Longitudinal Study of American Youth

SCIENCE

(Form M)

INTRODUCTION

This booklet contains questions about science for you to answer. You will be able to answer some of the questions quickly and others will require more thought. Please do not feel discouraged if you are not absolutely sure of an answer. Some questions will ask about things you have covered in class, but others will not. Please do your best to answer each question. If you are not sure of the answer, read the question again, and make your best guess.

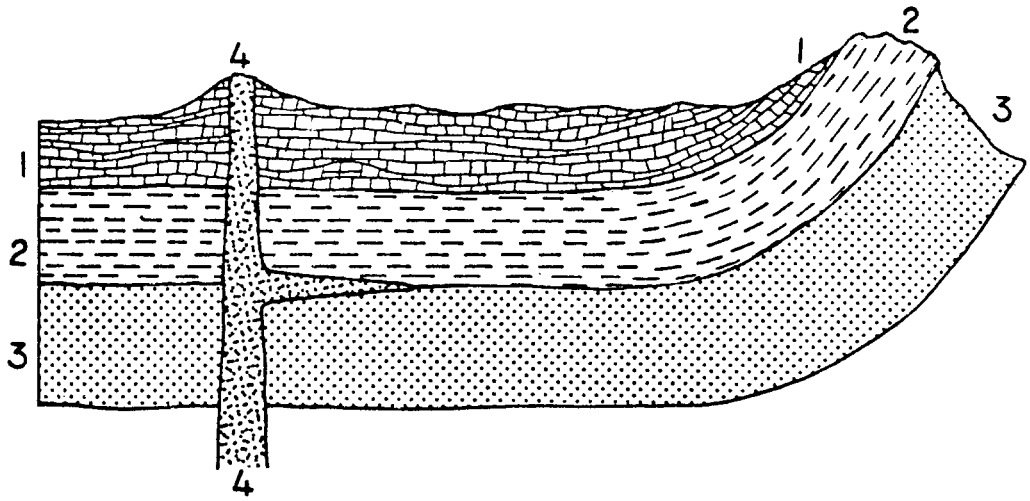
MARKING YOUR ANSWERS

Each question is followed by a set of possible answers labeled A, B, C, etc. Read each question carefully, then choose the *one* answer you think is the best, and darken in the letter on your *Answer Sheet* next to the number for that question. Be sure to mark only *one* letter for each question. Do not skip any questions.

Do not make any stray marks on your *Answer Sheet*. Do all of your calculations on the Question Booklet, and use the *Answer Sheet* only to record your answers.

If you have any questions while taking this test, raise your hand, and the person giving the test will come to your seat to help you.

► Questions 1-2 refer to the following picture.



This diagram represents a cross-section of one part of the earth's crust. Layers 1, 2, 3 and 4 are each different kinds of rock.

1. Which layer is oldest?

(A) 1
(B) 2
(C) 3
(D) 4

2. The layers curve up on the right side of the diagram. How can the curve of Layer 2 be explained?

(A) Layer 2 is sedimentary rock which was formed by sediment collecting on an underwater hillside.
(B) Layer 2 was probably flat once, but it has been bent by huge earth forces.
(C) There must be something wrong with the diagram because all rock layers are flat and level. N407302

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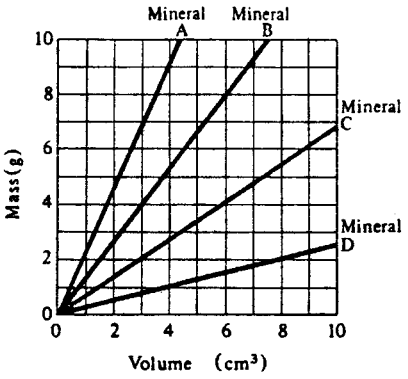
3. What is the probability that two people who are hybrid for brown eyes (*Bb*) will have a blue-eyed child? (*B* = genes for brown eye color, b = genes for blue eye color)

