

Student Name _____

OHIO GRADUATION TESTS



Science

Spring 2009

This test was originally administered to students in March 2009. This publicly released material is appropriate for use by Ohio teachers in instructional settings. This test is aligned with Ohio's Academic Content Standards.

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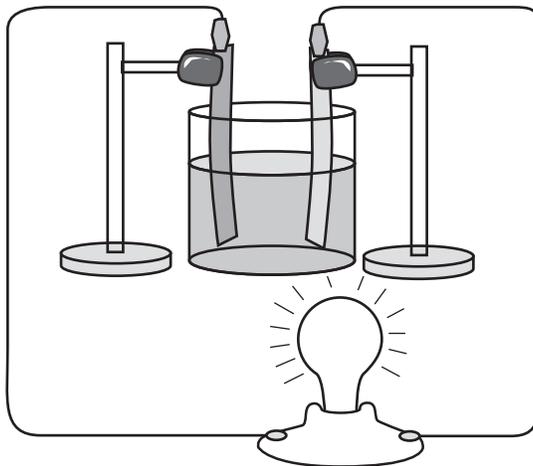
SCIENCE TEST

Directions: For multiple-choice questions, choose the correct answer and then mark the corresponding circle in the Answer Document. If you change an answer, be sure to erase the first mark completely.

Short-answer questions are worth two points. Extended-response questions are worth four points. Point values are printed near each question in your Test Booklet. The amount of gridded space provided for your answer is the same for all two- and four-point questions. Using the gridded space may or may not be necessary to answer the question; however, your response should be written in the gridded space.

Make sure the number of the question in this Test Booklet corresponds to the number on the Answer Document. Be sure to answer the question completely and show all your work in the Answer Document.

1. Strips of two different metals are placed in a solution of acid as shown in the picture below.



What indicates that ions are being formed?

- A. The solution becomes less acidic.
- B. The metal strips begin to swell up.
- C. An odor is emitted by the acid solution.
- D. An electrical current is present between the metal strips.

2. Mosquitoes carry malaria and other diseases. In order to control mosquito populations, a powerful pesticide called DDT was used for many years. DDT entered lakes, ponds, and rivers and accumulated in the tissues of fish. When birds, such as eagles, consumed the fish, they produced eggs with very thin shells. The thin-shelled eggs broke when the parents sat on them and the populations of eagles and other birds suffered. The U.S. government banned the use of DDT in 1972.

How did the banning of DDT most likely affect the population of bald eagles in the United States?

- A. The eagle population rapidly declined after the banning of DDT.
- B. The eagle population was not affected by the banning of DDT.
- C. The eagle population slowly increased after the banning of DDT.
- D. The eagle population increased and then rapidly decreased after the banning of DDT.

3. If you were working for the Center for Disease Control and discovered a new, highly dangerous pathogen, what information should be presented to the public that may prevent a widespread epidemic of the disease?
- A. the fatality rate caused by the pathogen
 - B. a report on how the pathogen is transmitted from one organism to another
 - C. pictures showing microscopic images of the pathogen so they will be familiar with it
 - D. a description of the surface receptors found on the pathogen and the immune response

4. Jackie used a portable electric drill to remove screws from a broken wooden table. He noticed that the screws holding the table together were warm to the touch after being removed from the wood.

What explains this phenomenon?

- A. Mechanical energy from the drill was converted into thermal energy due to friction.
- B. Electrical energy from the drill was converted into chemical energy due to resistance.
- C. Thermal energy from the drill was converted into mechanical energy due to inertia.
- D. The process of removing the screw concentrated the thermal energy that was already present in the wood.

5. What structure is absent in the cells of fungi thereby preventing them from performing photosynthesis?

- A. cilia
- B. nuclei
- C. chloroplasts
- D. mitochondria

6. State two factors and explain how each influences the weather in Ohio.

Respond in the space provided in your **Answer Document**. (4 points)

On the March 2009 Ohio Graduation Science Test, questions 7-12 are field test questions that are not released.

