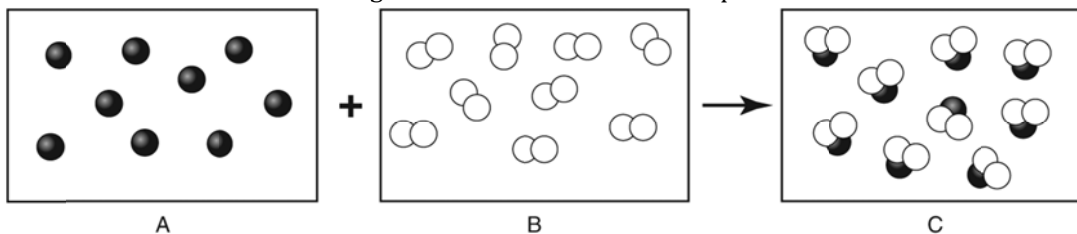
11. The periodic table, shown below, arranges elements according to their properties. Elements at the left are metals and have the properties you'd expect a metal to have.

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn						

Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

Based on its location in the periodic table, what statement **best** describes the element Ca?

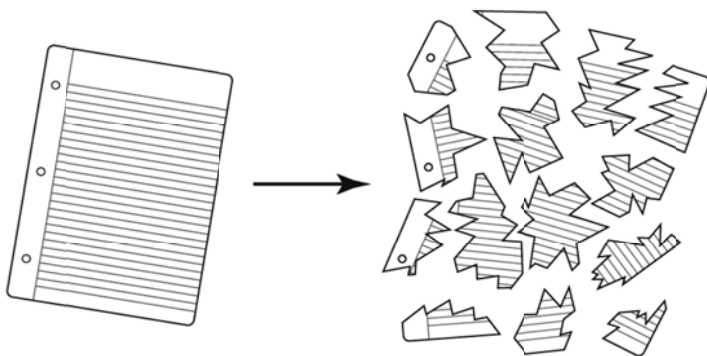
- A. It breaks easily like glass.
 - B. It is shiny and can be bent and shaped.
 - C. It doesn't conduct electricity.
 - D. It is definitely not a metal.
12. Reactant A and reactant B undergo a chemical reaction to form product C.



What type of substance is reactant B?

- A. a nucleus
 - B. a mixture
 - C. an element
 - D. a compound
13. David said that water can be created in a lab by burning hydrogen gas in air. He said that water is not a compound, because only hydrogen is used to make water. What is wrong with David's statement?
- A. A compound only contains one type of element.
 - B. Hydrogen is made up of two different types of atoms.
 - C. Water was not the product formed when he burned hydrogen.
 - D. Compounds must contain two elements, and oxygen from the air was what combined with hydrogen to make water.

14. Matter can undergo physical and chemical changes. A physical change is a change of matter from one form to another without a change in the identity of the substance. Which process is an example of a physical change?
- A. ice melting
 - B. milk souring
 - C. metal rusting
 - D. wood burning
15. It is important to understand the differences between chemical and physical changes. Chemical changes result in new substances, but physical changes do not. Which process is an example of a physical change?
- A. Water turns to steam when boiled over a Bunsen burner.
 - B. Carbon combines with oxygen to form carbon dioxide gas.
 - C. Water breaks down into hydrogen and oxygen gases over time.
 - D. Limestone breaks down into lime and carbon dioxide when heated.
16. Matter can go through two types of changes: physical changes and chemical changes. Chemical changes result in new substances, while physical changes do not. Which process is an example of a physical change?
- A. paper burning into ash
 - B. dough being baked into bread
 - C. apple juice turning into vinegar
 - D. rock being crushed into gravel
17. Marco tears a piece of notebook paper into smaller pieces, as shown below.



Tearing paper into pieces is an example of what kind of change?

- A. a change in mass
 - B. a physical change
 - C. a chemical change
 - D. a change in energy
18. Chemical changes result in new substances, but physical changes do not. Which process is an example of a chemical change?
- A. chopping a tree
 - B. cooking a steak
 - C. making a cup of tea
 - D. drying clothes in the dryer
19. Nora notices water droplets on the grass in the morning. It did not rain during the night. Which statement is **true** about this change of state?
- A. Mass was added to the water particles, resulting in deposition.
 - B. Energy was added to the water particles, resulting in evaporation.
 - C. Mass was removed from the water particles, resulting in sublimation.
 - D. Energy was removed from the water particles, resulting in condensation.

20. Density is the ratio of mass to volume. Troy listed the density of four metals at 20 °C.

Material	Density (g/cm ³)
brass	8.9
gold	about 19.3
iron	7.8
lead	about 11.3

If Troy has a 4-cm³ cube of each of these metals, which cube will have the **greatest** mass?

- A. brass
- B. gold
- C. iron
- D. lead

21. Look at the periodic table below. The metalloids are grouped in a certain section.

Part of the Periodic Table

							18 VIIA	
							2 He Helium 4.002602	
			13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	
			5 B Boron 10.811	6 C Carbon 12.011	7 N Nitrogen 14.0067	8 O Oxygen 15.9994	9 F Fluorine 18.998433	10 Ne Neon 20.1797
			13 Al Aluminum 26.981539	14 Si Silicon 28.0855	15 P Phosphorus 30.973762	16 S Sulfur 32.066	17 Cl Chlorine 35.4527	18 Ar Argon 39.948
10	11 IB	12 IIB						
28 Ni Nickel 58.6934	29 Cu Copper 63.546	30 Zn Zinc 65.39	31 Ga Gallium 69.723	32 Ge Germanium 72.61	33 As Arsenic 74.92159	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.8
46 Pd Palladium 106.42	47 Ag Silver 107.8682	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.71	51 Sb Antimony 121.760	52 Te Tellurium 127.6	53 I Iodine 126.90447	54 Xe Xenon 131.29
78 Pt Platinum 195.08	79 Au Gold 196.96654	80 Hg Mercury 200.59	81 Tl Thallium 204.3833	82 Pb Lead 207.2	83 Bi Bismuth 208.98039	84 Po Polonium 208.9824	85 At Astatine 209.9871	86 Rn Radon 222.0176
110 Ds Darmstadtium 269	111 Rg Roentgenium 272	112 Cn Copernicium 285	113 Uut Uruntrium 284	114 Uuq Ununquadium 289	115 Uup Ununpentium 288	116 Uuh Ununhexium 292	117 Uus Ununseptium n/a	118 Uuo Ununoctium 294

Which statement tells where the metalloids are located in the periodic table?

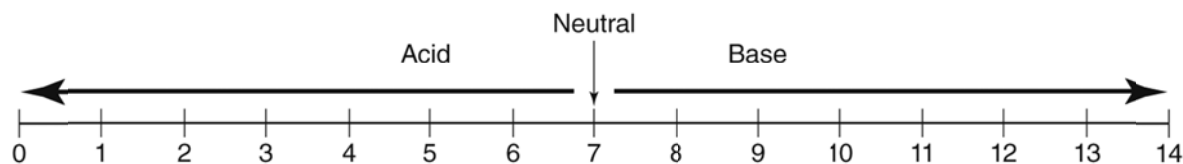
- A. Metalloids are the elements to the left of the zigzag line.
- B. Metalloids are the elements to the right of the zigzag line.
- C. Metalloids are the elements that do not border the zigzag line.
- D. Metalloids are the elements, except aluminum, that border the zigzag line.

22. The element phosphorus reacts with oxygen to produce a bright flame. Which is the smallest particle that will also react with oxygen to produce a bright flame?

- A. a phosphorus atom
- B. a phosphorus molecule
- C. an electron in a phosphorus atom
- D. the nucleus of a phosphorus atom

23. Some compounds are classified as acids or bases. The pH scale shows how acidic or how basic these compounds are. The lower the pH, the more acidic a compound is. The higher the pH, the more basic it is. Sodium hydroxide, a compound commonly found in drain cleaners, has a pH of 13.

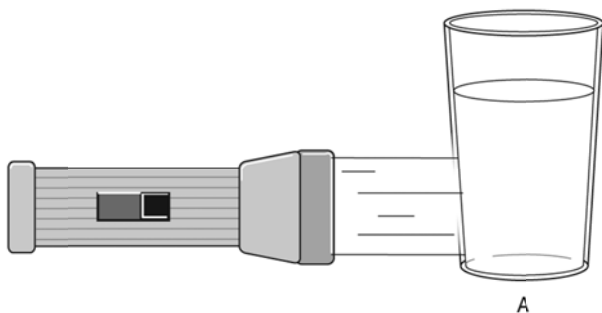
pH Scale



Which of these phrases describes sodium hydroxide?

- A. highly basic
- B. highly acidic
- C. slightly basic
- D. slightly acidic

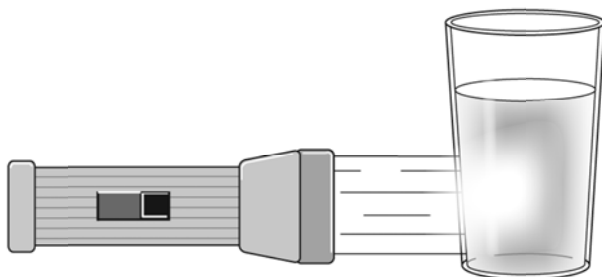
24. You are two that one of these containers has a mixture and one does not. You can only shine a light through them to determine which one is which.



A

What substance is **most likely** to be in container A?

- A. water
- B. apple juice
- C. mayonnaise
- D. gelatin



B

25. Trini adds 10 g of baking soda to 100 g of vinegar. The mixture begins to bubble. When the bubbling stops, Trini finds the mass of the resulting mixture. She determines its mass is 105 g. Why has the mass changed?
- A. A gas has formed and left the mixture.
 - B. Vinegar evaporated during the experiment.
 - C. Mixtures always are less massive than their parts.
 - D. Mass was destroyed when vinegar reacted with baking soda.
26. Rita wants to make some toast for breakfast, which she knows involves a chemical change to the bread. She puts a slice of bread in the toaster, but, after 10 minutes, she notices that the sides of the bread are black. What caused this chemical change to go too far?
- A. an increase in temperature
 - B. a decrease in temperature
 - C. the size of the bread
 - D. the type of bread

SC.7.P.10.1 Illustrate that the sun's energy arrives as radiation with a wide range of wavelengths, including infrared, visible, and ultraviolet, and that white light is made up of a spectrum of many different colors.

SC.8.E.5.11 Identify and compare characteristics of the electromagnetic spectrum such as wavelength, frequency, use, and hazards and recognize its application to an understanding of planetary images and satellite photographs.

SC.7.P.10.3 Recognize that light waves, sound waves, and other waves move at different speeds in different materials.

SC.7.P.10.2 Observe and explain that light can be reflected, refracted, and/or absorbed.

SC.7.P.11.2 Investigate and describe the transformation of energy from one form to another.

SC.7.P.11.3 Cite evidence to explain that energy cannot be created nor destroyed, only changed from one form to another.

SC.6.P.11.1 Explore the Law of Conservation of Energy by differentiating between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa.

SC.7.P.11.4 Observe and describe that heat flows in predictable ways, moving from warmer objects to cooler ones until they reach the same temperature.

SC.7.P.11.1 Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state.

Multiple Choice

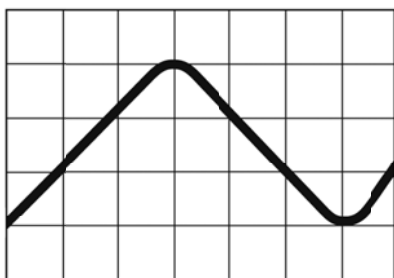
Identify the choice that best completes the statement or answers the question.

- Felipe was enjoying the sunny day at the beach. He told his friend Carl that he was really enjoying the warm feeling that he was getting as he sat in the Sun. Carl explained that the electromagnetic radiation was responsible for this warm feeling. Which part of the electromagnetic spectrum was responsible for making Felipe feel warm?

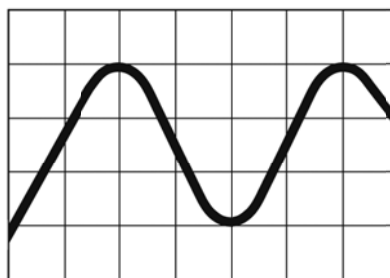
 - A gamma rays
 - B microwaves
 - C visible light
 - D infrared waves

- The graphs below show the wavelengths of four types of electromagnetic waves.

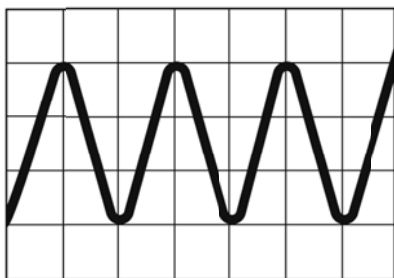
ELECTROMAGNETIC WAVES



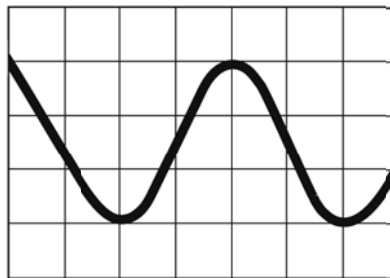
A



B



C



D

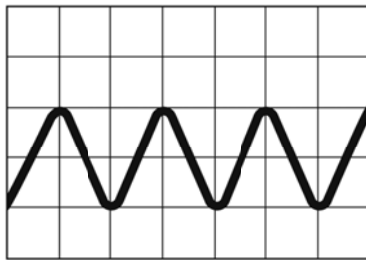
Which graph most likely illustrates radio waves?

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

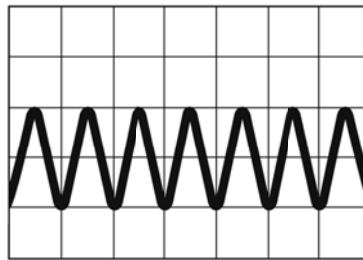
3. Both radio and television signals are carried by radio waves. What other type of electromagnetic radiation is used to send information over long distances?
- A X-rays
 - B microwaves
 - C gamma rays
 - D ultraviolet light

4. These graphs show two different types of electromagnetic radiation.

ELECTROMAGNETIC RADIATION



I



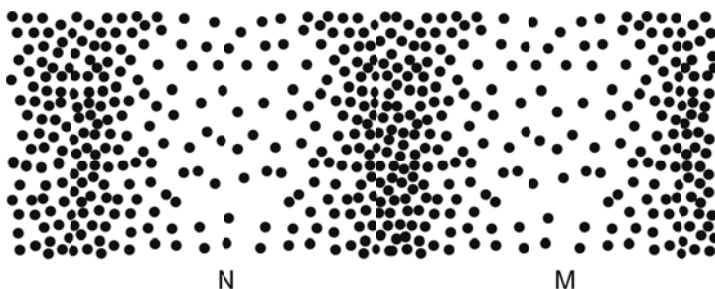
II

If Graph I shows ultraviolet radiation, what type of electromagnetic radiation would Graph II show?

- A infrared light
 - B microwaves
 - C violet light
 - D X-rays
5. All electromagnetic waves travel at the same speed in a vacuum. However, different kinds of electromagnetic waves have different wavelengths. For example, microwaves have longer wavelengths than visible light. How is it possible for both microwaves and visible light to travel at the **same** speed in a vacuum if they have **different** wavelengths?
- A Microwaves and visible light have the same energy.
 - B Microwaves and visible light have different frequencies.
 - C The waves of visible light have less energy than microwaves.
 - D The distance between a point on one wave to the identical point on the next wave is the same for both microwaves and visible light.

6. Waves can pass through a solid, liquid, or a gas. What is the name for any substance through which a wave can pass?
- A a crest
 - B a trough
 - C a medium
 - D a frequency

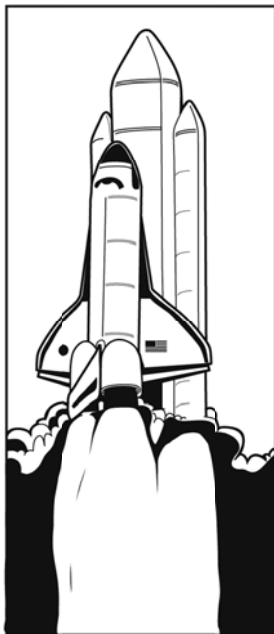
7. The pitch of a sound wave depends on its frequency. A high frequency results in a high pitch, while a low frequency results in a low pitch. The diagram below shows the frequency of a sound wave.



How should this diagram be changed to show that the wave has a **higher** pitch?

- A Eliminate half the dots in the diagram.
- B Move the areas labeled N and M closer to each other.
- C Make the entire diagram look like the areas labeled N and M.
- D Move the areas labeled N and M farther apart from each other.

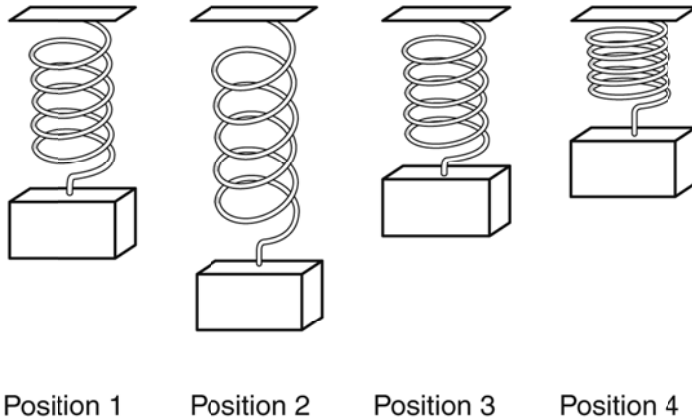
8. In 1947, pilot Chuck Yeager became the first person in an airplane to fly faster than the speed of sound. He flew his plane about 12,000 meters above sea level. At that altitude, the speed of sound travels at 290 meters/second. At sea level, the speed of sound is about 340 meters/second. What conclusion can you make from this information?
- A The speed of sound does not depend on altitude.
 - B The speed of sound depends on the type of plane flown.
 - C As the altitude increases, the speed of sound increases.
 - D As the altitude increases, the speed of sound decreases.
9. The speed of a sound wave through a substance depends on the vibrations caused by collisions of the particles that make up that substance. The more collisions there are, the faster the sound wave travels. The particles in a liquid are more closely packed together than the particles in a gas. What would you predict to happen to a sound wave as it travels from a liquid into a gas?
- A The speed of the sound wave would increase.
 - B The speed of the sound wave would decrease.
 - C The amplitude of the sound wave would increase.
 - D The amplitude of the sound wave would decrease.
10. Kalinda hates the sound of her alarm clock in the morning. What would be the **best** way for Kalinda not to hear the sound even if the alarm clock is ringing?
- A Put the alarm clock in a jar, and put it in her closet.
 - B Put the alarm clock in a jar, fill it with cotton, and seal it.
 - C Put the alarm clock in a jar, remove all the air from it, and seal it.
 - D Put the alarm clock in a sealed jar and cover it with a hand towel.
11. John's mom works as a scientist at the Space Center. She tells John that a rocket requires a large amount of energy to launch. The required energy is generated by burning liquid fuel.



Which type of energy is stored in the liquid fuel?

- A kinetic energy
- B thermal energy
- C chemical energy
- D electrical energy

12. During a science experiment, students compress four springs and then release them.



In which position would the greatest conversion of elastic energy to kinetic energy occur when the spring is released?

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

13. Juan serves a tennis ball. He throws the tennis ball into the air and hits it with his racket when it reaches its highest point. Once he hits the ball, it moves forward and downward, eventually hitting the ground after it goes over the net. At which point is kinetic energy converted to gravitational potential energy?

- A just before Juan throws the ball
- B just after Juan throws the ball into the air
- C just after Juan hits the tennis ball
- D just before the tennis ball hits the ground

14. Alonso is camping with his family. His torch runs on two batteries. Which type of energy is stored in the batteries?

- A light energy
- B thermal energy
- C chemical energy
- D electrical energy

15. Rachel is cooking breakfast before she leaves for school. In which of the following electrical appliances is electrical energy converted to kinetic energy?

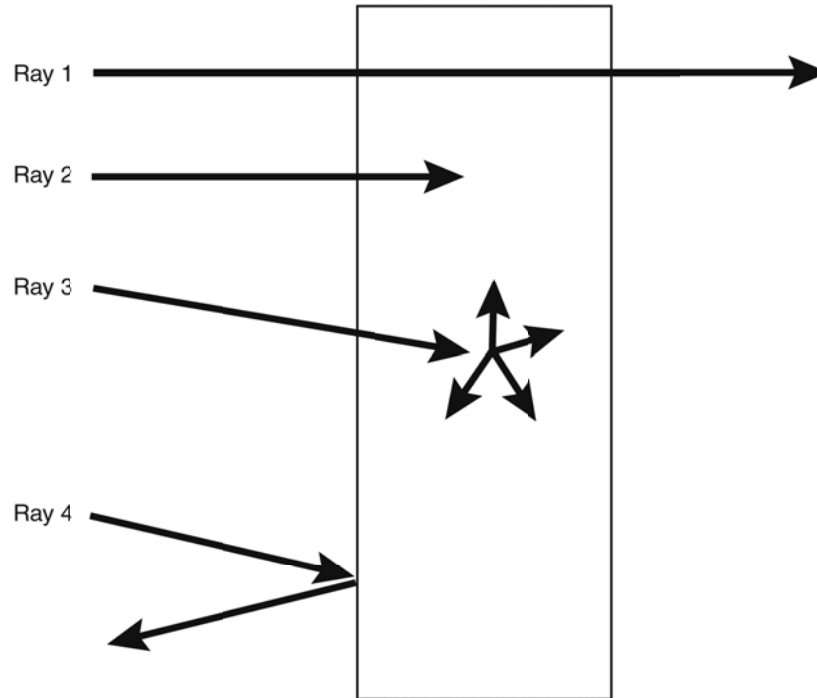
- A blender
- B oven
- C stove burner
- D toaster

16. Joe places two solid objects in contact with each other. Which property determines the direction of the flow of heat between the two objects?

- A material of the objects
- B volume of the objects
- C density of the objects
- D temperature of the objects

17. Myra places two objects in contact. One object is warmer than the other object. Which type of heat transfer is she **most likely** testing?
- A conduction
 - B convection
 - C insulation
 - D radiation
18. Jeriah places two metal cubes in contact with each other. Energy as heat flows from Cube A to Cube B. What conclusion can you draw regarding Cube A?
- A It is larger than Cube B.
 - B It is cooler than Cube B.
 - C It is smaller than Cube B.
 - D It is warmer than Cube B.
19. Kirby leaves a beaker of water at 80 °C to stand in a room with an air temperature of 20 °C. He measures the temperature of the water in the beaker every five minutes. At what temperature will the water temperature stop decreasing?
- A 0 °C
 - B 20 °C
 - C 50 °C
 - D 80 °C
20. Tran places a warm plate with a temperature of 60 °C on a bench that is at a temperature of 25 °C. After an hour, the plate and the bench are at the same temperature. Which of the following best describes what occurs during the hour?
- A The temperature of the plate stays the same, while the temperature of the bench increases to 60 °C.
 - B The temperature of the bench stays the same, while the temperature of the plate decreases to 25 °C.
 - C The temperature of the plate and the bench both decrease until they reach a temperature of 0 °C.
 - D The temperature of the plate decreases to 30 °C, while the temperature of the bench increases to 30 °C.
21. As Miguel walked farther from the soccer field after the evening game, the lights from the field got dimmer. What causes a beam of light to get dimmer the farther it travels through the air?
- A absorption
 - B reflection
 - C refraction
 - D scattering

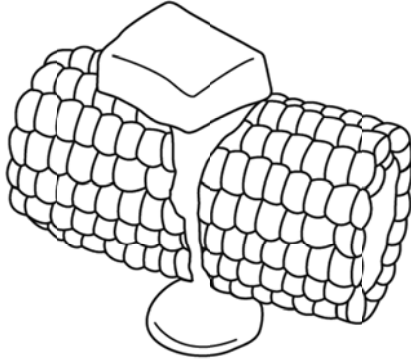
22. The diagram below shows what happens when light strikes a material.



Which behavior of light is NOT shown in this diagram?

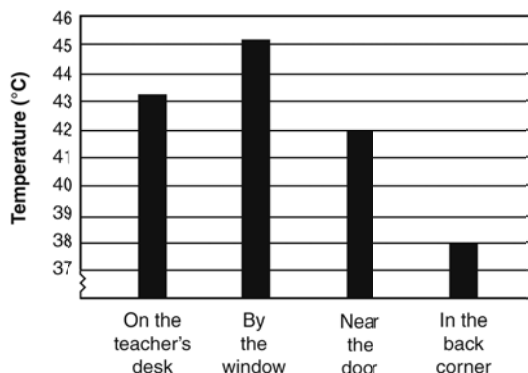
- A absorption
 - B reflection
 - C refraction
 - D transmission
23. Emma sets up an experiment to study light passing through different materials. What does Emma observe happen to light at the point when it passes into a material where the speed of light changes?
- A The light is brighter.
 - B The light is reflected.
 - C The light is refracted.
 - D The light is absorbed.
24. Tyler observed that light can be reflected, absorbed, and refracted. What causes the refraction of light?
- A Light waves travel extremely fast.
 - B Light waves move at different speeds through different materials.
 - C Light waves can have different wavelengths and different frequencies.
 - D Light waves maintain the same speed as they travel through a different material.
25. Alejandro walked into the classroom before anyone else, including the teacher, had arrived. Because it was too dark to see anything, he turned on the lights. He was then able to see his desk. Why was Alejandro able to see the desk?
- A The desk reflected the light.
 - B The desk became a light source.
 - C The desk absorbed the light when he turned it on.
 - D The desk separated the light into all the wavelengths of visible light.

26. Allan places a slice of butter on a cob of hot corn. Heat flows from the corn to the butter.



Which change of state does the butter undergo?

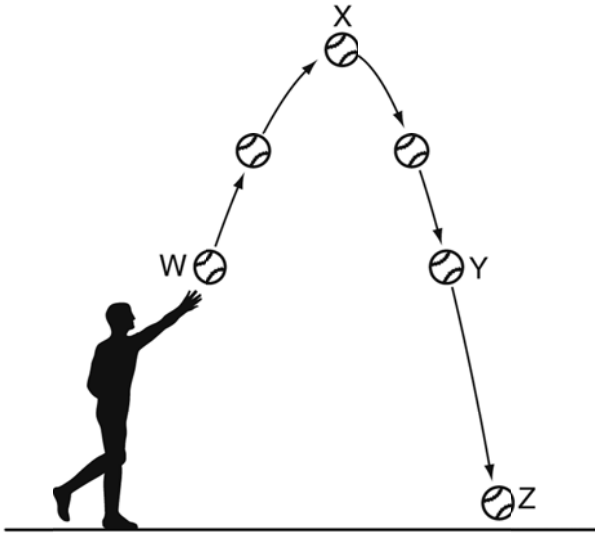
- A gas to solid
 - B solid to gas
 - C liquid to solid
 - D solid to liquid
27. When Roberto heats margarine in a hot skillet, what modification causes a change of state?
- A The margarine loses thermal energy.
 - B The margarine loses chemical energy.
 - C The margarine gains thermal energy.
 - D The margarine gains chemical energy.
28. During the summer, Chang takes a glass of milk from the refrigerator and places it on the kitchen counter. Over time, energy as heat is transferred to the milk from the air. Which change would **most likely** occur?
- A The temperature of the milk will increase.
 - B The temperature of the milk will decrease.
 - C The milk will change from a liquid to a gas.
 - D The milk will change from a liquid to a solid.
29. Allison visits the beach. She notices that the ice cubes in her water bottle melt over the course of the day. Which of the following **best** describes what occurs when ice cubes melt?
- A The cold ice cubes absorb heat energy from the air, and eventually the ice cubes melt.
 - B The cold ice cubes absorb heat energy from the air, and eventually the air freezes.
 - C The cold ice cubes release heat energy into the air, and eventually the ice cubes melt.
 - D The cold ice cubes release heat energy into the air, and eventually the air freezes.
30. During a science experiment, a group of students places the same amount of water in four identical beakers in four different locations in the classroom. The students measure the temperature of the water in each beaker after one hour. The students make this graph to show the results of the experiment.



Which conclusion is **best** supported by the results?

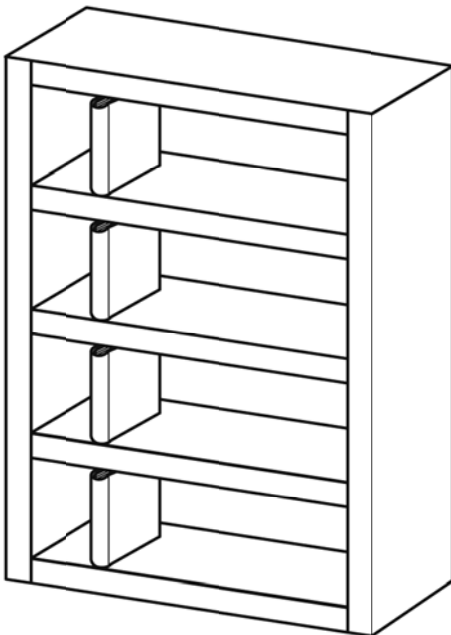
- A The water in the beaker by the window absorbed the most heat energy.
- B The water in the beaker by the window changed from one state to another.
- C The water in the beaker in the back corner did not absorb any heat energy.
- D The water in the beaker in the back corner released the heat energy it received.

31. Peyton throws a baseball at practice. As the baseball travels in the path shown below, energy is converted from kinetic energy to potential energy and from potential energy to kinetic energy.



At which point is the kinetic energy of the baseball at its minimum?

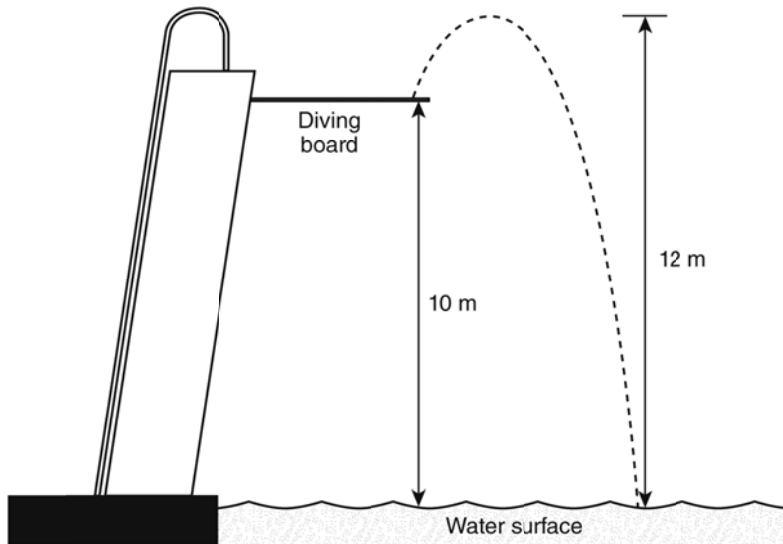
- A point W
 - B point X
 - C point Y
 - D point Z
32. Will learns that electrical energy can change form and that this energy conversion is utilized in many home appliances. What form would some of the energy take in every energy conversion?
- A light energy
 - B sound energy
 - C thermal energy
 - D electrical energy
33. Noah places four books with the same mass on four shelves of a bookcase. Each book has gravitational potential energy because of its height above the ground.



