

Maine High School Assessment

STUDENT PRACTICE TEST BOOKLET

RELEASED 2014 SCIENCE ITEMS

Maine Department of Education

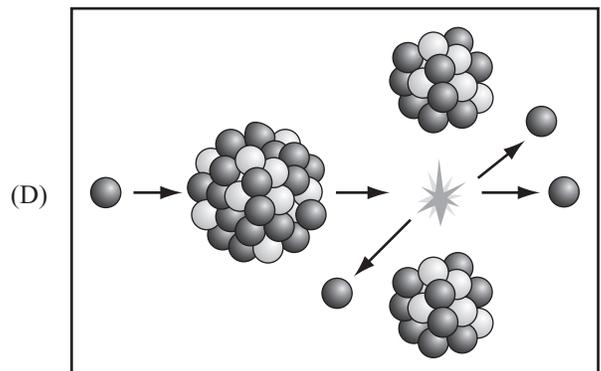
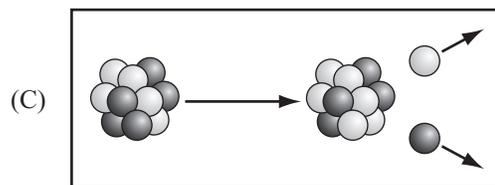
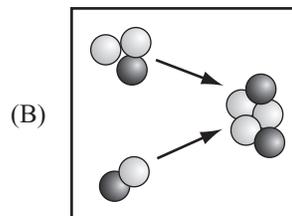
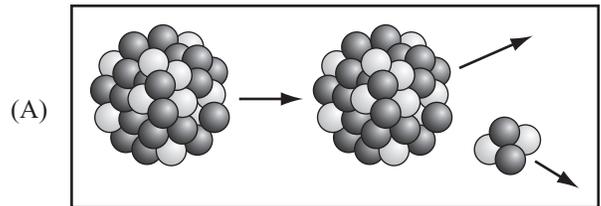
Directions: Read questions 1 through 20 and decide which is the best of the choices given. Fill in the corresponding circle on page 2 in your practice test answer booklet. You may use any available space in your practice test booklet for scratchwork.

- Which discovery supports the big bang theory?
 - Distant galaxies are moving away from Earth faster than nearer galaxies.
 - Black holes have the greatest gravitational pull of any object in the universe.
 - Planets clear their orbital paths around the Sun.
 - Stars orbit a bright core in many galaxies.

- Which statement describes a characteristic of light that is used in the measurement of a light-year?
 - The amplitude of light determines its brightness.
 - The wavelengths of light range from 400 to 700 nanometers.
 - Light can be attracted to black holes.
 - Light travels at a constant speed.

- A scientist finds an unknown species of big cat. The scientist believes that it is most closely related to either a panther or a lynx. How can the scientist provide the evidence needed to correctly classify the cat?
 - determine which big cat species has the closest DNA sequence to the unknown species
 - measure the length of the tail and compare it to the other big cat species
 - compare the size of the teeth of the unknown species to the other big cat species
 - determine which habitat of the big cat species is closest to the unknown species

- Which diagram shows a nuclear fusion reaction?

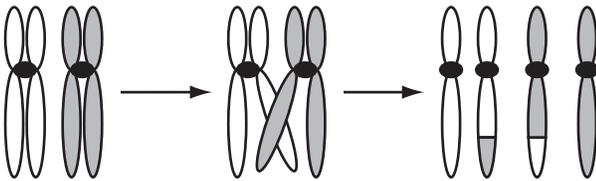


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5. Based on similarities in function, the different parts of a house can be used as models of the different parts of a cell. The furnace of a house is a model for which part of a cell?