(A) 0%
(B) 25%
(C) 50%
(D) 75% N432601

4. Which statement best describes how the earth's rocks change over billions of years?

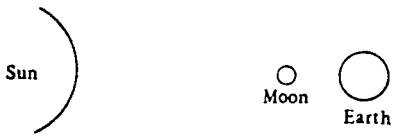
(A) Large rocks break up into smaller and smaller pieces, until most of the whole surface is sand.
(B) Grains of sand form together into larger and larger pieces until most of the surface is solid rock.
(C) Large rocks break up and are eventually formed back into rocks, and so on over and over again.
(D) Large rocks and sand stay side by side with very little change. N407801

5. If you wish to obtain a sample of the mineral that has the greatest mass for a given volume, which of the minerals should you select?



(A) A
(B) B
(C) C
(D) D N436801

6. When the Moon, the Earth, and the Sun are in the same line, as shown below, which of the following could occur?



(A) An eclipse of the Sun could occur.
(B) An eclipse of the Moon could occur.
(C) The Moon could be pulled out of its orbit toward the Sun.
(D) The spin of the Earth could be speeded up. N414401

7. Which of the following is the best way to induce an electrical current in a coil of wire?

(A) Heating the coil uniformly
(B) Surrounding the coil with oil
(C) Pounding the coil with a hammer
(D) Rotating the coil in a magnetic field
(E) Stroking the coil with a piece of cat's fur N407901

8. Which of the following is NOT an example of a chemical change?

(A) A log burning
(B) A nail rusting
(C) An ice cube melting
(D) An apple rotting

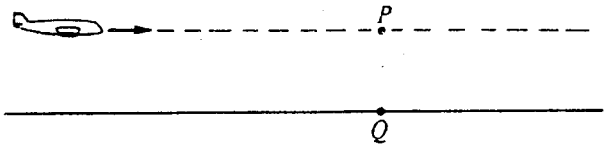
N420201

9. Which of the following best explains why insects or birds that are introduced to a new country often become pests in the new area?

(A) Their food supply in the new country is unlimited.
(B) The new country produces beneficial mutations.
(C) The predators of their former habitat are lacking in the new country.
(D) Competition among them increases.

N428001

10.



An airplane flies in a straight level line at constant speed as shown above. A package is to be dropped from the plane so that it hits a target at point *Q*. Point *P* is directly over the target. When should the package be dropped?

(A) At a certain time before the plane reaches point *P*
(B) At the instant that the plane reaches point *P*
(C) Immediately after the plane passes point *P*
(D) Several seconds after the plane has passed point *P*

N422201

11. Polaris, the North Star, will appear most directly overhead to an observer at which of the following places in the Northern Hemisphere?

(A) Near the equator
(B) In Miami
(C) In Seattle
(D) Near the North Pole

N420601

12. Due to the expansion of our universe, the wavelenghts of the light from the most distant stars are shifted to longer wavelengths. A combination of which two of the following instruments could be used to measure this property of the distant stars?

I. Telescope
II. Microscope
III. Spectrometer
IV. Thermometer

(A) I and II
(B) I and III
(C) II and III
(D) III and IV

N418001

13. Which of the following best explains why marine algae are most often restricted to the top 100 meters in the ocean?

(A) They have no roots to anchor them to the ocean floor.
(B) They are photosynthetic and can live only where there is light.
(C) The pressure is too great for them to survive below 100 meters.
(D) The temperature of the top 100 meters of the ocean is ideal for them.

N432901

14. Can you see a single atom with an ordinary microscope?

(A) Yes
(B) No

N404803

15. How do air masses that form over oceans during the winter compare with air masses that form over continents during the winter?

(A) The air masses that form over oceans are colder and drier than air masses that form over continents.
(B) The air masses that form over oceans are colder and wetter than air masses that form over continents.
(C) The air masses that form over oceans are warmer and drier than air masses that form over continents.
(D) The air masses that form over oceans are warmer and wetter than air masses that form over continents.

