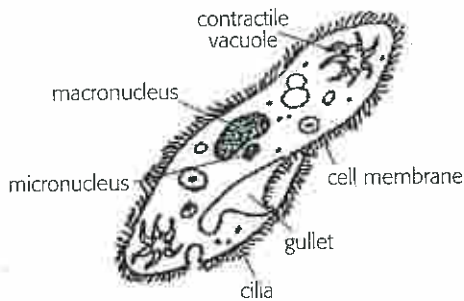


Unit 1 *continued***Nature of Science**

15. The illustration below depicts a paramecium. Paramecia have star-shaped organelles called contractile vacuoles that move water from inside to outside the cell. The data presented in the table below were obtained in an experiment in which paramecia were placed in different salt concentrations. The rate at which the contractile vacuole contracted to pump out excess water was recorded.

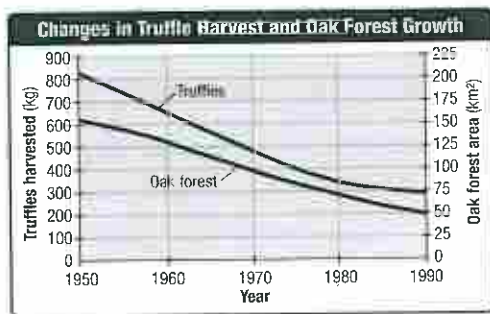


Salt concentration	Rate of contractile vacuole contractions/minute
Very high	2
High	8
Medium	15
Low	22
Very low	30

How could you explain the observed relationship between the rate of contractile vacuole contraction and the salt concentration?

- A When the salt concentration outside the cell is very high, diffusion causes water to move inside the cell, and the contractile vacuole has to contract more rapidly.
- B When the salt concentration outside the cell is very low, diffusion causes water to move outside the cell, and the contractile vacuole has to contract more rapidly.
- C When the salt concentration outside the cell is very high, diffusion causes water to move outside the cell, and the contractile vacuole does not need to contract as rapidly.
- D When the salt concentration outside the cell is very low, diffusion causes water to move outside the cell, and the contractile vacuole does not need to contract as rapidly.

16. The graph below shows changes in truffle harvesting in an oak forest over a period of 40 years.



Which statement **BEST** describes the relationship between the oak forest and the truffle population?

- A As the amount of oak forest declined, the number of truffles available for harvest increased.
- B As the amount of oak forest declined, the number of truffles available for harvest also declined.
- C The number of truffles available for harvest is inversely proportional to the area of oak forest.
- D Even though both the area of oak forest and number of truffles decreased, there is no relationship between the two.

17. Transpiration, the loss of water vapor from leaves, is an important function in plants. The loss of water vapor creates a force that pulls water up from the roots through the stem. Stomata play an important role in transpiration. Guard cells around stomata in plant leaves open to let in carbon dioxide. As they open, water vapor escapes (see Figure 1). Humidity has an effect on the rate of transpiration. Figure 2 shows that a plant in low humidity (Line A) has a high rate of transpiration, moving water a greater distance in the plant. A plant in high humidity (Line B) has a lower rate of transpiration, moving water a shorter distance in the plant.

Figure 1

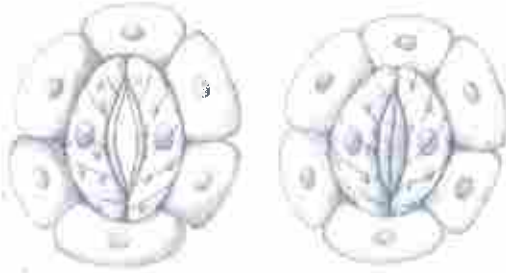
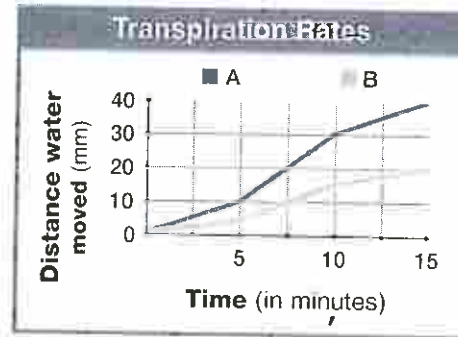


Figure 2



Relate the graph to a tree growing in a tropical rain forest.