If each book falls from its position, which statement correctly compares the kinetic energy of the books just before they hit the ground?

- A They will all have zero kinetic energy.
- B They will all have the same kinetic energy.
- C The book on the top shelf will have the greatest kinetic energy.
- D The book on the bottom shelf will have the greatest kinetic energy.

34. When Meagan strikes her drum, the skin of the drum moves. The kinetic energy of the skin is converted to sound energy. Which statement **best** explains why all of the kinetic energy is NOT converted to sound energy?
- A Some of the kinetic energy is lost as heat.
 - B The skin of the drum absorbs kinetic energy.
 - C Friction slows the movement of the drum skin.
 - D The kinetic energy is converted to potential energy.
35. Caroline dives from a diving board.



Which statement **best** describes the energy conversion that occurs from the moment she dives to the moment she hits the water?

- A Energy is gained as she moves upward and then lost as she moves downward.
- B Energy is lost as she moves upward and then gained as she moves downward.
- C Kinetic energy is gained as she moves upward and then lost as she moves downward.
- D Potential energy is gained as she moves upward and then lost as she moves downward.

SC.6.P.13.1 Investigate and describe types of forces including contact forces and forces acting at a distance, such as electrical, magnetic, and gravitational.

SC.8.P.8.2 Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass.

SC.6.P.13.2 Explore the Law of Gravity by recognizing that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are.

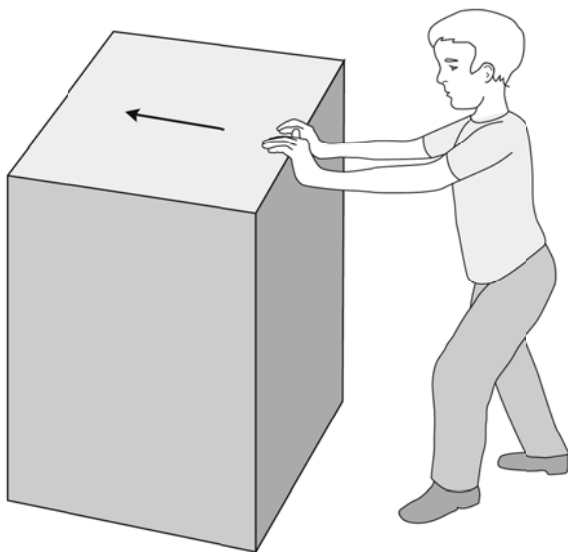
SC.6.P.13.3 Investigate and describe that an unbalanced force acting on an object changes its speed, or direction of motion, or both.

SC.6.P.12.1 Measure and graph distance versus time for an object moving at a constant speed. Interpret this relationship.

Multiple Choice

Identify the choice that best completes the statement or answers the question.

1. Luis is pushing a box of new soccer balls across the floor. In the following picture, the arrow on the box is a vector representing the force Luis exerted.

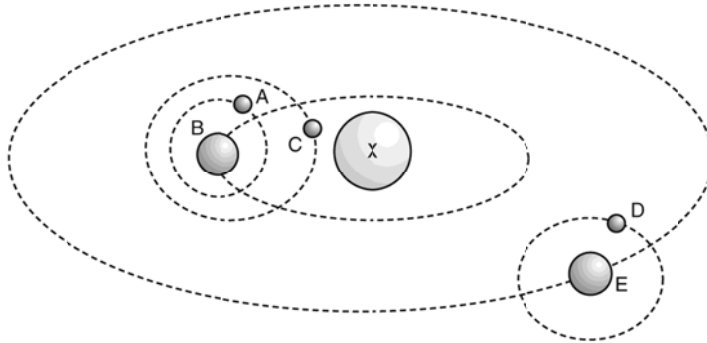


What do the length and direction of the arrow represent?

- A. the distance and direction of the motion of the box
 - B. the strength and direction of the force applied to the box
 - C. the motion of the box and the direction of the force applied to it
 - D. the strength and direction of the unbalanced force applied to the box
2. A rocket burns fuel to create hot gases that explode violently out of the rocket engine. This explosion creates thrust. Thrust is a force that pushes the rocket upward. What force must thrust overcome in order to send a rocket up into space?
 - A. gravity acting on the rocket
 - B. gravity acting on the exploding gases
 - C. friction between the rocket and the ground
 - D. friction between the rocket and the exploding gases

3. In order for a space shuttle to leave Earth, it must produce a great amount of thrust. Its rocket boosters create this thrusting force by burning great amounts of fuel. However, once in space, the shuttle needs very little fuel. It circles Earth while gravity pulls it toward Earth. What term describes the circular path the shuttle makes in space?
- orbit
 - gravity
 - free fall
 - weight

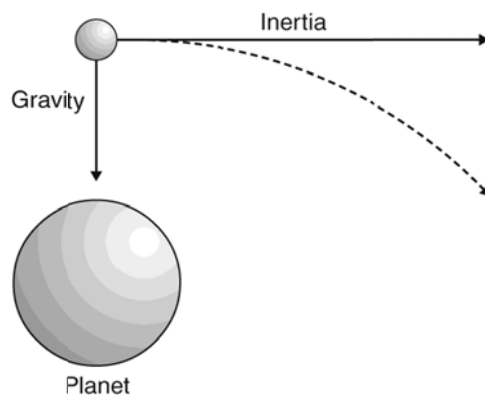
4. Justin drew the following diagram of the orbits of several objects in space.



What keeps object A in orbit around object B?

- the force of gravity between objects A and B
- the force of gravity between objects A and C
- the force of gravity between objects A and E
- the force of gravity between objects B and X

5. The diagram shows the components of motion that affect an object in orbit around a planet.

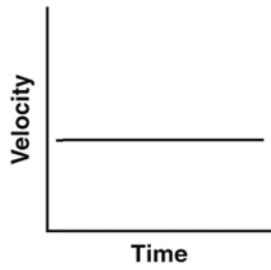


How is the dotted arrow related to the two solid arrows?

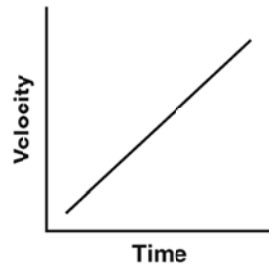
- It shows the path the object would take if it had no inertia.
 - It shows the path the object would take if there were no gravity.
 - It shows the path the object would take if the object were not in motion.
 - It shows the path the object takes because of its motions from inertia and gravity.
6. Measuring acceleration requires the appropriate units. Scientists measure acceleration using a standardized set of units that are part of the SI system. Which are SI units for acceleration?
- N
 - m/s
 - m/s²
 - kg·m/s
7. In science, some quantities are known as vectors. Acceleration is one type of vector. Which of the following would identify an acceleration vector?
- 5 m/s
 - 8 m/s south
 - 5 m/s²
 - 5 m/s² south

8. Elizabeth is a wildlife biologist. She traveled by boat in the Everglades to observe alligators. The following graphs show the motion of her boat at several times during the trip.

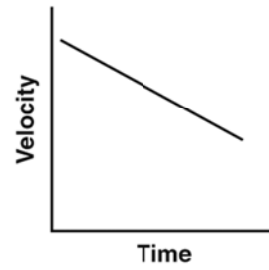
Graph A



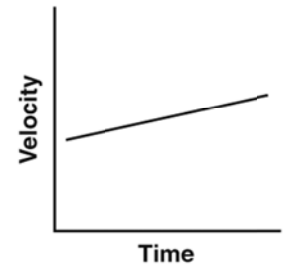
Graph B



Graph C

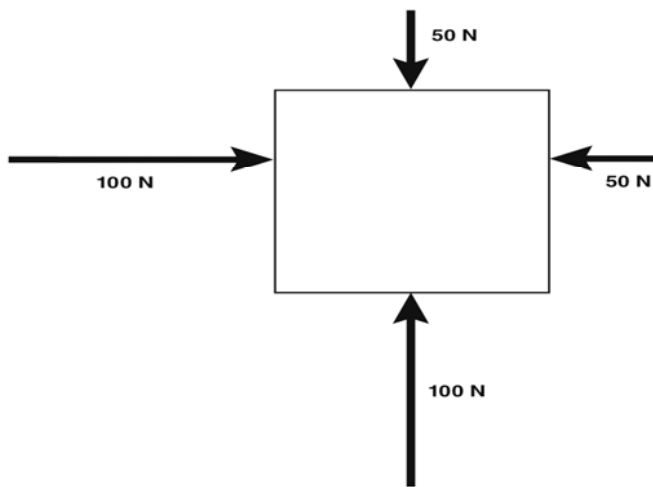


Graph D



Which graph shows her boat traveling when it is **not** accelerating?

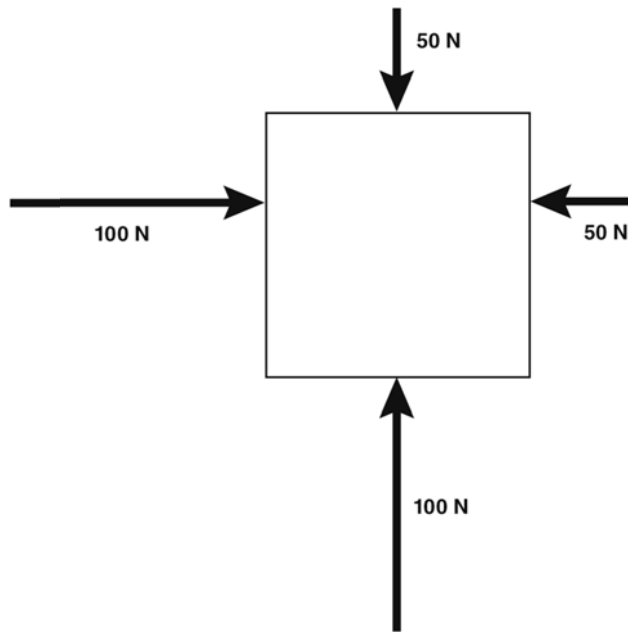
- A. graph A
 - B. graph B
 - C. graph C
 - D. graph D
9. Imagine a weightless box floating in space. The following picture shows all the forces acting on this box.



In what direction will this box accelerate?

A.		C.	
B.		D.	

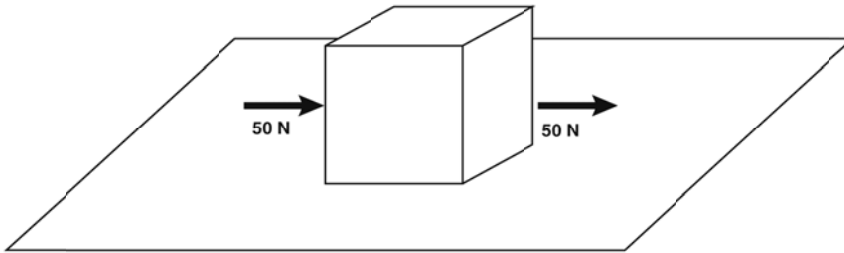
10. Imagine a box floating in space. The following picture shows all the forces acting on this box.



What is the vertical force on this box?

- A. -100 N upward
- B. -50 N upward
- C. 50 N upward
- D. 100 N upward

11. A box of books is on the floor. The following picture shows a push and a pull acting on the box.



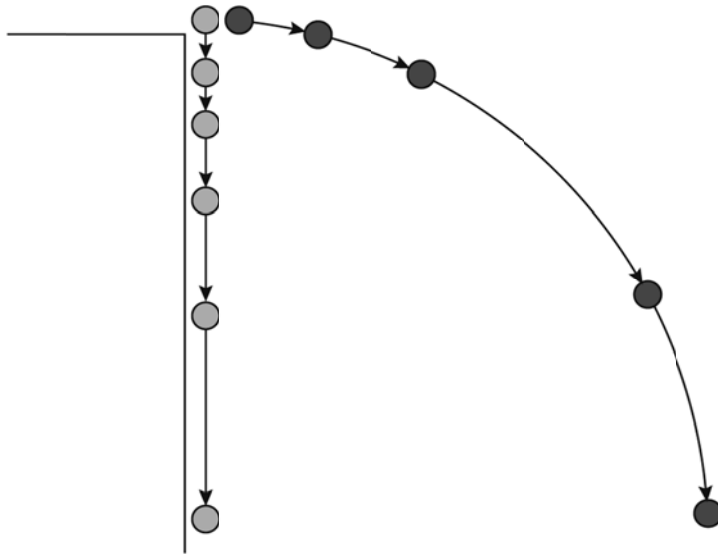
What is the net force toward the right on the box?

- A. 0 N
- B. 50 N
- C. 100 N
- D. 2,500 N

12. Imagining that a chair on the floor experiences two horizontal forces. One force measures 200 N and the other force measures -200 N. Which of the following statements describes what is happening to the object?

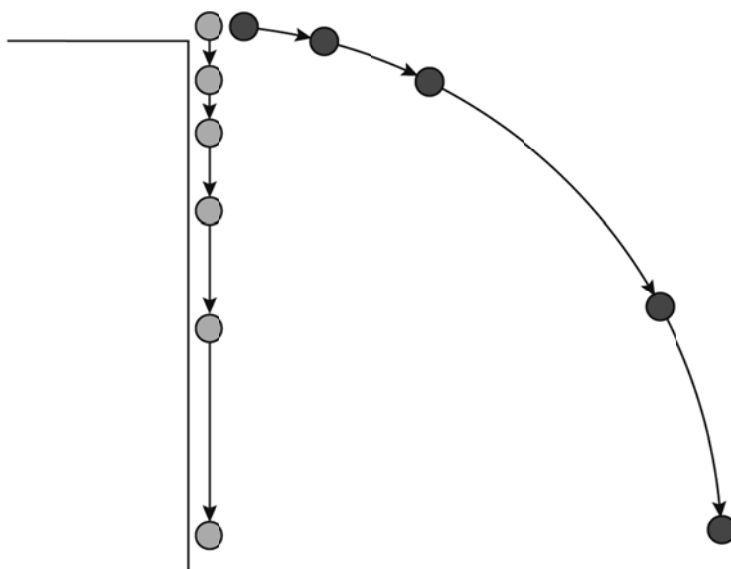
- A. The object is moving.
- B. The object is not moving.
- C. The object's motion is changing.
- D. The object's motion is not changing.

13. Two balls are falling from the same ledge. One ball falls straight down. The other ball is moving horizontally when it leaves the ledge.



Which of the following statements describes the amount of time needed for the balls to reach the ground?

- A. The balls hit the ground at the same time because gravity is the only unbalanced force acting on them.
 - B. The ball that is falling straight down from the ledge hits the ground first because it does not travel as far.
 - C. The ball with more mass will hit the ground first because it experiences more acceleration due to gravity.
 - D. The ball that is moving horizontally away from the ledge hits the ground first because it experiences acceleration in both directions.
14. The following picture shows the path followed by two balls. One is dropped from the ledge. The other ball is rolled off the ledge.

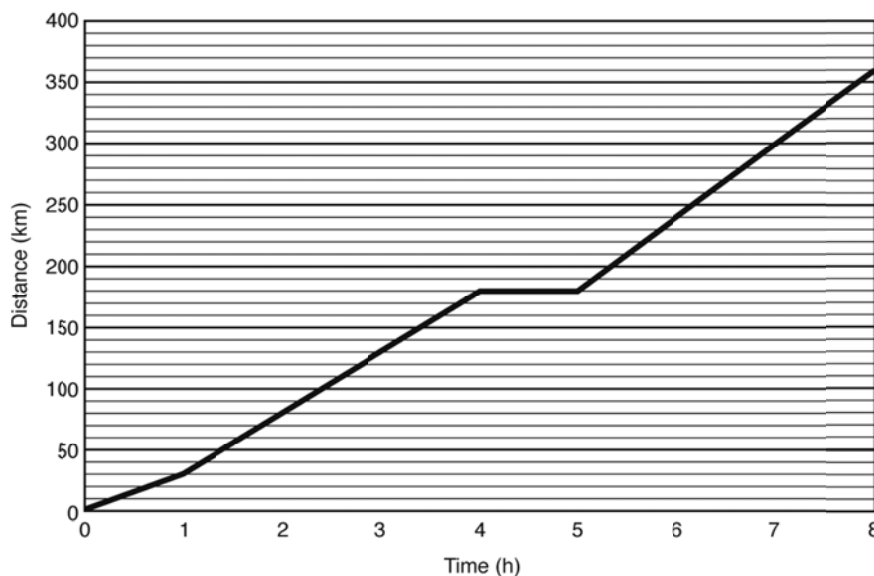


Why don't both balls fall straight down?

- A. The ball that is moving to the right continues to experience a force in that direction.
- B. The ball that is moving to the right keeps moving to the right until gravitational force acts on it.
- C. The force causing the ball to move to the right stops after a few seconds, and then the ball drops straight down.
- D. The horizontal motion of the ball moving to the right balances the force of gravity, so the ball does not fall as quickly.

15. During a baseball game, a hitter strikes the ball with a bat. When this happens, the ball and the bat each exert a force on the other. Why does the ball accelerate away from the bat more than the bat accelerates away from the ball?
- The ball has less mass, so an equal force causes greater acceleration on the ball.
 - The ball has less mass, so it exerts less force on the bat than the bat exerts on the ball.
 - The ball has greater velocity before the collision, so force affects the ball more than the bat.
 - The bat exerts more force than the ball because the batter is exerting a force on the bat as it hits the ball.
16. In a swimming race, Miho swam the first 50 m in 42 s. She swam the second 50 m in 40 s. What was Miho's average speed during the race?
- 0.82 m/s
 - 1.19 m/s
 - 1.22 m/s
 - 1.25 m/s

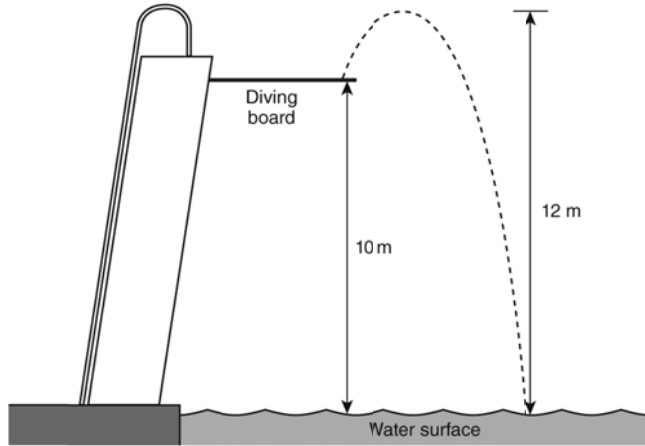
17. Joanna's family drove 360 km to visit relatives in Jacksonville. Joanna recorded the distance they traveled each hour. The entire trip took 8 h.



What was the average speed during the last 3 h of the trip?

- 45 km/h
 - 60 km/h
 - 120 km/h
 - 180 km/h
18. Montez read that bobcats can reach speeds of up to 30 mi/h. What does the speed of a bobcat indicate?
- the time it takes to reach its maximum speed
 - the total amount of time it travels in one direction
 - the distance it travels to move between two points
 - the distance it can travel in a certain amount of time
19. Masato is practicing his serve for a tennis match. His coach measures the speed of the ball just after Masato hits it. What does the speed indicate?
- how fast the ball is moving
 - what direction the ball moves
 - what distance the ball has traveled
 - how long the ball takes to reach the net

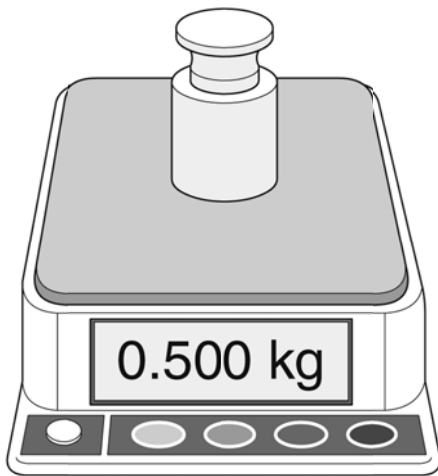
20. Sita is on the school diving team. She drew the diagram below to show the path she takes when she dives.



When Sita is at the highest point, she is 12 m above the pool. Which of the following does this statement describe?

- A. motion
- B. path
- C. position
- D. speed

21. The following picture shows an object resting on a balance.



With what force does the object push down on the balance?

- A. $0.500 \text{ kg}\cdot\text{m}/\text{s}^2$
- B. $4.90 \text{ kg}\cdot\text{m}/\text{s}^2$
- C. $9.3 \text{ kg}\cdot\text{m}/\text{s}^2$
- D. $9.8 \text{ kg}\cdot\text{m}/\text{s}^2$

22. The following table lists the weights and volumes of several items.

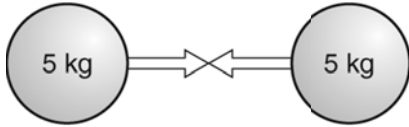
Object	Mass (g)	Volume (cm ³)
bowling ball	3,600	5,400
golf ball	60	33
soccer ball	450	5,400
tennis ball	60	130

Which object has the **greatest** force of gravity acting on it?

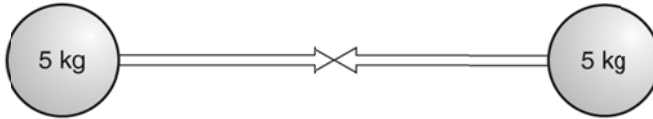
- A. bowling ball
- B. golf ball
- C. soccer ball
- D. tennis ball

23. The objects shown in the following diagrams have different masses and are different distances apart. Which diagram shows the two objects that have the **greatest** force of gravity acting between them?

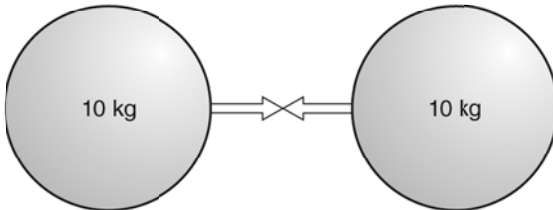
A.



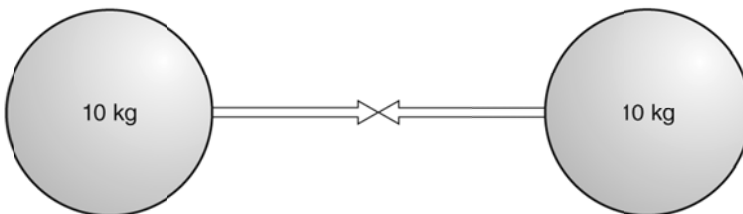
B.



C.



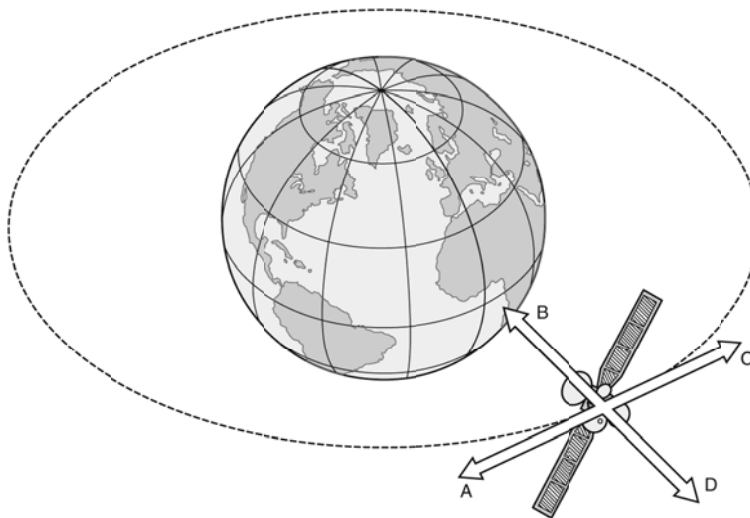
D.



24. High and low tides are the regular pattern of rising and sinking ocean-water levels. They are caused when the sun's gravity and the moon's gravity pull on ocean water. The moon's gravity has a greater effect on Earth's oceans than the sun's gravity. Why would the moon have a greater effect than the sun?

- A. The moon is not as hot as the sun.
- B. The moon has less mass than Earth.
- C. The moon has less mass than the sun.
- D. The moon is closer to Earth than the sun.

25. The following diagram shows a satellite in orbit around Earth.



Which arrow shows the direction of the force that keeps the satellite in its circular path around Earth?

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

Earth Science FCAT Preparation



Organized by Grade-level Benchmarks

SC.8.E.5.3 Distinguish the hierarchical relationships between planets and other astronomical bodies relative to solar system, galaxy, and universe, including distance, size, and composition.

SC.8.E.5.1 Recognize that there are enormous distances between objects in space and apply our knowledge of light and space travel to understand this distance.

SC.8.E.5.2 Recognize that the universe contains many billions of galaxies and that each galaxy contains many billions of stars.

SC.8.E.5.5 Describe and classify specific physical properties of stars: apparent magnitude (brightness), temperature (color), size, and luminosity (absolute brightness).

SC.8.E.5.6 Create models of solar properties including: rotation, structure of the Sun, convection, sunspots, solar flares, and prominences.

SC.8.E.5.7 Compare and contrast the properties of objects in the Solar System including the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions.

SC.8.E.5.4 Explore the Law of Universal Gravitation by explaining the role that gravity plays in the formation of planets, stars, and solar systems and in determining their motions.

SC.8.E.5.8 Compare various historical models of the Solar System, including geocentric and heliocentric.

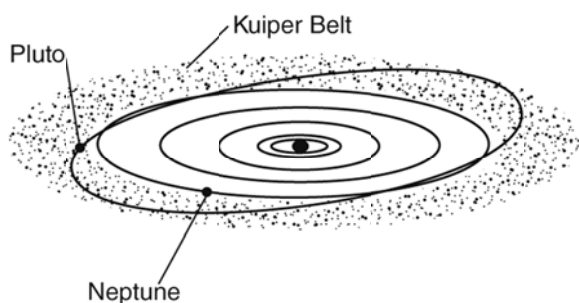
SC.8.E.5.9 Explain the impact of objects in space on each other including: 1. the Sun on the Earth including seasons and gravitational attraction 2. the Moon on the Earth, including phases, tides, and eclipses, and the relative position of each body.

Multiple Choice

Identify the choice that best completes the statement or answers the question.

- Where do short-period comets originate?
 - the asteroid belt
 - the Kuiper Belt
 - the orbit of Jupiter
 - the Oort cloud

- This picture shows the Kuiper Belt.



Approximately how wide is the Kuiper Belt?

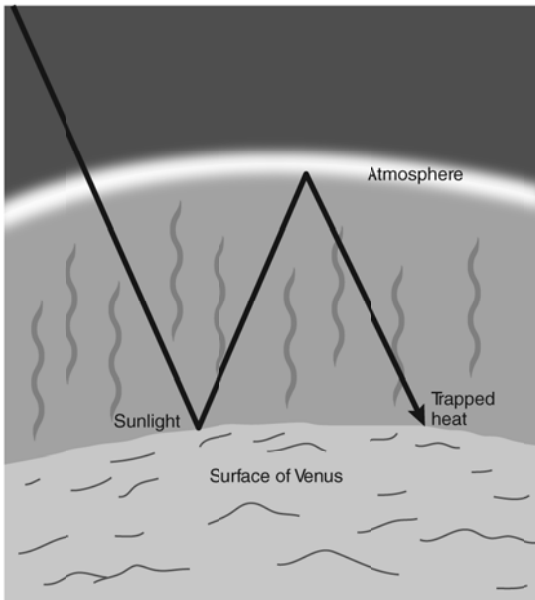
- 12 AU
 - 25 AU
 - 55 AU
 - 110 AU
- The following table shows the densities of the planets in our solar system.

Planet	Density (g/cm ³)
Mercury	5.427
Venus	5.204
Earth	5.515
Mars	3.934
Jupiter	1.326
Saturn	0.687
Uranus	1.290
Neptune	1.638

Based on its density, which kind of planet is Uranus?

- gas giant
- terrestrial
- supergiant
- white dwarf

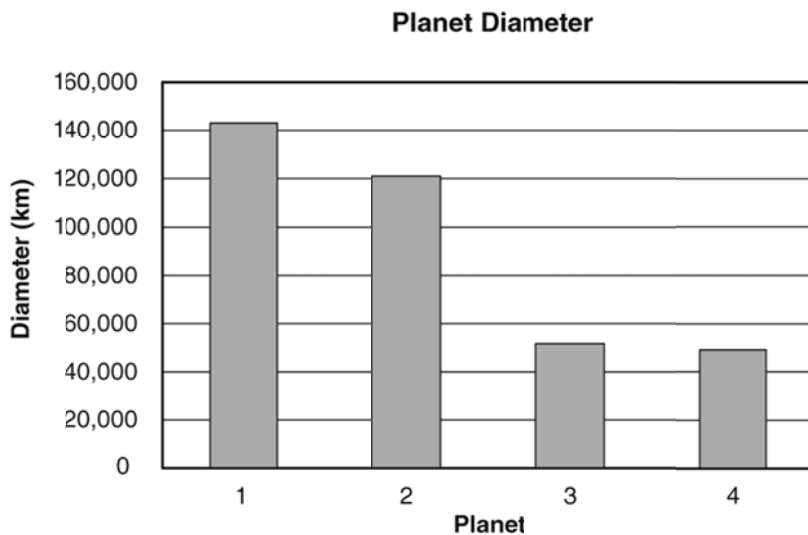
4. Venus is the hottest planet in the solar system. The figure below shows part of the planet's surface and atmosphere.



Why is Venus so hot?

- A. The surface of Venus absorbs energy from the sun.
- B. The rotation of Venus affects how the sun's rays enter its atmosphere.
- C. The atmosphere of Venus reflects heat back down to the surface of the planet.
- D. The atmosphere of Venus allows the sun's rays to go back into space to absorb more energy from the sun.

5. Astronomers have calculated the sizes of the planets in the solar system. The graph below compares the diameters of the gas giant planets in the solar system.



Which gas giants are the **closest** in size?

- A. Uranus and Jupiter
- B. Jupiter and Saturn
- C. Saturn and Neptune
- D. Neptune and Uranus

6. Star systems are made up of a single star or a small number of stars that orbit each other. The table below summarizes the number of stars in some star systems and gives examples of each type of system.