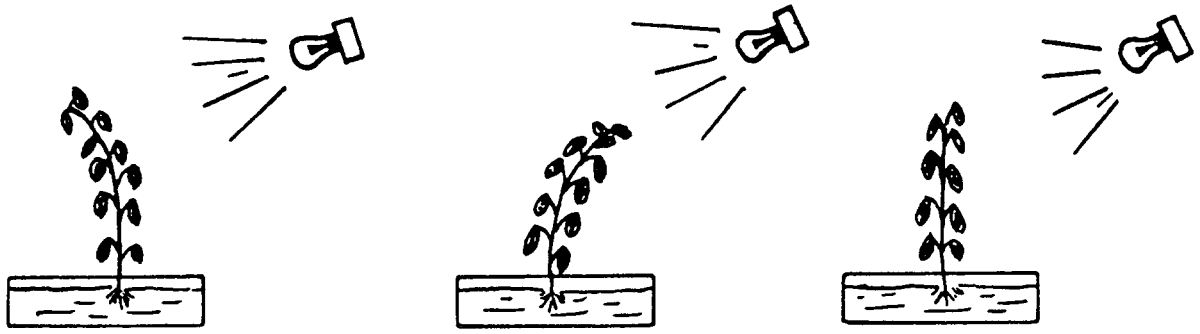
N408201

16. A science class experimented on twenty mice to see if eating sugar causes cavities in their teeth. A special food which was half sugar was fed to the mice for a year. Sixteen of the twenty mice got cavities in their teeth. Which one of the following procedures would have improved the experiment?

(A) Feeding the mice more sugar
(B) Repeating the experiment over again in the same way and comparing the results
(C) Having another group of mice that didn't get any sugar and comparing the two groups
(D) Keeping the experiment going until all the mice had cavities

N408401

17. A teacher left a plant in a dark classroom during the school's ten day spring break. She placed a light near the plant, and she watered the plant well. When students returned to school after spring break, what do you think the plant looked like?



(A) (B) (C)

N401201

18. Which of the following produces the antibiotic penicillin?

(A) Protists
(B) Molds
(C) Protozoa
(D) Algae

N419101

19. Which of the following is true of the process of respiration?

(A) It is universal in animals and plants.
(B) It is universal in animals but limited to a few plants.
(C) It is universal in plants but limited to a few animals.
(D) It is limited to vertebrate animals and green plants.

N420101

20. Recently, some forests were cleared in the Himalayan Mountains. What could have happened as a result of this clearing?

(A) Colder weather in the hills
(B) Less rain on the plains below
(C) Floods on the plains below
(D) Snow in the mountains
(E) Warmer weather in the hills

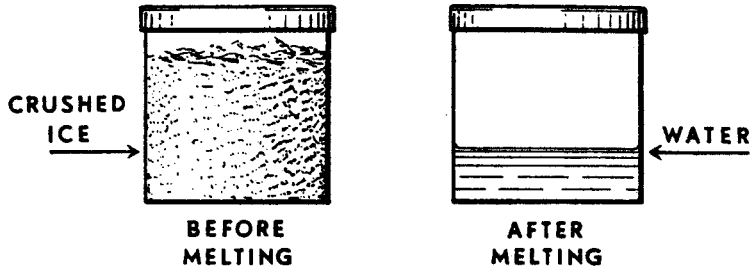
N407701

21. The volume of water put into a tank is equal to the rate of flow multiplied by the time it flows. An equation that shows this relationship is

(A) volume = rate × time.
(B) rate = volume × time.
(C) time = rate × volume.
(D) time = rate/volume.
(E) volume = time/rate.

N409301

22. The can below was filled with crushed ice, sealed, and weighed. The ice was melted by slowly warming the can and its contents. No water vapor escaped and no air entered the can.

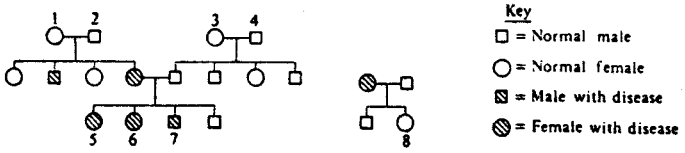


The can was then weighed again. Which one of the following results would you expect to find?