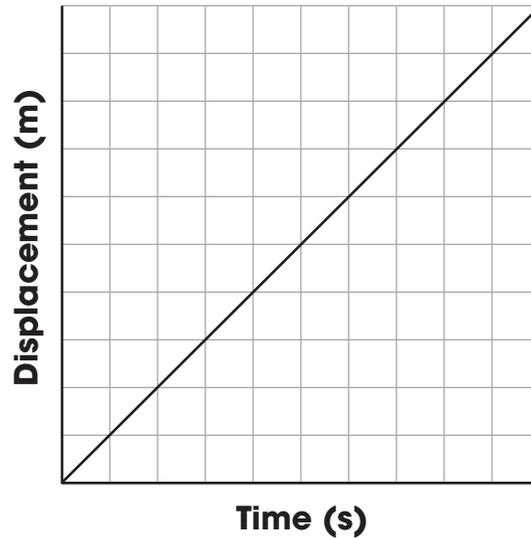
13. Rising ocean temperatures can cause corals to expel the symbiotic algae on which they depend for survival.

Which human influence could be responsible for an increase in this phenomenon?

- A. shoreline erosion
- B. burning fossil fuels
- C. solar power generation
- D. introduction of non-native species

14. A student records the position of a car every second for a period of time and plots the following displacement and time graph.

Displacement vs. Time



Illustrated below is the change in position of a car every second. Which observation of an object moving from left to right did the student record?

Position of a Car



Position of a Car



Position of a Car

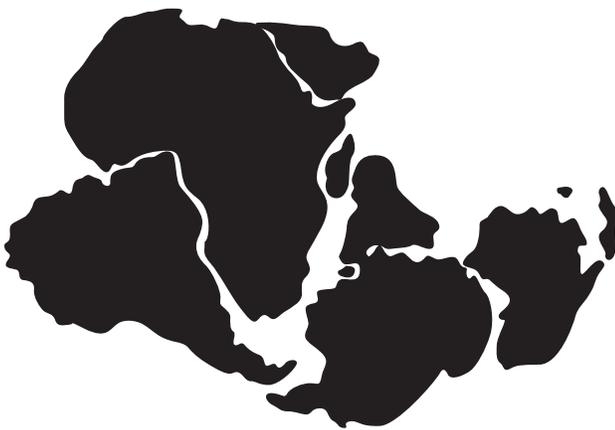


Position of a Car



15. Scientists have hypothesized for years that Earth's continents once formed a single landmass that broke apart and became the continents as we know them today. The model below shows the landmasses (Gondwanaland) as they started to break apart to form South America, Africa, Antarctica, India, and Australia.

Gondwanaland



What evidence best supports the model proposed above?

- A. Igneous rocks have been found on all the continents.
- B. Similar fossils have been found in parts of Africa and South America.
- C. Australia has marsupial species that are not found on other continents.
- D. Indications of sea level changes have been recorded on all the continents.

16. A student walks from inside an air-conditioned building to stand outside on a sunny, sandy beach. The student says that her face and the bottoms of her feet feel warm.

Which statement best describes the thermal energy transfer taking place?

- A. Thermal energy is transferred to her face by radiation, and thermal energy is transferred to the bottoms of her feet by radiation.
- B. Thermal energy is transferred to her face by convection, and thermal energy is transferred to the bottoms of her feet by radiation.
- C. Thermal energy is transferred to her face by radiation, and thermal energy is transferred to the bottoms of her feet by conduction.
- D. Thermal energy is transferred to her face by conduction, and thermal energy is transferred to the bottoms of her feet by conduction.