- A Because tropical rain forests tend to have very high humidity, a tree living there would not need transpiration at all.
- B Tropical rain forests have low humidity, so the transpiration rate of a tree living there would best be represented by Line A.
- C Tropical rain forests have high humidity, so the transpiration rate of a tree living there would best be represented by Line B.
- D Tropical rain forests have high humidity, so the transpiration rate of a tree living there would best be represented by Line A.
-
18. Research shows that higher levels of carbon dioxide in the air favor the growth of fast-growing, weedy plant species. Which statement BEST evaluates the impact of this research on our understanding of the environment?
- A Weedy species produce more carbon dioxide.
- B Over time, weeds will not grow in areas with lower carbon dioxide levels.
- C Weedy species will eventually go extinct due to increased carbon dioxide levels.
- D Over time, increased carbon dioxide levels may result in different plant communities.

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19. Parasitic leeches attach to a host and cut or digest a hole in the host's skin. The leech then secretes anticoagulants and an anesthetic into the host's blood. The strongest anticoagulant a leech produces, called hirudin, is being produced through genetic engineering. Why are scientists interested in producing hirudin?
- A to treat pain in human patients
 - B to treat clotting disorders in human patients
 - C to remove blood from human patients without the use of needles
 - D to study the effects of long-term leech attachment

20. The ion (salt) concentration of sea water is three times that of most marine fishes' tissues. As a result, these fishes lose water to the environment through osmosis. To make up for the lost water, fishes drink sea water and pump out the excess salt through their gills. Freshwater fishes have the opposite problem. Their bodies contain more salt than the surrounding water, so they tend to take in water by osmosis. The additional water dilutes their body salts. Freshwater fishes regain salts by actively taking them in from their environment. Because of these challenges, few fish can move between salt water and fresh water.

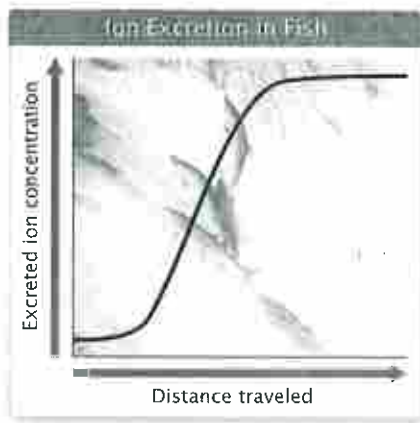


Figure 1 shows ion excretion in a fish as it moves from one body of water to another. What kind of water is the fish initially swimming in?

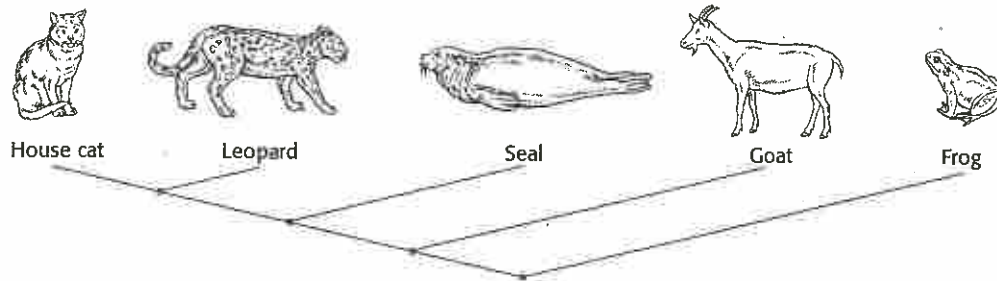
- A fresh water
- B salt water
- C brackish water
- D hypersaline water

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21. The diagram below shows the results of a laboratory experiment that defined some similarities and differences between five animals.

ANIMAL CLADOGRAM



A scientist wants to draw conclusions about all mammals based on the results of the study above that included five animals: a house cat, a leopard, a goat, a frog, and a seal. Her peers suggest that the data from other studies might better support her conclusions. Why might this experiment be a poor choice for finding data that support her conclusions?

- A The study does not include mammals, so she cannot use the data to draw conclusions about mammals.
- B The study includes only a few mammals, so she cannot use the data to draw conclusions safely about all mammals.
- C The study includes only vertebrates, so she cannot use the data to draw conclusions about invertebrate mammals.
- D The study includes only mammals, so she cannot use the data to make a conclusion.
-
22. DNA sequences in humans and chimpanzees are very similar. Which of the following is the MOST reasonable conclusion based on this information?
- A Humans must have a direct ancestor that is a chimpanzee.
- B Chimpanzees must have single-stranded DNA.
- C Humans and chimpanzees must have a recent common ancestor.
- D Humans and chimpanzees are the same species.
-