(A) The weight was the same.
(B) The weight was more.
(C) The weight was less.

N405101

23. The pedigree chart below shows the occurrence of a hypothetical inherited disease.



If individual 7 marries Individual 8, what is the chance that any of their children will have the disease?

(A) 0
(B) 25%
(C) 50%
(D) 100%

N430003

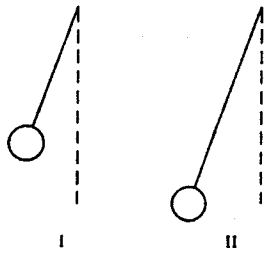
24. Beaker I contains 200 milliliters of water and beaker II contains 400 milliliters of water. Both beakers are initially at 25°C.

If the two beakers are heated at the same constant rate for 2 minutes, how will the temperature of the water in them compare?

(A) It will be higher in beaker I than in beaker II.
(B) It will be higher in beaker II than in beaker I.
(C) It will be the same in both beakers.

N423901

25.



The bobs of two pendulums shown above have the same masses and volumes. The string of pendulum I is 100 centimeters long and the string of pendulum II is 150 centimeters long.

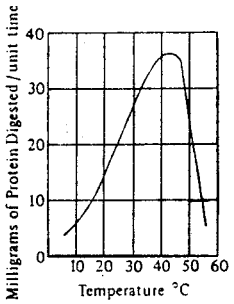
A student holds each bob at its starting angle of 20°, and then releases both bobs simultaneously.

How does the period (time for one complete swing) of pendulum I compare with the period of pendulum II?

(A) The period of pendulum I is greater.
(B) The periods of pendulums I and II are the same.
(C) The period of pendulum II is greater.

N424901

26.



The graph above shows how temperature affects the rate of digestion of a protein by an enzyme. Based on the information above, which of the following is true?

(A) Digestion of this protein is equally effective at 35°C and 55°C.
(B) Any enzyme will digest this protein at 40°C.
(C) This enzyme is most effective for digesting this protein between 35°C and 45°C.
(D) An increase in temperature always increases the rate at which this protein is digested. N427101

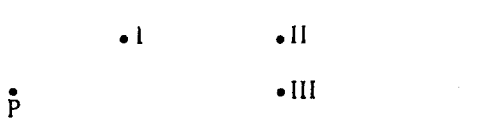
27. If a stone is a diamond, it can scratch glass. Stone B can scratch glass. Which of the following statements about stone B is true?

(A) It is a diamond.
(B) It is not a diamond.
(C) There isn't enough information to tell whether or not it is a diamond. N413301

28. Elements with chemical characteristics most similar to those of sodium are listed in what part of the periodic table?

(A) Immediately to the right of sodium in the same row
(B) Immediately to the left of sodium in the same row
(C) Above and below sodium in the same column
(D) On the far right of the periodic table N419601

29.



Objects are placed in front of an ordinary mirror at points I, II, and III as shown in the diagram above. Which of the objects can be seen in the mirror by a person at point P?

(A) I only
(B) II only
(C) II and III only
(D) I, II, and III N430601

30. The shape of the Earth's shadow during an eclipse of the Moon indicates that the shape of the Earth could be like which of the following?

(A) A cylinder
(B) A doughnut
(C) A pyramid
(D) A cube N429201

31. Which of the following best explains why logs can be floated down a river?

(A) Wood has a lower mean density than water and so will remain only partly submerged in the water.
(B) The buoyant force of the water on the logs is less than the weight of the logs.
(C) River water has a greater density than pure water because river water contains many dissolved minerals.
(D) Logs are not porous and so they cannot absorb any water. N422301

32. Ten grams of A is added to 8 grams of B, and the container is capped. In the resulting chemical reaction, all of A and all of B are used to produce 6 grams of C and a certain amount of D. Chemicals A, B, C, and D are the only chemicals involved in this reaction. How much D is produced?