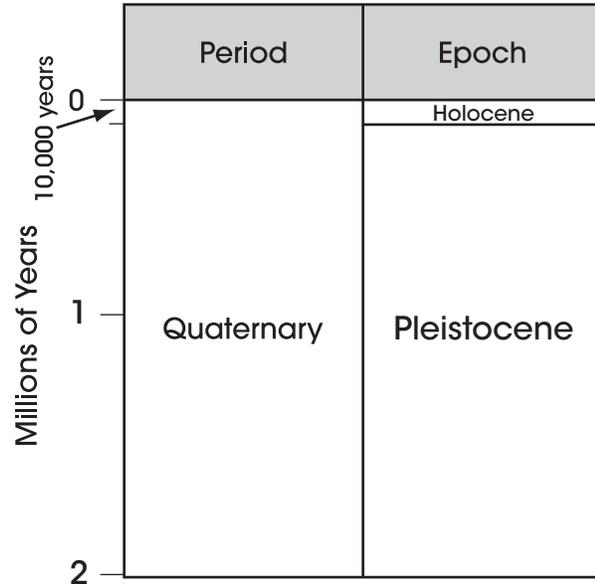
Use the tables to answer question 17.

Table A
Half-lives

Radioactive Isotope	Half-life
Potassium 40	1.25 by
Rubidium 87	48.8 by
Thorium 232	14 by
Uranium 238	4.47 by
Uranium 235	704 my
Carbon 14	5,730 yrs

by = billions of years
my = millions of years

Table B
Partial Cenozoic Time Scale



17. Which isotope from Table A is the only one with applications for dating Holocene materials?

- A. carbon 14
- B. rubidium 87
- C. uranium 238
- D. potassium 40

18. Companies seeking new drug approval are required to conduct clinical trials involving human volunteers. During these trials, people with the disease are separated into different groups. One group receives a placebo (an inert or harmless substance used in controlled experiments). Each of the remaining groups receives a different dose of the drug (i.e., Group A receives a 30 mg dose once a day, Group B receives a 50 mg dose once a day, etc.).

Describe two reasons for testing new drugs at varying doses.

Respond in the space provided in your **Answer Document**. (2 points)

19. Some coal-burning power plants install "chemical scrubbers". These scrubbers reduce the amount of sulfur dioxide (SO_2) that is released when coal is burned.

How does installation of these scrubbers benefit the environment?

- A. reduce the amount of acid rain
- B. reduce the amount of coal mined
- C. increase the amount of atmospheric CO_2
- D. increase the amount of ground level ozone

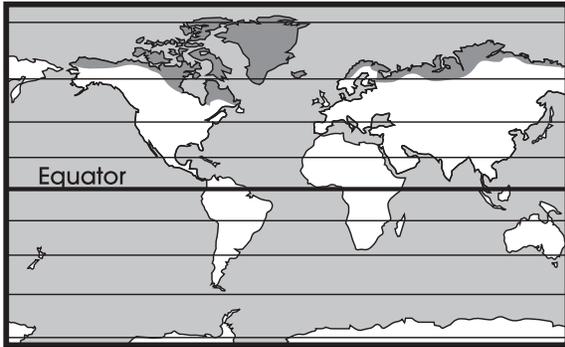
20. Color blindness is a sex-linked trait that is carried on the X chromosome. If a boy is born color-blind, what would have to be true?

- A. His father had normal vision.
- B. His grandmother was color-blind.
- C. His mother carried at least one gene for color blindness.
- D. His grandfather passed on the color-blind trait to his father.

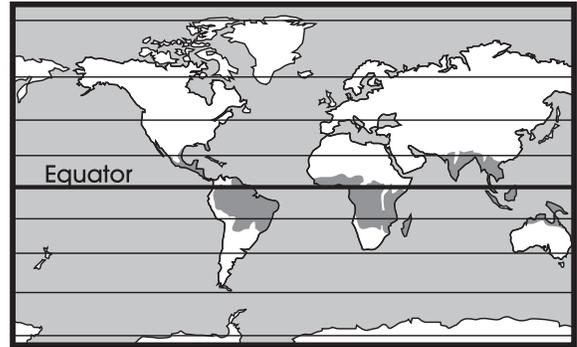
Science

21. On which map do the shaded land areas represent regions where the average annual temperature is greater than 18°C (64.4°F)?