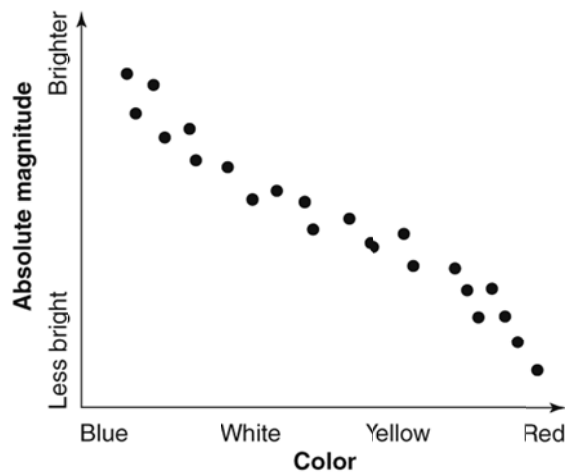
Types of Star Systems

Type of Star System	Number of Stars	Example
Single	1	Sun
Binary	2	Sirius
Triple	3	Polaris
Quadruple	4	Mizar
Quintuple	5	Sigma Orionis
Sextuple	6	Castor

Carlos is studying a star system that appears to have two stars. When a more powerful telescope provides a better image, he discovers that one of the stars is actually two stars. With which other star system would he classify this system?

- A. sun
 - B. Mizar
 - C. Polaris
 - D. Castor
7. Gloria is at the observatory and is examining a newly discovered star through a powerful telescope. She wants to find out how bright the star actually is. What information does she need to calculate the absolute magnitude of a star?
- A. color and temperature of the star
 - B. color and composition of the star
 - C. apparent magnitude and distance from Earth of the star
 - D. color and distance from Earth of the star
8. The teacher gave Carly a list of four stars of different colors. Carly used the graph shown below to help compare the stars' luminosity.

Comparison of Absolute Magnitude and Color in Stars



Based on the graph, a star of which color **most likely** has the lowest luminosity?

- A. red
- B. blue
- C. yellow
- D. white

9. During a class astronomy project, the teacher displayed a table similar to the one below that relates the color of a star to its surface temperature.

Temperature and Color of Various Stars

Color	Surface Temperature (K)	Example
blue	Above 25,000	10 Lacertae
blue-white	10,000–25,000	Rigel
white	7,500–10,000	Vega
yellow-white	6,000–7,500	Canopus
yellow	5,000–6,000	sun
orange	3,500–5,000	Aldebaran
red	Below 3,500	Betelgeuse

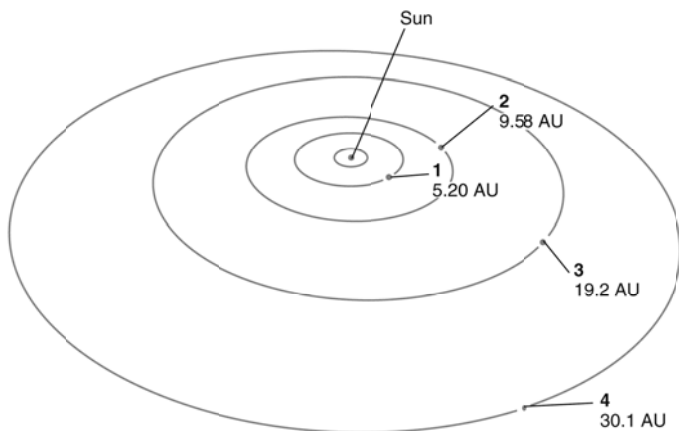
The teacher gave Kwan a card with the following description of a star:

Star A
6,750 K

Based on the table above, what color should Kwan predict the star will be?

- A. red
 - B. blue
 - C. orange
 - D. yellow-white
10. Ashni is a member of the astronomy club. During a trip to an observatory, the members of the astronomy club observe several different stars. Ashni records information about some of the stars in her journal. Of the following four stars, which star should Ashni label as the hottest?
- A. Wolf, red
 - B. Ceti, yellow
 - C. Cygni B, orange
 - D. Vega, blue-white
11. Of the following bodies that orbit the sun, which body has the fastest orbital speed?
- A. a dwarf planet between Mars and Jupiter
 - B. a comet as it nears the sun
 - C. an asteroid
 - D. a Kuiper Belt object

12. One way that astronomers measure distances is by using the astronomical unit (AU), which is equal to the average distance between Earth and the sun. The diagram below shows the orbits of the gas giant planets.



Which gas giant is **farthest** from the sun?

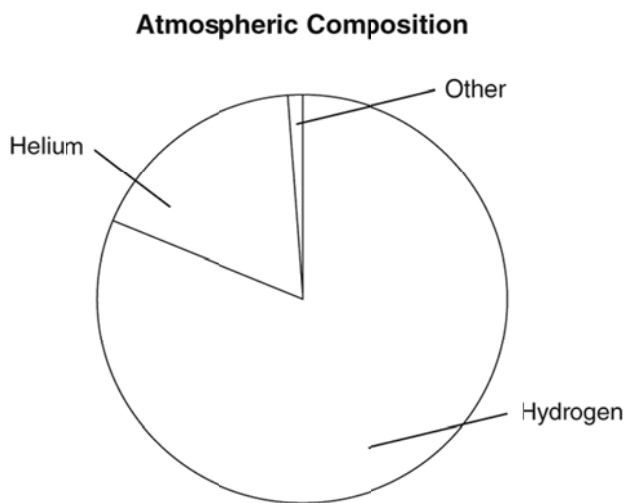
- A. Jupiter
- B. Neptune
- C. Saturn
- D. Uranus

13. During December, Florida gets about 10.5 hours of daylight every day. On which gas giant is the length of a day about the **same** as the hours of sunlight in Florida during December?

Planet	Day
Earth	23 h 56 min
Jupiter	9 h 55 min
Neptune	16 h 7 min
Saturn	10 h 39 min
Uranus	17 h 24 min

- A. Jupiter
- B. Neptune
- C. Saturn
- D. Uranus

14. Part of the reason that we are able to live on Earth is the gases that make up our atmosphere. The diagram below shows a pie graph of the atmospheric composition of a gas giant planet.

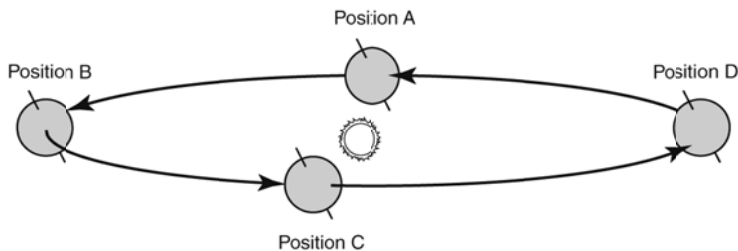


How would a pie graph of Earth's atmosphere differ from the graph of the gas giant?

- A. The largest sections would be nitrogen and oxygen, not hydrogen and helium.
- B. The largest sections would be hydrogen and oxygen, not hydrogen and helium.
- C. The helium section would be bigger, and the hydrogen section would be smaller.
- D. The largest sections would be carbon dioxide and oxygen, not hydrogen and helium.

15. Most planets in the solar system have moons. Some moons have surface features that are similar to those found on Earth, such as active volcanoes. Which planet has a moon with the **most** volcanic activity in the Solar System?
- A. Earth
 - B. Jupiter
 - C. Mars
 - D. Saturn

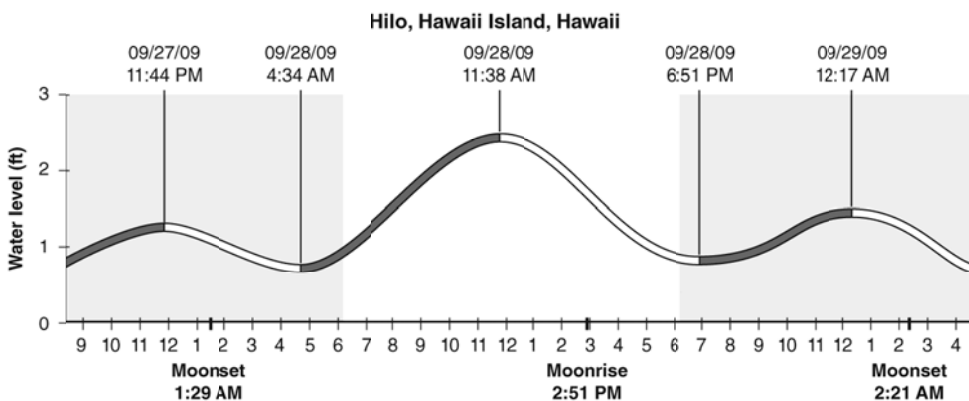
16. The tilt of Earth at four different times throughout the year is shown in the diagram below.



At which point would the United States receive the **fewest** hours of daylight?

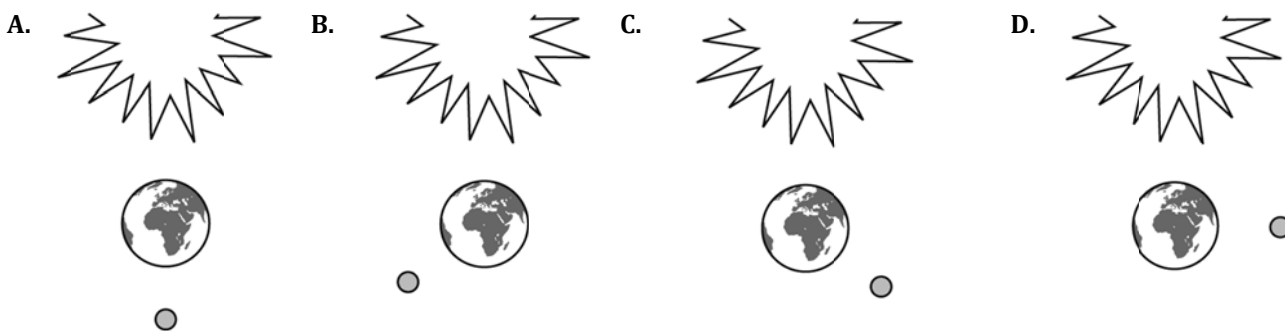
- A. position A
- B. position B
- C. position C
- D. position D

17. Zach is visiting Hilo, Hawaii. He wants to collect seashells, and the local people tell him that the best time to collect shells is at low tide. According to the diagram below, at what time should Zach collect shells?



- A. 9:00 a.m.
- B. noon
- C. 3:00 p.m.
- D. 7:00 p.m.

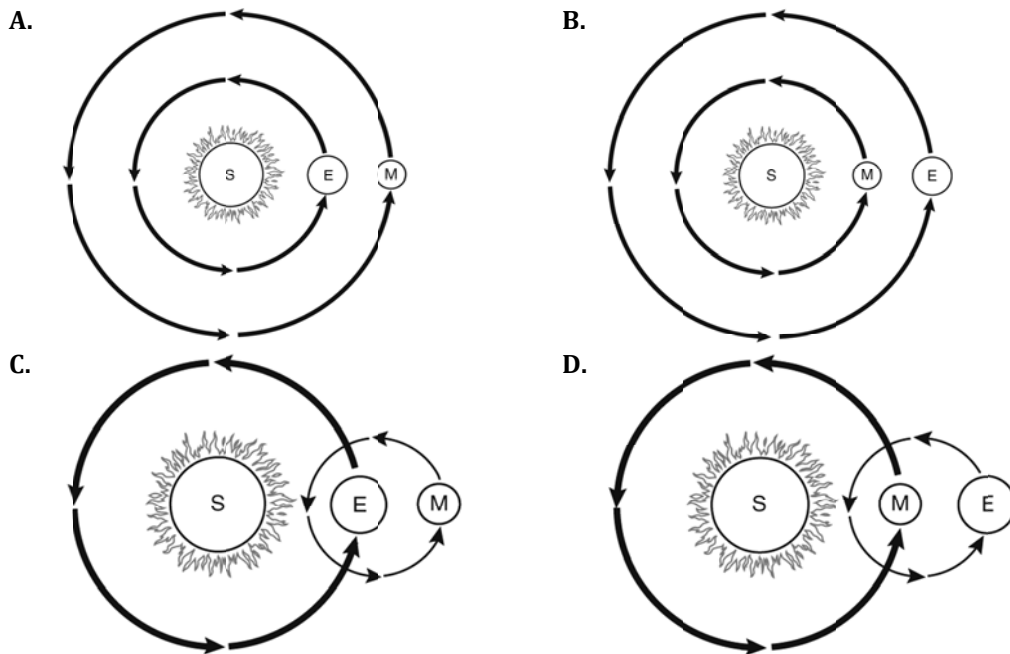
18. The diagrams below show the alignment of the sun, the moon, and Earth. Which diagram shows an alignment in which neap tides take place?



19. Astronomers use cameras on Earth and in orbit to observe the solar system and other objects in space. Suppose that a camera on Earth takes a picture of an astronomical event. The picture shows an object that is large, dark, and has a bright area immediately around it. Which event does this picture **most likely** show?

- A. total solar eclipse
- B. total lunar eclipse
- C. waning gibbous moon
- D. waxing crescent moon

20. Space bodies, such as Earth and its moon, are not stationary. Rather, they are moving at a rapid speed. The diagrams below show the relative movements of the sun (S), Earth (E), and the moon (M). Which diagram **best** represents the motion of Earth and the moon, relative to the sun?



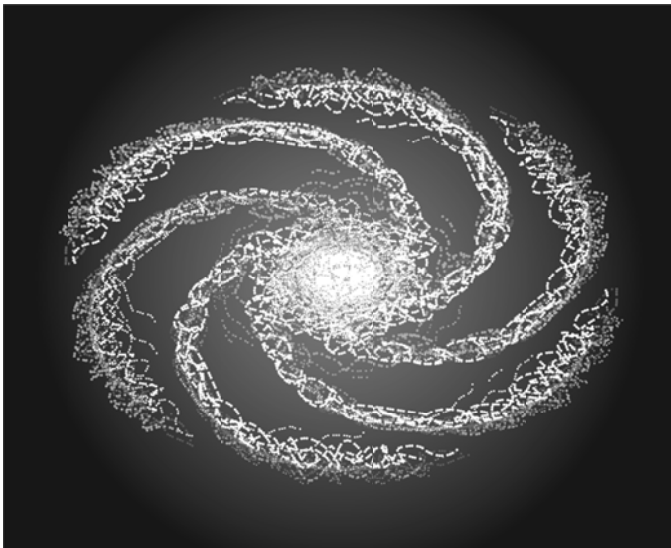
21. Astronomers use the light-year to describe the relationship between objects in space. For example, the Andromeda galaxy is 2.5 million light-years from Earth. Which of the following units is **most similar** to the light-year?

- A. gram
- B. second
- C. kilometer
- D. degrees Celsius

22. The sun is much larger than the moon. However, as viewed from Earth, the sun and moon appear to be the same size. Why do the sun and moon appear to be the same size when viewed from Earth?

- A. The moon is much hotter than the sun.
- B. The moon is much denser than the sun.
- C. The moon is much brighter than the sun.
- D. The moon is much closer to Earth than the sun.

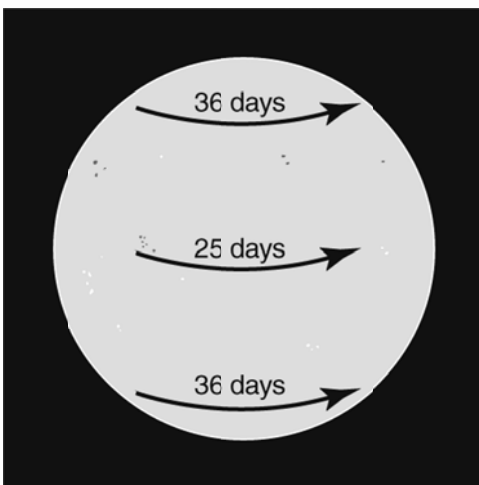
23. Space exploration has advanced our knowledge of the universe. Which space journey would take the **longest**?
- a journey from Earth to the sun
 - a journey from Earth to the moon
 - a journey from Earth to a star in the constellation Centaurus
 - a journey from Earth to the farthest planet in our solar system, Neptune
24. A galaxy contains stars, gas, and dust. This matter must be held together or the galaxy will break apart. What is responsible for holding the stars, gas, and dust together in a galaxy?
- heat
 - light
 - gravity
 - friction
25. In 1995, the Hubble Space Telescope photographed a tiny spot in the sky for a period of ten days; 342 exposures were placed together to create an image known as the Hubble Deep Field. Although the sample is tiny, it is representative of the universe, which looks similar in all directions. The image below shows a collection of billions of stars. The Hubble Deep Field shows at least 3,000 groups of these stars.



Which term describes this group of stars?

- moon
- galaxy
- universe
- solar system

26. The figure below shows the rotation of the sun.

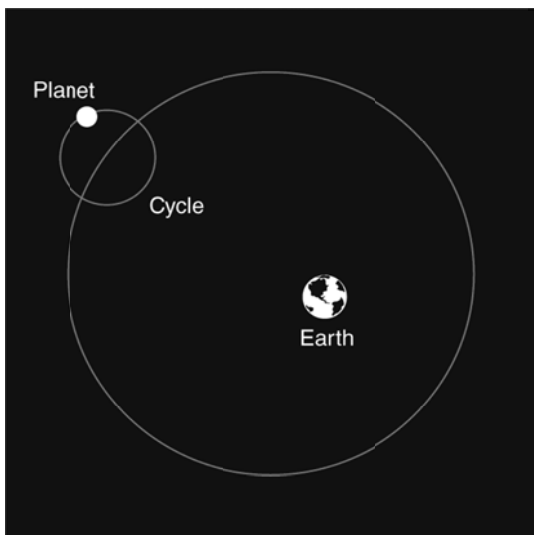


How is the rotation of the sun **different** from the rotation of Earth?

- The parts of the sun rotate at different speeds and the parts of Earth rotate at the same speed.
- The sun's equator rotates faster than its poles and Earth's equator rotates slower than its poles.
- The sun's poles rotate faster than its equator and Earth's poles rotate slower than its equator.
- The parts of the sun rotate in different directions and the parts of Earth all rotate in the same direction.

27. In convection, hot gases rise through cooler gases as they travel to the top of the convective zone. Once they reach the top of the convective zone, they cool. What happens to these gases next?
- They create sunspots.
 - They sink back down.
 - They give off energy in solar flares.
 - They begin the process of nuclear fusion.
28. Convection cells in the sun's convective zone carry energy from the top of the radiative zone to the photosphere. In convection cells, hot gases rise to the photosphere, cool, and then sink back into the convective zone. What causes the transfer of energy in this process?
- the absorption and re-emission of electromagnetic waves
 - the condensation of hot gas into liquid
 - the movement of matter
 - the process of nuclear fusion
29. Diana is explaining centripetal force to some younger students. Which example illustrates the concept of centripetal force?
- Centripetal force is a force that makes a body follow a curved path.
 - Centripetal force is a force that makes objects move in straight lines.
 - Centripetal force is a force that is directed away from a center of rotation.
 - Centripetal force is a force in which a smaller body acts gravitationally on a larger body.
30. Cara is explaining to her sister how the solar system formed. Which description would she use to explain the solar nebula?
- a rotating cloud of dust and gas
 - a disk of material surrounding a young star
 - a small body from which planets form
 - a rocky core surrounded by a deep atmosphere of gas and ice
31. Eric is creating a timeline of the formation of the solar system. Which flow chart **best** describes the formation of the solar system?
- solar nebula ----- protostellar disk ----- nuclear fusion ----- sun ----- planetesimals ----- planets
 - solar nebula ----- protostellar disk ----- nuclear fusion ----- planetesimals ----- planets ----- sun
 - protostellar disk ----- nuclear fusion ----- sun ----- solar nebula ----- planetesimals ----- planets
 - solar nebula ----- nuclear fusion ----- sun ----- planets ----- planetesimals ----- protostellar disk

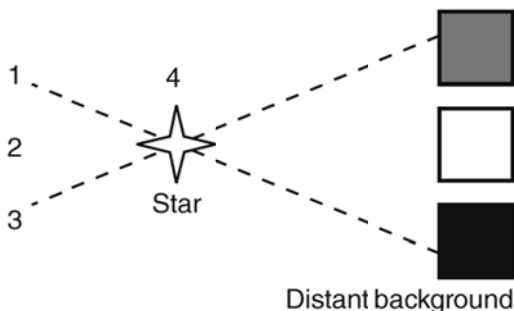
32. Aristotle thought that all objects in the universe move around Earth. One astronomer developed a model based on mathematical calculations that supported Aristotle's theory. This model is shown below.



Who developed this model to support Aristotle's theory of the universe?

- A. Aristarchus
- B. Copernicus
- C. Galileo
- D. Ptolemy

33. The diagram below shows parallax.



From which viewing position does the star appear to be in the black square?

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

34. Aristotle thought that if Earth were moving, he would see the positions of the stars change as Earth moved. However, he could not observe parallax, which is the apparent shift in the position of an object, such as a star, when viewed from different positions. How might Aristotle have interpreted this problem?

- A. Earth is not moving.
- B. The stars are very far away.
- C. Parallax is undetectable to the naked eye.
- D. Observers need to change position to view parallax.

35. An astronomer observes four stars from two different locations on Earth. The distances of the stars from Earth are shown in the table below.

Star	Distance from Earth in astronomical units (AU)
1	4.2
2	6.8
3	3.4
4	10.4

For which star will the astronomer observe the **greatest** parallax?

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

SC.7.E.6.2 Identify the patterns within the rock cycle and relate them to surface events (weathering and erosion) and subsurface events (plate tectonics and mountain building).

SC.7.E.6.6 Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water.

SC.6.E.6.1 Describe and give examples of ways in which Earth's surface is built up and torn down by physical and chemical weathering, erosion, and deposition.

SC.6.E.6.2 Recognize that there are a variety of different landforms on Earth's surface such as coastlines, dunes, rivers, mountains, glaciers, deltas, and lakes and relate these landforms as they apply to Florida.

SC.7.E.6.4 Explain and give examples of how physical evidence supports scientific theories that Earth has evolved over geologic time due to natural processes.

SC.7.E.6.3 Identify current methods for measuring the age of Earth and its parts, including the law of superposition and radioactive dating.

SC.7.E.6.5 Explore the scientific theory of plate tectonics by describing how the movement of Earth's crustal plates causes both slow and rapid changes in Earth's surface, including volcanic eruptions, earthquakes, and mountain building.

SC.7.E.6.1 Describe the layers of the solid Earth, including the lithosphere, the hot convecting mantle, and the dense metallic liquid and solid cores.

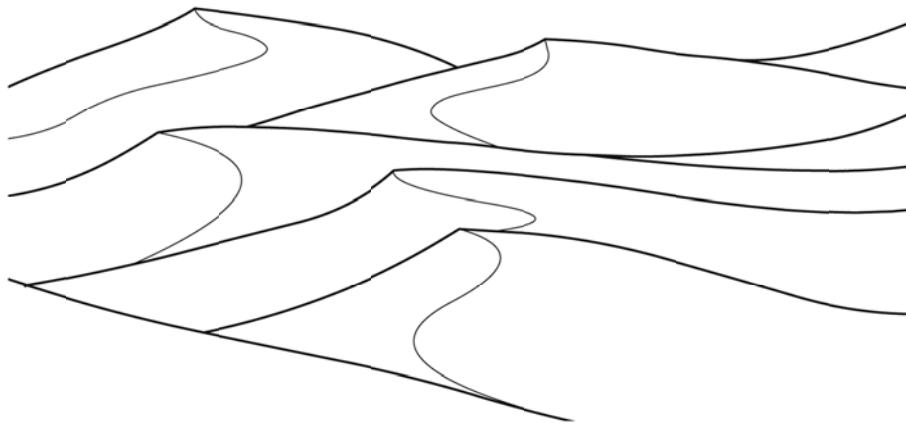
SC.7.E.6.7 Recognize that heat flow and movement of material within Earth causes earthquakes and volcanic eruptions, and creates mountains and ocean basins.

Multiple Choice

Identify the choice that best completes the statement or answers the question.

1. When Daniel was studying for his Earth Science class, he asked his friend Cesar to quiz him about the rock cycle. Cesar presented Daniel with a scenario. Imagine that a large area of sedimentary rock gets moved deeper into Earth's crust through tectonic plate movement. There, rising temperatures and high pressure change the rock. Eventually the rock melts from the high temperatures and pressure. After some time in those conditions, there is a time of cooling. Cesar asked Daniel to predict what kind of rock there will be at the end of all these steps. What should Daniel predict?
 - A. magma
 - B. igneous rock
 - C. sedimentary rock
 - D. metamorphic rock

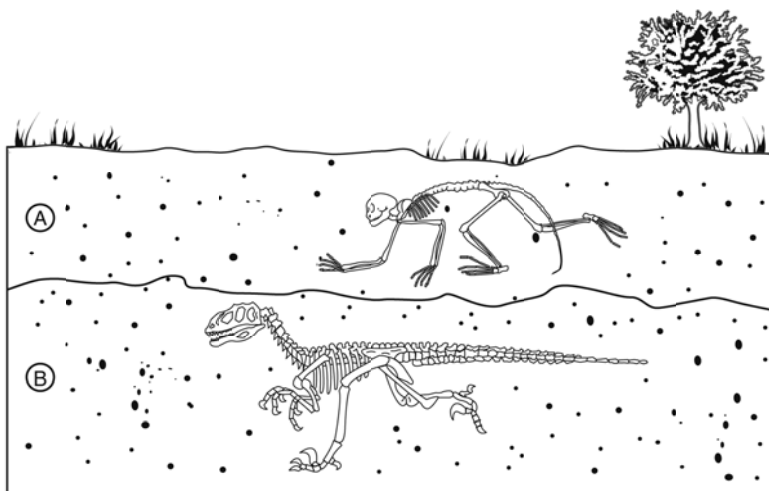
2. The diagram below shows one way that wind can affect sand.



Brandon is building a model of how wind erosion can affect steps of the rock cycle. He wants to show how sand as shown in the diagram could be moved from place to place. His materials are a long shallow wooden box, a bucket of sand, a shovel, and a battery-operated fan. How could he model the process of wind eroding sand to get the result shown in the diagram?

- A. Spread the sand through the box, aim the fan at the sand, and use the shovel to knock down any peaks that form.
 - B. Spread the sand through the box; shape it with the shovel to start, and aim the fan towards the sand so it moves the sand from one place to another.
 - C. Spread the sand through the box, shape it into dunes with the shovel, and aim the fan towards the external edges of the box so it does not affect the sand.
 - D. Spread the sand through the box, dig one deep hole with the shovel, and place the fan inside the hole so that most of the sand is not affected by the air motion.
3. When Raul went on a road trip with his family, they drove through some dramatic mountain chains in a national park. Raul wanted to understand how mountains form, so he did some reading about mountain building. Once he understood the process of mountain building, he could make an inference about what happened in that national park millions of years ago. What must have happened in the national park?
- A. Erosion must have moved all the surrounding rock to expose the rock that remains to make up the mountain chain.
 - B. Tectonic plates in Earth's crust must have collided with each other, and one of the plates was pushed far up above the other one.
 - C. Weathering must have occurred to break down all the rock that was surrounding the hard rock that remains to make up the mountain chain.
 - D. Tectonic plates in the Earth's crust must have slowly eroded over time, exposing the remaining rock that currently makes up the mountain chain.
4. River deltas form through erosion when rivers carrying large amounts of sediments broken down from various rocks deposit them in the area where the river meets the ocean. Sediments can provide a diversity of minerals and nutrients to the soils where the sediments are deposited. Delta regions are located in several places around the world. What can you predict about the characteristics of these delta regions?
- A. The delta regions should have fertile soil and successful agriculture.
 - B. The delta regions should have poor quality soil that cannot support agriculture.
 - C. The delta regions should experience frequent sub-surface events that influence the rock cycle in those places.
 - D. The delta regions should experience mountain building as more and more sediments are deposited in the delta region.

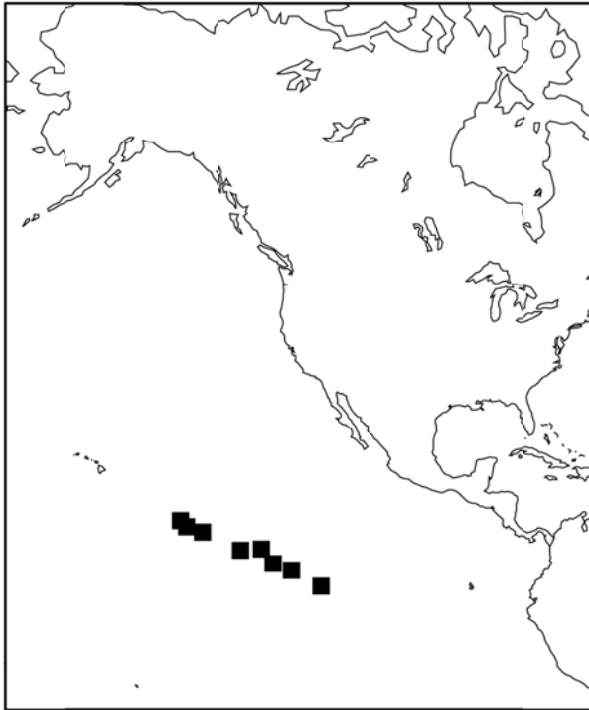
5. Chemical weathering can break down Earth's surface just as physical weathering can. When Taylor was working for a chemistry lab, she wanted to determine whether acid rain could have a negative impact on buildings that were constructed from different types of rock. She wanted to compare slate, a metamorphic rock, and granite, an igneous rock. She decided to complete the following steps.
- 1) She set up four conditions that she could monitor over time. In condition A, acidic water is applied to slate. In condition B, neutral water is applied to slate. In condition C, acidic water is applied to granite. In condition D, neutral water is applied to granite.
 - 2) After continuous application for several months, Taylor planned to compare the changes that took place in conditions B and D to determine whether acidic rain has a stronger effect on one of these types of rock.
- Taylor's experiment has a flaw. What is wrong with her experimental design, and what is the **best** option for improving it?
- A. Comparing conditions B and D will not give any information about how acid rain affects the rocks. Taylor should compare conditions A and C to see how acidity affects the two kinds of rocks differently.
 - B. Comparing conditions B and D will not give any information about how acid rain affects the rocks. Taylor should compare conditions A and B to see which changes are due to acidity rather than to other changes that can be caused by water.
 - C. Comparing conditions B and D will not give any information about how acid rain affects the rocks. Taylor should completely redesign her experiment to look at real buildings made of slate and granite that have existed for different amounts of time.
 - D. Comparing conditions B and D will not give any information about how acid rain affects the rocks. Taylor should compare conditions A and C, and make sure that those results differ from B and D to be sure that the changes are due to acidity rather than other changes that can be caused by water.
6. One principle used by scientists to understand how the Earth has changed over time is called uniformitarianism. Which of the following statements **best** supports the principle of uniformitarianism?
- A. Volcanoes happen in the present, and volcanoes happened in a similar way in the past.
 - B. Crustal folding does not happen in the present, so it is unlikely to have occurred in the past.
 - C. Wind erosion happens in the present, but wind erosion might have worked in a different way in the past.
 - D. Water erosion does not change very much on Earth today, so it is unimportant to consider water erosion when studying the history of changes on Earth.
7. Finding different fossils in different layers of rock in Earth's crust can provide physical evidence about how Earth has changed over time. The diagram below shows fossils in different rock layers.