(A) Less than 12 grams
(B) 12 grams
(C) More than 12 grams
(D) It depends on what the chemicals are. N411601

33. One hundred pea seeds were put in Petri dishes and covered with wet paper towels. The dishes were put inside black plastic sacks and carefully divided between two temperature-controlled incubators set to different temperatures.

The experiment was apparently designed to study the effect of which of the following variables on the germination of pea seeds?

(A) Seed type
(B) Water
(C) Light
(D) Temperature N431901

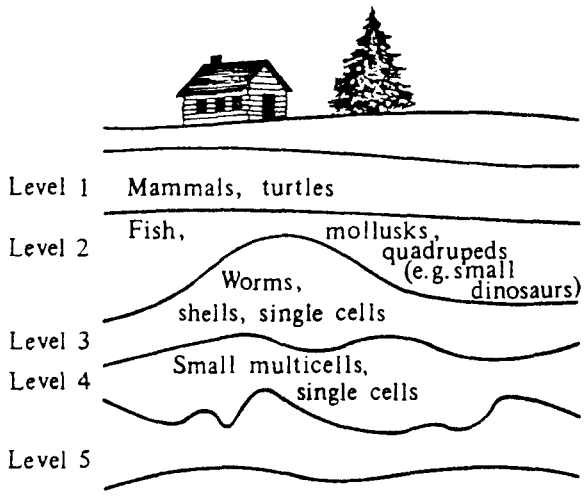
34. Animal bones, seashells, and a certain mineral, all found in shallow ocean water, combine to form the rock limestone. Limestone is found in the state of Ohio. What would this information lead scientists to conclude about Ohio?

(A) Ohio is a good area for geologists.
(B) An unusual number of animals died in Ohio in the past.
(C) Part of Ohio was probably once covered by an ocean.
(D) Many fish live in Ohio. M416401

35. Which part of the blood carries most of the oxygen to the body?

(A) Plasma
(B) Platelets
(C) Red cells
(D) Serum
(E) White cells N405201

36.

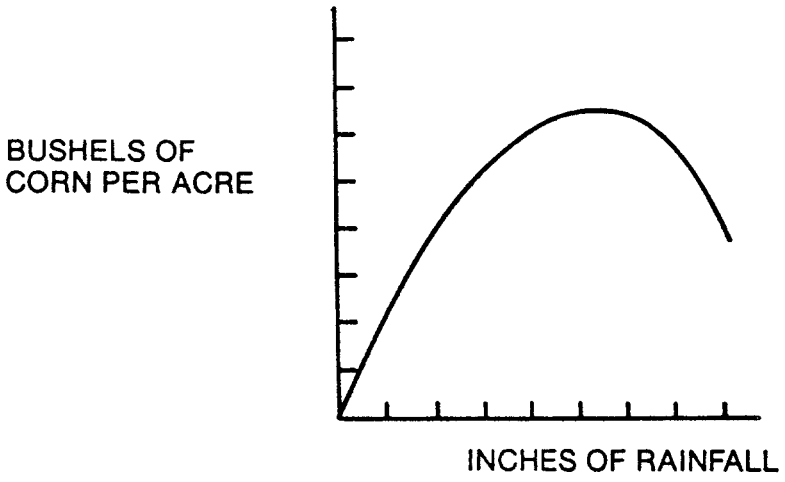


The drawing above shows a side view of rock layers containing various kinds of fossils. Which of the following can you conclude from the drawing?

(A) Organisms at level 1 are older than those at level 2 because their fossils are smaller.
(B) Organisms at level 2 are youngest because their fossils have shapes similar to those of modern organisms.
(C) Organisms at level 4 are the oldest because they are in the lowest layer that contains fossils.
(D) There are no organisms in level 5 because there has not been enough time for fossils to sink to that level.

