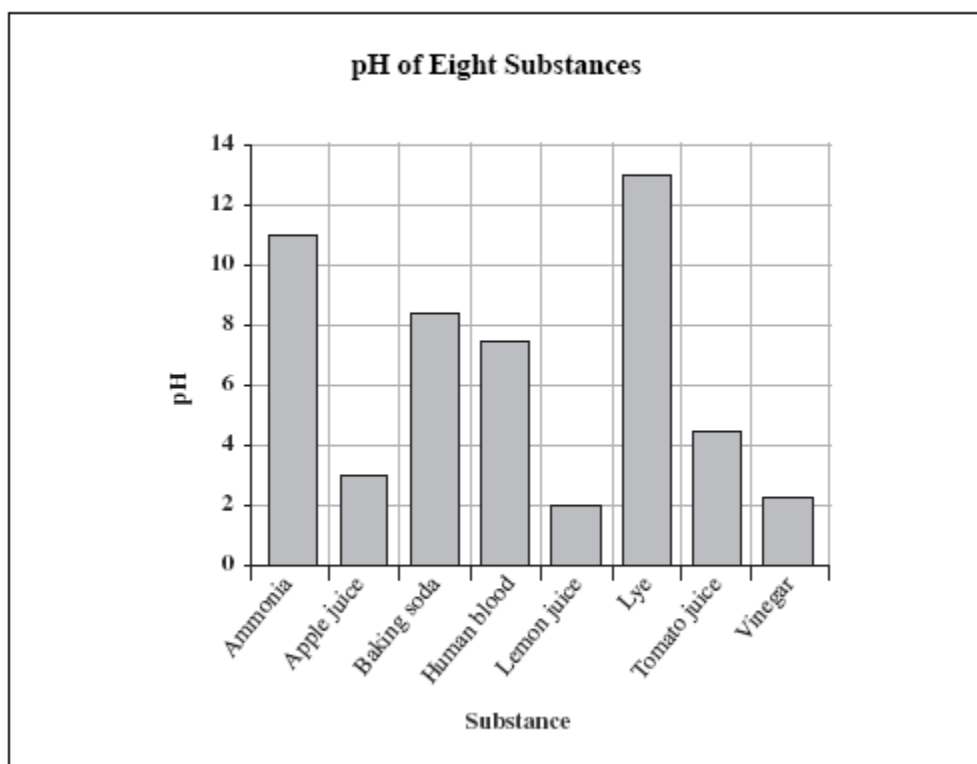


The process by which toxins are concentrated as they move up the food chain is called

- A. pollution
- B. biomagnification
- C. web magnification
- D. biomass stratification