Based on the diagram, which is the **best** statement about how Earth has changed over time?

- A. The organisms living on Earth have not changed over time.
- B. The temperature on Earth's surface changed with each new rock layer.
- C. Different kinds of organisms have lived in different periods of Earth's history.
- D. The sediments that are compressed and cemented into sedimentary rock have changed over time.

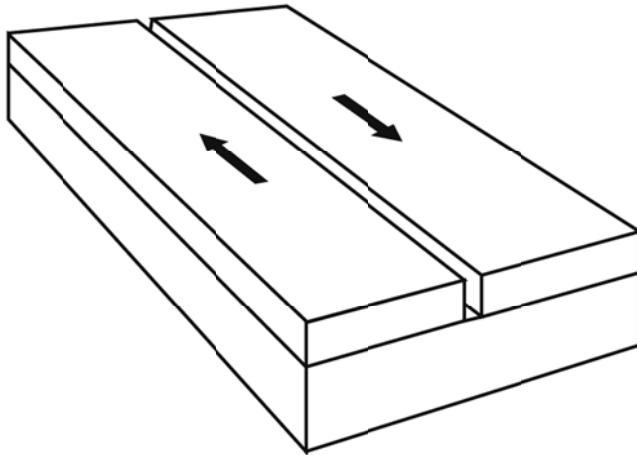
8. The following map shows the Pacific Ocean. It is marked with squares that show the location of some planned field studies.



Rosa was part of a team that was planning to collect samples of rock layers from the ocean floor in the 8 marked locations. She wanted to study natural changes in Earth's climate over time by looking at features of invertebrates living on Earth over time. She was planning to use invertebrates that were fossilized in amber as physical evidence, because that way she could study their entire body rather than just the hard parts that become fossilized in sedimentary rock. Why is looking for organisms fossilized in amber NOT a good idea?

- A. Amber does not fossilize whole organisms, so it is not a good choice for the planned study.
 - B. Amber only fossilizes vertebrate organisms, so it is not a good choice for the planned study.
 - C. Amber is hardened sap from trees, so the planned ocean field sites probably won't have amber in the rock there.
 - D. Amber can only fossilize in air, not in water, so the planned ocean field sites probably will not have amber in the rock there.
9. The characteristics of mountains can be used as physical evidence of how Earth has changed over long periods of time. When mountains are young and have recently formed, they have jagged edges and high peaks. Since weathering and erosion are constantly changing Earth's surface, which of the following are differences between young and old mountain ranges?
- A. Young mountains have more organisms living on them than older mountains do.
 - B. Young mountains have tall jagged peaks, and older mountains have lower rounded peaks.
 - C. Young mountains have lower rounded peaks, and older mountains have tall jagged peaks.
 - D. Young mountains have more fossilized organisms inside of them than older mountains do.
10. Evan was considering attending a presentation by a famous geologist. Evan could not remember what the geologist was going to talk about, but he saw a poster advertising the presentation. The poster presented information about how folding and faulting can change layers of rocks, how volcanoes release magma to Earth's surface, and how weathering and erosion break down parts of Earth's surface. After reading the poster, Evan has a good idea of what the talk is about. Based on the poster, which concept is **most** likely to be the topic of the geologist's presentation?
- A. Landforms change over time.
 - B. Living organisms can tell us about Earth's history.
 - C. The fossil record can tell us how life on Earth has changed over time.
 - D. The composition of sedimentary rock varies throughout Earth's history.

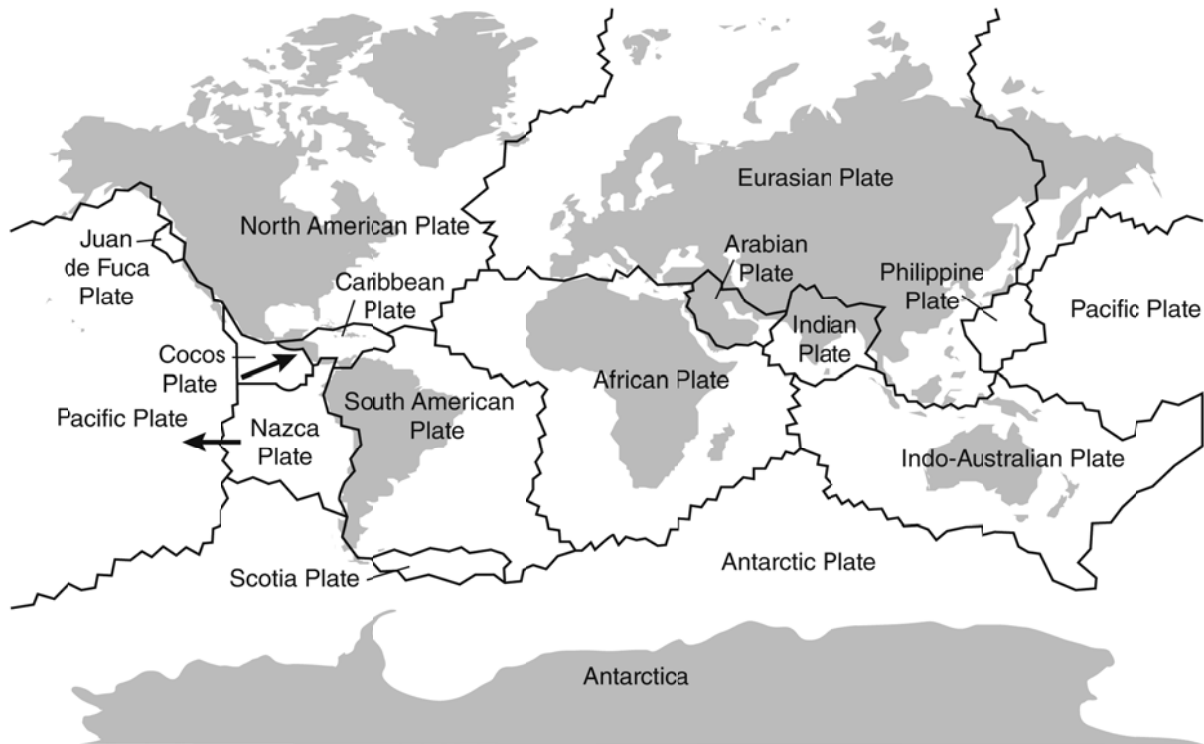
11. The diagram below shows a strike-slip fault, where two plates of Earth's crust are moving in parallel but opposite directions.



This type of tectonic movement can cause earthquakes. What is the **best** explanation for how the movement shown in the diagram can lead to earthquakes?

- A. Stress builds as the rocks become bent and folded, and eventually energy is released as an earthquake.
- B. Compression stress increases as the rocks press towards each other, and eventually releases energy as an earthquake.
- C. Shear stress causes energy to build as the rocks slide past each other, and the energy is eventually released as an earthquake.
- D. Tension stress increases as the rocks are pulled apart from each other, and eventually energy is released as an earthquake.

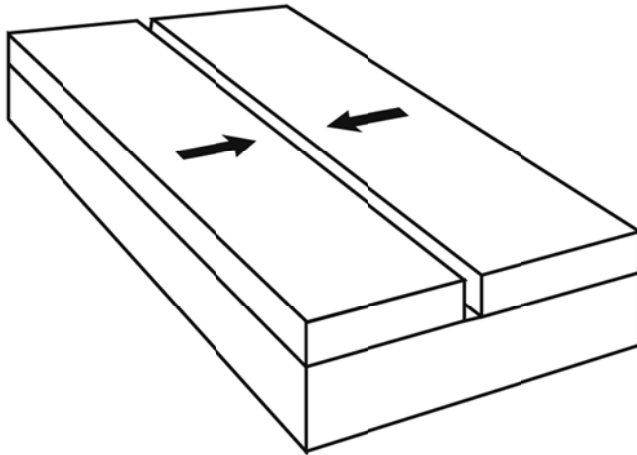
12. The map below shows the locations of tectonic plates around the globe.



Earthquakes can cause major changes to Earth's surface to occur very quickly. Based on the map and the principles of how tectonic plates cause earthquakes in which of the following places is an earthquake **most likely** to occur?

- A. in Antarctica
- B. in the center of the Eurasian Plate
- C. in the center of the Pacific Ocean
- D. along the edges of the Philippine Plate and the Eurasian Plate

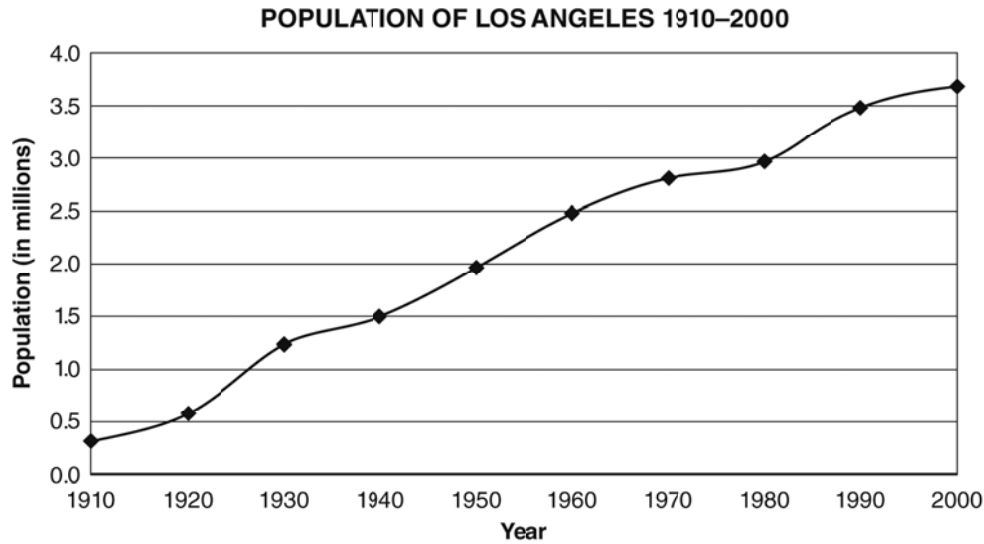
13. The diagram below shows two pieces of the Earth's crust, with arrows indicating the direction they are moving.



The movement of tectonic plates can build up stress that causes changes in Earth's surface. What type of stress is caused when tectonic plates move as shown in the diagram?

- A. tension
 - B. strike-slip
 - C. shear stress
 - D. compression
14. Mark and Kevin were studying for their earth science test. They were focusing on ways that the movement of tectonic plates can change the Earth's surface. Mark was having trouble understanding the concept of uplift, so Kevin offered to quiz him on whether different examples of movements in Earth's crust were examples of this process. Which of the following is an example of the process of uplift?
- A. Old crust on the ocean floor is destroyed as it moves downward into a deep ocean trench.
 - B. Volcanic eruptions deposit new rock on Earth's surface, eventually forming a mountain.
 - C. Two plates scrape against each other as they move in parallel but opposite directions at a transform boundary.
 - D. When two oceanic plates collide, one oceanic plate sinks deep underneath the other.
15. Many of the variable characteristics of Earth's surface are the result of different kinds of tectonic plate movement. Tectonic plates can move towards each other, away from each other, or past each other. Each of these movements causes stress that can change the shape of the rock along the edges of the plates. What scientific term refers to the variety of ways rocks can change shape as a result of stress?
- A. folding
 - B. deformation
 - C. compression
 - D. elastic rebound
16. Sofia worked for a conservation agency that was trying to improve local water quality. She had discovered a chemical in the groundwater of the local aquifer that matched the wastes of a local factory, suggesting that there was a leak somewhere at the factory. If her agency worked with the factory to find the location of the leak, they could control it and improve the water quality. What is the term for this type of pollution?
- A. thermal pollution
 - B. biological pollution
 - C. point-source pollution
 - D. nonpoint-source pollution

17. The graph below shows how the population of Los Angeles, California, changed in the 1900s.



- As the population of a city increases, human activity can impact the Earth in many ways. Based on the graph, what can you conclude about how the land space in Los Angeles changed during this period of time?
- A. Most of the land space was turned into natural areas.
B. Most of the land space was turned into rural areas.
C. More natural land space was covered by human structures.
D. Less natural land space was covered by human structures.
18. When soil becomes very dry, wind can cause huge dust storms that erode the soil. The roots of plants can reduce the drying out of soil and can help keep it in place. Which statement **best** explains how human activity could contribute to soil erosion?
- A. When people farm the land, it is impossible to avoid over-farming the soil such that it becomes polluted and new plants can't grow there.
B. When people use careful farming practices, it is possible to maintain healthy soil such that it will allow new plants to grow there, and thus avoid erosion.
C. When people over-use land by removing the natural plants and then over-farming the soil so new plants can't grow there, it is easier for soil to dry out and erode.
D. When people farm the land, it is impossible to avoid over-farming the soil such that new plants can't grow there, making it easier for soil to dry out and erode.

19. Ariana was studying data about the thickness of Earth’s crust. She had crust thickness measurements for many individual locations. She was confused because it varied a lot. In some places, the crust was 5-10 km thick, and in other places, the crust was 35-70 km thick. To understand this difference, she began to plot her data points onto a map of the world. As she plotted more and more of her data, she noticed a trend. Her data is presented below.

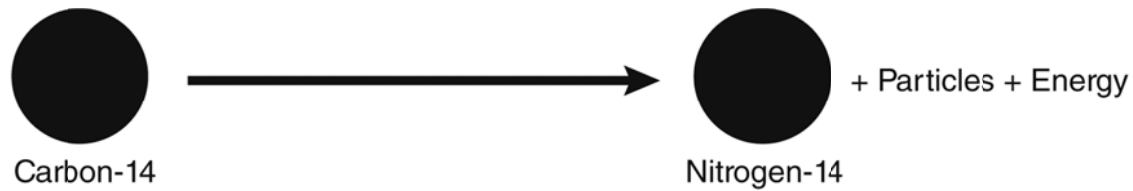
THICKNESS OF EARTH’S CRUST IN DIFFERENT LOCATIONS

Data Point	Location (Ocean Basin or Continent)	Thickness (km)
A	Continent	62
B	Continent	45
C	Ocean Basin	7
D	Continent	55
E	Ocean Basin	5
F	Ocean Basin	9

What generalization can Ariana make about the thickness of Earth’s crust?

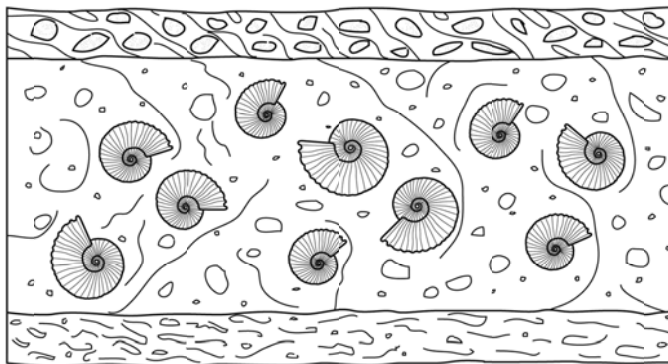
- A. The crust is thicker in the ocean basins than the continents.
 - B. The crust is thicker in the continents than in the ocean basins.
 - C. There is no trend to how the thickness of Earth’s crust varies.
 - D. The crust is not as thick as the other layers that make up Earth.
20. Eduardo was learning about the layers of Earth and he was having difficulty understanding the difference between Earth’s crust and Earth’s lithosphere. Which statement **best** describes the difference between the crust and the lithosphere?
- A. The lithosphere contains both the crust and the uppermost rigid layer of the mantle.
 - B. The crust contains both the lithosphere and the uppermost rigid layer of the mantle.
 - C. The lithosphere is located beneath the crust, and contains the uppermost rigid layer of the mantle.
 - D. The crust is located beneath the lithosphere, and contains the uppermost rigid layer of the mantle.
21. The characteristics of Earth vary from its surface to its core. When scientists try to map this variation to make models of Earth, they must decide what kinds of variation are important. What are the two kinds of variation from Earth’s surface to its core that scientists use to model the layers that make up Earth’s structure?
- A. age and chemical composition
 - B. state of matter and physical properties
 - C. chemical composition and physical properties
 - D. tectonic plate distribution and physical properties

22. Carbon-14, a radioactive isotope of carbon, can be used for radioactive dating, or measuring the age of some things on Earth that contain carbon. The diagram below shows what happens when carbon-14 decays over time.



Both carbon-12 and carbon-14 are found in organic materials, such as plants and animals. Carbon-12, a stable form of carbon, is its most common isotope. Carbon-12 does not decay over time. When plants and animals are alive, they take in both kinds of carbon. When plants and animals die, only the radioactive isotopes in their cells begin to change. Which of the following is the **best** description about what happens to both the carbon-12 and the carbon-14 in an organism after it dies?

- A. The amounts of carbon-12 and carbon-14 will remain the same over time.
 - B. The amount of carbon-12 will remain the same over time, but the amount of carbon-14 will increase over time.
 - C. The amount of carbon-12 will remain the same over time, but the amount of carbon-14 will decrease over time.
 - D. The amount of carbon-12 will decrease over time, but the amount of carbon-14 will remain the same over time.
23. A geologist collected the section of three-layered rock shown in the diagram below and wanted to know the age of the middle section.

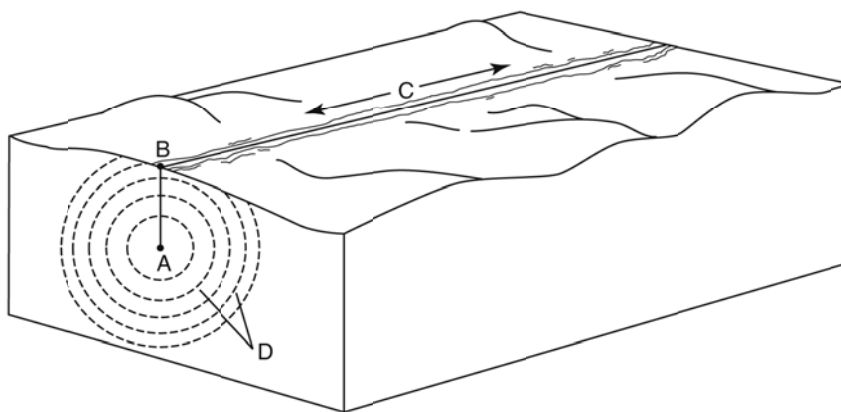


The middle layer contains fossils of organisms called ammonites. Rachel's lab group has been studying how ammonite species changed over time. They identified fossils of ammonites that formed at different periods of Earth's history as particular species. Many of these fossils meet the requirements of being used as index fossils. How could Rachel's group be **most helpful** to the geologist?

- A. They could identify the fossils and tell the geologist when that species of ammonite lived. This time period would be later than when the rock layer formed.
- B. They could identify the fossils and tell the geologist when that species of ammonite lived. This time period would be the same as when the rock layer formed.
- C. They could say whether the type of rock in the middle layer was commonly associated with ammonite fossils. This would tell the geologist whether the ammonites lived when the rock layer formed.
- D. They could say whether the type of rock in the middle layer was commonly associated with ammonite fossils. This would tell the geologist whether the fossils were actually ammonites rather than another kind of organism.

24. Luis was studying an organism that lived long ago in Earth's history. He was trying to choose a method to determine when this organism lived. He thought that radioactive dating based on carbon decay would work well, because he was working with the remains of organisms. Specifically, he was using fossils found in layers of rock. What is wrong with this plan?
- Radioactive dating with carbon is not a good way to date the remains of organisms.
 - Radioactive dating with carbon can only be used for relative dating, not for absolute dating.
 - Once organic remains have become fossilized there is no way to know when they lived on Earth.
 - Once organic remains have become fossilized they can no longer be dated by conducting radioactive dating with carbon.
25. Earth's mantle contains solid rock that is very hot and flows slowly. The cooler rock sinks as the warmer rock rises because of differences in density. What is the scientific term for this type of movement?
- tectonics
 - convection
 - continental drift
 - sea-floor spreading
26. Matthew was learning about the layers of Earth in his science class. When he learned that under Earth's crust is an enormous amount of hot molten rock, he wondered why volcanoes do not occur everywhere more frequently. If hot rock rises, why don't volcanoes happen all the time?
- Hot molten rock that rises through the mantle is not the source of magma that flows from a volcano.
 - Hot molten rock does not cause volcanoes because the hot molten rock sinks while the cooler rock rises.
 - Hot molten rock that rises through the mantle continues rising as a volcano when there are cracks in Earth's crust or the crust is very thin.
 - Hot molten rock that rises through the mantle continues rising as a volcano only if there is a large earthquake that exerts extra upward force on the rock.
27. The diagram below shows the focus, epicenter, seismic waves, and fault line of a cross section of the lithosphere during an earthquake.

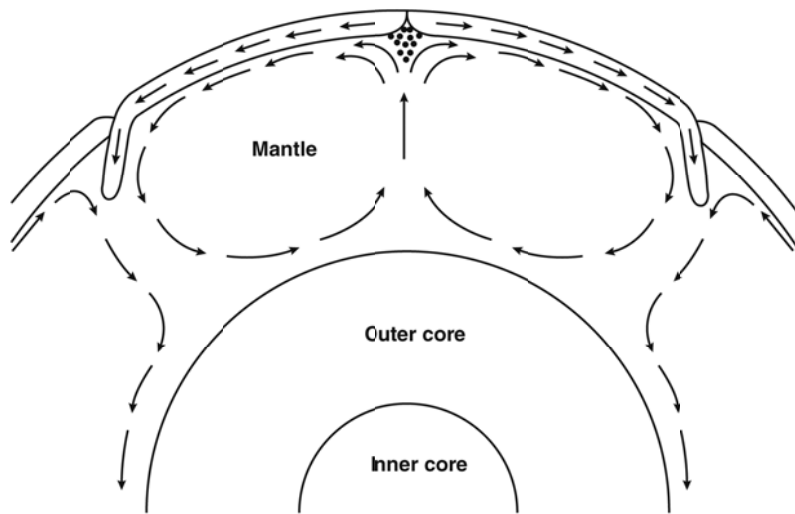
CROSS SECTION OF LITHOSPHERE DURING AN EARTHQUAKE



Earthquakes occur when large blocks of Earth's lithosphere suddenly move, releasing a lot of energy. Which letter on the diagram marks the point where this first movement actually occurs, and what is this point called?

- Letter A; focus
- Letter B; epicenter
- Letter C; focus
- Letter D; epicenter

28. The diagram below shows a cross section of Earth's layers. Arrows show the direction of the flow of rock in the outer layers of Earth.



- Movement of rock in Earth's crust can occur because of heat flow, as hot rock rises and cool rock sinks, and because of new rock pushing older rock away from ridges. What is the **best** description of how the older rock moves to allow continents to move apart, leaving behind ocean basins?
- A. As new rock forms at ocean ridges, the older rock is pulled towards the ridge. This moves Earth's crust, so continental plates can move closer together, forming ocean basins.
 - B. As new rock forms at ocean ridges, the older rock is pushed up to form mountain ranges. These mountain ranges push continental plates farther apart, leaving behind ocean basins.
 - C. As new rock forms at ocean ridges, the older rock is pushed away from the ridge. This moves Earth's crust, so continental plates can move farther apart, leaving behind ocean basins.
 - D. As new rock forms at ocean ridges, the older rock is pushed away from the ridge. This moves Earth's crust, so continental plates can move closer together, forming ocean basins.
29. When magma reaches Earth's surface it cools and becomes lava. The cooled lava can build up in layers over time as more magma reaches Earth's surface in repeated volcanic eruptions. This cooled lava can form a variety of volcanic mountains. The type of volcanic mountain that forms depends on how resistant the lava is to flowing. What describes how resistant a liquid material is to flowing?
- A. porosity
 - B. viscosity
 - C. progression
 - D. compression
30. Imagine that far away in the universe in an undiscovered location, there is a planet very similar to Earth. However, the core of this planet is not very hot, and its mantle is uniformly cool rock. Temperature differences influence the movement of materials within Earth. A planet with a cool mantle should experience different levels of activity on its surface. How would this be **most** likely to influence activity on this planet's surface?
- A. This planet would still experience movement of geologic features, such as volcanoes, earthquakes, and mountain building.
 - B. If the mantle did not have cool rock sinking and hot rock rising, there would be even more volcanic eruptions, earthquakes, and mountain building.
 - C. If the mantle did not have cool rock sinking and hot rock rising, there would not be hot magma rising to the surface as volcanic eruptions, but tectonic plates would still move past each other causing earthquakes and mountain buildings.
 - D. If the mantle did not have cool rock sinking and hot rock rising, there would not be hot magma rising to the surface as volcanic eruptions, and the flow responsible for moving the tectonic plates would not occur, so the continents would probably remain in one location.

SC.6.E.7.4 Differentiate and show interactions among the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere.

SC.6.E.7.2 Investigate and apply how the cycling of water between the atmosphere and hydrosphere has an effect on weather patterns and climate.

SC.6.E.7.3 Describe how global patterns such as the jet stream and ocean currents influence local weather in measurable terms such as temperature, air pressure, wind direction and speed, and humidity and precipitation.

SC.6.E.7.6 Differentiate between weather and climate.

SC.6.E.7.9 Describe how the composition and structure of the atmosphere protects life and insulates the planet.

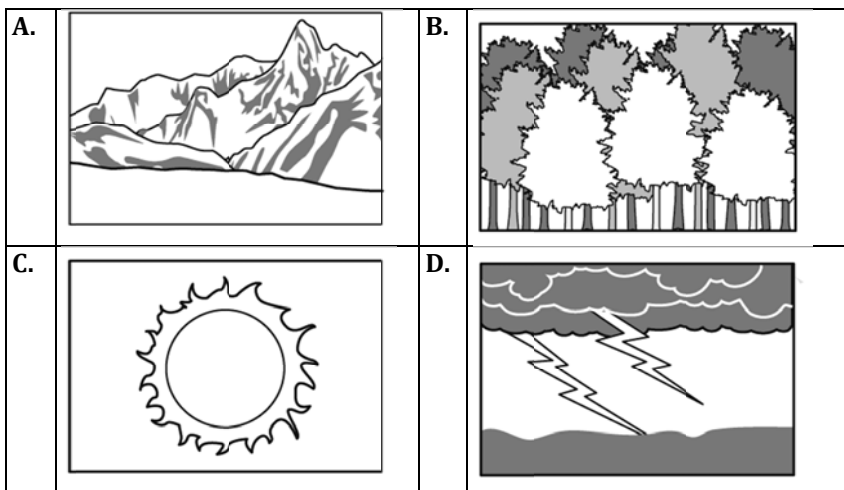
SC.6.E.7.5 Explain how energy provided by the sun influences global patterns of atmospheric movement and the temperature differences between air, water, and land.

SC.6.E.7.1 Differentiate among radiation, conduction, and convection, the three mechanisms by which heat is transferred through Earth's system.

Multiple Choice

Identify the choice that best completes the statement or answers the question.

- The continent of Antarctica is covered with an ice sheet. Which part of the Earth system includes the ice sheet?
 - biosphere
 - cryosphere
 - hydrosphere
 - atmosphere
- Living things in the biosphere interact with other parts of the Earth system to exchange energy. Which picture represents the basic source of energy for the biosphere?



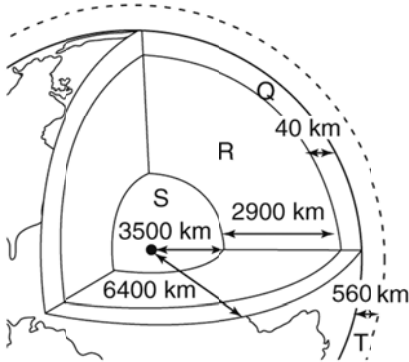
- The table below shows the amount of Earth's freshwater in several kinds of locations.

Source	Estimated volume (km ³)
Groundwater	8,000,000
Lakes	125,000
Atmosphere	13,000
Wetlands	11,500
Rivers	1,000

About what percentage of groundwater is all the other freshwater combined?

- 0.02%
- 0.2%
- 2.0%
- 20.0%

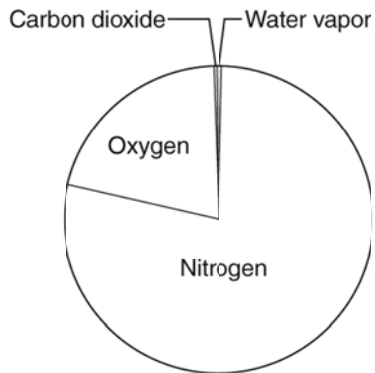
4. The picture below shows a view of the layers of the geosphere.



About how thick is Earth's mantle?

- A. 40 km
- B. 2,900 km
- C. 3,500 km
- D. 6,440 km

5. The pie chart below shows the gases that make up the air we breathe.



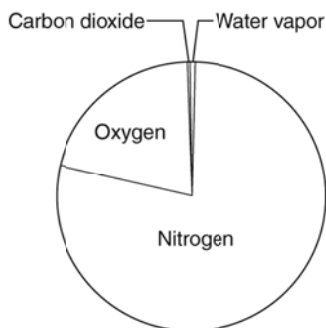
About how many times more nitrogen is there in the air than oxygen?

- A. about 2 times more
- B. about 4 times more
- C. about 5 times more
- D. about 6 times more

6. When trees die, they often fall on the ground and decompose. Which part of the Earth system includes dead and decomposed trees?

