SCIENTIFIC ABILITY

Choose the letter of the best answer. Shade the circle which corresponds to the letter of your choice.

EXAMPLE:
Why are fruits and leafy vegetables included in a healthy diet?

A) They have a high water content.
B) They are rich in minerals and vitamins.
C)They are high in protein.
D) They contain a lot of carbohydrates.



1. A student wires a series circuit that includes a block of rubber and a light bulb. She states that she does not expect the light bulb to light up when current is applied to the circuit. Which of the following best describes her statement?
A) It is a conclusion based on observed data about electrical phenomena.
B) It is a hypothesis based on knowledge of the theory of electrical phenomena.
C) It is a procedure based on her hypothesis about electrical phenomena.
D) It is a theory based on her observations of electrical phenomena.

The following three brands of fertilizer are administered to three seedlings in a controlled experiment. Before the administration of the fertilizers, each seedling had similar root growth and three leaves. None of the seedlings had developed flowers. The components and results are shown:

Composition of Three Brands of Fertilizer

	Major Components (%)		
Brand	**Nitrogen**	**Phosphorous**	**Potassium**
W	7	15	17
X	10	24	5
Y	13	5	10

Observations at the end of two-month period

Characteristics of Three Plants Fertilized with Three Brands of Fertilizer

Plant	Brand of Fertilizer	Number of Flowers	Length of Roots	Number of Leaves
1	W	15	9 cm	6
2	X	5	14 cm	11
3	Y	10	4 cm	16

2. What is the manipulated variable in the experiment above?
A) The overall growth of the plants.
B) The length of time that each plant grows.
C) The amount of water that the plants receive.
D) The brand of fertilizer that is used on each plant.

3. Which of the following conclusions is supported by the results of the experiment?
A) Nitrogen promotes leaf growth, and potassium promotes flower growth.
B) Nitrogen promotes leaf growth, and potassium promotes root growth.
C) Nitrogen promotes root growth, and phosphorous promotes flower growth.
D) Nitrogen promotes root growth, and phosphorous promotes leaf growth.

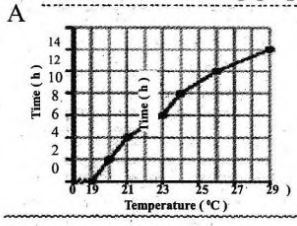
Use the data below to answer question number 4.

A student's observation on temperature change over a twelve-hour period.

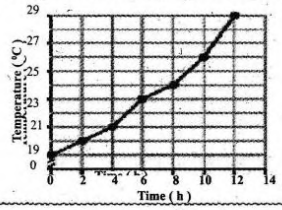
Time (h)	0	2	4	6	8	10	12
Temperature (^{0}C)	19	20	21	23	24	26	29

4. Which of the following graph best illustrates the data above?

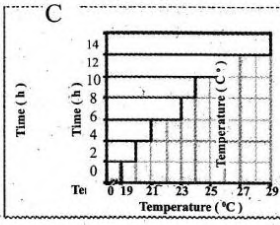
A



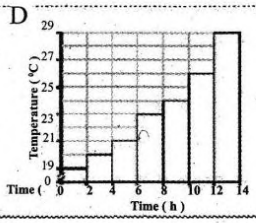
B



C

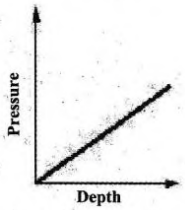


D

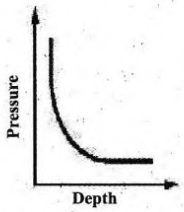


5. Pressure is directly proportional to depth. Which of the following graphs represents the relationship between the depth of the water and the water pressure in a dam?