(A) cell membrane
 (B) ribosome
 (C) mitochondrion
 (D) endoplasmic reticulum

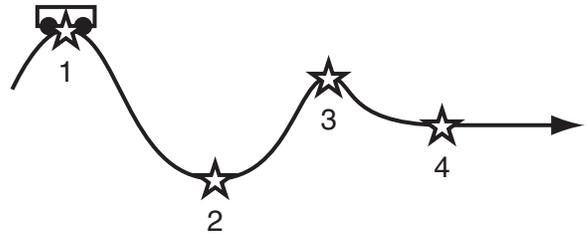
6. The process of crossing over during meiosis is illustrated in the diagram below.



What is the effect of crossing over?

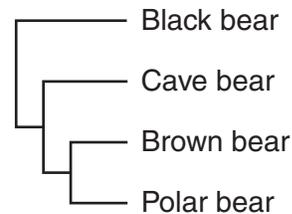
- (A) It increases the number of genetic combinations in gametes.
 (B) It allows diploid cells to form after fertilization.
 (C) It decreases the likelihood of mutations in gametes.
 (D) It ensures that the chromosome number stays the same.
7. A plant population grows on the forest floor where there is a low level of light. If the plants become crowded, which plants are most likely to survive?
- (A) plants that become consumers
 (B) plants that grow tall quickly
 (C) plants that have small leaves
 (D) plants that spread roots

8. The diagram below shows a cart rolling along a track.



At which location does the cart have the most kinetic energy?

- (A) location 1
 (B) location 2
 (C) location 3
 (D) location 4
9. The diagram below shows a phylogenetic tree of four bear species.

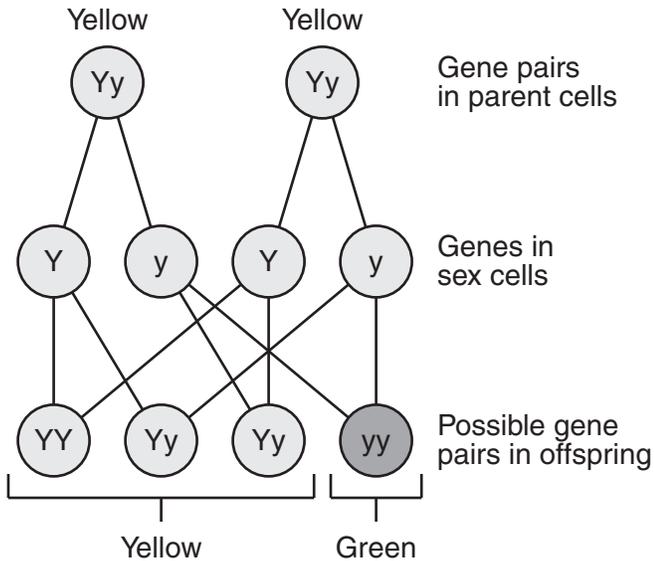


Which two species are most closely related?

- (A) polar bear and brown bear
 (B) brown bear and cave bear
 (C) black bear and polar bear
 (D) black bear and brown bear

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10. Gregor Mendel did genetic research with pea plants. He discovered that a cross between two parents with yellow seeds could result in offspring with green seeds, as shown in the diagram below.



Which statement best explains how parents with yellow seeds can produce offspring with green seeds?

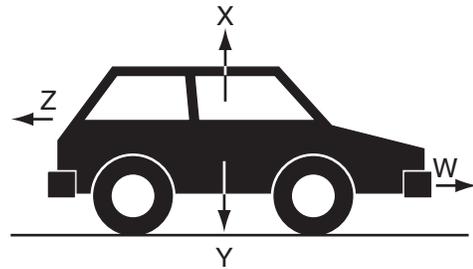
- (A) Recessive genes from each parent combine to form a gene pair in the offspring.
- (B) Dominant genes from each parent combine to form a gene pair in the offspring.
- (C) Differentiation during offspring development turns on the genes for green seeds.
- (D) Offspring with green seeds are more likely to survive than offspring with yellow seeds.

11. Photosynthetic organisms are organisms that use energy from the Sun to build glucose molecules. What else do photosynthetic organisms need to build glucose molecules?