N423301

37. Which one of the following is the best conclusion you can make from this graph?



(A) The more rain there is, the better the corn will grow.
(B) Corn needs rain to grow, but too much rain is harmful.
(C) Different kinds of corn need different amounts of rain to grow best.
(D) Corn can grow well even if there is no rain. N408801

38. A student is doing a project on the effect of a magnet on the picture on a television screen. The student uses only a strong bar magnet, and later writes the following four statements. Which of the following statements does NOT describe an observation?

(A) The magnet distorts the picture when held near the front of the screen.
(B) Electrons are attracted by the magnet as they travel through the tube.
(C) Opposite ends of the magnet produce opposite directions of distortion on the screen.
(D) The magnet has no effect on the volume of sound. N425901

39. An artificial satellite travels in an easterly direction and orbits the Earth every 6 hours. To an observer in the central United States, the satellite would appear to

(A) rise in the east and set in the west.
(B) rise in the west and set in the east.
(C) remain stationary above the observer's position. N434801

40. Every year for seventy-eight years it has snowed on a mountain top on January 12. Next year on January 12,

(A) it will snow for sure.
(B) the chances are very good that it will snow.
(C) the chances are 50-50 that it will snow.
(D) the chances are poor that it will snow on January 12 seventy-nine years in a row.
(E) it will not snow because the odds are against snowing seventy-nine years in a row on January 12. N409001

41. A female white rabbit and a male black rabbit mate and have a large number of baby rabbits. About half of the baby rabbits are black, and the other half are white. If black fur is the dominant color in rabbits, how can the appearance of white baby rabbits best be explained?

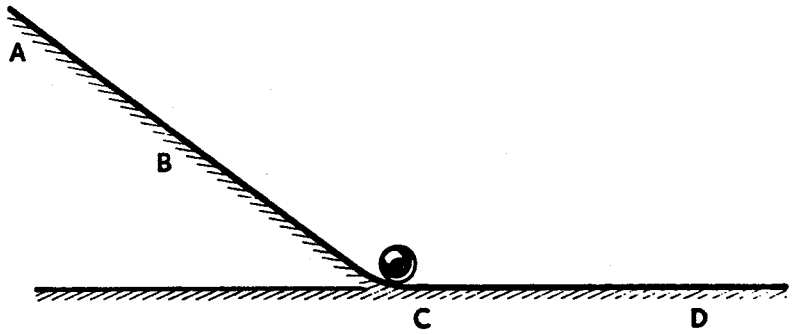
(A) The female rabbit has one gene for black fur and one gene for white fur.
(B) The male rabbit has one gene for black fur and one gene for white fur.
(C) The white baby rabbits received no genes for fur color from the father.
(D) The white baby rabbits are result of accidental mutations. N424401

42. The fact that much of the world's oil supply is found under desert areas should lead one to conclude which of the following about what that land once was?

(A) It was radioactive.
(B) It was rich in vegetation.
(C) It was very mountainous.
(D) It was mined for minerals.

N417701

43.



A ball rolls down a wooden ramp from A to C and onto a level wooden surface. Which one of the following statements about the speed of the ball at C is sure to be true?

(A) The speed at C is faster than it will be at D.
(B) The speed at C is the same as it was at B.
(C) The speed at C is the same as it will be at D.
(D) The speed at C is slower than at B.

N406701

44. A medical researcher wanted to find out what caused a certain disease. She gathered the following information from different places in the world.

	Major Type of Food	Type of Area	Mosquitoes	Disease
Country 1	Fish only	City	Yes	Yes
Country 2	Meat and vegetables	Farmland	No	No
Country 3	Fish and rice	City	No	Yes
Country 4	Fish only	Farmland	Yes	Yes

Which one of the following would be best for the researcher to study more closely in order to find the cause of the disease?

(A) Major type of food
(B) Type of area
(C) Mosquitoes
(D) Swamps

N411201

45. The Pacific Ocean is surrounded by a large belt of mountain ranges and volcanoes. Which natural events are most closely associated with these landforms?