- A. biosphere
- B. geosphere
- C. atmosphere
- D. hydrosphere

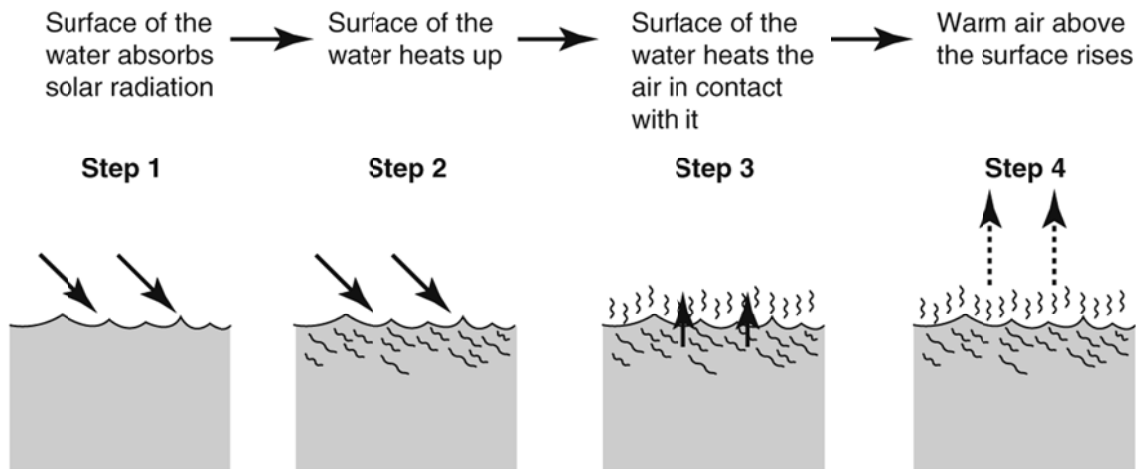
7. The graph below shows the composition of air.



Which two gases represent the smallest parts of the composition of air?

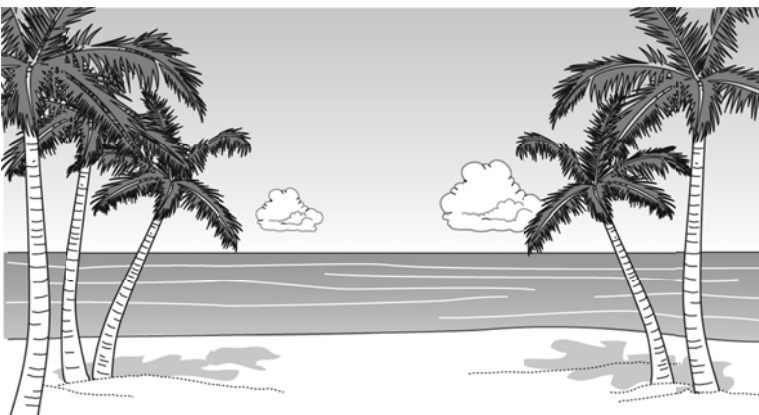
- A. oxygen and nitrogen
- B. water vapor and oxygen
- C. carbon dioxide and oxygen
- D. water vapor and carbon dioxide

8. Leanne created the following diagram to show the process that warms the air above a lake. She decided to label each step with the energy transfer that is happening.



Which step should Leanne label conduction?

- A. step 1
 - B. step 2
 - C. step 3
 - D. step 4
9. If a warm wind passes over snow, the snow can be heated rapidly. When this happens, the snow can change directly into water vapor without first becoming liquid water. What is the correct term for this process?
- A. deposition
 - B. evaporation
 - C. melting
 - D. sublimation
10. Florida beaches are known for their white sand, clear ocean water, and palm trees. A picture of a Florida beach is shown below.



Which elements seen would be adding water vapor to the atmosphere?

- A. palm trees only
- B. ocean water only
- C. ocean water and sand
- D. palm trees, ocean water, and sand

11. Whether you live in a tropical climate, a temperate climate, or a polar climate, you share something with the rest of the world—your climate is influenced by the latitude where you live. Which **best** describes why latitudes closer to the equator have warmer climates?
- A. Latitudes closer to the equator are at lower elevations than latitudes away from the equator.
 - B. Latitudes closer to the equator receive more solar energy than latitudes away from the equator.
 - C. Latitudes closer to the equator are nearer to ocean currents than latitudes away from the equator.
 - D. Latitudes closer to the equator get more wind carrying energy in the form of heat than latitudes away from the equator.
12. For several days, the weather where Cheyenne lives was cool. When the temperature did warm, Cheyenne noticed that it was also very windy. How could winds influence the temperature?
- A. Winds carry energy in the form of heat around Earth.
 - B. Winds are caused by the energy of the sun.
 - C. Winds move because of differential heating.
 - D. Winds transfer energy in the form of heat from the air to the ground.

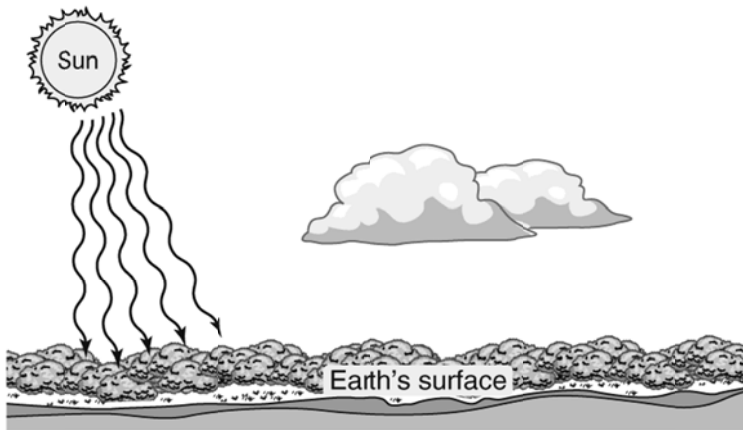
13. The arrows on the globe point to different latitudes and longitudes.



Which arrow points to the area on Earth you would expect to be coldest based on its latitude?

- A. R
 - B. S
 - C. T
 - D. W
14. Leah is going for a swim at the beach. She notices that the sand is much warmer than the water in the ocean. Which statement **best** explains why this happens?
- A. Water is unable to absorb energy.
 - B. Water is unable to release energy.
 - C. Water has a lower specific heat capacity than sand.
 - D. Water has a higher specific heat capacity than sand.
15. Light from the sun heats Earth's atmosphere. When the air becomes warmer, it expands. Which type of energy increases to cause this expansion?
- A. chemical
 - B. electrical
 - C. kinetic
 - D. potential

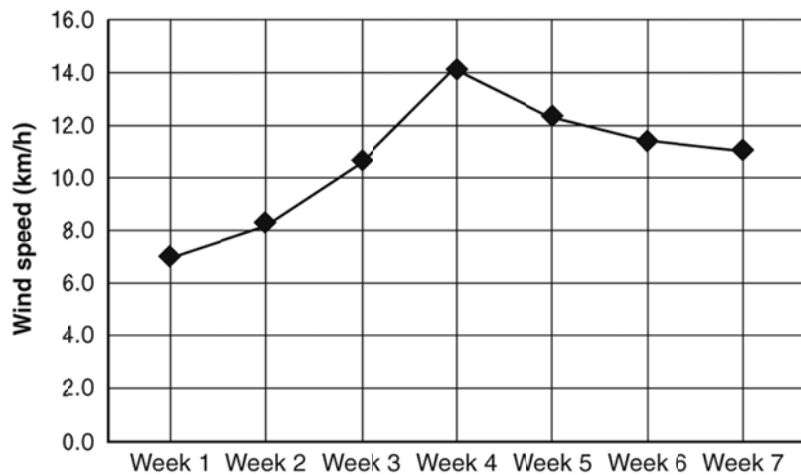
16. Joseph made a poster for his Earth science project. He included the following diagram to show how Earth's surface receives solar energy.



Which process is involved when solar energy warms the surface of Earth?

- A. conduction
- B. convection
- C. radiation
- D. reflection

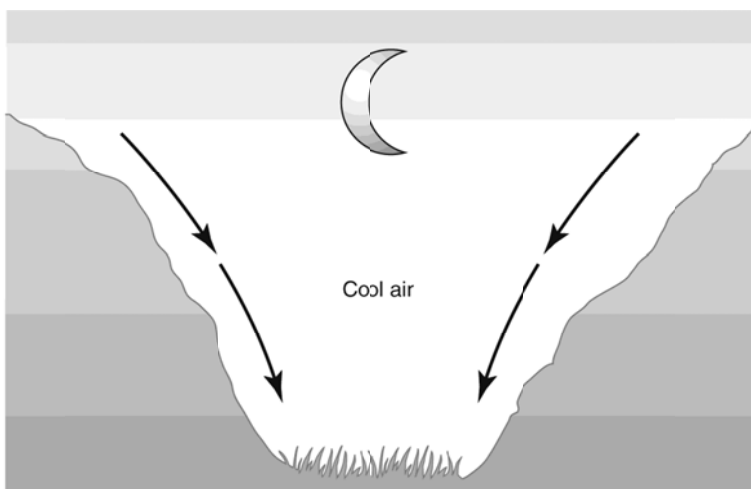
17. Meggie measures the wind speed every day for 7 weeks. She constructs the following line graph of the average daily wind speed.



How many of the 7 weeks experience average wind speeds **greater than** 7.9 km/h?

- A. 4 weeks
- B. 5 weeks
- C. 6 weeks
- D. 7 weeks

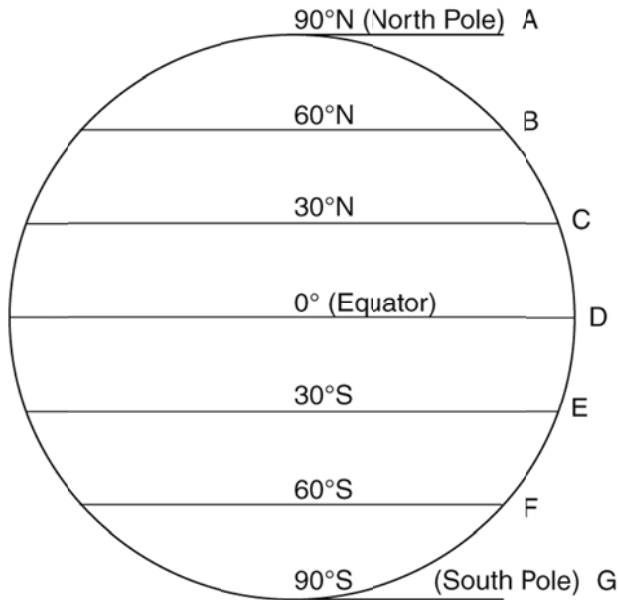
18. The following figure shows a valley between two mountains. The arrows indicate direction of air movement.



Which type of breeze is illustrated in the figure?

- A. a sea breeze
- B. a land breeze
- C. a valley breeze
- D. a mountain breeze

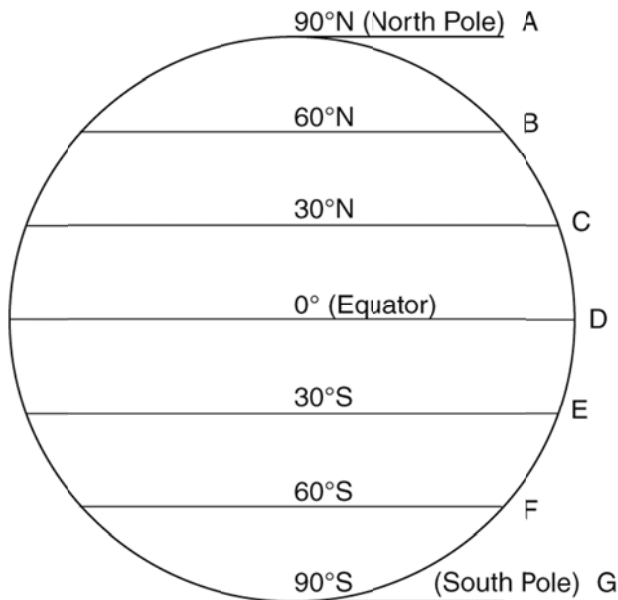
19. Air rising and sinking in Earth's atmosphere forms a pattern of smaller convection cells.



These convection cells create both high- and low-pressure belts. Where in the preceding diagram are the high-pressure belts located?

- A. A, B, C, D
- B. A, C, E, G
- C. D, E, F, G
- D. B, C, D, E, F

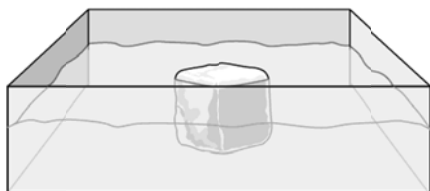
20. Air rising and sinking in Earth's atmosphere forms a pattern of smaller convection cells.



These convection cells create both high- and low-pressure belts. Where in the preceding diagram are the low-pressure belts located?

- A. A, D, G
- B. B, D, F
- C. C, D, E
- D. D, E, F, G

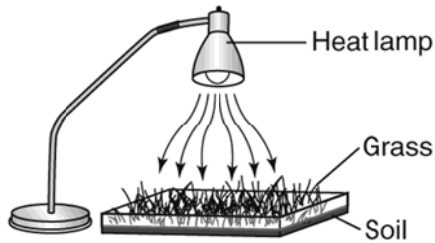
21. Donnie created a model to investigate what happens to icebergs in water. He placed an ice cube in a tray of water, as shown in the following illustration. Donnie observed that the ice cube slowly melted.



What can Donnie conclude from this observation?

- A. The water has a lower temperature than the ice cube.
- B. The water has a higher temperature than the ice cube.
- C. The water has a lower specific heat capacity than the ice cube.
- D. The water has a higher specific heat capacity than the ice cube.

22. Kumar is studying how plant growth is affected by the temperature of the soil. The following picture shows his experiment.



Which of the following processes is **mainly** responsible for warming the soil?

- A. conduction
- B. convection
- C. expansion
- D. radiation

23. The temperatures in Gainesville, Florida, vary more than the temperatures in Miami, Florida. The map shows the locations of both of these cities.



How can the locations of the two cities explain the differences in their temperature ranges?

- A. Gainesville is farther north than Miami, so latitude will make its temperatures vary more widely.
- B. Miami is closer to the ocean, and winds from the ocean cause its temperatures to vary greatly.
- C. Miami is closer to the ocean, which affects its climate by keeping its temperatures more consistent.
- D. Gainesville is further inland, which affects its climate by keeping it warmer at night and colder during the day.

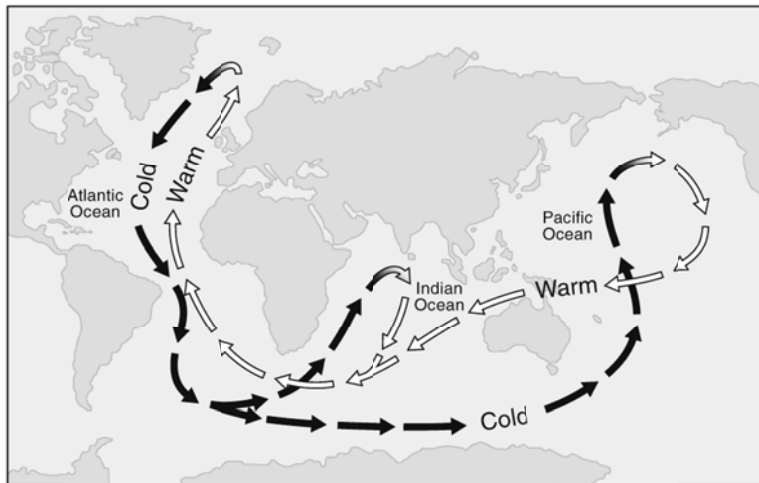
24. The following table shows the temperature and precipitation levels of four different cities on the same day. In only one city on this day, it snowed.

	City A	City B	City C	City D
Low Temperature (°C)	15	19	-9	-11
High Temperature (°C)	22	26	-3	-5
Precipitation (mm)	14	11	25	0

Which city experienced snow on this day?

- A. City A
 - B. City B
 - C. City C
 - D. City D
25. During a winter storm, Annabelle observes hail falling in her yard. After the hailstorm, rain falls. Which of these statements correctly describes hail and rain?
- A. Hail and rain are both solids.
 - B. Hail and rain are both liquids.
 - C. Hail is a liquid, and rain is a solid.
 - D. Hail is a solid, and rain is a liquid.

26. Zuri is a meteorologist. She is using a barometer. What feature of weather is Zuri studying?
- humidity
 - wind speed
 - temperature
 - air pressure
27. A deep ocean current forms when ocean water becomes denser and sinks. The following figure shows a major global deep ocean current.



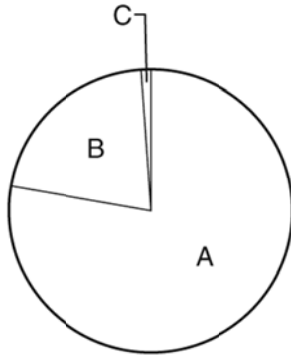
Based on the illustration, which of the following statements describes the relationship between density and temperature?

- Cold water is denser than warm water.
 - Warm water is denser than cold water.
 - Warm and cold water have equal densities.
 - The density of water is not affected by temperature.
28. Donnie makes flash cards for the vocabulary in the chapter on ocean currents. For *Coriolis effect*, he writes the following definition: the curving of the path of a moving object from a straight path.

What important information did Donnie forget in his definition?

- due to wind
 - due to Earth's rotation
 - due to the sun's energy
 - due to continental deflection
29. Eliana measures the outdoor temperature each day for a week at exactly 3:00 p.m. The temperatures she records are all between 25 °C and 30 °C. Eliana concludes that the climate of her area is tropical. What is the **most** important reason why her study and conclusion may **not** be correct?
- She recorded the temperature at only one time of day instead of more often.
 - She made her conclusion based only on temperature and not also on precipitation.
 - She made her conclusion based on only 1 week of data instead of over a long period of time.
 - She did not calculate the humidity, air pressure, and wind conditions when she made her conclusion.
30. Aurora records the following observations: It rained on Monday. It was sunny on Tuesday. It rained again on Wednesday. What is Aurora recording?
- observations of the weather
 - observations of the climate
 - observations of both weather and climate
 - observations of neither weather or climate

31. The gases that make up Earth's atmosphere are commonly referred to as air. Air consists of major gases and trace gases. What are the two **most** abundant gases in the atmosphere?
- A. nitrogen and oxygen
 - B. water vapor and argon
 - C. oxygen and carbon dioxide
 - D. nitrogen and carbon dioxide
32. The layer of gases that surrounds Earth is called the atmosphere. The atmosphere is tied to Earth by gravitation, so that it cannot disperse into space. Refer to the following circle graph.



The graph shows the relative abundance of gases in Earth's atmosphere. Which gas(es) correspond(s) to label C in the figure?

- A. oxygen
- B. nitrogen
- C. argon and carbon dioxide
- D. oxygen and carbon dioxide

NATURE OF SCIENCE (NOS)

The intent of these NOS practice problems is to help prepare students for the Science FCAT 2.0. By using this practice booklet, students will become familiar with the types of items that annually assessed and possibly assessed.



SC.8.N.1.1 - Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

SC.8.N.1.3 Use phrases such as? "Results support?" or? "Fail to support?" in science, understanding that science does not offer conclusive? 'Proof?' of a knowledge claim.

SC.8.N.1.4 Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.

SC.7.N.1.1 Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

SC.7.N.1.3 Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.

SC.7.N.1.4 Identify test variables (independent variables)

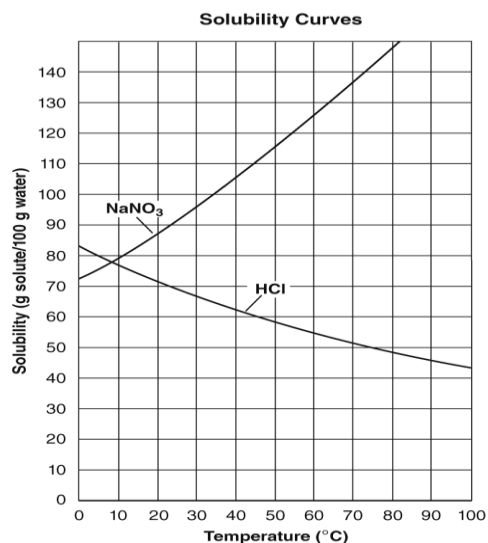
SC.6.N.1.1 Define a problem from the sixth grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

SC.6.N.1.3 Explain the difference between an experiment and other types of scientific investigation, and explain the relative benefits and limitations of each.

Multiple Choice

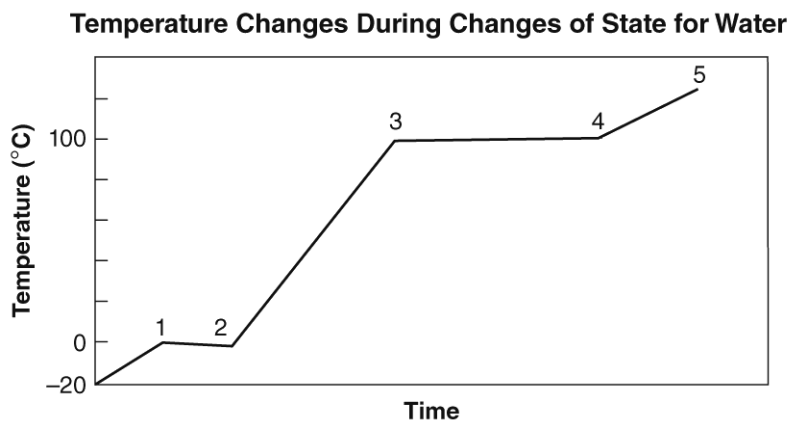
Identify the choice that best completes the statement or answers the question.

1. Many substances can be dissolved in water. The maximum amount of a substance that can be dissolved in a solvent is called *solubility*. The solubility of a substance often changes with the temperature of the water. The graph shows the solubility of NaNO_3 (sodium nitrate) and HCl (hydrochloric acid).



How does the solubility of HCl (hydrochloric acid) change as the temperature increases from 50°C to 80°C ?

- A. It increases by about 10 g per 100 g of water.
 - B. It decreases by about 10 g per 100 g of water.
 - C. It increases by about 32 g per 100 g of water.
 - D. It decreases by about 32 g per 100 g of water.
2. The temperature of an ice-filled beaker is measured and recorded every minute as the beaker is heated continuously. The resulting temperature and time data are shown in the following graph.



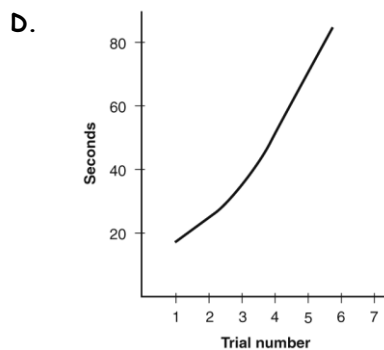
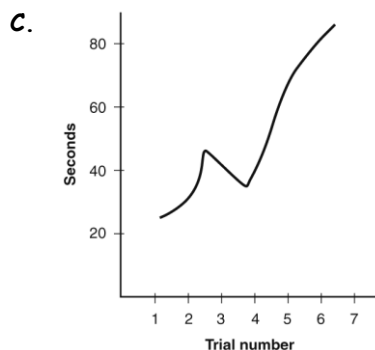
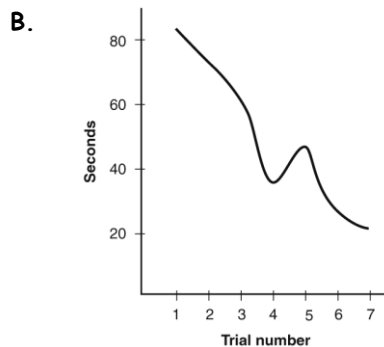
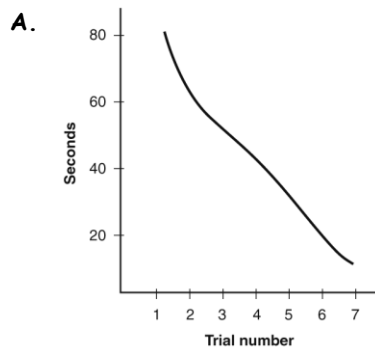
Which portion of the graph takes the **greatest** amount of time to happen?

- A. from point 1 to point 2
 - B. from point 2 to point 3
 - C. from point 3 to point 4
 - D. from point 4 to point 5
3. Kenji must conduct a scientific investigation for a science project. Which step should Kenji complete **first**?
- A. List the steps to be used for the procedure of the investigation.
 - B. Use appropriate tools to collect data, and then organize the data using tables and graphs.
 - C. Develop a testable question based on research or prior knowledge.
 - D. Analyze data, recognize any patterns, and make inferences based on those patterns.

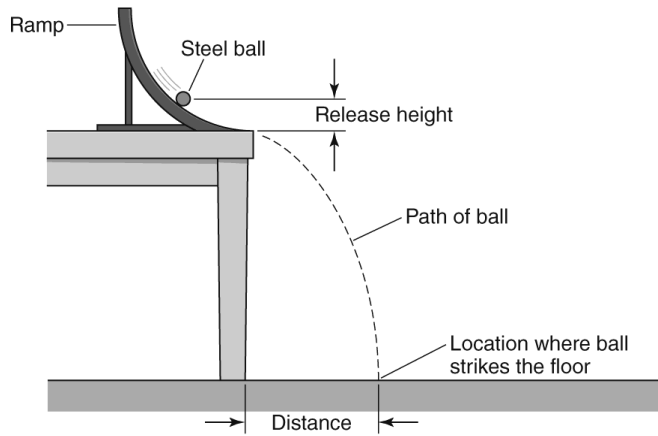
4. A scientist wants to calculate the density of an object that is the shape of a rectangular prism. She will find its density based on its mass and volume. Which procedure should she use?
- A. 1. Use a balance to measure the object's mass.
2. Use a scale to weigh the object.
3. Calculate the density.
- B. 1. Weigh the object using a scale.
2. Calculate the density from the weight.
- C. 1. Measure the object's dimensions using a ruler.
2. Use the dimensions to calculate the object's volume.
3. Use a balance to measure the object's mass.
4. Calculate the density.
- D. 1. Add the object to a water-filled graduated cylinder.
2. Record the volume increase of the graduated cylinder.
3. Use the volume to calculate the density of the object.
5. Rodney has been training a mouse to run a maze. He has been recording the data in the chart below.

Trial	Time (s)
1	83
2	75
3	61
4	35
5	45
6	30
7	25

If Rodney graphed his data, which of the following would show the shape of his graph?



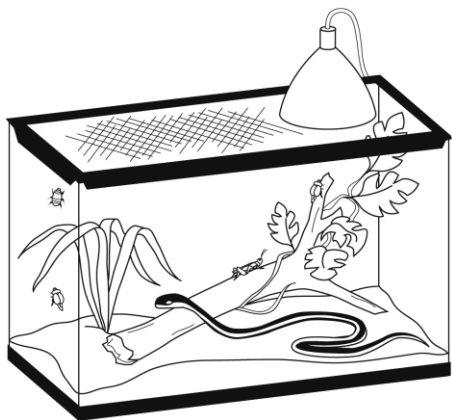
6. Roberta experiments by rolling a steel ball down a ramp. She conducts multiple trials by releasing the ball from varying heights on the ramp. For each trial, Roberta measures and records the release height of the ball and the distance the ball travels from the ramp before falling to the ground. Roberta's experiment is shown below.



Which piece of equipment does Roberta need to collect her data?

- A. balance
 - B. meterstick
 - C. stopwatch
 - D. scale
7. Observation is the process of gathering information through the senses, including sight, sound, taste, smell, and touch. Which observation is an example of sensory data?
- A. The mass of a pebble is 25.0 g.
 - B. The volume of a pebble is 5.0 cm³.
 - C. A white pebble is speckled with gray spots.
 - D. A pebble does not conduct an electric current.
8. Joshua investigates the effect of varying amounts of sunlight on the rate of plant growth. He experiments by exposing seedlings to different amounts of sunlight each day. He stops the experiment when each seedling reaches 20 cm in height. Which variable does Joshua control in the experiment?
- A. rate of plant growth
 - B. amount of water per plant per day
 - C. amount of sunlight per plant per day
 - D. time needed to reach a height of 20 cm
9. Which source is **most** credible for a new study on the effect of different types of foods on human health?
- A. story in a magazine by a restaurant critic
 - B. ad in the health section of a local newspaper
 - C. story on the Internet by a food manufacturer
 - D. article in a professional medical journal by a scientist
10. Which sequence of steps does a scientist follow during an experimental investigation?
- A. collect data; analyze data; draw conclusions
 - B. draw conclusions; interpret data; graph results
 - C. plan an experiment; draw conclusions; collect data
 - D. identify variables; define a problem; plan an experiment

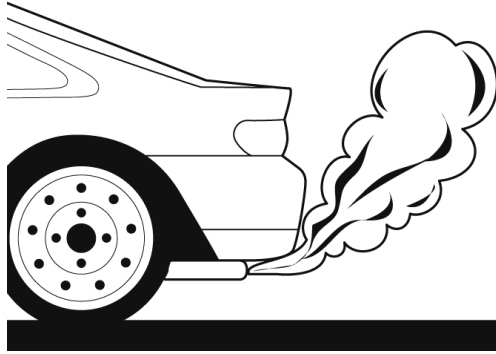
11. Gemma wants to investigate the rain forest ecosystem of the Amazon jungle in South America. To conduct the experiment, Gemma uses plants, reptiles, and insects native to New Jersey, where she lives, to build a terrarium such as the one shown in the following figure.



Which limitation is **true** of Gemma's experiment?

- A. It does not model the interaction of certain insects and plants.
 - B. It does not model the interaction of certain reptiles and plants.
 - C. It does not model the interaction of certain reptiles and insects.
 - D. It does not model the exact conditions of nature in the Amazon.
12. Raul wants to investigate how the angle of a ramp affects the speed of an object rolling down the ramp. He can conduct his investigation in a number of different ways. Which investigation should he perform?
- A. observe different bicyclists riding down hills of varying steepness
 - B. record the time it takes one bicyclist to ride down hills of varying steepness
 - C. perform an experiment in a lab in which the angle of the ramp is controlled and the speed of a rolling cart is measured
 - D. observe video of various objects rolling down hills and estimate the angle of the hill and the speed of the object
13. Anton is a geologist. He wants to get the best possible information about lava flows from eruptions that are happening at some specific locations around the world. He wants to be able to vary what he studies based on his initial findings. Which type of investigation should Anton conduct?
- A. a survey
 - B. fieldwork
 - C. library research
 - D. a laboratory investigation
14. Raul wants to investigate how the angle of a ramp affects the speed of an object rolling down the ramp. He can conduct his investigation in a number of different ways. Which INVESTIGATION should he perform?
- A. observe different bicyclists riding down hills of varying steepness
 - B. record the time it takes one bicyclist to ride down hills of varying steepness
 - C. perform an experiment in a lab in which the angle of the ramp is controlled and the speed of a rolling cart is measured
 - D. observe video of various objects rolling down hills and estimate the angle of the hill and the speed of the object
15. Anton is tracking and observing two black bears in Northern Minnesota. He is trying to determine what bears in the wild eat during different seasons. Which type of scientific investigation is Anton conducting?
- A. a survey
 - B. fieldwork
 - C. library research
 - D. a laboratory investigation

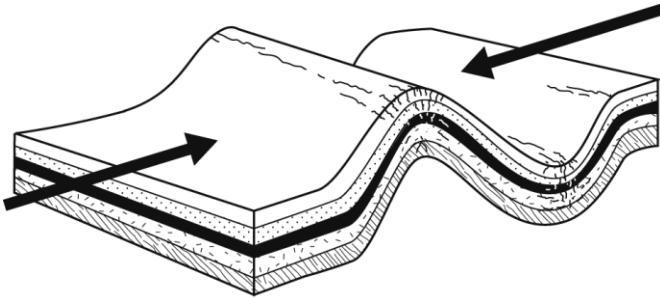
16. Carlos wants to investigate which cars cause the most pollution. He will measure the amount of exhaust that different cars produce.