- (A) carbon dioxide
- (B) amino acids
- (C) lipids
- (D) oxygen

12. Four different forces are acting on a car that is accelerating, as shown below.

Forces Acting on Accelerating Car

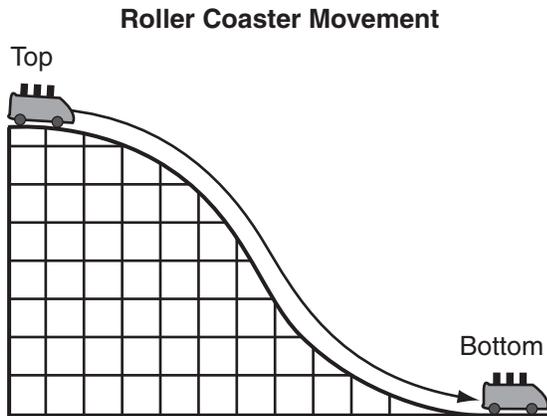


Which pair of forces are not balanced so that the car continues to accelerate?

- (A) X and Y
- (B) Y and Z
- (C) W and X
- (D) W and Z

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13. The diagram below shows a roller coaster car rolling down a ramp.



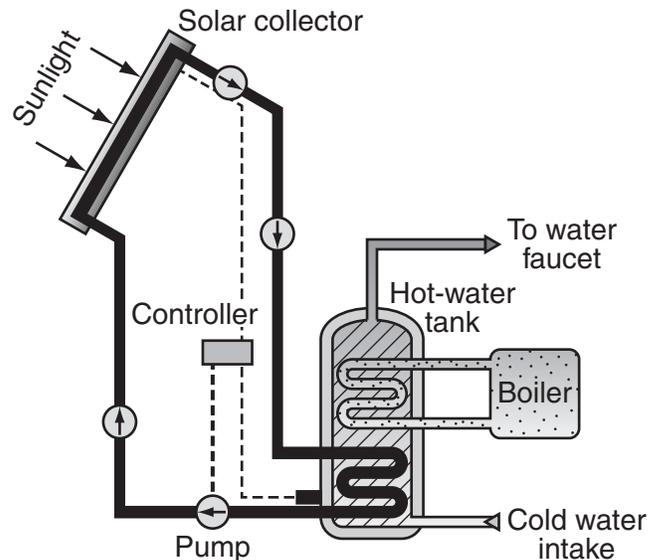
Which statement best explains why the roller coaster car's brakes are warmer when the car reaches the bottom of the ramp than when the car was at the top of the ramp?

- (A) The brakes absorbed heat from the atmosphere.
- (B) The potential energy of the roller coaster car increased.
- (C) Some of the kinetic energy of the roller coaster car turned into heat.
- (D) Some of the heat from the ramp was transferred to the brakes.
14. An asteroid travels on a path that stays within the solar system. What causes the asteroid to stay within the solar system?
- (A) Light from the Sun attracts the asteroid.
- (B) Gravitational force from the Sun pulls the asteroid.
- (C) Earth's magnetic field attracts the iron core of the asteroid.
- (D) Magnetic forces from outside the solar system repel the asteroid.

15. Which of the following best describes a gene?

- (A) instructions for building a protein
- (B) a DNA sequence that varies from cell to cell
- (C) a protein copy of nuclear material that may mutate
- (D) an RNA sequence that all cells within an organism must follow

16. The diagram below shows a solar-powered hot water system.



Which statement describes an inefficiency of this heating system?

- (A) Heat is given off in tap water that is used in a house.
- (B) Heat is given off as liquid flows from the solar collector to the hot-water tank.
- (C) Heat is given off as boiler water flows through pipes inside the hot-water tank.
- (D) Heat is given off by the liquid from the solar collector as it travels inside the hot-water tank.

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17. A student is investigating the effect of surface area on the rate of a chemical reaction between a solid and a liquid. Which variable should the student manipulate in the investigation?