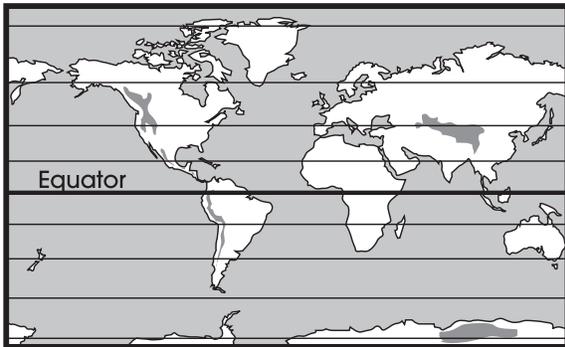
A.



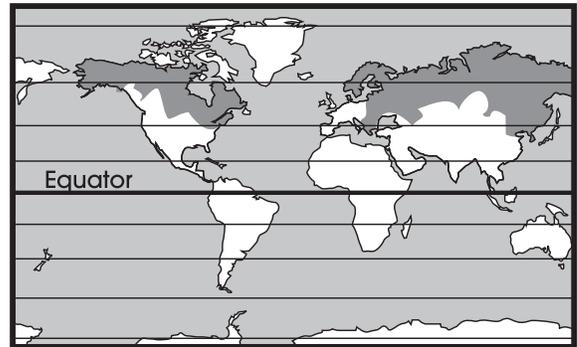
B.



C.



D.



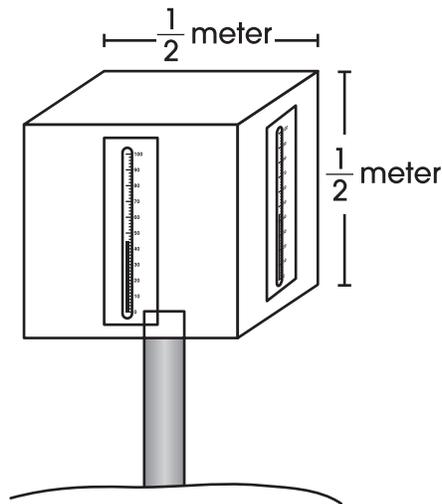
22. Solid copper wire is a good conductor because
- A. copper contains no protons.
 - B. electrons move easily within the wire.
 - C. protons and electrons tend to cluster at opposite ends of it.
 - D. copper contains the same number of protons and neutrons.

Use the information and illustration to answer questions 23 and 24.

Solar Warming

A group of students in Ohio conducted an investigation during the month of January to study the effects of solar warming. The students used a wooden box painted white. The box was mounted on a post in an open area and a thermometer was fastened on each of the four sides. The box was oriented so that each thermometer faced squarely in a different direction: north, south, east or west. The temperature on each thermometer was recorded in degrees Fahrenheit at 12:00 noon during five consecutive days of clear skies.

The picture shows the apparatus used by the students.



The table shows the data collected by the students.

**Effects of Solar Warming
(Temperature in °F)**

	North	South	East	West
Day 1	29	36	32	32
Day 2	29	36	32	31
Day 3	30	37	34	33
Day 4	27	34	32	30
Day 5	30	37	35	33

23. Based on the data, which statement best summarizes the effects of solar warming in January?
- A. Solar warming at noon is greatest on south-facing surfaces.
 - B. Solar warming is greatest in January when the weather is clear.
 - C. Solar warming in Ohio is greatest in the northern part of the state.
 - D. Solar warming increases from the west side of Ohio to the east side of Ohio.
24. When designing the investigation, one student suggested painting the wooden box black. Predict how painting the box black would affect the temperature readings from the four thermometers. Explain your reasoning.