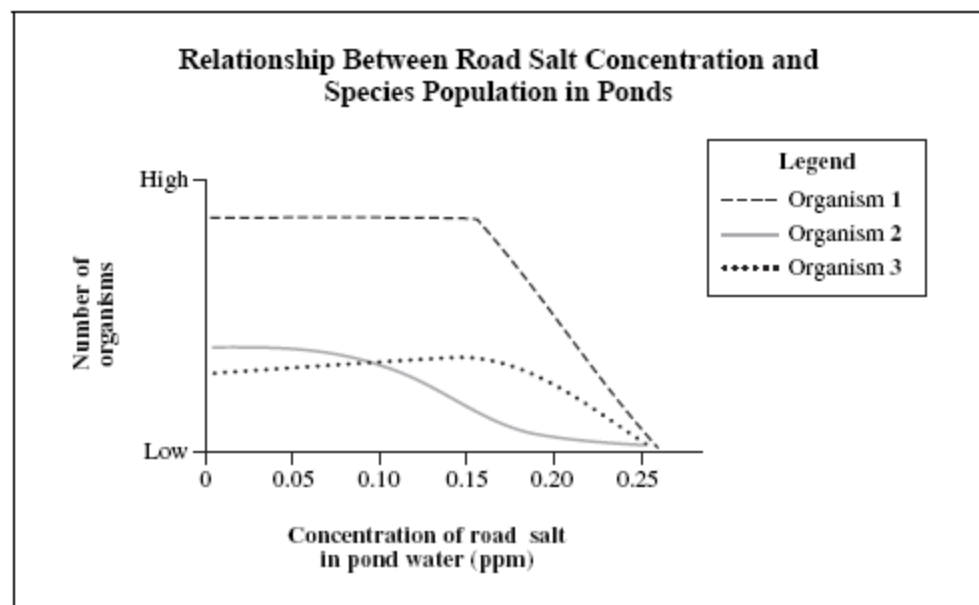


Which of the following conclusions can be made from the graph above?

- A. Vinegar is more basic than lye.
- B. Ammonia is more acidic than apple juice.
- C. Baking soda is more basic than human blood.
- D. Tomato juice is more acidic than lemon juice.

Which of the following statements describes one characteristic shared by **all** biodegradable substances?

- A. They can be broken down by inorganic compounds.
- B. They can be broken down by simple organisms.
- C. They decompose faster at low temperatures.
- D. They decompose faster in dry conditions.



According to the graph above, an increase in the concentration of road salt in pond water from zero to 0.10 ppm results in a decrease in the number of

- A. organism 1
- B. organism 2
- C. organisms 1 and 3
- D. organisms 2 and 3

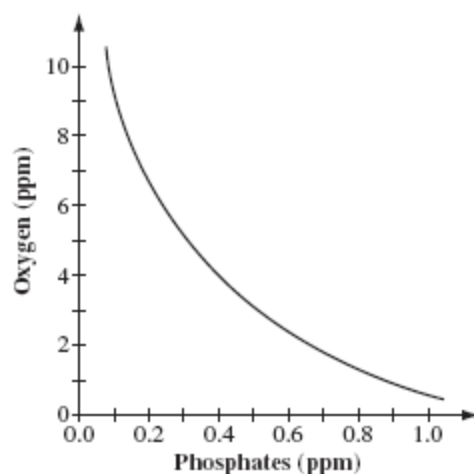
Water in a particular lake has a pH of 5.2. Calcium carbonate is added to the lake water. The purpose of treating the lake water with calcium carbonate is to

- A. decrease the basic nature of the lake water
- B. increase the acidic nature of the lake water
- C. bring the pH of the lake water closer to 7.0
- D. bring the pH of the lake water closer to zero

A dissolved oxygen concentration of 6 ppm indicates that 6 mL of oxygen is dissolved in

- A. 100 mL of water
- B. 1 000 mL of water
- C. 10 000 mL of water
- D. 1 000 000 mL of water

The Relationship Between the Concentrations of Oxygen and Phosphates in a Particular Pond



Minimum O ₂ Concentrations Within Which Invertebrates Can Survive	
O ₂ Concentration (ppm)	Invertebrates
8–10	Stonefly nymph
4–8	Dragonfly nymph
0–4	Midge larvae

Which of the following statements describes the relationship between oxygen concentration and phosphate concentration that is illustrated in the graph?

- A. As oxygen levels increase, phosphate levels increase.
- B. As oxygen levels increase, phosphate levels stay the same.
- C. As phosphate levels increase, oxygen levels decrease.
- D. As phosphate levels increase, oxygen levels stay the same.

If a sample of water contains an abundance of dragonfly nymphs and no stonefly nymphs, then the phosphate level of the water **most likely** falls within which of the following phosphate ranges?

- A. 0.1–0.2 ppm
- B. 0.2–0.4 ppm
- C. 0.4–0.6 ppm
- D. 0.8–1.0 ppm

Opinions Related to the Issue of Non-Renewable Resources

- I "Companies must reduce the price of gasoline."
- II "Citizens must be encouraged to use public transportation."
- III "Tax incentives must be given to individuals to buy houses."
- IV "Government must create incentives to develop alternative energy sources."
- V "Legislation that requires energy-efficient cars must be put in place."

Which of the opinions given above refer to actions that promote long-term energy conservation?