Which variable will NOT affect the amount of exhaust?

- A. age of car
- B. car color
- C. engine size
- D. model of car

17. Christy holds a pack of paper in her hands. She pushes the ends towards each other and the middle buckles.

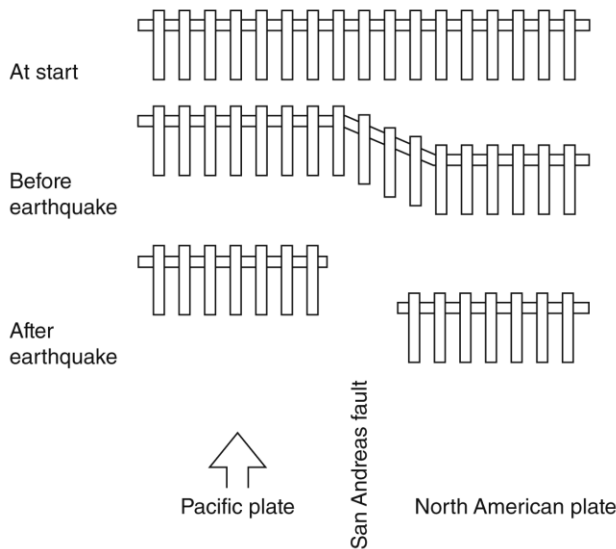


If the peak represents a mountain and the dip represents a valley, what idea is she investigating?

- A. how mountains form
- B. how many layers are in Earth
- C. how tall a particular mountain is
- D. how rivers and glaciers form valleys

18. Letti shows what happened to her backyard fence before, during, and after an earthquake.

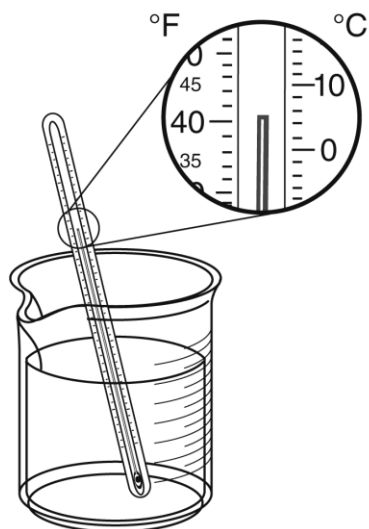
Earthquake Effects on a Fence



Based on the diagram, why is the fence in two pieces after the earthquake?

- A. The fence is broken at the start.
- B. Part of the fence falls into the fault.
- C. The Pacific plate pushes up and breaks the fence.
- D. The plates collide and force the fence onto itself.

19. During an experiment, Cali places a thermometer in a beaker of water. She finds the temperature to be 40 degrees Fahrenheit. However, she must report her findings in degrees Celsius.



What is the temperature of the water in degrees Celsius?

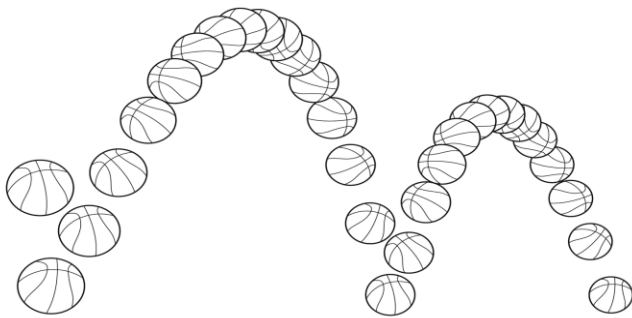
- A. 0
B. 5
C. 10
D. 40
20. Bob and Matt drop a ping pong ball and a golf ball from 50 cm and measure the height of each bounce. The ping pong ball bounces higher than the golf ball. Next, they drop the golf ball with the ping pong ball on top of it. The ping pong ball bounces higher than it did when dropped alone, and the golf ball bounces lower than it did when dropped alone. Which statement explains this effect?
- A. The golf ball gains weight.
B. The ping pong ball loses weight.
C. Some energy from the hand transfers to the ping pong ball.
D. Some energy from the golf ball transfers to the ping pong ball.
21. Mr. Chan wants his students to understand the purpose of scientific inquiry: to acquire scientific knowledge. Which of the following strategies is NOT useful for a scientist?
- A. assumption
B. experimentation
C. investigation
D. observation
22. Michael wants to do an experiment involving the moon. Which of the following would be classified as an experiment?
- A. He will identify the types of rock on the moon.
B. He will make a poster of the moon phases.
C. He will calculate his weight on the moon.
D. He will determine whether children's test scores improve during a full moon.

23. Carly is studying dominant and recessive traits. She will observe those around her, and make notes about whether or not each person's earlobes are attached. Since attached earlobes are a recessive trait, she thinks the probability of having them is very low.
Which strategy will she use to find the probability of a person having attached earlobes?



- A. assumption
- B. experimentation
- C. invention
- D. investigation

24. Paul wants to know whether the height from which a ball is dropped affects how high it bounces. He drops a ball and measures how high it bounces after the first bounce.



Which strategy **best** describes this activity?

- A. assumption
- B. experimentation
- C. invention
- D. investigation

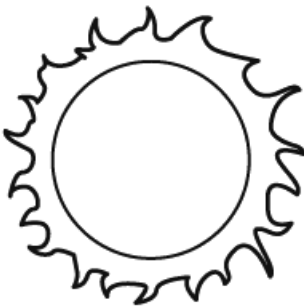
25. Taylor fills a jar with vinegar and places steel wool in the jar.



The answer to which question requires experimentation?

- A. What is the rate of rusting in vinegar as compared to water?
- B. What is the mass of the steel wool after it begins to rust?
- C. How long does it take the steel wool to rust?
- D. How much vinegar is in the jar?

26. Patrick conducts an experiment to test how his watering habits impact the amount of apples his trees produce. He divides his farm into four sections and gives the trees in each section a different amount of water each week. Which of the following is the test variable in his experiment?
- A. number of sections
 - B. number of fruits produced in each section
 - C. amount of water each section receives
 - D. amount of sunlight each section receives
27. Casey wants to determine whether the rate at which melted glass cools affects the strength of the glass. He pours melted glass into a form and cools the glass at different rates. Then, he tests the breaking strength of each form. Which of the following is the test variable in this experiment?
- A. type of glass
 - B. strength of the glass
 - C. thickness of the glass
 - D. cooling rate of glass
28. Marley's mom's company wants to test the effectiveness of its new sunscreen products.



Which of the following is NOT a test variable they might want to investigate?

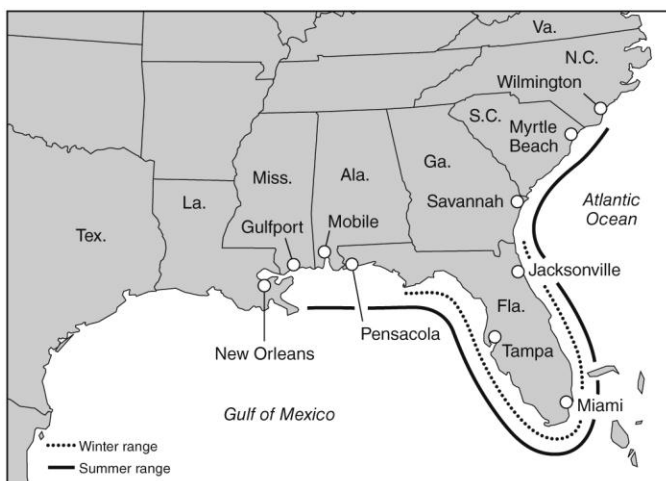
- A. resulting sunburns
 - B. frequency of application
 - C. length of exposure to the sun
 - D. numerical strength of the sunscreen
29. A bicycle company wants to test the safety of its brakes. The test must contain both an outcome variable and a test variable. Which of the following is the most appropriate experiment for testing the effectiveness of various brake materials?
- A. Measure the heat produced in the braking system for each type of material.
 - B. Measure the stopping distance required for various types of brake material.
 - C. Measure the stopping distance required for one brake material at various speeds.
 - D. Measure the stopping distance required for a braking material in different types of bikes.
30. Frances's family is building a new home. She wants to know what types of soil best support structures such as buildings. What are some examples of test variables for such an experiment?
- A. bridges, skyscrapers, homes
 - B. 1-story, 2-stories, 10-stories
 - C. sand, clay, rocky soil, loam
 - D. collapse, crack, shift, no change

31. Geologist Alfred Wegener believed that all the land on Earth once formed a giant continent called Pangaea. Wegener theorized that Pangaea broke apart into smaller continents that moved away from each other. This theory is called continental drift. The map below shows the continents as they exist today.



Which of these facts **best** supports the theory that today's continents were once part of a larger landmass that broke up and drifted apart?

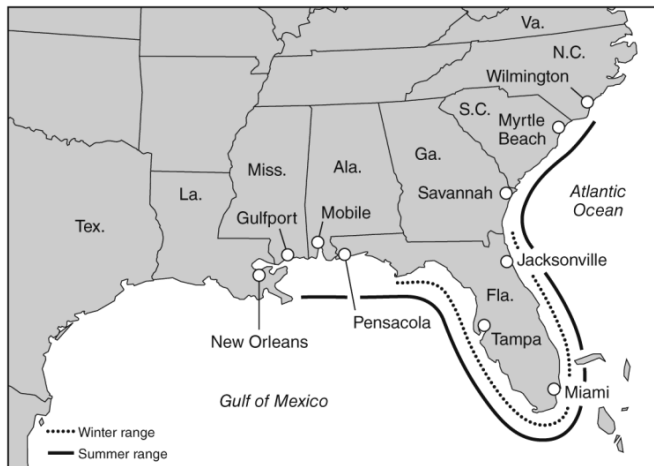
- A. The Asian and Australian continents are close together.
 - B. Most of the continents are north of the equator.
 - C. The continent of Asia is nearly twice the size of the continent of North America.
 - D. The Atlantic coastlines of South America and Africa fit together like jigsaw pieces.
32. Scientists are not certain what signals cause Florida manatees to begin migrating, although manatees seem to sense when cold weather is coming. By tracking manatees, scientists have found evidence that manatees travel hundreds of miles during their seasonal migration. The map below shows the migratory range of the Florida manatee.



According to the map, which are the **farthest** points in the Atlantic Ocean and Gulf of Mexico where manatees commonly migrate?

- A. Miami, Florida, and Mobile, Alabama
- B. Savannah, Georgia, and Tampa, Florida
- C. Pensacola, Florida, and Jacksonville, Florida
- D. Wilmington, North Carolina, and Mobile, Alabama

33. Scientists hypothesize that manatees travel generally south in winter to stay in warm water. The map below shows migration patterns observed for the Florida manatee.



According to the map, finding manatees in which area during January would give the **greatest** evidence to support this hypothesis?

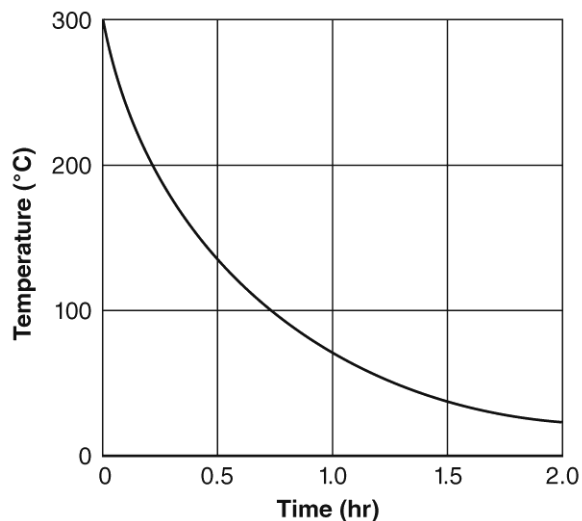
- A. between Mobile, Alabama, and Pensacola, Florida
 - B. between Tampa, Florida, and Jacksonville, Florida
 - C. between Savannah, Georgia, and Wilmington, North Carolina
 - D. between Jacksonville, Florida, and Myrtle Beach, South Carolina
34. What is the purpose of repeating trials after reaching a conclusion in an investigation?
- A. to develop a new theory
 - B. to repeat experiments and verify results
 - C. to conduct experiments with more variables
 - D. to revise each step of their research procedure
35. Paleontologists study fossils. A team of paleontologists published an article in a scientific journal announcing which dinosaur a set of fossil eggs came from. Which of these sources is a **poor** one for contributing to the knowledge represented in the article?
- A. research about the dinosaur that laid the eggs
 - B. media interview of a rival paleontologist about the work
 - C. part of a book on fossil eggs by a famous paleontologist
 - D. report from a professor of paleontology who reviewed the data
36. Clara tests a hypothesis that the heavier of two materials will insulate cold drinks better than the lighter-weight material. She adds equal volumes of the same cold beverage to two cups. One cup is made of lightweight plastic foam, and the other cup is made of a heavier, ceramic material. She records her results in a chart.

Material	Time for beverage to warm to room temperature (hours)
plastic foam	3.25
ceramic	2.50

How are these experimental results valuable to Clara?

- A. The results explain why the materials perform differently.
- B. Clara has to accept that her hypothesis was not supported.
- C. Clara can use a different heavier material to see if she obtains different results.
- D. The results can be communicated with others through newspapers, magazines, and the Internet to increase the validity of her results.

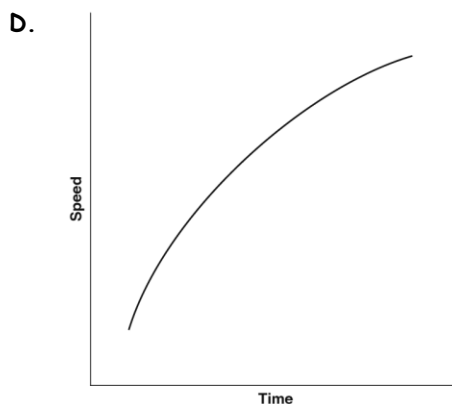
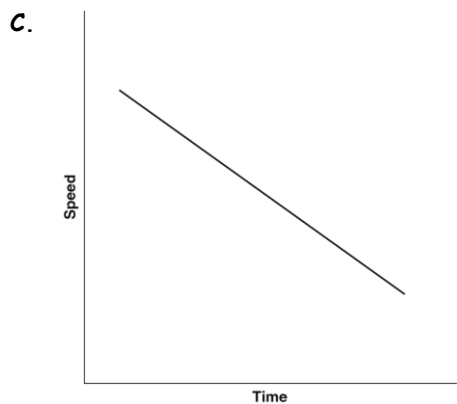
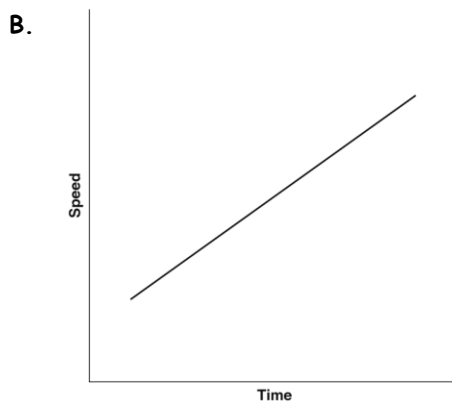
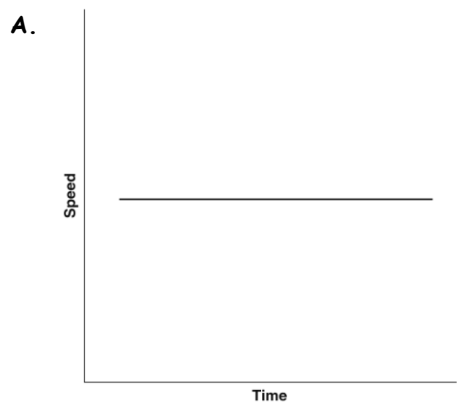
37. Shakira hypothesizes that hot objects cool at constant rates. She experiments by heating a metal object with a Bunsen burner and then allowing it to cool to room temperature. She records her results in a graph.



Which choice describes the results of the experiment and tells what Shakira should do next?

- A. The result of the experiment is not conclusive. Shakira should repeat the experiment.
- B. The downward curve supports the hypothesis. Shakira should present her results to the class.
- C. The graph supports the hypothesis. Shakira should conduct several more trials to increase the accuracy of her data.
- D. The graph does not support the original hypothesis. Shakira should revise the hypothesis and design a new experiment.

38. Adam's hypothesis states that an object's speed constantly changes. Which data requires Adam to form a new hypothesis?



39. Dr. Misra is conducting an experiment in which she is testing a substance she believes will turn green when put into different acid solutions. She finds that sometimes the substance turns green, but at other times it turns red. What would be a logical hypothesis for her to develop for a new experiment with the substance?
- A. The substance will turn red whenever it is put into an acid solution.
 - B. The substance will never turn green when it is put into an acid solution.
 - C. The substance will not change colors when it is put into an acid solution.
 - D. The substance will turn green when it is put into an acid solution with a pH between 3 and 4.
40. New experimental data does not support a currently accepted hypothesis. Which course of action should the researcher take?
- A. Do the experiment until the results support the hypothesis.
 - B. Change the data to fit the hypothesis.
 - C. Form a new hypothesis and plan a new experiment.
 - D. Change the procedure to obtain the desired outcome.

SC.7.N.1.2 Differentiate replication (by others) from repetition (multiple trials).

SC.8.N.1.2 Design and conduct a study using repeated trials and replication.

SC.6.N.1.2 Explain why scientific investigations should be

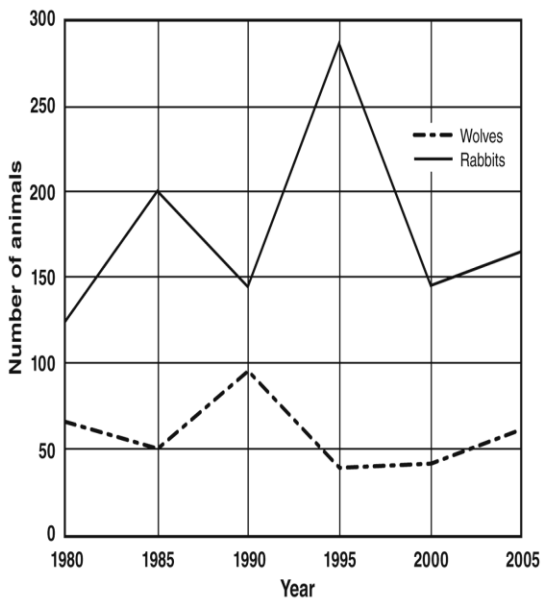
SC.6.N.1.4 Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.

Multiple Choice

Identify the choice that best completes the statement or answers the question.

1. Jenny's mom has tracked the wolf and rabbit populations in a local forest from 1980 to 2000.

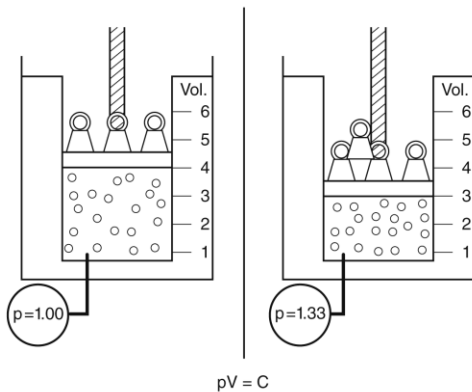
WOLF AND RABBIT POPULATIONS IN LOCAL FOREST



Based on this graph, what conclusion can she draw?

2. Sherrie learns that Boyle's Law says that with an increase in pressure, the volume of a gas will decrease.

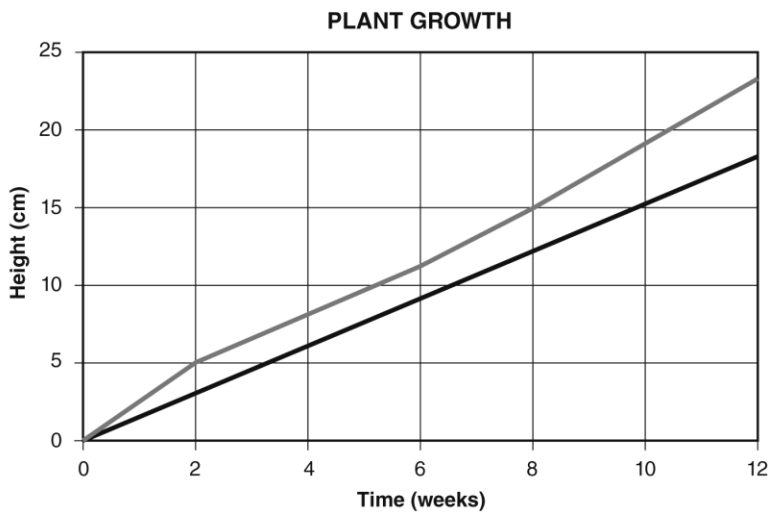
BOYLE'S LAW



Because Boyle's conclusion is a law, what do you know about it?

- A. It holds true in a lab only.
- B. It cannot be observed in nature.
- C. It has been replicated by other scientists.
- D. It describes a possibility, but not a reality.

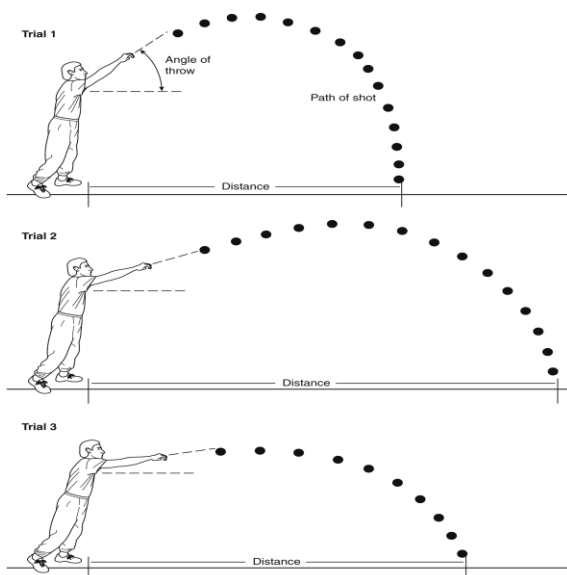
3. Which statement is an example of repetition?
 - A. George drops a ball from 10 meters.
 - B. Candace weighs four rocks using a balance scale.
 - C. Julio fills three beakers with alcohol, water, and hydrogen peroxide.
 - D. Daniel conducts six trials to determine the time it takes 1 liter of water to boil.
4. Which statement is an example of replication?
 - A. Ami rolls a toy car down a ramp 8 times.
 - B. Todd gets the same results from an experiment as Hank.
 - C. Paula's ball takes 9 seconds to hit the ground every time she drops it.
 - D. Caroline does not get the results she expects, so she runs the experiment again.
5. Using the same materials and process, Robert and Lori both plant seeds and place them in full sunlight. They each measure the growth of their plants over 12 weeks.



Based on this graph, what conclusion can you draw about the two experiments?

- A. By increasing the water, they can replicate the experiment.
- B. Another student repeats the experiment with the plants in the shade.
- C. One plant grows more than the other, and the results are not replicated.
- D. Their measurements are not accurate because they do not repeat the experiment.

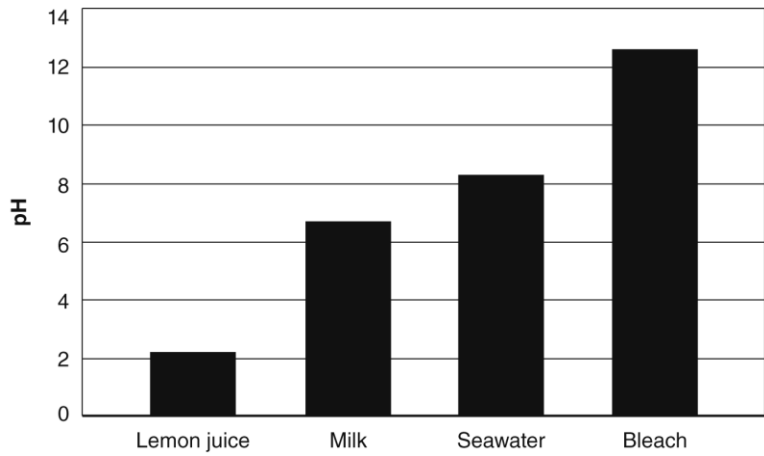
6. Lance throws a ball three times and tracks its distance.



Why is this experiment NOT an example of repetition.

- A. The ball reaches the same distance each time.
- B. He needs to throw the ball more than three times.
- C. He does not throw the ball at the same angle each time.
- D. He changes from an overhand throw to an underhand throw.

7. Dan uses a thermometer to measure the temperature of alcohol in a beaker. He heats the beaker for 1 minute and measures the temperature again. The temperature increases by 10 degrees. Which of the following experiments replicates Dan's experiment?
 - A. Teo repeats Dan's experiment, but he replaces the alcohol with water.
 - B. Freda repeats Dan's experiment, and the temperature increases 10 degrees.
 - C. Dan performs the experiment again, and the temperature increases by 12 degrees.
 - D. Dan heats another beaker of alcohol for 1 minute and measures the temperature before and after heating.
8. Dallas, a corn farmer, is interested in a larger crop yield. He uses the same growing techniques for the next five years and achieves good results. He shares the techniques with his friends, who try them and achieve high crop yields. Which statement is an example of replication?
 - A. Dallas teaches his friends the techniques.
 - B. Dallas uses the same technique for five years.
 - C. Dallas experiments with different growing techniques.
 - D. Dallas's friends use his techniques and achieve the same results.
9. Danielle's group tests the pH level of four different substances and displays their results in a bar graph.



She retests bleach and confirms the result. Another group tests milk and lemon juice. This group's results show 6.7 for milk 4.9 for lemon juice. Which statement is an example of repetition?

- A. Danielle's group retests bleach.
 - B. Danielle's group tests four substances.
 - C. Another group finds the pH for milk to be 6.7.
 - D. Another group finds the pH for lemon juice to be 4.9.
10. Vernon listens to his MP3 player and records the life of the battery in minutes. He charges the battery and repeats the experiment. He asks his friends to run the experiment with their players. They do, and they record their results. The results are identical to Vernon's. Which statement is an example of repetition?
 - A. Vernon records his results.
 - B. Vernon charges the battery and records the results.
 - C. Vernon records the life span of his MP3 player battery in minutes.
 - D. Vernon's friends repeat the experiment and record the same results.
11. Scientific investigations involve many steps and processes. Which characteristics define a laboratory experiment?
 - A. hypothesis, models, and calculations
 - B. test variables, data, and uncontrolled conditions
 - C. data, conclusions, and unregulated environment
 - D. independent and dependent variables, data, and controlled conditions

12. Cathy designs an experiment to investigate how well cups made of different materials maintain the temperature of a cold drink. Which step will increase the accuracy and validity of Cathy's results?
- Use a different beverage in each cup.
 - Conduct the experiment in a cool room.
 - Conduct multiple trials and have another scientist repeat the experiment.
 - Analyze the experimental results and organize experimental data in a table.
13. Repetition is an important element of a good scientific investigation. Which data table has places to record information for repeated trials?

A.

Distance traveled (m)	Time (s)	Average speed (m/s)

B.

Time (min)	Temperature (°C)
0	
1	
2	
3	
4	
5	

C.

Trial	Height (cm)	Distance traveled (cm)
1		
2		
3		
4		
5		

D.

Initial temperature of water (°C)	
Final temperature of water (°C)	
Mass of water (g)	

14. During several trials, a group of scientists tests the reaction of a new medicine on a strain of bacteria. Which step is essential for proving the validity of the results?
- Make the process public so the results can be replicated.
 - Change the procedure to check whether the same results take place.
 - Have another scientist check to make sure the medicine was properly produced.
 - Have each group member use a different medicine and see what happens when they test it on the bacteria.
15. A good experiment has several characteristics. Which characteristic is part of a good scientific experiment?
- Results can be reproduced.
 - Results are not reviewed by peers.
 - Results are based on a small sample size.
 - Results are based on an undisclosed process or procedure.
16. Lee wants to make sure she understands the components of a good scientific investigation. She knows that it should be controlled and have a large sample size. Also, she thinks that the results should be communicated to other scientists. Which is another component that is necessary for a good investigation?
- It must be conducted in a big lab.
 - It must be run by a university scientist.
 - It must be done with expensive equipment.
 - It must be able to be replicated by other scientists.

17. In 1989, two university research scientists reported that they had produced a nuclear reaction during a simple tabletop experiment. Other scientists, however, were unable to reproduce the results of the original experiment. What characteristic of a good scientific investigation is missing from the original results?
- The results were made public.
 - The research was conducted at a university.
 - The results of the experiment were not reproducible.
 - The experiment did not include sophisticated equipment.
18. Which practice greatly limits the value of experimental findings?
- having the findings published
 - basing the findings on a large amount of data
 - having the findings reviewed by a panel of peers
 - using an experimental procedure that cannot be reproduced
19. Three different lab groups perform experiments to determine the density of samples of iron. They have all rounded the density to the nearest whole number.

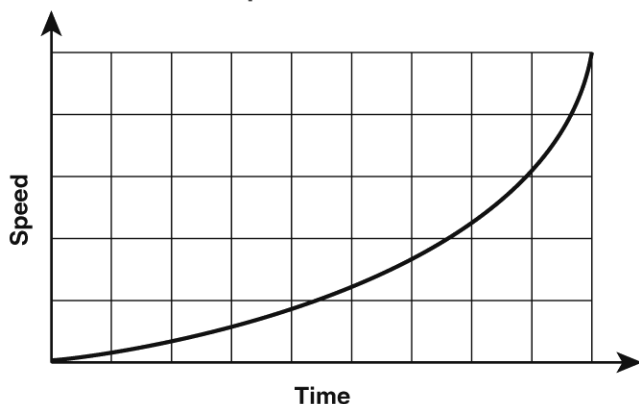
Group	Mass of iron (g)	Volume of iron (cm ³)	Density of iron (g/cm ³)
1	32	4	8
2	48	6	8
3	?	5	8

What is the mass of iron for group 3?