Respond in the space provided in your **Answer Document**. (2 points)

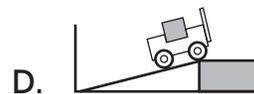
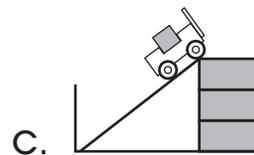
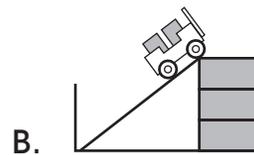
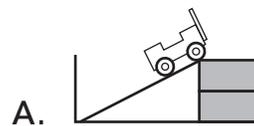
Science

25. A student is studying several species that belong to the plant kingdom. Which two are most closely related?

- A. *Ficus benjamina* and *Ficus lyrata*
- B. *Castilla elastica* and *Ficus elastica*
- C. *Bromus japonicus* and *Ipomoea violacea*
- D. *Fermaldia pandurata* and *Ficus pandurata*

26. All carts shown below are identical 0.5 kilogram metal carts. Blocks placed in the carts have a mass of 1 kilogram each.

Which cart arrangement has the greatest amount of gravitational potential energy with the cart sitting at the top of the ramp as shown in each diagram?



27. An aquatic ecologist collects data about the water quality of an Ohio lake throughout the year. In the summer, the ecologist shares data with a public health official from a nearby town.

Which data would a public health official use to determine whether the water was safe for swimming?

- A. the temperature of the surface water
- B. the amount of dissolved oxygen in the deep water
- C. the number of water lilies, *N. odorata*, growing in the lake
- D. the concentration of *E. coli* bacteria near the surface of the lake

28. Scientists and engineers from The Society of Automotive Engineers (SAE) and National Transportation and Safety Board (NTSB) conduct studies and develop technical guidelines for designers and manufacturers of consumer products. Such guidelines have made possible the development or improvement of collision avoidance systems, passenger and pedestrian safety systems, and safer automotive power and fuel systems.

Which statement accurately describes a positive effect on science and society from studies and guidelines developed by the SAE and NTSB?

- A. SAE and NTSB guidelines are permanent.
- B. SAE and NTSB help scientists and engineers decide how the products will be marketed.
- C. Scientific studies provide the data SAE and NTSB use to develop the guidelines for design standards that scientists and engineers follow.
- D. SAE and NTSB studies and guidelines are used to protect the trademarks, copyrights and patents that scientists and engineers receive on their inventions.

Science

29. Most bacteria reproduce asexually. Mammals reproduce sexually. Describe how these two methods of reproduction differ with respect to the genetic makeup of the offspring produced.

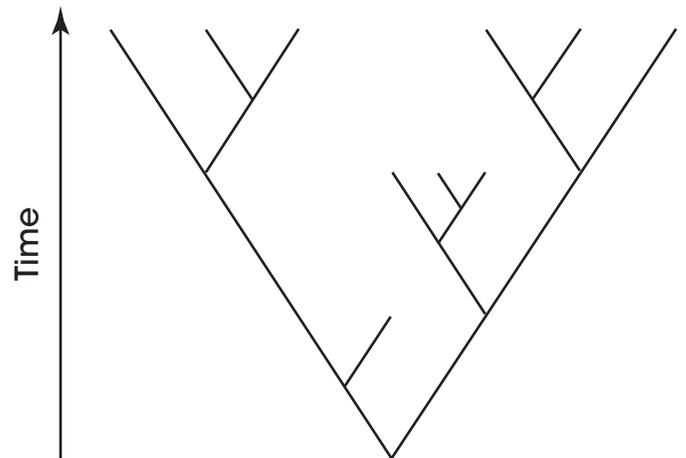
Respond in the space provided in your **Answer Document**. (2 points)

30. An oceanographer is traveling from the west toward the east on the Atlantic Ocean. She collects rock samples from the seafloor every 5 kilometers. The oceanographer stops when she determines that the rock samples are getting progressively younger as she moves toward the east.

What conclusion is best supported by this data?

- A. She is traveling toward a mid-ocean ridge.
- B. She is traveling toward a deep-ocean trench.
- C. She is traveling away from an underwater volcano.
- D. She is traveling away from a hot spot in the crust.