- A. I, II, and III
- B. I, III, and IV
- C. II, III, and V
- D. II, IV, and V

Numerical Response

- 3.** For each of the substances listed below, indicate whether it is organic or inorganic using the following code.

1 = Organic

2 = Inorganic

Potassium

Magnesium

Carbohydrate

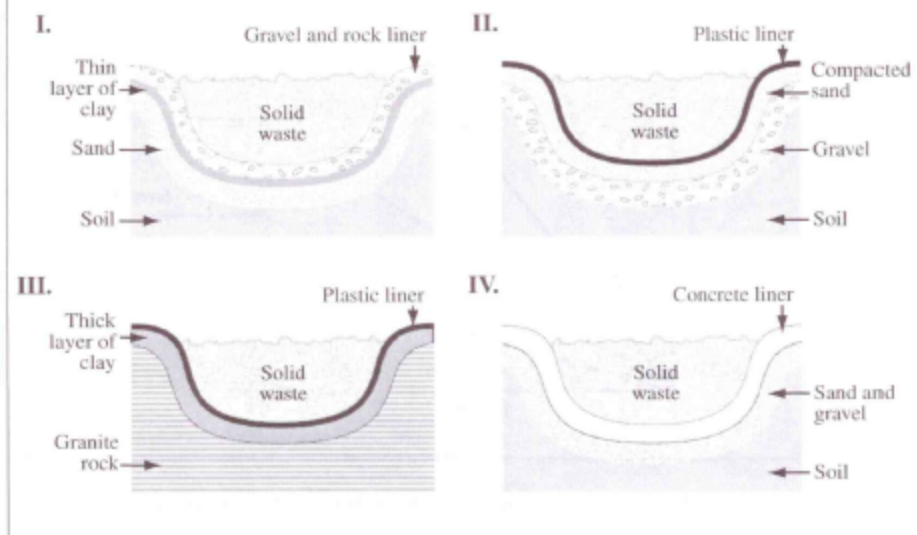
Salt

(Record all four digits of your answer in the numerical-response section on the answer sheet.)

The most common type of energy loss in electrical devices is

- A. thermal
- B. potential
- C. chemical
- D. mechanical

Some resort owners plan to develop a new sanitary landfill site. Four possible types of landfills are shown below. The resort is located in a forested area and is near a lake. A design engineer has stressed that caution will need to be exercised if the resort's solid wastes are disposed of in a sanitary landfill site.



Which of the designs for sanitary landfill sites shown above would **most likely** result in the contamination of the nearby lake as a result of leaching?

- A. Design I
- B. Design II
- C. Design III
- D. Design IV

In an ecosystem, poisons tend to be most concentrated in organisms that are

- A. primary food sources
- B. secondary food sources
- C. low on the food chain
- D. high on the food chain

Four Types of Pollution

- I. Carbon dioxide
- II. Heat
- III. Radioactive materials
- IV. Sulfur dioxide

The types of pollution released during the combustion of fossil fuels are types

- A. I and IV only
- B. II and IV only
- C. I, II, and IV only
- D. I, III, and IV only

Acid rain is a form of pollution that is harmful to lakes. Which of the following sources of pollution is a major contributor to the creation of acid rain?

- A. Coal-fired power generating stations
- B. Primary sewage-treatment plants
- C. Sanitary landfill sites
- D. Animal feedlots

The manager of a trout hatchery notes that a nearby lake has overabundant growth of algae and other water plants. She says that this growth could eventually cause the fish in the lake to die.

Which of the following statements explains why the fish would **most likely** die?

- A. As the algae and plants die, oxygen needed by the fish is used up by decomposers.
- B. The overabundant plant growth leaves little room for fish to survive.
- C. As plants die, they rot and release a poison that is toxic to fish.
- D. The algae collect on the gills of the fish, making it difficult for the fish to breathe.

Which of the following roles is played by carbohydrates in human nutrition?