- 5 g
- 8 g
- 40 g
- 64 g

20. The result of an experiment about how the speed of an object changes over time is shown in the following graph.

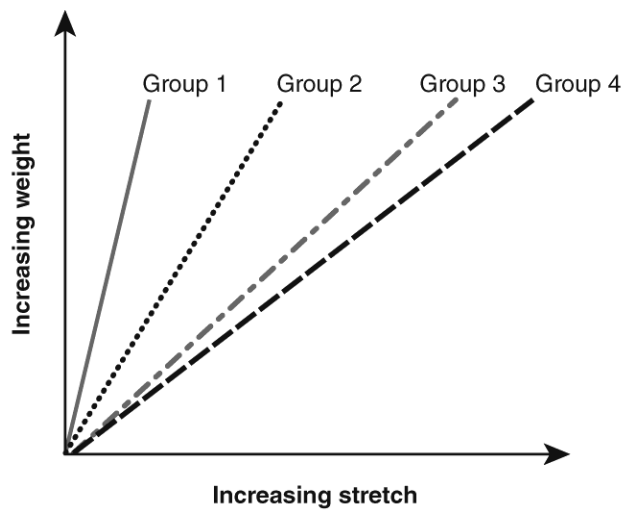
Speed vs. Time



Based on this graph, four different lab groups came to the following conclusions. Which group's conclusion describes the result shown in the graph?

- Group 1: The speed of the object increases as time passes.
- Group 2: The speed of the object decreases as time passes.
- Group 3: The speed of the object does not change as time passes.
- Group 4: The speed of the object decreases, then increases as time passes.

21. The following graph shows the results of an experiment done by four different groups. Each group took a different rubber band and recorded how far it stretched as they added weights to it.



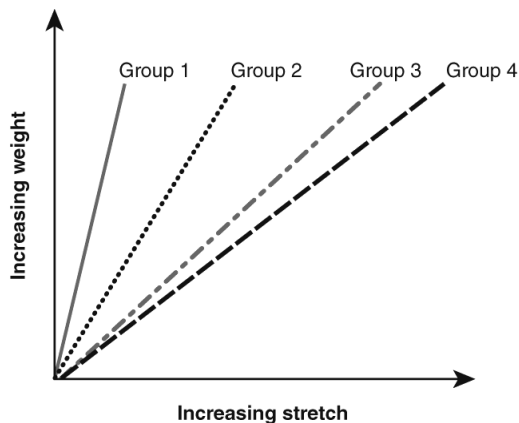
Which group's rubber band stretched the **least** as more weight was added?

- A. group 1
 - B. group 2
 - C. group 3
 - D. group 4
22. Three different lab groups perform experiments to determine the density of samples of iron. They have all rounded the density to the nearest whole number.

Group	Mass of iron (g)	Volume of iron (cm ³)	Density of iron (g/cm ³)
1	32	4	8
2	48	6	8
3	?	5	8

What is the MASS of iron for group 3?

- A. 5 g
 - B. 8 g
 - C. 40 g
 - D. 64 g
23. The following graph shows the results of an experiment done by four different groups. Each group took a different rubber band and recorded how far it stretched as they added weights to it.



Which of the following **BEST** explains why the four groups got different results?

- A. They all used metric rulers to measure.
- B. They used different sized rubber bands.
- C. They performed the test at different times.
- D. They tested the rubber bands with the same weights.

SC.7.N.1.5 Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.

SC.8.N.1.5 Analyze the methods used to develop a scientific explanation as seen in different fields of science.

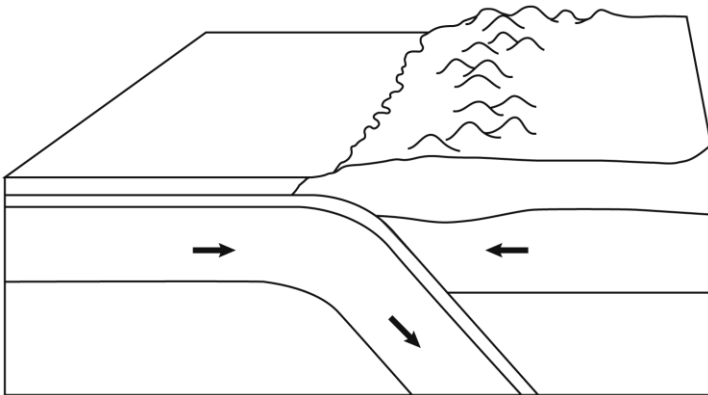
SC.8.E.5.10 Assess how technology is essential to science for such purposes as access to outer space and other remote locations, sample collection, measurement, data collection and storage, computation, and communication of information. - NOT INCLUDED

SC.7.N.3.2 Identify the benefits and limitations of the use of scientific models.

Multiple Choice

Identify the choice that best completes the statement or answers the question.

1. Paleontology is a field of science that studies prehistoric life. What is one method that paleontologists use to learn about dinosaurs?
 - A. They observe dinosaur behavior.
 - B. They read reports from when dinosaurs were alive.
 - C. They use fossils to see how dinosaurs looked and acted.
 - D. They run repeated experiments to learn how dinosaurs respond to their environment.
2. Geologists explain why the Earth is shaped as it is.



What is one method that geologists have used to gain knowledge and develop scientific explanations about how mountains form?

- A. Geologists make maps of current mountain ranges.
 - B. Geologists create new mountain ranges under the ocean.
 - C. Geologists observe the formation of new mountain ranges each year.
 - D. Geologists use models to show what happens to the Earth when mountains are formed.
3. Biologists study living organisms. To learn more about humans, biologists often have mice in their labs.

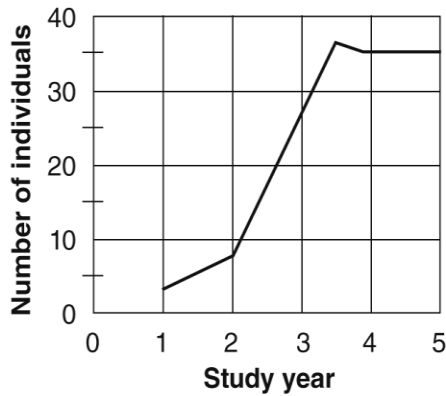


Why might a biologist use mice in their pursuit of scientific explanations of humans?

- A. Mice and humans look alike.
- B. Mice are smarter than humans.
- C. Mice and humans are genetically similar.
- D. Mice eat a lot and do not move very much.

4. Ecologists study the relationship among living organisms and their surroundings. An ecologist graphs the changes in rabbit population over time.

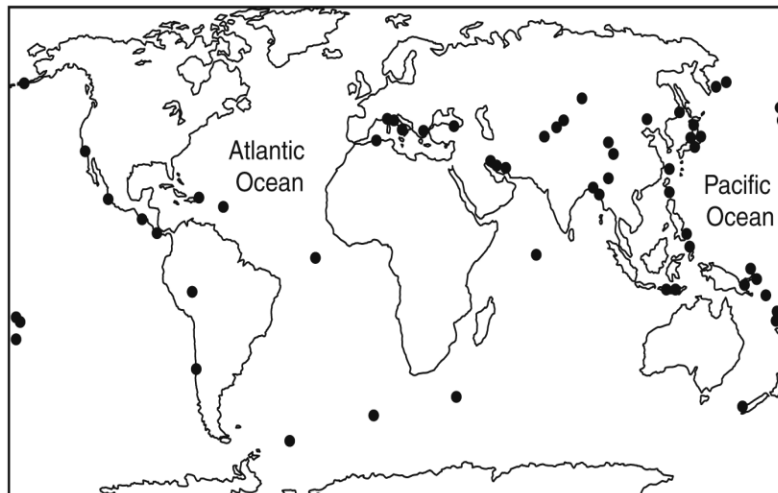
CHANGE IN A RABBIT POPULATION OVER TIME



How would a graph like this one NOT help a scientist pursue scientific explanations about the populations?

- A. It shows changes in the data.
 - B. It visually represents the data collected.
 - C. It reveals patterns and trends in the data.
 - D. It compares the predictions scientists made and the actual data.
5. Physicists study matter, energy, and forces. Physicists use many different methods as they search for evidence. Which is NOT a method they would use in their pursuit of scientific explanations?
- A. assuming
 - B. experimenting
 - C. measuring
 - D. observing
6. Geologists study earthquakes and where they occur.

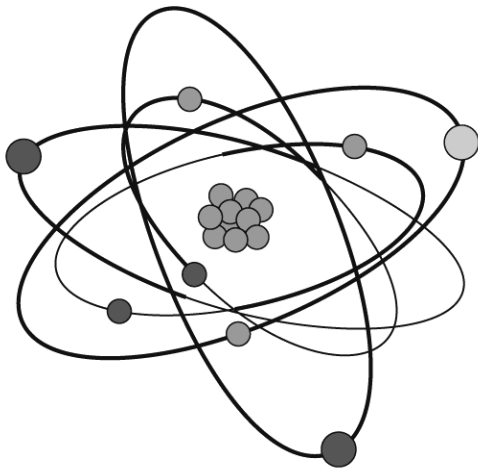
LOCATIONS OF MAJOR EARTHQUAKES IN 2003



How might this map help scientists pursue scientific explanations about earthquakes?

- A. It gives each earthquake's magnitude.
 - B. It predicts where the next earthquake will occur
 - C. It identifies the amount of devastation each earthquake caused.
 - D. It helps scientists identify where earthquakes are more likely to happen.
7. Geneticists study genetics. What tool would be **most** necessary in their pursuit of scientific explanations?
- A. beaker
 - B. microscope
 - C. scale
 - D. thermometer

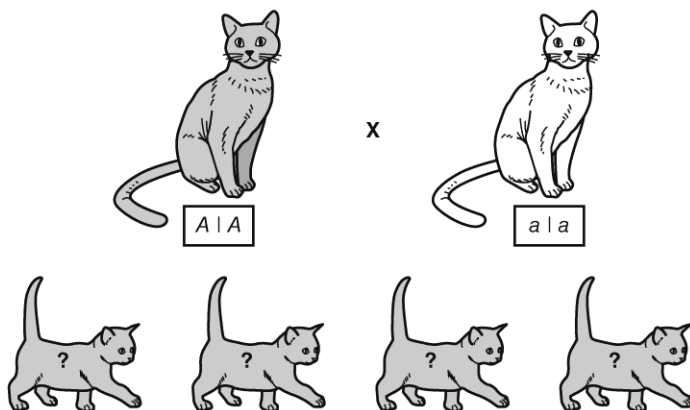
8. A physicist studies matter, energy, and forces. She completes an experiment, but the results are not what she had thought they would be. She forms a new hypothesis, makes some changes, and runs the experiment again. Which **best** describes her methods used in pursuit of scientific explanations?
- A. She formulates, tests, and modifies her hypothesis.
 - B. She does not carefully complete the experiment, so she has to do it again.
 - C. She makes observations and relies solely on the visual evidence from these observations.
 - D. She guesses what should happen and modifies the experiment to make it happen in the second trial.
9. Chemistry is the study of the composition of matter and its properties. Experimentation is the primary method by which chemists pursue scientific explanations. How do they know if the results of their experiments are valid?
- A. They are repeatable.
 - B. They are measurable.
 - C. They match their hypothesis.
 - D. They can be used to design another experiment.
10. A biologist studies living or once-living organisms. When a biologist thinks he has discovered a new plant, he classifies it. What method is he **most likely** to use to in his pursuit of scientific explanation?
- A. He uses experimentation.
 - B. He plants it and observes the growth.
 - C. He compares its traits to other plants he knows.
 - D. He measures it and draws a bar graph for its different parts.
11. Look at the figure below.



What is this an example of?

- A. a model
 - B. a hypothesis
 - C. an experiment
 - D. an observation
12. A microbiologist investigates the outbreak of an unknown illness, which is thought to be caused by a new strain of bacteria. Doctors have determined the bacteria are located in the lungs. Initial work on treating the illness is dependent upon analysis of the bacteria. Which investigational method should the microbiologist use to start the process to analyze the bacteria?
- A. Review the patients' medical charts.
 - B. Interview people who have become sick.
 - C. Review the treatment medications and their effectiveness.
 - D. Take samples of the bacteria and grow cultures in a lab setting.

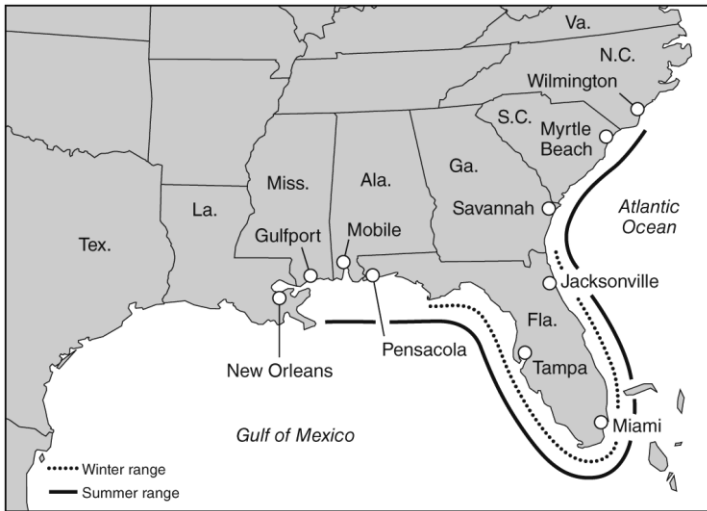
13. Karsten is researching a recent, controversial scientific issue. Which of these sources is a reliable source for Karsten to use for unbiased scientific information?
- an encyclopedia article in a respected, older encyclopedia
 - a scientific journal with peer-reviewed articles
 - a personal website or blog
 - an informative pamphlet mailed to your home by a politician or lobby group
14. Part of cell theory says that all living things are made up of one or more cells. Scientists had to find ways to test this theory. Which investigation could scientists use to test this part of cell theory?
- heat plant or animal tissue on a hot plate
 - test plant or animal tissue with a pH meter
 - examine plant or animal tissue with a microscope
 - measure the mass of plant or animal tissue with a scale
15. Early scientists wondered how two parents with brown eyes could have a child with blue eyes. Which of these studies would **best** help scientists investigate how blue eye color is inherited from brown-eyed parents?
- study the history of the family eye color of 100 random people
 - study the history of the family eye color of 50 blue-eyed people
 - study the history of a family in which all individuals within the past five generations were born with blue eyes
 - study the history of four generations of 20 different families in which brown-eyed parents had at least one blue-eyed child
16. According to Gregor Mendel's laws of genetic inheritance, when two parents have different genes for a trait, one form of the trait will be dominant and the other recessive. The dominant form normally appears in the offspring. In this illustration, one cat parent has genes for gray fur and the other has genes for white fur. Gray fur is dominant. The gene for gray fur is *A*. The gene for white fur is *a*.



What color would the kittens have to be in order to provide evidence supporting Mendel's laws?

- gray
- white
- white with gray spots
- gray stripes

17. Biologists analyze signals from tracking devices on manatees to gather evidence about manatee migration patterns. The map shows the migration range of manatees.



Suppose the scientists originally thought that manatees lived no farther north than North Carolina. What evidence would cause them to modify their ideas?

- A. tracking data showing a manatee in the Florida Keys
 - B. tracking data showing a manatee in the Gulf of Mexico
 - C. tracking data showing a manatee off the coast of Texas
 - D. tracking data showing a manatee off the coast of Virginia
18. Scientists once believed that Earth's continents were fixed in position. Then scientists began to theorize that the continents started as one large landmass. Today, this idea is commonly accepted as part of the theory of plate tectonics. Which of the following events could have led scientists to change their ideas and accept the theory that Earth's crust is made of moving plates?
- A. the observation of changing sea levels
 - B. the idea that Earth's core is made of mostly iron and nickel
 - C. the observation that earthquakes and volcanoes occur along certain lines
 - D. the observation that new rock forms on parts of Earth's surface
19. What is the purpose of repeating trials after reaching a conclusion in an investigation?
- A. to develop a new theory
 - B. to repeat experiments and verify results
 - C. to conduct experiments with more variables
 - D. to revise each step of their research procedure
20. Evan and his sister Jessica were in the house. Evan put his glass of orange juice on the kitchen table. He let the dog in and then went to his room to get a book. When he got back to the kitchen, the glass was knocked over. Evan was pretty sure the dog did it. Which statement offers the **best** support for Evan's inference?
- A. The dog barked.
 - B. The dog went back outside.
 - C. Jessica said she heard the dog bark.
 - D. Jessica said she heard a crash just after the dog went into the kitchen.
21. According to the current theory regarding the extinction of the dinosaurs, the extinction was triggered by the effects of a large meteor that struck Mexico 65 million years ago. What is the **best** evidence of this theory?
- A. fossil remains of dinosaurs found in Mexico
 - B. magnetic mapping of rocks that reveals a buried crater in Mexico
 - C. a permanent change in world sea levels about 65 million years ago
 - D. rock studies that show the age of the rocks where the meteor struck

22. One of the following scientists contributed to the modification of atomic theory by showing that electrons orbit an atom's nucleus and that electron orbits have a particular amount of energy. Which scientist and his work led to the modification of atomic theory?
- A. Joseph Thomson discovered electrons, which he believed did not move.
 - B. John Dalton proposed a model of the atom showing it as a solid sphere.
 - C. James Chadwick found that, in addition to protons and electrons, atoms also contain neutrons.
 - D. Niels Bohr's research showed that electrons follow specific paths around the nucleus of an atom.
23. In 1897, Joseph Thomson discovered that atoms contained electrons. He proposed a change in the atomic theory of that time, and the theory was modified because of his discovery. Since Thomson's discovery, atomic theory has been further modified. What is the **best** explanation for why scientific theories are modified?
- A. Theories more than ten years old are usually out of date.
 - B. Scientists want to prove that the work of other scientists is wrong.
 - C. New evidence that supports a revision prompts scientists to modify earlier theories.
 - D. So much information is available today that it is harder to focus research and disprove theories.

SC.6.N.2.2 Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.

SC.8.N.1.6 Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.

SC.7.N.1.6 Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based.

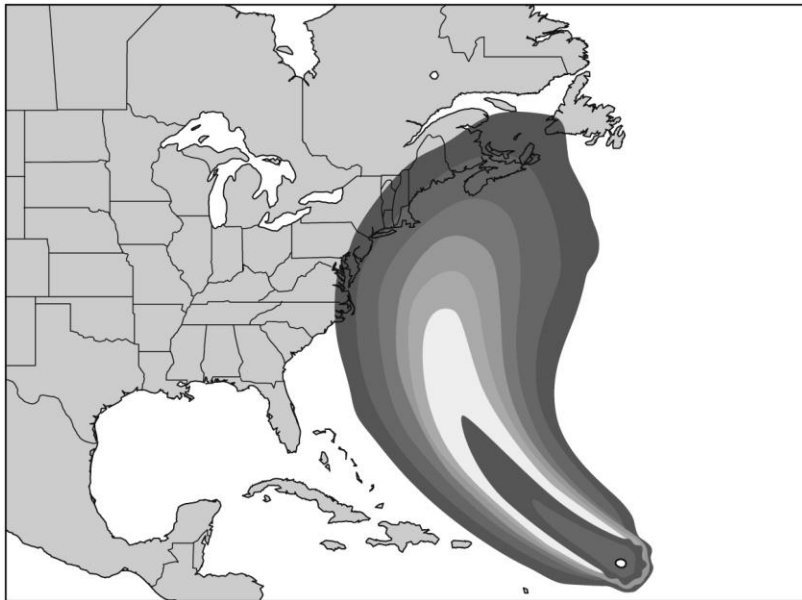
SC.7.N.1.7 Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community.

SC.7.N.2.1 Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.

Multiple Choice

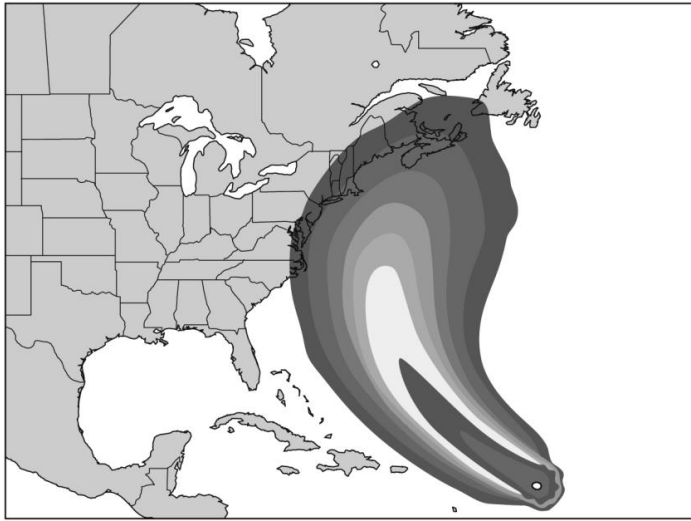
Identify the choice that best completes the statement or answers the question.

1. The following map shows how likely it is for a storm to develop winds that are fast enough to become a tropical storm. The map was made with a computer program that uses weather data and mathematical equations to make predictions about the storm.



What type of model is shown in the diagram?

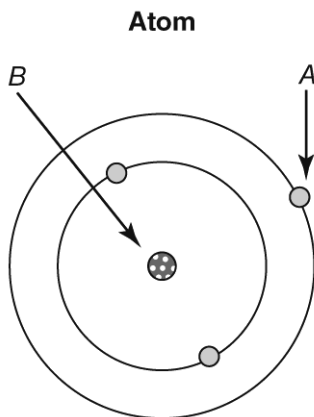
- A. data model
 - B. visual model
 - C. conceptual model
 - D. mathematical model
2. Medical students use a three-dimensional reproduction of a human skeleton to learn about bones. Which item describes this learning tool?
 - A. an x-ray model
 - B. a physical model
 - C. a computer model
 - D. a mathematical model
 3. The following weather map shows current conditions in the area. Ten hours later, the operator inputs new weather data into the computer. These data differ from the earlier data, which produced this map.



As a result of the new weather data, what will happen to the map?

- A. The map will remain unchanged.
- B. The map will change to reflect the new data.
- C. The map will show new weather patterns in Europe.
- D. The map will predict all characteristics of a weather pattern.

4. The diagram shows Niels Bohr's theory about how electrons are arranged in atoms. He thought electrons traveled on specific paths around a nucleus. The current theory is that electrons exist in certain cloudlike regions around a nucleus.



How would a model of the current theory **differ** from Bohr's model?

- A. It would be the same as Bohr's model.
 - B. Object A would differ from Bohr's model.
 - C. Object B would differ from Bohr's model.
 - D. Both objects A and B would differ from Bohr's model.
5. Although a scientific theory is well supported and widely accepted, what might cause it to change?
- A. new evidence
 - B. a scientific law
 - C. individual claims
 - D. a scientific model
6. The theory of evolution describes how organisms change over time. Scientists now use information in the DNA of living organisms to understand how they are related. The theory of evolution was developed before scientists discovered DNA; however, these new data still fit with and support the theory. What does this sequence of events tell us about the theory of evolution?
- A. It is a bad theory because it makes scientists biased.

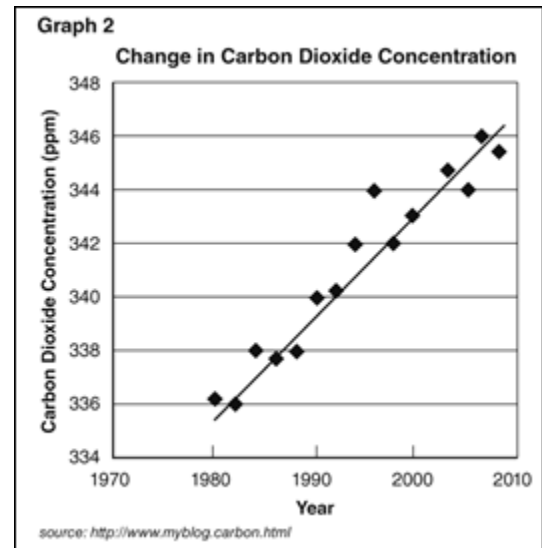
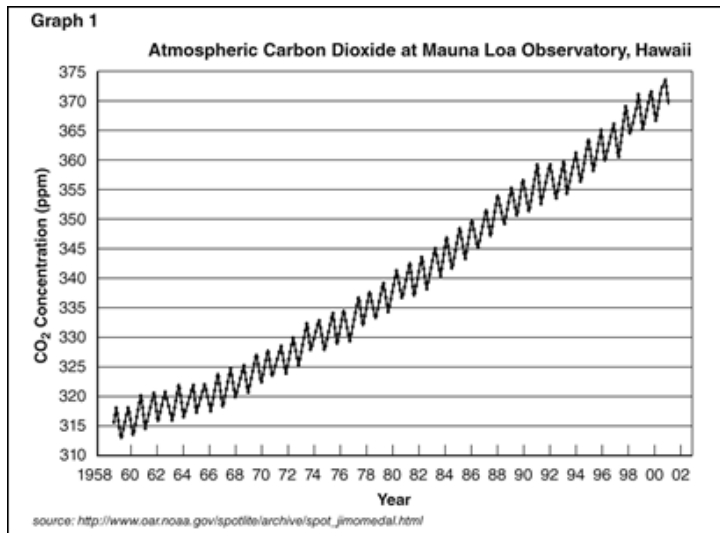
- B. It is a good theory because it is able to explain new evidence.
 - C. It is a good theory because it has changed greatly over time.
 - D. It is a bad theory because it was formed before the discovery of DNA.
7. The table shows events that led to the current theory that the sun is the center of the solar system.

	Event
1	Scientists observe planetary motion that cannot be explained if Earth is the center of the universe.
2	Scientists accept the theory that the planets and sun travel around Earth.
3	Scientists develop the theory that the planets travel around the sun.

Which sequence of events is correct?

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

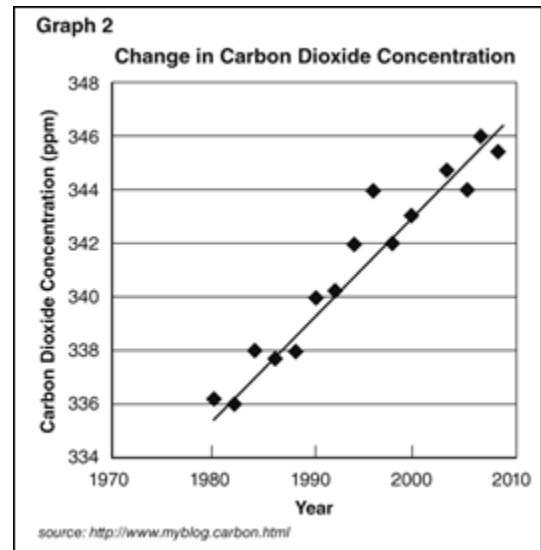
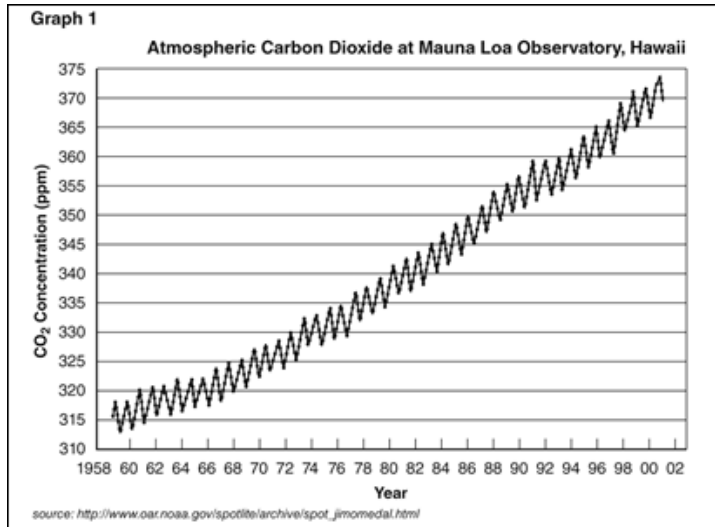
8. Ishya researches how the amount of carbon dioxide in the atmosphere has changed over time. She finds two graphs on the Internet, shown in the following diagrams.



Which graph is **likely** to be more reliable?

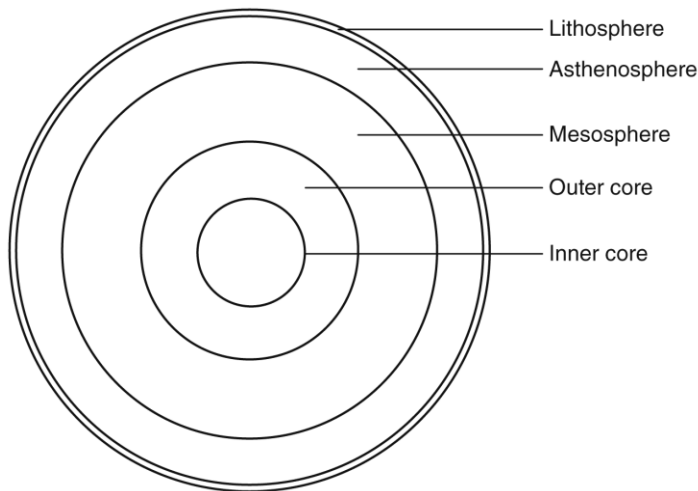
- A. graph 1, because it is more complicated
- B. graph 2, because it shows a best fit line
- C. graph 1, because it is from a government source
- D. graph 2, because it shows fewer variations in the data

9. The following graphs show how the amount of carbon dioxide in the atmosphere has changed over time.



How might a researcher label graph 2?

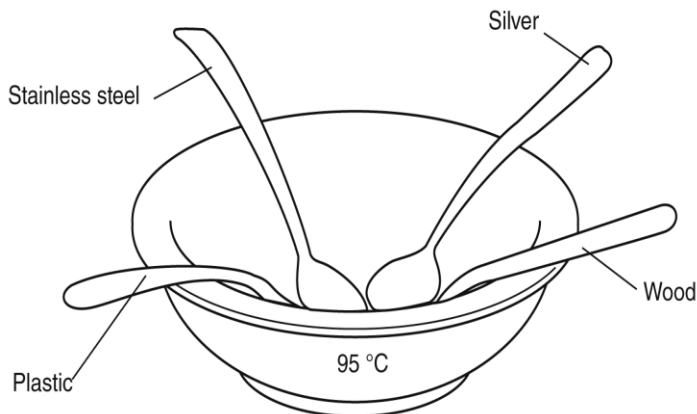
- A. unreliable source
 - B. reliable source
 - C. matches theory
 - D. does not match theory
10. Scientists use evidence to determine how old something is. Look at this fossilized tree trunk.



Which is NOT an example of empirical evidence?