(A) Hurricanes
(B) Tornadoes
(C) Sandstorms
(D) Earthquakes

N420401

46. A chemist will frequently write a formula for some kind of matter. For example, H_2SO_4 is the formula for sulfuric acid. The numbers used in the formula stand for

(A) the number of isotopes in a mole of substance.
(B) the number of grams of each atom in a given molecule.
(C) the number of atoms of each element in a given molecule.
(D) the number of molecules of each component in a mole of H_2SO_4
(E) the number of parts by weight of each material in a pound of substance.

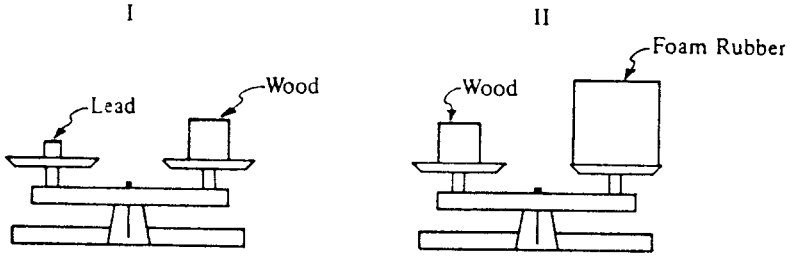
N411101

47. Which of the following objects has the greatest density?

	Mass of Object	Volume of Object
(A)	11.0 grams	24 cubic centimeters
(B)	11.0 grams	12 cubic centimeters
(C)	5.5 grams	4 cubic centimeters
(D)	5.5 grams	11 cubic centimeters

N426201

48.



In Picture I, a piece of lead and a piece of wood are balanced on a scale, and in Picture II the same piece of wood is balanced with a piece of foam rubber. Which of the materials is most dense and which is least dense?

	Most Dense	Least Dense
(A)	Wood	Lead
(B)	Lead	Foam rubber
(C)	Foam rubber	Lead
(D)	Wood	Foam rubber

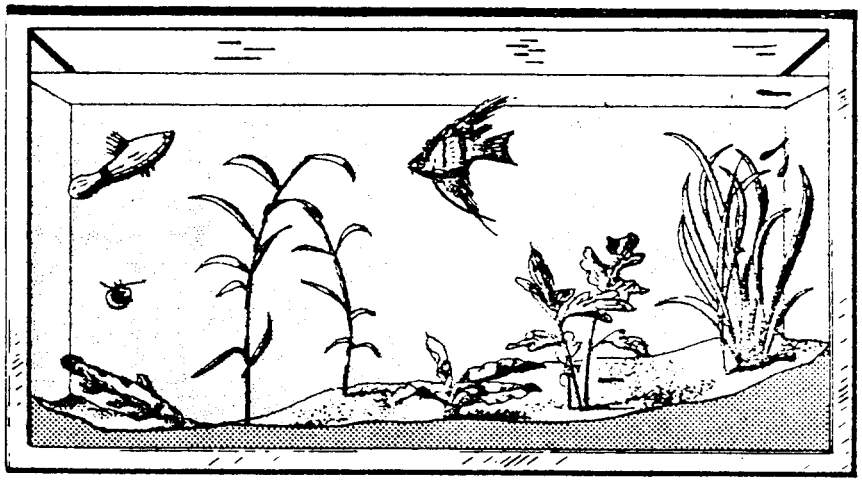
N434901

49. Scientists today agree on many ideas about how the natural world works. Which of the following is a scientific attitude toward these ideas?

(A) Some of the ideas will probably have to change when scientists have more information.
(B) Most ideas will not be changed for a very long time to come.
(C) All of the ideas will have to change to keep up with fast-moving world events.
(D) None of the ideas will be changed because they are scientific ideas.

N435001

50. Some water plants, fish, snails, and other water animals were placed in a sealed aquarium as shown in the picture below.