31. The following diagram is found in an evolutionary biology textbook.



This branching tree diagram is most likely used to represent the theory that suggests

- A. new species arise throughout time following rounds of mass extinction.
- B. all species share a common ancestor and that change occurs through time.
- C. speciation occurs very quickly with long periods of no change in between.
- D. all species originated during the same period and some have subsequently gone extinct.

32. Light travels in air at approximately 3.0×10^8 m/s. When it enters a glass window, this speed is reduced to about 2.0×10^8 m/s. When the light re-enters the air, what will the speed of light be?

- A. 2.0×10^8 m/s
- B. 2.5×10^8 m/s
- C. 3.0×10^8 m/s
- D. 5.0×10^8 m/s

33. A student has set up an artificial ecosystem for a class project. This ecosystem has producers, first-level consumers, second-level consumers, and third-level consumers. By accident, a chemical enters the ecosystem and kills all of the first-level consumers.

Which group(s) of organisms will most likely survive?

- A. producers
- B. second-level consumers
- C. second-level and third-level consumers
- D. third-level consumers and producers

34. An astronomer investigating a star determines that the light wavelengths she observes are longer than those expected to be emitted by the star.

What can be concluded about the motion of the star relative to Earth's position?

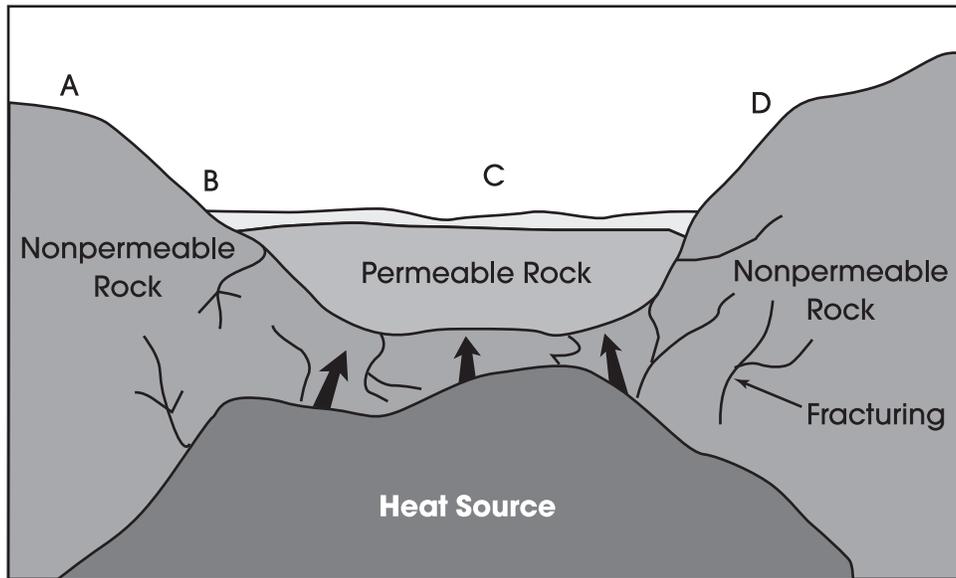
- A. The star is moving closer to Earth.
- B. The star is moving away from Earth.
- C. The star is accelerating faster than Earth.
- D. The star is accelerating at the same speed as Earth.

35. A teacher gives a student a non-toxic, odorless, white powder to identify. Generate four questions, each regarding a different property of the unknown powder, that could be safely tested and answered in the laboratory.

Respond in the space provided in your **Answer Document**. (4 points)

Use the diagram below to answer question 36.

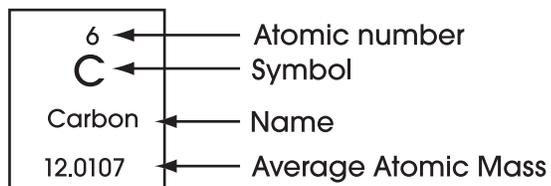
Cross Section of an Area of Earth's Crust



36. In which area of the diagram above is a geyser most likely to form?

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

Use the diagram to answer question 37.