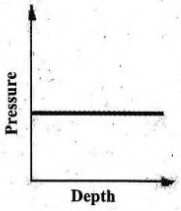
A



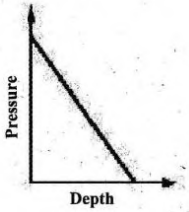
B



C

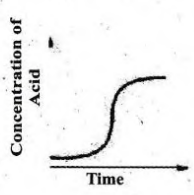


D

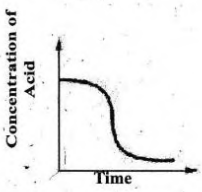


6. In a laboratory experiment, acid was accidentally spilled. A base was used to neutralize the acid. Which of the following graphs illustrates what happens to the concentration of an acid as the base is mixed with it?

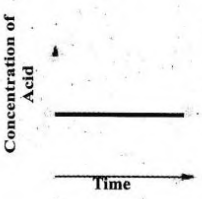
A



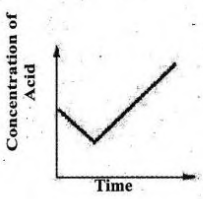
B



C



D



7. A prediction was made that the best conditions for earthworm growth occur when there are fewer than five earthworms per cubic meter of soil. This prediction is called a _____.

A) law B) theory C) hypothesis D) conclusion

A mineral supplement designed to prevent the common cold was given to two groups of people during a scientific study.

	Dosage
Group 1	50 mg
Group 2	100 mg

8. After eight weeks, neither group reported a case of the common cold. Which of the following would have made the outcome of this study more valid?

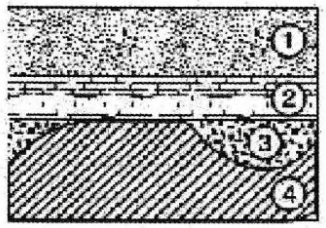
A) Test only one group with 150 mg of the supplement.
B) Give the supplement to both groups for only 6 weeks.
C) Create a third group that receives 75 mg of the supplement.
D) Create a third group that does not receive the supplement.

Students hypothesized that their normal pulse rates would double after doing 50 sit-ups. After completing t *hree trials, four students averaged their individual pulse rates and recorded their results below.*

Student	Average Pulse Rate After 3 Trials
1	120 beats/min
2	100 beats/min
3	130 beats/min
4	115 beats/min

9. Based on the data above, a conclusion cannot be made because
A) the exercise was not strenous enough to affect the pulse rates.
B) control data of normal pulse rates for each individual are missing.
C) the variability in pulse rates among the students is too great.
D) not enough trials were conducted to be able to draw a conclusion.

The diagram below shows a geologic cross section.



10. Which rock layer most likely contains fossils of the most recently evolved organisms?
A) 1 B) 2 C) 3 D) 4

A spring scale is pulled downward and readings are recorded.

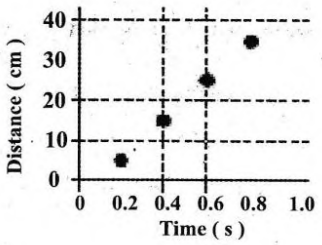
Distance Pulled (cm)	Spring Scale Reading (N)
1.0	4
1.5	6
2.0	8
2.5	10

11. If the spring is pulled 3.5 cm, the spring scale should read
A) 12 N. B) 13 N. C) 14 N. D) 15 N.

Data from an experiment are presented below.

Experimental Data

Distance (cm)	Time (s)
5	0.2
15	0.4
25	0.6
35	0.8



12. The slope of the graph represents what characteristic of an object?
A) displacement B) force C) speed D) inertia

13. Not far from the town, a pulp and paper mill is being built. The owners of the mill believe that with clearcut harvesting and a reforestation program, the mill can have a harvestable forest forever. The mill owners have a perspective that is primarily concerned with
A) the environment B) education C) ethics D) economics

While a camp waste pit is being excavated, you notice a white, crystalline substance. You decide to find out what the substance is before removing it. When mixed with water, some of the substance disappears. You pour some of the solution on a plate, and when the liquid evaporates, the crystals reappear.