- A. Act as an energy source
- B. Assist enzyme function
- C. Storage form of unused chemical energy
- D. Structural component of cells in the body

Bromothymol blue is an indicator that changes colour at different pH levels.

pH	Colour
Above 7.6	Blue
6 – 7.6	Green
Below 6	Yellow

Bromothymol blue will appear yellow when mixed with

- A. lemon juice
- B. baking soda
- C. drain cleaner
- D. distilled water

Some electric power plants use water pumped in from rivers to absorb the excess heat they produce. This warm water is then returned to the river.

Which of the following rows describes what can happen to the oxygen concentration and the variety of organisms at the point in the river where the warm water is returned?

Row	Oxygen Concentration	Variety of Organisms
A.	Increases	Increases
B.	Increases	Decreases
C.	Decreases	Decreases
D.	Decreases	Increases

The presence of a species of large trout in a particular lake indicates a

- A. high dissolved oxygen concentration
- B. low dissolved oxygen concentration
- C. high water temperature
- D. low water pH

Algae growth typically increases in polluted lakes.

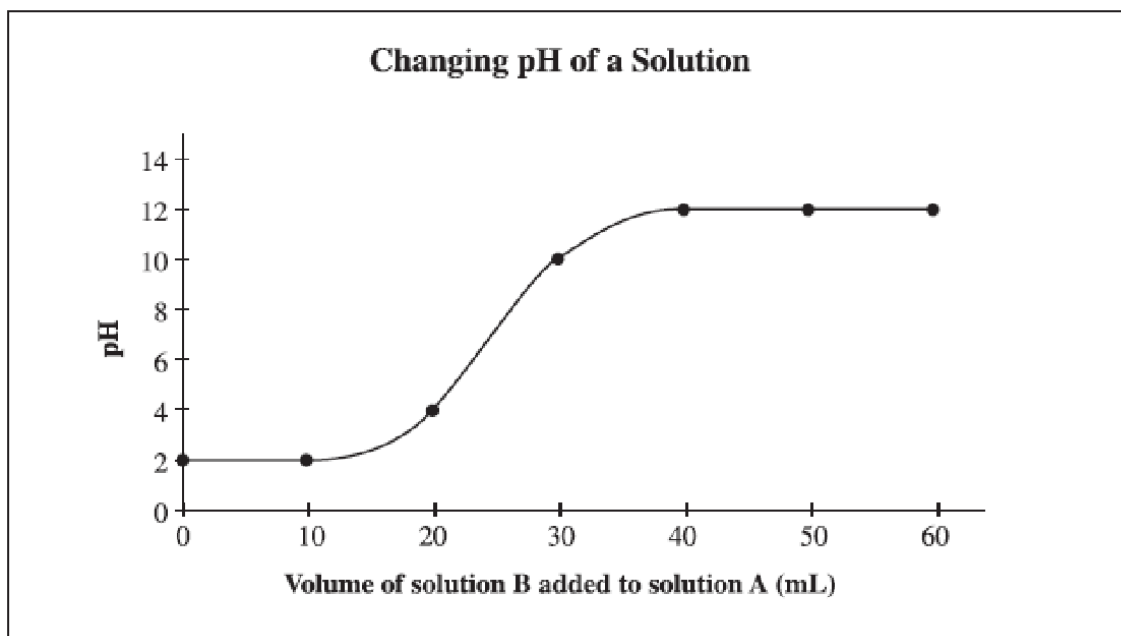
The chemicals that are **most likely** responsible for increases in algae growth in lakes are

- A. oxygen and carbon dioxide
- B. nitrates and carbon dioxide
- C. oxygen and phosphates
- D. nitrates and phosphates

The dissolved oxygen concentration of a pond is 8 ppm by volume.

This level of dissolved oxygen indicates that 8 mL of oxygen is found in

- A. 1 000 000 mL of water
- B. 10 000 mL of water
- C. 1 000 mL of water
- D. 100 mL of water



What volume of solution B must be used to neutralize solution A?