(A) amount of stirring of the liquid
 (B) concentration of the solid
 (C) particle size of the solid
 (D) temperature of the liquid

18. Which statement best explains why a fertilized egg develops into an organism that is structurally similar to its parents?

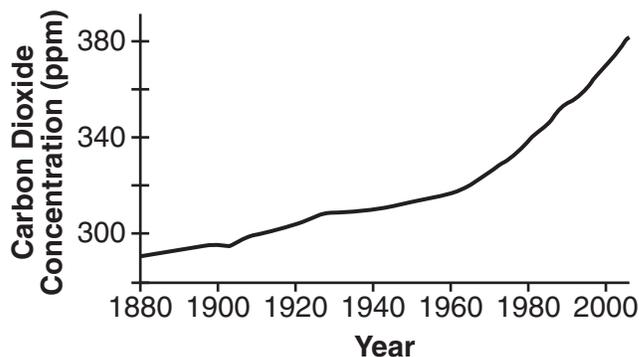
(A) Inherited DNA sends messages to the brain.
 (B) Inherited DNA provides the code for making proteins.
 (C) The fertilized egg is nurtured by its parents.
 (D) The fertilized egg obtains energy from the same sugars its parents utilize.

19. Some modern rail systems elevate the trains from the rails by approximately a millimeter. Which phenomenon creates this “cushion of air”?

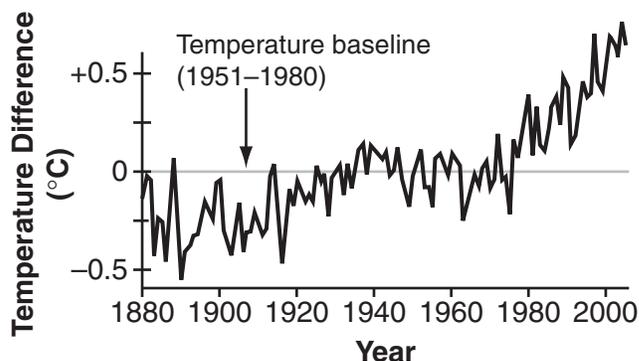
(A) A fluctuating magnetic field polarizes iron oxide particles.
 (B) An electric field converts into rotating mechanical energy.
 (C) Charged particles in motion produce magnetic fields that can repel each other.
 (D) Charged particles are surrounded by electric fields that can repel each other.