14. The evidence that the crystalline substance underwent a physical change is that
A) some of the water turned white C) not all of the substance disappeared
B) the change produced heat D) the change could be reversed

To study the effects of the campsite on the soil, a senior student collected soil samples from four different sites in the camp area before the camp was set up during the project and after the camp was removed. The chart below shows the result of the student's observation. **pH Level**

Site	Before	During	After
1	7.6	7.2	6.6
2	7.8	7.5	6.9
3	7.5	7.4	7.4
4	7.4	6.9	6.5

15. You conclude that the activities at the campsite caused the soil to become
A) neutral B) more basic C) more acidic D) polluted

Using a resource material, you find the following information on pure substances.

Properties of Some Pure Substances

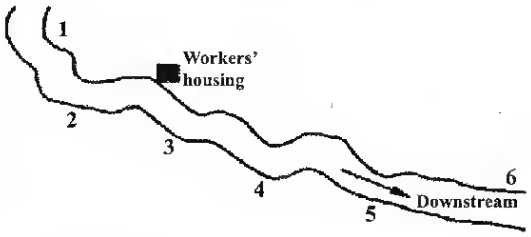
Substance	Melting Point (C°)	Density (g/cm³)	Solubility in Water	Appearance
Copper II sulphate	---	2.3	dissolves	blue solid crystals
Calcium carbonate		2.9	does not dissolve	grey-white solid
Sodium Chloride	801	2.2	dissolves	white solid crystals
Calcium Hydroxide	---	2.2	does not dissolve	white solid

16. You found a substance that is white solid crystal and dissolves in water. Based on the chart you obtained, the substance that you found is **most likely**
A) copper II sulphate B) calcium carbonate C) sodium chloride D) calcium hydroxide

Treated wastewater from a domestic area is discharged into a river. An environmentalist and an advocate to water quality wants to know more about the impact of the waste water on the river system. The DENR representative shows the environmentalist the results of the study in which water samples were collected from six different sites along the river.

The oxygen concentration for each sample was determined and the following data were obtained.

Site Number	Oxygen Concentration (mg/L)
1	12.0
2	12.5
3	8.0
4	3.5
5	2.0
6	5.0



17. Based on this data, the delegate inferred that immediately downstream from the workers' housing the treated waste water discharged

A) had no effect on the quality of river water
B) added toxic chemicals to the river water
C) improved the abiotic conditions of the river water
D) decreased the concentration of oxygen of the river water

While doing research for an experiment on the acidic nature of fruit, you read an information pamphlet about mandarin production. The pamphlet outlines issues surrounding a spray used on mandarin grown in China. Some people say that the spray may be causing long-term health problems for some people. The fruit growers say they cannot operate their orchards at a profit without the spray.

18. Considering the possible health problems of some people, the **most responsible** action for the fruit growers to take is to shut down the operations of all the orchards immediately until

A) the people with the long-term health problems get better
B) experiments are conducted to determine whether the spray does harm people
C) mandarin can be imported from the other countries
D) a less-concentrated spray is available on the market

A researcher at the center unpacks a box containing four glass vials. The vials are numbered 1,2,3,4, and each contains liquid. The researcher asks you to perform three tests to determine whether the substance in each vial is acidic or neutral. You made the following observations.

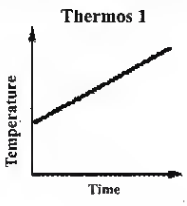
	Test 1 Two drops from each vial are placed on a piece of zinc	Test 2 One drop of each vial is placed on red litmus paper	Test 3 One drop of each vial is placed on blue litmus paper
Vial 1	gas bubbles appear	no color change	turns red
Vial 2	no reaction takes place	turns blue	no color change
Vial 3	no reaction takes place	no color change	no color change
Vial 4	gas bubbles appear	no color change	turns red

19. The liquids in vials 1, 2, 3, and 4 are, respectively,

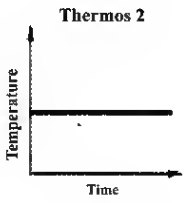
A) basic, acidic, neutral, and basic
B) acidic, basic, neutral, and acidic
C) neutral, basic, acidic, and neutral
D) neutral, acidic, basic, and neutral