37. The atomic number of carbon is 6, which means that carbon atoms always have 6

- A. ions.
- B. protons.
- C. neutrons.
- D. valence electrons.

Science

38. An earth science teacher places four pieces of carpet padding, representing sedimentary layers, between two large book ends, as shown in Figure 1. She then pushes the book ends toward each other, as shown in Figure 2.

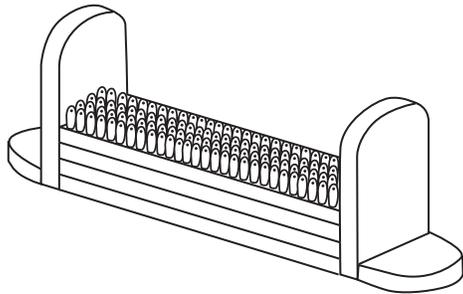


Figure 1

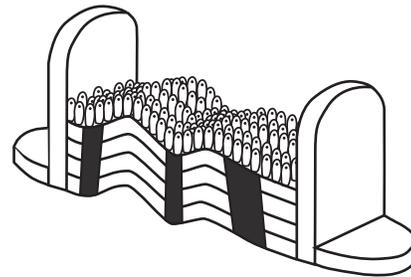
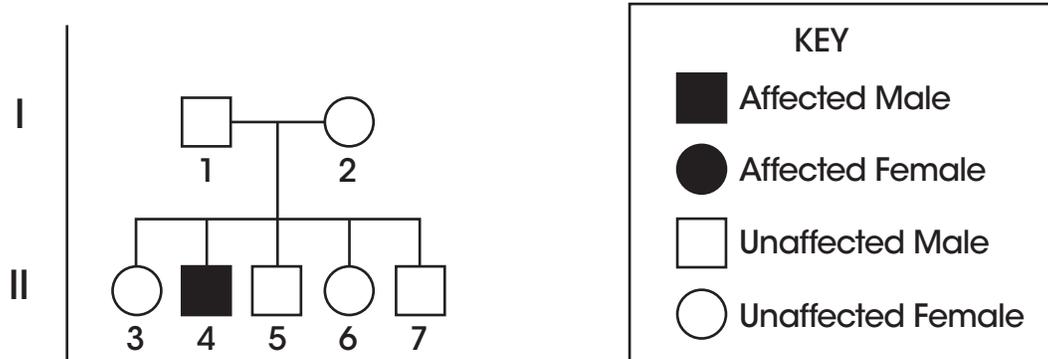


Figure 2

What geologic process has the teacher demonstrated?