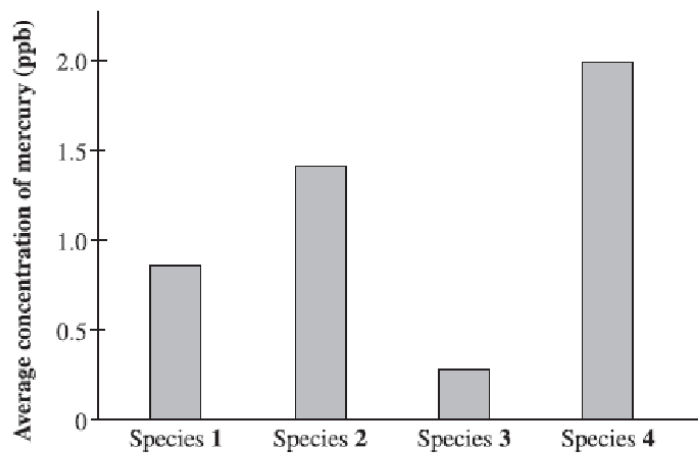
- A. 15 mL
- B. 25 mL
- C. 35 mL
- D. 45 mL

The diversity of the mayfly decreases as stream habitat quality declines.

Considering the information above, a study of the mayfly can be useful to scientists, since it is a

- A. species influenced by biomagnification
- B. species influenced by predation
- C. tolerant invertebrate species
- D. biological indicator species

A biologist studies the concentration of mercury in the livers of four species that are in the same food chain. She records her findings in the graph below.



Numerical Response

3. When listed in order from the species that is first in the food chain to the species that is last in the food chain, the species are _____, _____, _____, and _____.
First Last

(Record all four digits of your answer in the numerical-response section on the answer sheet.)

Which of the following substances is inorganic?

- A. Table salt
- B. Peanut oil
- C. Orange juice
- D. Brown sugar

Which of the following statements **best** defines the term LD₅₀?

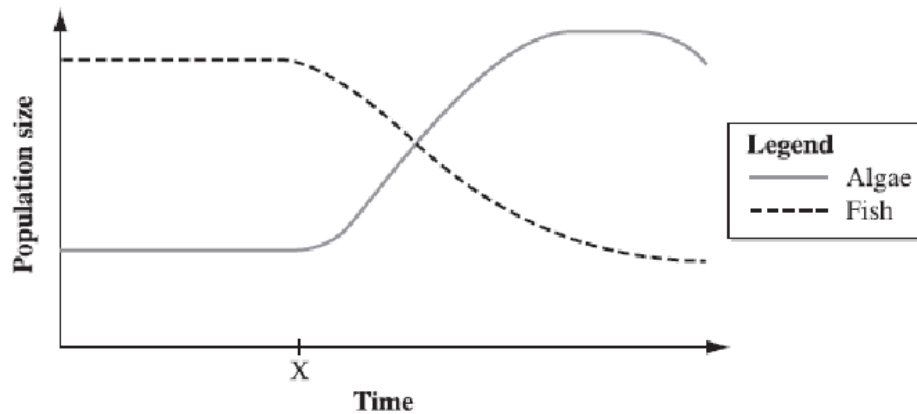
- A. LD₅₀ is the proportion of the first 50 organisms in a test population that dies when exposed to a particular substance.
- B. LD₅₀ is the proportion of the first 50 organisms in a test population that becomes sick when exposed to a particular substance.
- C. LD₅₀ is the concentration of a substance administered to a test population that kills half the organisms in the test population.
- D. LD₅₀ is the concentration of a substance administered to a test population that makes half the organisms in the test population sick.

Which of the following substances can be synthesized by plants?