20. You test four different coffee thermoses and graph the data for each. The graph that **best** represents the results of a thermos that would keep coffee hot is

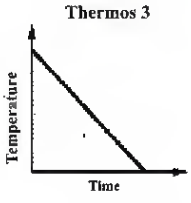
A



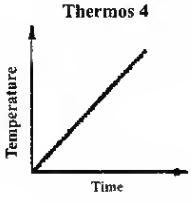
B



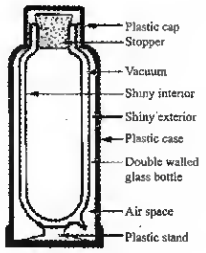
C



D



At the end of the day, you have your hot drink from a thermos. The cross-section of the thermos is shown below.



21. Which of the following statements **best** explains why the drink remains hot in a thermos?

A) Air is a good conductor of heat.
C) A vacuum is a poor conductor of heat.
B) Plastic does not conduct heat well.
D) Shiny surfaces do not reflect heat well.

Before investigating animal life in a pond, you refer to your field manual and find the following information.

Oxygen Requirements of Some Freshwater Invertebrates

Oxygen Concentration (mg/L)	Organisms Present
8 and above (excellent level)	▪large variety of invertebrates (insect larvae of many kinds, worms,etc.)
6 (good level)	▪a few mayfly larvae ▪some stonefly larvae ▪many midge larvae ▪many worms including leeches
4 (critical level)	▪many midge larvae ▪many worms including leeches
2 (low level)	▪many midge larvae ▪some worms including leeches
less than 2 (very low level)	▪some midge larvae ▪some worms

22. You collect water samples from the pond and find more midge larvae than mayfly larvae. You infer that the oxygen concentration in this pond is **most likely**

A) 6 mg/L
B) 4 mg/L
C) 2 mg/L
D) less than 2 mg/L

In one of the water samples taken from the pond, you notice a small organism. Unable to identify the organism in your field manual, you note that it has the following characteristics.

***three distinct body parts *ability to change colors *specialized mouth parts and *joint legs**

23. Given the characteristics noted above, which of the following pictures from your field manual is **most likely** the organism you are trying to identify?

A 
B 
C 
D 

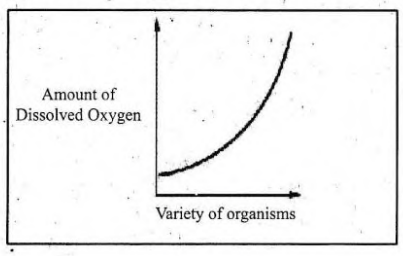
To gather information about a nearby stream, you collect data on the following factors.

Some Abiotic and Biotic Factors

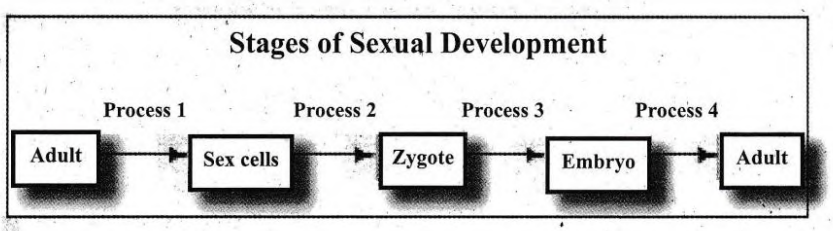
I Oxygen content **II** Undissolved solids **III** Variety of life forms **IV** Flow rate **V** Temperature

24. You decide to research biotic factors first and you know that, of the above factors,
A) III only is biotic B) I and V are biotic C) I, II, and IV are biotic D) II and III are biotic

After making more observations about a lake, you plotted the graph showing the relationship between a variety of organisms in the water and the amount of dissolved oxygen in the water, as shown below.