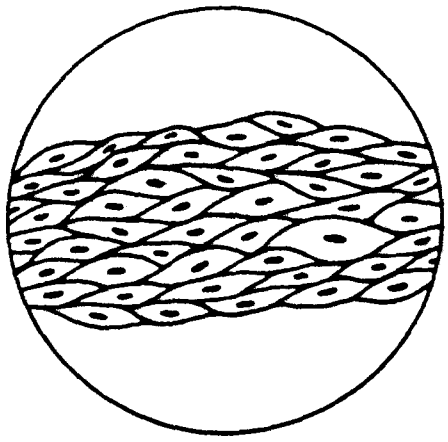


No food, water or air was added to the aquarium for three months. The water level remained the same and the plants, fish, snails, and other water animals continued to live and thrive. What did this prove?

(A) Fish do not require oxygen.
(B) Water plants do not require oxygen.
(C) Snails do not require oxygen.
(D) It did not prove any of these things.

N404601

51. A group of cells looks like this under a microscope.



These cells all work together to do the same thing. A group of cells like this is called

(A) a tissue.
(B) an organism.
(C) an organ.
(D) a system. N405001

52. Two astronauts walking on the moon are trying to communicate with each other. Which one of the following ways of communicating will not work for them?

(A) Ringing a bell
(B) Flashing a light
(C) Using a radio
(D) Waving N406901

53. The new product Super Plant Food has been advertised. Claims have been made that Super Plant Food will cause plants to grow to giant sizes. Directions on the label of this new product say: "Simply add 1 teaspoon of Super Plant Food powder to each gallon of water used to water your seeds or growing plants. Plants watered with Super Plant Food solution will grow faster and become twice as large as normal plants."

Suppose you wish to test scientifically the claims of the makers of Super Plant Food. Which of the following experiments would best test whether Super Plant Food helps the growth of bean plants?

(A) Place 1 bean seed in each of two identical pots of soil. Water each pot with the same amount of Super Plant Food solution each day.
(B) Plan 10 bean seeds in a pot of soil. Water with the same amount of Super Plant Food solution each day.
(C) Plant 10 bean seeds in each of two identical pots of soil. Water one pot with a cup of Super Plant Food solution each day, and water the other pot with a cup of water each day.
(D) Place 100 bean seeds on a sponge. Keep the sponge moistened with Super Plant Food solution. N421301

54. Adele decided to try Super Plant Food solution on her potted begonia plants. She placed 5 begonias on a table near a window and watered each plant daily with the same amount of Super Plant Food solution. After two weeks, Adele was amazed to see that all of the begonia plants were bending over in the same direction. Adele believed that the Super Plant Food caused the bending. How could she test this?

(A) Place 2 similar begonia plants in the window. Water one with Super Plant Food solution as before and water one without Super Plant Food.
(B) Leave the original 5 plants where they are, continue to water with the same amount of Super Plant Food solution, and observe for two more weeks.
(C) Leave the original 5 plants where they are and double the amount of Super Plant Food solution used in watering them for two more weeks.
(D) Place 5 similar begonia plants in a dark closet and water them with plain water each day for two weeks.

N421302

LONGITUDINAL STUDY OF AMERICAN YOUTH

SCIENCE TEST (FORM M)

Student's Name

CORRECT MARK
Ⓐ Ⓑ Ⓒ ● Ⓔ

INCORRECT MARKS
⊗ ⊘ ⊘ ⊘ ⊘

- Use black lead No. 2 pencil.
- Make heavy marks the full length of the boxes.
- Make only one mark per question.
- Erase cleanly any unintended marks.

PAGE 1

1 Ⓐ Ⓑ Ⓒ Ⓓ

PAGE 2

2 Ⓐ Ⓑ Ⓒ
3 Ⓐ Ⓑ Ⓒ Ⓓ
4 Ⓐ Ⓑ Ⓒ Ⓓ
5 Ⓐ Ⓑ Ⓒ Ⓓ
6 Ⓐ Ⓑ Ⓒ Ⓓ
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FOR LSAY USE ONLY

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9	9	9	9	9	9