- A. Silicon
- B. Sulfur
- C. Sugar
- D. Salt

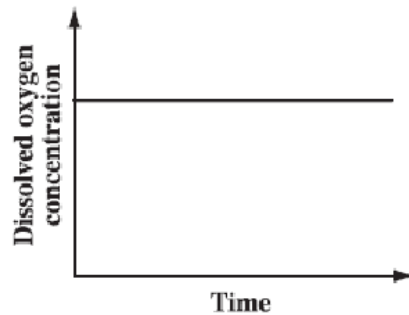
Nitrogen waste from a cattle feedlot enters a nearby lake. A biologist plots the following graph of the population sizes of algae and fish in the lake over time. At point X, the biologist starts to measure the level of dissolved oxygen in the lake.

The Effect of Nitrogen Waste on a Lake Ecosystem

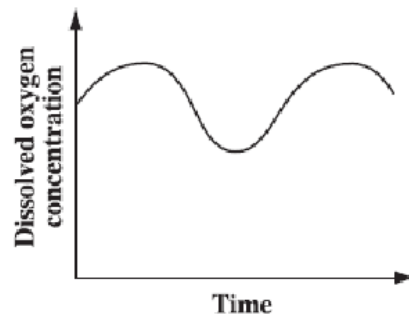


Which of the following graphs shows the dissolved oxygen concentration that the biologist measures in the lake?

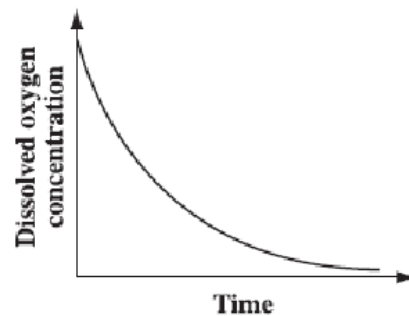
A.



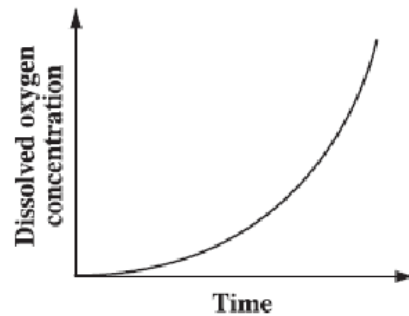
B.



C.



D.



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.

Composition of Three Brands of Fertilizer

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

At the end of a two-month growth period, the following observations are made.

Characteristics of Three Plants Fertilized with Three Brands of Fertilizer

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

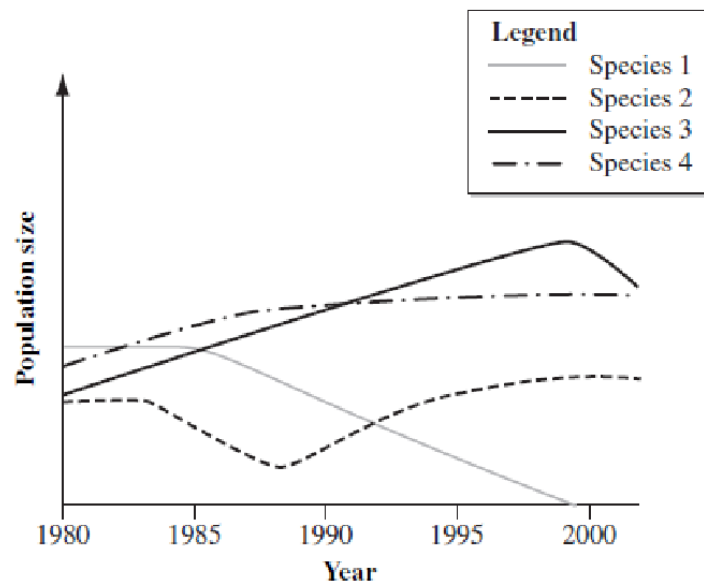
What is the manipulated variable in the experiment above?

- 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

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.

The graph below shows the population trends of four species between the years 1980 and 2002. Annual pesticide applications began in 1982.



Which of the following inferences is supported by the information in the graph above?

- A. Species 1 became resistant to pesticide use.
- B. Species 2 became resistant to pesticide use.
- C. Species 3 was affected most by pesticide use.
- D. Species 4 was affected most by pesticide use.