- A. folding
- B. faulting
- C. convection
- D. divergence

39. The pedigree below shows the inheritance pattern of a recessive allele (z) that results in a genetic disease.



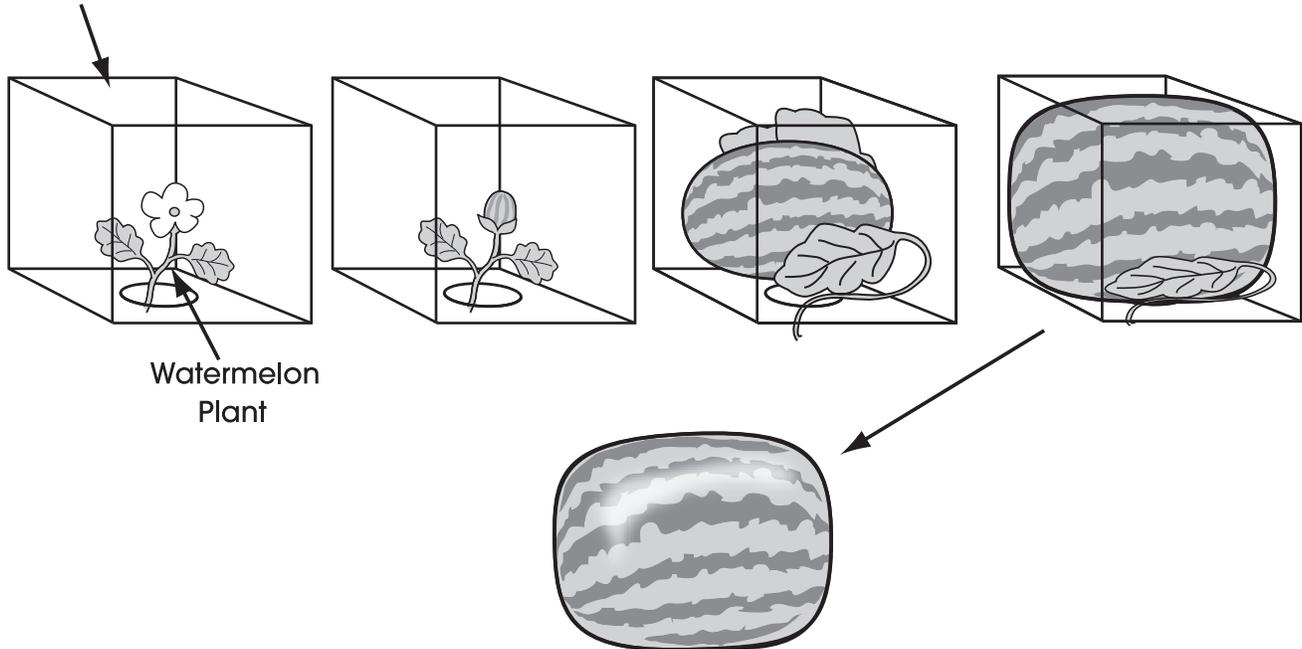
Based on the inheritance pattern, what are all the possible genotypes for individual 6?

- A. Zz
- B. ZZ and zz
- C. ZZ and Zz
- D. ZZ, Zz and zz

Science

40. In a recent agricultural experiment, farmers in Japan inserted fertilized watermelon blooms into square containers, which resulted in the fruit taking the shape of its container as it grew.

Clear container



Describe two benefits of farming practices that produce square watermelons.

Respond in the space provided in your **Answer Document**. (2 points)

41. Geneticists have determined that the majority of individuals in an isolated island population have blood type B. Type A blood is found to be more common in the mainland population from which the island was settled.

How could a geneticist best explain the dominance of blood type B in the island population?

- A. Random mutations have occurred in the island population.
- B. Genetic drift has reduced the frequency of type A individuals.
- C. Natural selection has only occurred in the mainland population.
- D. Environmental conditions on the island are less favorable for type B individuals.

42. Graphite and diamond are both forms of pure carbon. Graphite is soft and grey while diamond is hard and transparent. The physical properties of graphite and diamond differ due to

- A. the charge of their electrons.
- B. their average kinetic energy.
- C. the bonds between their atoms.
- D. the number of neutrons in their nuclei.

43. The White Cliffs of Dover are made of a white sedimentary stone called chalk, which was formed when shells and skeletons of small marine organisms were deposited in a thick layer.

An examination of the Cliffs of Dover from top to bottom would show a change from

- A. younger fossils to older fossils.
- B. simple fossils to complex fossils.
- C. igneous rock to sedimentary rock.
- D. marine organisms to land organisms.

44. Due to a loss of habitat, hunting, drought, disease, and inbreeding, the cheetah population has declined in number and is close to extinction. The current cheetah population has very little genetic variation.

Which is a result of the limited genetic variation in the current cheetah population compared to earlier cheetah populations with more variation?

- A. Current populations of cheetahs are more resistant to diseases.
- B. The survival rate of young cheetahs is increased in current populations.
- C. Current populations of cheetahs are less likely to be able to adapt to environmental changes.
- D. Current populations of cheetahs are able to interbreed with other species, increasing genetic variation.

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