- A. The depth at which a fossil is uncovered indicates its age.
- B. The amount of carbon-14 in a rock tells how old a tree's fossil is.
- C. The number of rings in a tree's trunk shows how many years old it is.
- D. A scientist sees that the tree has fallen and assumes that it is 10,000 years old.

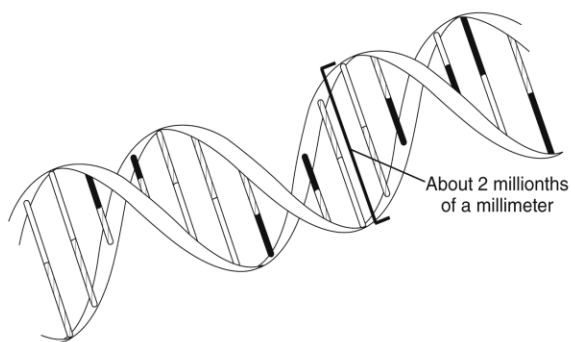
11. What is NOT a way that scientists gain empirical evidence?
- assumptions
 - experiments
 - measurement
 - observations
12. What would NOT be empirical evidence that the moon orbits the Earth every 27.3 days?
- Scientists observe the phases of the moon.
 - Scientists read myths that explain the moon's phases.
 - Scientists use images from space to see the moon orbiting the Earth.
 - Scientists measure the distance the moon travels as well as its speed as it orbits the Earth.
13. On what do scientists base their explanations of natural events?
- legends
 - assumptions
 - empirical evidence
 - opinions of other scientists
14. A scientist wants to know how well different materials conduct heat. The materials are stainless steel, plastic, silver, and wood.



Hot water and the four spoons made of different materials are put into a bowl. What empirical evidence explains how well the materials conduct heat?

- the shape of the spoons
- the temperature of each spoon
- the change in the depth of the water
- the number of seconds the spoons are in the water

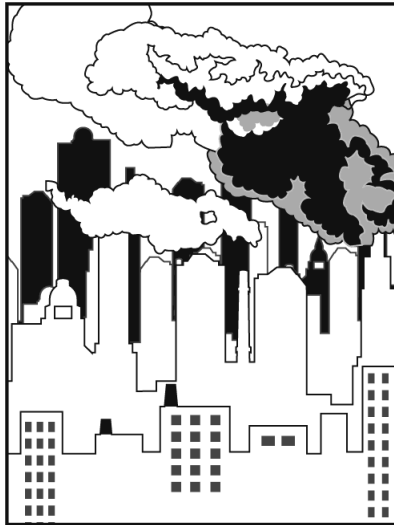
15. While scientists already know a great deal about DNA, they continue to learn more about its role in genetics.



What is the basis of scientists' current understanding of DNA?

- They guess how they think it works.
- They use combined empirical evidence from many scientists.
- They only use evidence that they have personally proven.
- They assume they already know all there is to know, even when evidence contradicts that assumption.

16. Scientists study the impact of human activity on the climate, and global warming is an international concern.



Which is NOT empirical evidence on which scientists base their concerns?

- A. reduction in the size of icebergs due to melting
- B. rising average temperatures
- C. increasing concentrations of carbon dioxide in the atmosphere
- D. greater personal desire to protect the planet

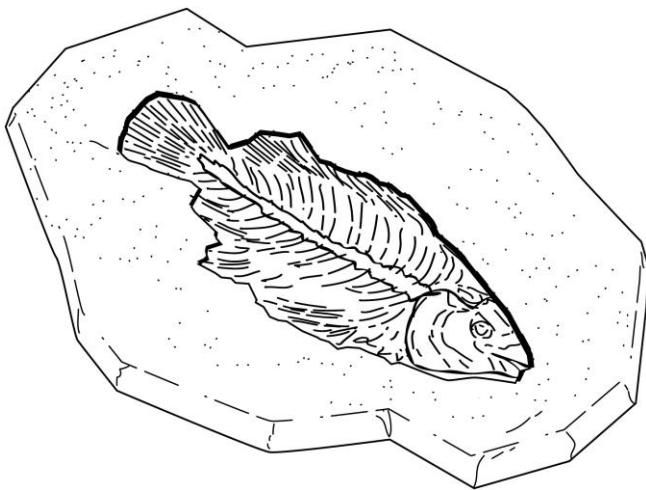
17. Which of the following is NOT empirical evidence supporting what scientists understand about genetics?

- A. Identical twins look almost identical.
- B. Bioengineering produces plants with desired traits.
- C. Cloning is thought to be immoral by some people.
- D. Recessive traits may skip generations before appearing again.

18. Which of the following is empirical evidence that supports scientists' understanding of the orbit of the moon around the Earth and the Earth around the sun?

- A. solar eclipse
- B. story of Apollo
- C. temperatures on the sun
- D. humans traveling to the moon

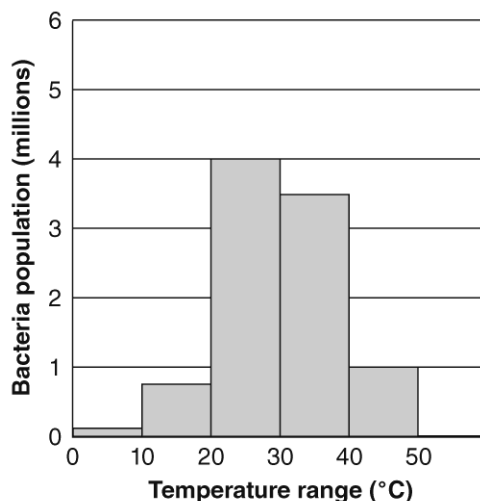
19. A scientist finds the fossil of a fish.



Which statement would be empirical evidence related to this fossil?

- A. This is the best fossil ever found.
- B. This fossil should be put in a museum.
- C. This fossil is unique because I've never seen one like it.
- D. This fossil shows that water must have covered this land at one time.

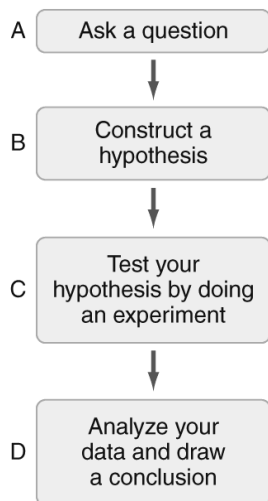
20. Scientists often use visual or mathematical representations to investigate items that are very large, very small, or otherwise difficult to study. What are these visual or mathematical representations called?
- experiments
 - hypotheses
 - models
 - observations
21. Identifying the independent and dependent variables in an experiment will help you better interpret and convey results. What is the difference between the independent and dependent variables in an experiment?
- The independent variable is always a number, and the dependent variable is never a number.
 - The independent variable is what you control, and the dependent variable is what changes as a result.
 - The dependent variable is what the investigator controls, and the independent variable is what happens as a result of this.
 - The dependent variable is typically found in the first column of a table, and the independent variable is typically found in the second column.
22. The school physician performed an experiment to investigate the effects of aerobic exercise on high school freshmen. He examined 25 student volunteers and found them to be in good health. He then had the students perform aerobic exercises, such as jogging, swimming, and bicycling. The doctor recorded the students' pulse rates before each activity, during each activity, and after each activity. Which was the dependent variable in this experiment?
- the physician
 - the exercises
 - the volunteers
 - the pulse rates
23. A graph can help scientists display and convey data. What part of a line graph shows trends?
- title
 - legend
 - x - and y -axis labels
 - line of best fit
24. A biomedical company uses a certain type of bacteria to manufacture a new medicine. A researcher for the company studies how temperature affects the rate at which the bacteria reproduce. He records his results in a graph.



Currently, the company grows the bacteria in a lab maintained at 18 °C. If the company wants to grow the bacteria as quickly as possible, which recommendation should the researcher make?

- The current lab temperature is ideal for growing the bacteria.
- The lab temperature should be increased to between 20 °C and 30 °C.
- The lab temperature should be increased to between 30 °C and 40 °C.
- The lab temperature should be increased to between 40 °C and 50 °C.

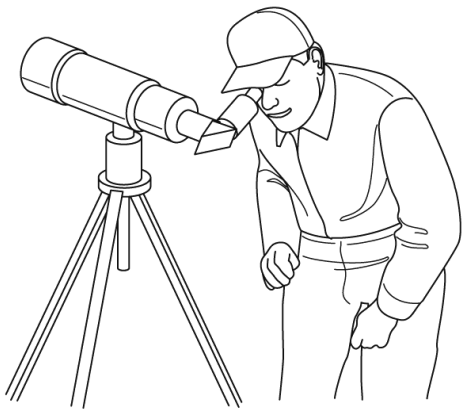
25. Cindy predicts that plastic foam insulates cold drinks better than metal or ceramic materials do. To test the hypothesis, she fills cups made from these materials with equal amounts of cold water. She records the temperature of the water in each cup, using scientific thermometers, every 10 minutes until the water reaches room temperature. Which of these conditions must be the same for this experiment to be valid?
- the thermometer that is in each cup
 - the starting temperature of the water in each cup
 - the ending temperature of the water in each cup
 - the material that makes up each cup
26. Which term describes the information that a scientist gathers during an investigation?
- data
 - hypothesis
 - observation
 - variable
27. In the 1950s, a scientist conducted a study on the changes in a population of moths. Dead moths of the same species, but of two different color types were fastened to trees to study which color of moth was most likely to be eaten by birds. On dark trees, the light moths were eaten. On light trees, the dark moths were eaten. Other scientists criticized the investigation because birds' food choice using live moths should also have been studied. Which personal trait prompts scientists to question the validity of an investigation?
- creativity
 - determination
 - imagination
 - skepticism
28. The figure below shows a sequence of steps that a scientist might take during a scientific investigation.



Which letter best represents the step where a scientist takes accurate measurements?

- A
- B
- C
- D

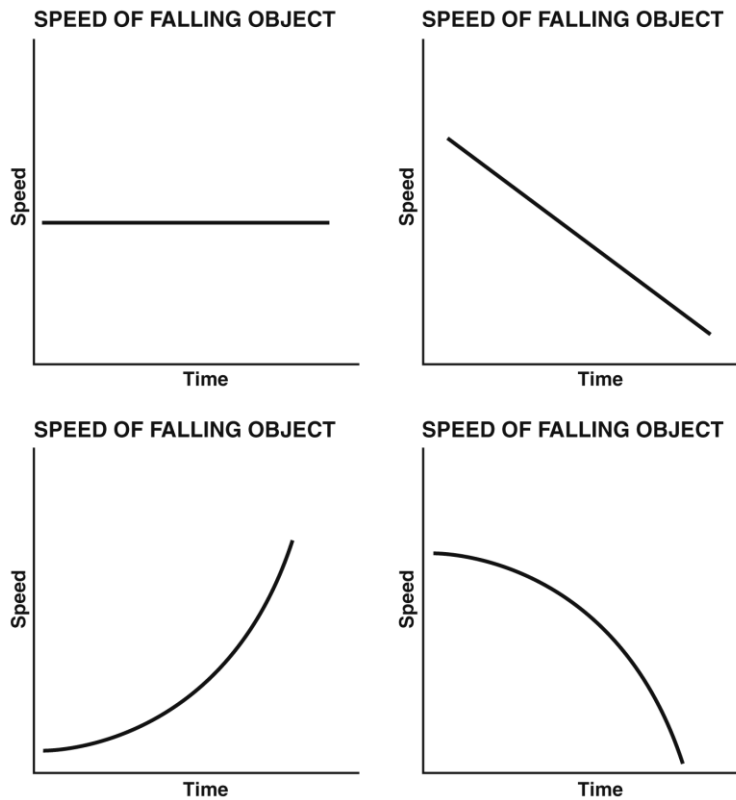
29. Scientists depend upon various traits to carry out their work. An example is shown in the figure below.



Which of these terms **best** describes the scientist in this figure?

- A. creative
- B. logical
- C. observant
- D. skeptical

30. Four scientists run the same experiment and graph their results.



What must happen before any of the results are confirmed if they get different results?

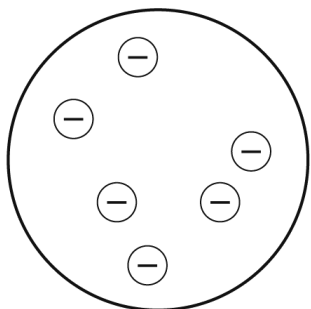
- A. The scientists are fired.
- B. The first results are accepted as fact.
- C. They must come together and debate their findings.
- D. The experiment is declared invalid, and the results are rejected.

31. The genetics behind the Punnett square model has been debated thoroughly by scientists. Pete learns to use Punnett squares to predict the outcome of a cross-breeding experiment.

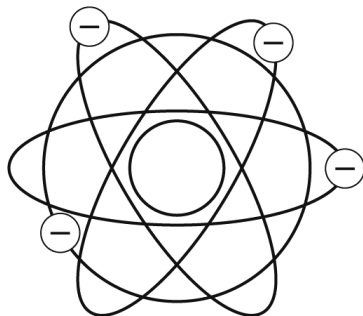
	B	B
B	BB	BB
b	Bb	Bb

Why does he think that he can use the scientific knowledge behind this model to predict the outcomes of his experiment?

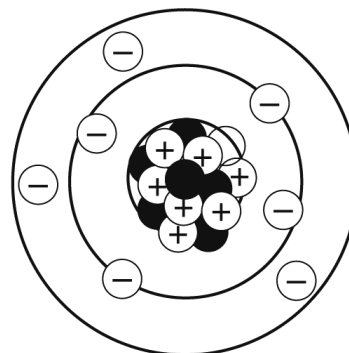
- A. Models are always accurate.
 B. Reginald C. Punnett was a scientist.
 C. The square is made from four smaller squares.
 D. Punnett squares have been confirmed by the scientific community.
32. Which does NOT result in scientific knowledge?
- A. empirical evidence
 B. more assumptions by scientists
 C. communication and debates within the scientific community
 D. confirmation through more experiments through repetition and replication
33. Over time, scientists have used different models to describe the atom.



Thomson's model of atom



Rutherford's model of atom

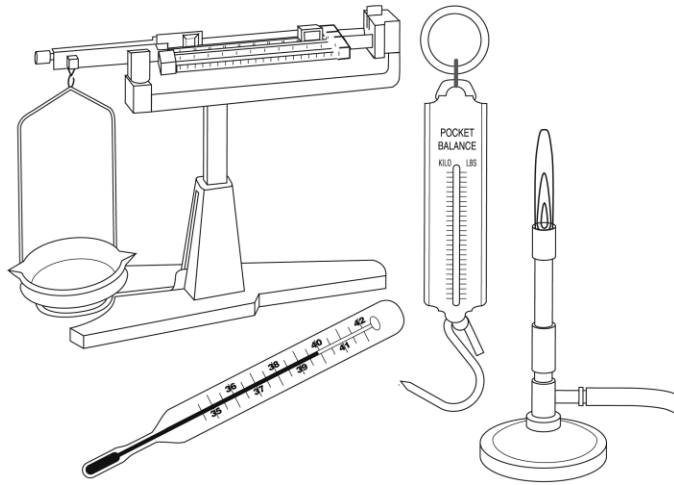


Current model of atom

What does this indicate the scientific community does before confirming new knowledge?

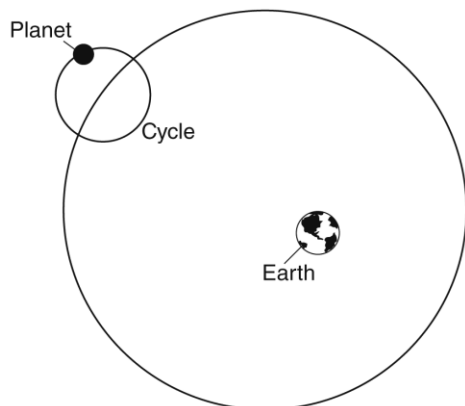
- A. It cannot use models accurately.
 B. It accepts theories without researching them.
 C. It does not really understand what it attempts to describe.
 D. It debates scientific knowledge and changes it with new evidence.

34. Scientists use many different tools to conduct experiments. The results of their experiments cannot be confirmed until the scientific community has thoroughly debated them.



When scientists complete experiments, which is the **main** reason that they communicate their results?
so that they win prize money

- A.
B. .so they get a building named after them
C. so their results can be used by other scientists
D. so their results can confuse others scientists' experiments.
35. Paleontologists use fossils to develop a picture of the history of life on Earth. Which of the following discoveries provided evidence that some dinosaurs had feathers?
- A. the discovery of a fossil of a bird-like dinosaur
B. the discovery of a bird fossil that shows feathers
C. the discovery of fossils of reptiles that has the ability to fly
D. the discovery of bird and dinosaur fossils from the same time period
36. When scientists first discovered Pluto, they classified it as a planet. In 2006, it was reclassified as a dwarf planet. Which of the following discoveries **most** likely contributed to the reclassification of Pluto?
- A. the discovery that Pluto has moons
B. the discovery that Pluto has an atmosphere
C. the discovery of Earth-sized planets orbiting stars in other solar systems
D. the discovery of similarly sized objects in the outer parts of the solar system
37. Greek astronomers tried to explain the motion of the planets they observed. Their model of the universe is shown below. Copernicus tried to explain the motion using a different model. He proposed that the planets orbit the sun in circular orbits.



How did Copernicus's interpretation of planetary motion lead to changes in the model of the Greek astronomers?

- A. The model would include a sun for each planet.
B. The model would match our current understanding of the universe.
C. The model would show the sun in the center surrounded by planets.
D. The model would include several solar systems which have different suns.

38. Chemists today look to the periodic table when they need to find information about elements. Dimitri Mendeleev organized elements in the first periodic table based on their properties. What is the **most** likely way that the periodic table has changed the understanding of chemistry?
- A. Scientists could infer the subatomic structure of the atom.
 - B. Scientists could predict the properties of undiscovered elements.
 - C. Scientists could find ways to combine any element with any other element.
 - D. Scientists could identify the elements found in compounds in living things.
39. Today scientists understand that radioactive elements decay to become more stable. Which discovery provided evidence that led to the current understanding of radioactive elements?
- A. the discovery that atoms contain a nucleus
 - B. the discovery that atoms contain electrons
 - C. the discovery of elements that gave off energy on their own
 - D. the discovery that certain elements give off light when they are exposed to light
40. Isaac Newton developed the universal law of gravity to explain the attractive force between two objects that are not touching. This law has changed scientific knowledge in a variety of fields. Which of the following is **most** affected by this law?
- A. the eruptions of volcanoes
 - B. the effect of the moon on the tides
 - C. the ability of runners to accelerate
 - D. the effect of friction on moving objects

SC.7.N.3.1 Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them. (Also assesses SC.6.N.3.1 and SC.8.N.3.2.)

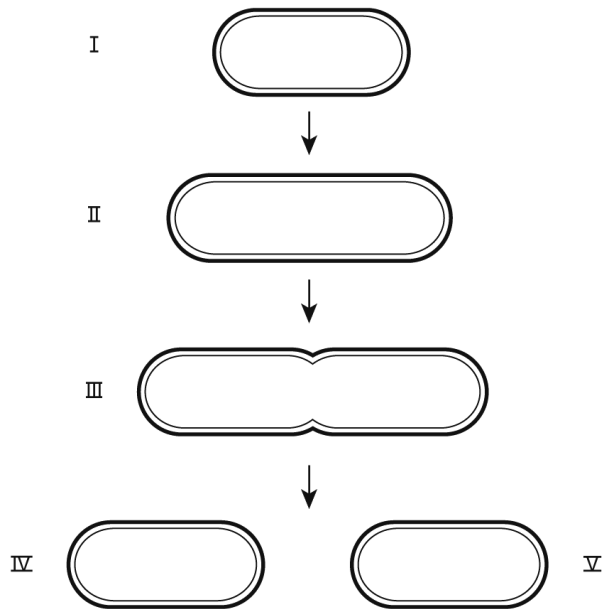
SC.8.N.3.2 Explain why theories may be modified but are rarely discarded.

SC.6.N.3.1 Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual. Thus, the use of the term theory in science is very different than how it is used in everyday life.

Multiple Choice

Identify the choice that best completes the statement or answers the question.

1. In developing a theory, scientists must have evidence to support it. An example is the cell theory. Look closely at the diagram below.



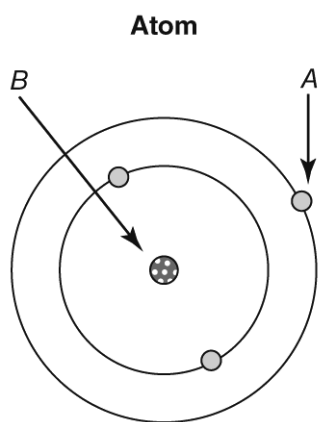
This diagram shows evidence used to support the cell theory. Which statement of the cell theory is supported by this diagram?

- A The cell is the smallest form of life.
 - B Cells contain hereditary information.
 - C Cells come only from preexisting cells.
 - D The cell is the basic unit of all organisms.
2. On June 30, 1908 a tremendous explosion occurred in Siberia in Russia. The explosion was equivalent to the detonation of about 15 million tons of TNT. Many hypotheses have been proposed for what caused the explosion. One hypothesis is that the explosion was caused by the impact of an extraterrestrial ship. Why is this explanation considered a hypothesis and not developed into a theory?
- A A hypothesis can never lead to the development of a theory.
 - B A hypothesis must be verified by repeated tests using empirical evidence before it can become a theory.
 - C Unlike a hypothesis, a theory is based on careful observations and experimental evidence.
 - D Unlike a hypothesis, a theory can help scientists make predictions by forming if-then statements.

3. The law of universal gravitation states that both mass and distance of objects affect the gravitational force between them. Gravitational force increases as the mass of the objects increase. Gravitational force decreases as distance between the objects increases. Why are these statements considered scientific law, and not scientific theory?
- A The statements tells what happens, and not why the event occurs.
 - B This statement involves mass and distance measurements.
 - C This statement explains the attractive force between two objects.
 - D This statement predicts what will happen under certain conditions.
4. Scientists can use the law of conservation of mass to predict how much product will form in a chemical reaction. This law is based upon atomic theory and how atoms behave during reactions. What can you conclude from this information?
- A The atomic theory has limited application in the area of chemistry.
 - B Atoms form the basis of all scientific theories.
 - C A scientific theory can help us understand a scientific law.
 - D A scientific law is the same as a scientific theory.
5. When scientists study the natural world, they may form scientific theories and scientific laws. How does a scientific theory differ from a scientific law?
- A Unlike a theory, a law is not universal.
 - B Unlike a theory, a law describes how the natural world operates.
 - C Unlike a law, a theory is based on observations and experiments.
 - D Unlike a law, a theory can be modified as new evidence is obtained.
6. Scientists often use mathematical relationships when they study the natural world. Which of the following describes the natural world in terms of a mathematical relationship?
- A theory of evolution
 - B law of superposition
 - C theory of plate tectonics
 - D law of universal gravitation
7. In the 1860s, Charles Darwin proposed the theory of evolution. His theory stated that populations change very slowly over a very long period of time. Then in 1972, some scientists took a closer look at the fossil record. They concluded that evolution involves long periods of little change in populations which are interrupted by short periods of rapid change. This finding became part of the theory of evolution. What can you conclude from this information?
- A New evidence can cause a scientific theory to be modified.
 - B New evidence can cause a scientific theory to be discarded.
 - C New evidence can cause a scientific theory to become a law.
 - D New evidence can cause a scientific theory to change into a new theory.
8. Sedimentary rocks are formed particle by particle. Over time, layers of particles are piled one on top of the other. Therefore, in any sequence of layered rocks, a given layer must be older than any layer on top of it. This is know as the law of superposition. This law is fundamental to the interpretation of Earth's history because it indicates the relative ages of rock layers and the fossils in them. What evidence would support the law of superposition?
- A An earthquake occurs so that the rock layers are disturbed.
 - B Sedimentary rock gradually turns into another type of rock.
 - C Fossils in higher layers are not as advanced and complex as the fossils in lower layers of sedimentary rock.
 - D Radiometric dating shows that fossils in lower layers are older than fossils in higher layers of sedimentary rock.

9. Kalinda was trying to explain to her friend the difference between a theory and a law in science. She used the theory of plate tectonics and the law of superposition as examples. Kalinda explained the difference by using nonscientific language. Which statement did Kalinda use to correctly describe the difference between a theory and a law in science?
- A A theory describes a natural event, while a law explains it.
 - B A theory explains a natural event, while a law predicts it.
 - C A theory explains a natural event, while a law describes it.
 - D A theory predicts a natural event, while a law explains it.
10. The atomic theory has been modified many times to explain new experimental data. However, the data have never led to atomic theory being discarded. Why are theories sometimes modified but rarely discarded?
- A Scientists find it easier to modify a theory rather than reject it.
 - B Discarding the theory would mean that all the data used to form the theory were false.
 - C Once a theory has been formed, scientists no longer carry out investigations to test the validity of the theory.
 - D Before scientists form a theory, they have repeatedly verified the hypotheses leading to the theory by carrying out experiments.
11. According to the current theory regarding the extinction of the dinosaurs, the extinction was triggered by the effects of a large meteor that struck Mexico 65 million years ago. What is the **best** evidence of this theory?
- A fossil remains of dinosaurs found in Mexico
 - B magnetic mapping of rocks that reveals a buried crater in Mexico
 - C a permanent change in world sea levels about 65 million years ago
 - D rock studies that show the age of the rocks where the meteor struck
12. One of the following scientists contributed to the modification of atomic theory by showing that electrons orbit an atom's nucleus and that electron orbits have a particular amount of energy. Which scientist and his work led to the modification of atomic theory?
- A Joseph Thomson discovered electrons, which he believed did not move.
 - B John Dalton proposed a model of the atom showing it as a solid sphere.
 - C James Chadwick found that, in addition to protons and electrons, atoms also contain neutrons.
 - D Niels Bohr's research showed that electrons follow specific paths around the nucleus of an atom.
13. In 1897, Joseph Thomson discovered that atoms contained electrons. He proposed a change in the atomic theory of that time, and the theory was modified because of his discovery. Since Thomson's discovery, atomic theory has been further modified. What is the **best** explanation for why scientific theories are modified?
- A Theories more than ten years old are usually out of date.
 - B Scientists want to prove that the work of other scientists is wrong.
 - C New evidence that supports a revision prompts scientists to modify earlier theories.
 - D So much information is available today that it is harder to focus research and disprove theories.
14. Joe tells Mai his theory about why sea turtles nest on the beach instead of in the ocean. He says, "The turtle eggs would sink to the bottom of the ocean, and the baby turtles would drown." Joe says his uncle, a fisherman, told Joe this information. Mai tells Joe that his theory is not scientific. Why does Joe's idea not meet the requirements to be a scientific theory?
- A Joe's idea is already a scientific law.
 - B Joe's idea is not supported by scientific evidence.
 - C Joe's idea is a good guess that can be tested by experiments.
 - D Joe and his uncle are not scientists.

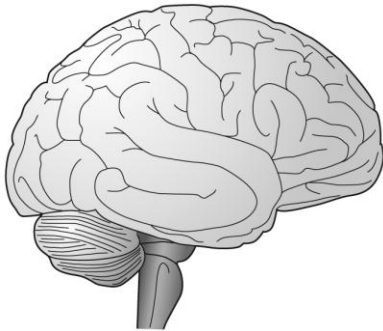
15. Which phrase defines a scientific theory?
- A an untested idea
 - B an educated guess
 - C an accepted description
 - D a well-supported explanation
16. Which statement belongs in a scientific theory about how hurricanes form?
- A Hurricanes get bigger over warm water.
 - B The eye is the calmest part of the storm.
 - C Hurricanes have wind speeds greater than 119 km/h.
 - D Rotating thunderstorms gain energy over warm tropical waters.
17. In which statement does the word *theory* mean *scientific theory*?
- A In theory, the experiment will work as planned.
 - B She has a theory about why the storm arrived later than predicted.
 - C The atomic theory explains that all objects are made up of atoms.
 - D The doctor's prescription for curing a cold is based on his best theory or guess.
18. The fact that atoms and molecules are always in motion helps scientists explain how solids turn into liquids. What is this explanation an example of?
- A a prediction
 - B an observation
 - C a scientific law
 - D a scientific theory
19. The following diagram below shows Niels Bohr's theory about how electrons are arranged in atoms. The electrons are labeled *A* and the nucleus in the center of the atom is labeled *B*.



Which statement describes this model?

- A It is a mathematical model.
- B It is a representation of a real atom.
- C It is a representation of a solid object.
- D It is a smaller version of a real atom.

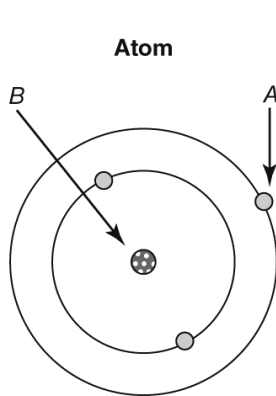
20. This diagram shows one type of model of the brain.



Which item represents another type of brain model?

- A a copy of the human skull
- B the results of a lie detector test
- C the results of an intelligence test
- D a three-dimensional brain x-ray

21. Although a scientific theory is well supported and widely accepted, what might cause it to change?



- A new evidence
- B a scientific law
- C individual claims
- D a scientific model

22. Cesar reads about the big bang theory, which explains that the universe expanded as the result of an explosion. He wants to evaluate whether this theory is a good one. Which statement is a characteristic of a good theory?

- A It is the idea of only one scientist.
 - B It does not change as time passes.
 - C It is not supported by scientific evidence.
 - D It changes with new observations made by astronomers.
23. The theory of evolution describes how organisms change over time. Scientists now use information in the DNA of living organisms to understand how they are related. The theory of evolution was developed before scientists discovered DNA; however, these new data still fit with and support the theory. What does this sequence of events tell us about the theory of evolution?
- A It is a bad theory because it makes scientists biased.
 - B It is a good theory because it is able to explain new evidence.
 - C It is a good theory because it has changed greatly over time.
 - D It is a bad theory because it was formed before the discovery of DNA.

24. The table shows events that led to the current theory that the sun is the center of the solar system.

	Event
1	Scientists observe planetary motion that cannot be explained if Earth is the center of the universe.
2	Scientists accept the theory that the planets and sun travel around Earth.
3	Scientists develop the theory that the planets travel around the sun.

Which sequence of events is correct?

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

25. The diagram shows Niels Bohr's theory about how electrons are arranged in atoms. He thought electrons traveled on specific paths around a nucleus. The current theory is that electrons exist in a certain cloudlike region around a nucleus.

How would a model of the current theory DIFFER from Bohr's model?

- A It would be the same as Bohr's model
- B object A would differ from Bohr's model
- C object B would differ from Bohr's model
- D both objects A and B would differ from Bohr's model