20. The two graphs below show changes to Earth’s atmosphere over the past 120 years.

**Annual CO₂ Concentration
1880–2000**



**Annual Temperature Difference
1880–2000**



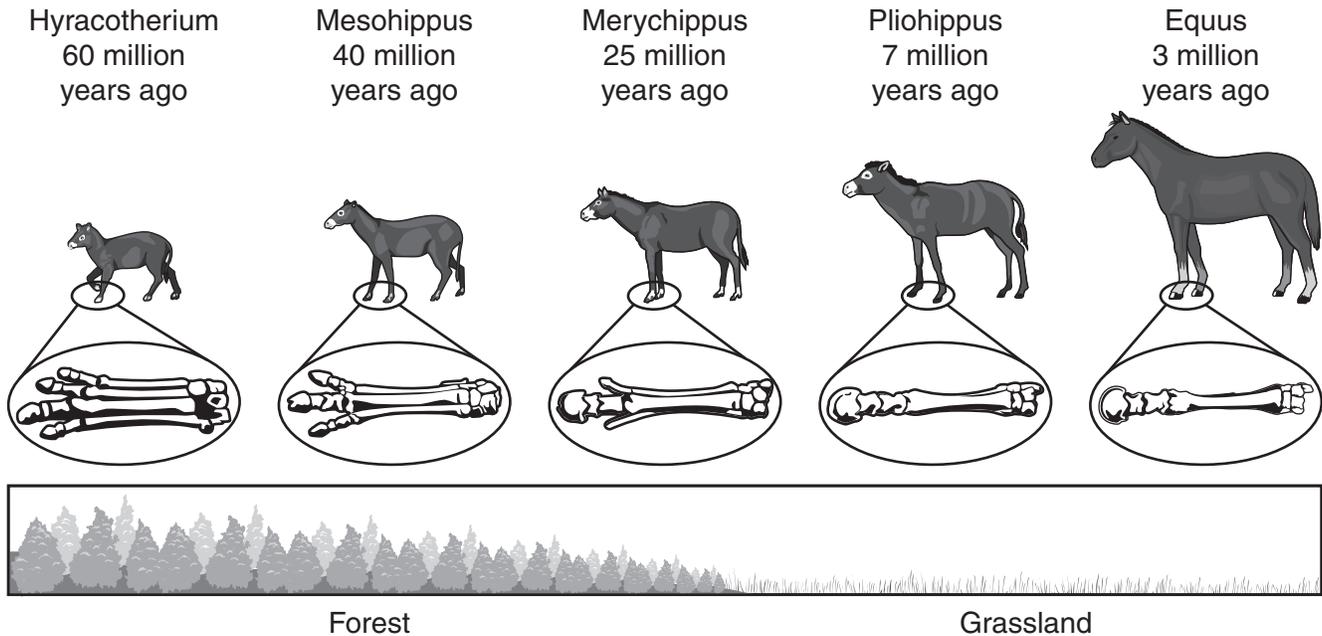
Which conclusion is best supported by these graphs?

- (A) There is a direct relationship between the concentration of atmospheric CO₂ and air temperature.
 (B) Over time, both the concentration of atmospheric CO₂ and air temperature will gradually decrease.
 (C) Over time, both the concentration of atmospheric CO₂ and air temperature will increase exponentially.
 (D) There is no relationship between the concentration of atmospheric CO₂ and air temperature.

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Directions: Write your answers to constructed-response questions 21 and 22 in the boxes provided on pages 2 and 3 of your practice test answer booklet. Be sure to answer and label all parts (a, b, c, etc.) of the questions.

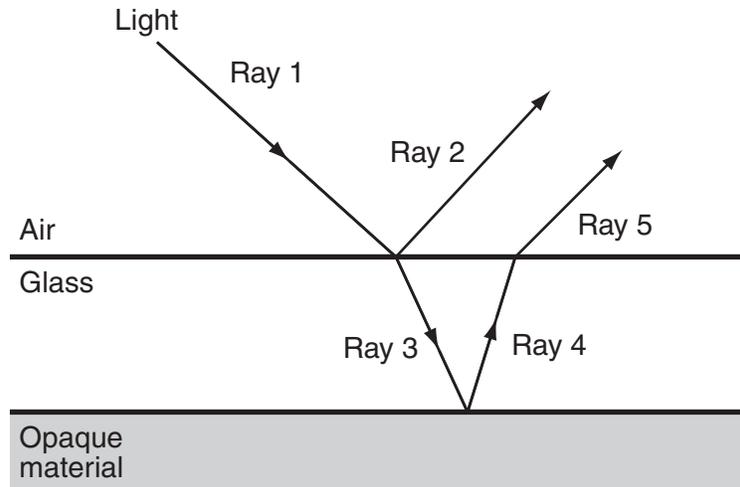
21. The diagram below shows changes to the foot and leg bones of horses over time.



- Based on the information about horses shown in the diagram, provide a conclusion about the changes in horses over the last 60 million years. Use evidence from the diagram to support your conclusion.
- Describe the scientific ideas about the interaction of organisms and environments that lead to changes in a species over time **and** explain how this connects to your conclusion in part a.

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22. The diagram below shows the wave behavior of light in air and in glass.
Rays 1, 2, and 5 are in air. Rays 3 and 4 are in glass.



- Identify and describe two wave behaviors that are shown in the diagram. Use evidence from the diagram to support your answer.
- Describe two differences between Ray 1 and Ray 3. For each difference, explain your answer.

STOP