25. From this graph, you infer that the variety of organisms will
A) increase as the amount of dissolved oxygen decreases
B) decrease as the amount of dissolved oxygen increases
C) increase as the amount of dissolved oxygen increases
D) remain the same no matter what the amount of dissolved oxygen may be

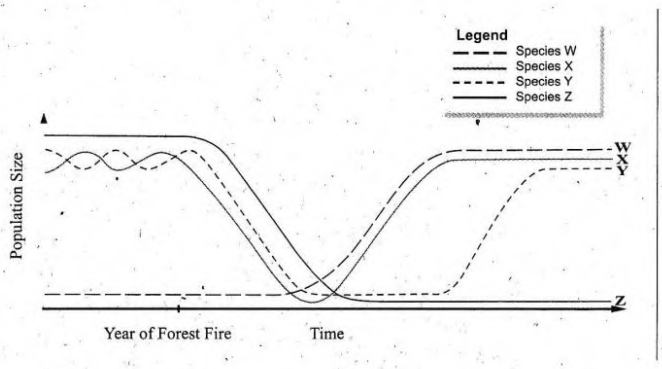


26. In the flowchart above, the stage at which fertilization takes place is labeled…
A) Process 1 B) Process 2 C) Process 3 D) Process 4

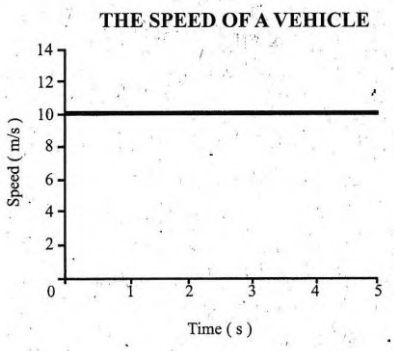
- Wolves prey on elk.
- Willow shrubs along stream banks provide shade.
- Elk consume willow shrubs.
- Bull trout require cool water temperatures.

27. Which of the following changes is most likely to occur as a result of a decreased wolf population?
A) A decreased number of elk. B) A decreased number of bull trout.
C) An increased number of willow shrubs. D) An increased number of predators of wolves.

Population Size of Four Species Before and After a Forest Fire



28. Given the trends on the graph shown above, which species has the broadest niche?
A) W B) X C) Y D) Z



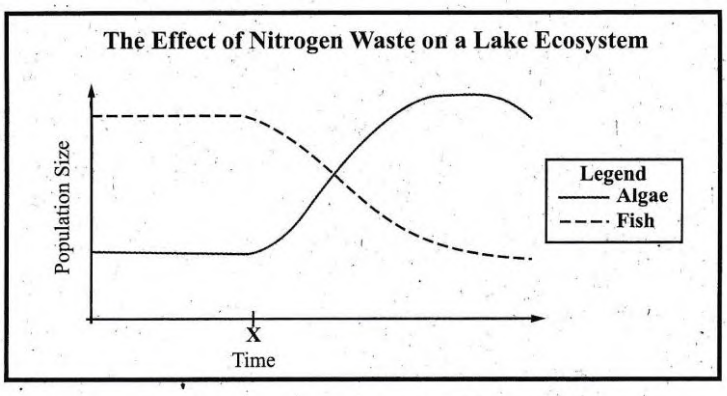
29. Which may not be changing based on the given graph above?
A) speed B) velocity C) direction D) time

The data below shows information about some body fluids and their pH.

Body Fluid	pH	red litmus paper	blue litmus paper
Bile	8.2	turns blue	no change
Saliva	6.8	no change	turns red
Gastric Juice	1.7	no change	turns red
Blood	7.4	turns blue	no change

30. These data indicate that gastric juice is
A) very acidic. B) very basic. C) positively charged. D) negatively charged.

Nitrogen waste from cattle enters a nearby lake. A biologist plots the following graph of the population sizes of algae and fish in the lake over time. At point X, the biologist starts to measure the level of dissolved oxygen in the lake.



31. Which of the following graphs shows the dissolved oxygen concentration that the biologist measures in the lake?