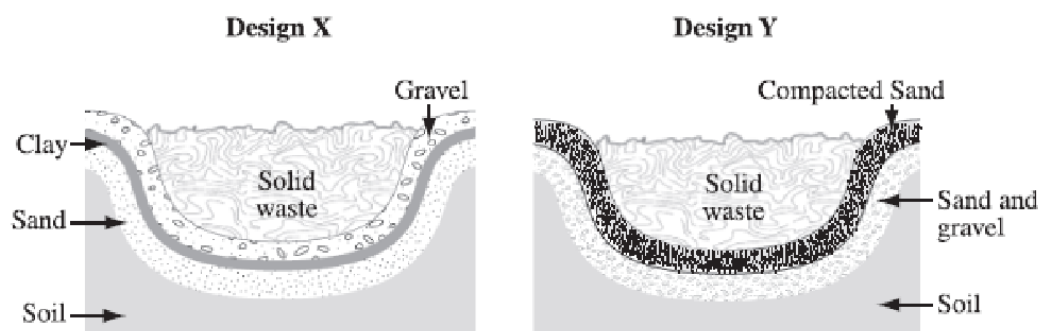
The carcass of a whooping crane was found along the shore of a lake. It was examined, and high levels of pesticide were found in its tissue.

Fish of various species were then collected from the lake, and they were found to have moderate levels of pesticide in their tissues.

Which of the following statements **best** explains the high levels of pesticide in the whooping crane?

- A. The whooping crane's skin absorbed the pesticide.
- B. The whooping crane swam in contaminated lake water.
- C. The whooping crane fed on pesticide-treated grass near the lake.
- D. The whooping crane's primary food source was the fish from the lake.

The following diagrams show two proposed designs for a new landfill.

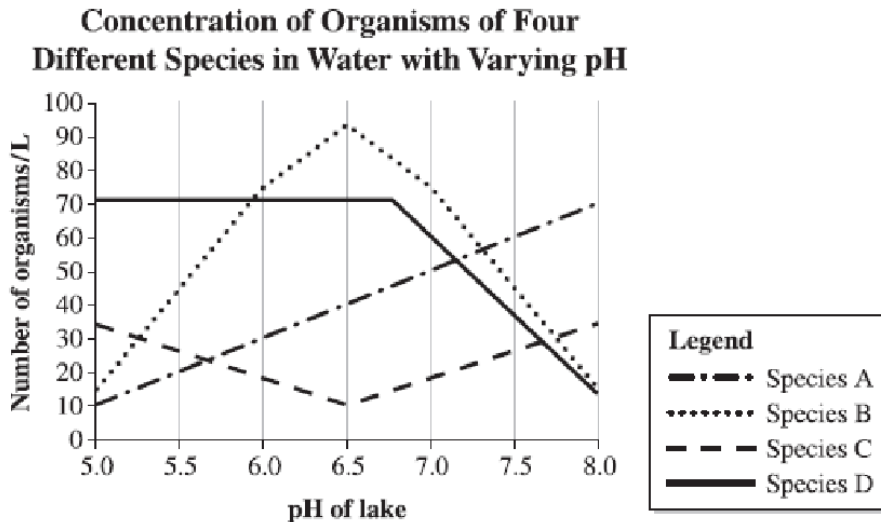


Design i should be selected as the design for the new landfill, because the ii layer prevents chemical leaching.

The statement above is completed by the information in row

Row	i	ii
A.	X	gravel
B.	X	clay
C.	Y	sand and gravel
D.	Y	compacted sand

Many organisms are sensitive to changes in the pH of their environments. The graph below shows the concentrations of organisms of four different species as a function of the pH of a lake.



According to the information in the graph, which of the species is **most sensitive** to changes in the pH of the lake?

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

Which species has the **fewest** number of organisms present in lake water that has a neutral pH?

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

If acid rain falls into the lake and changes the pH of the water from 6.3 to 5.0, then the species that will increase in concentration is

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

**Test Results Showing the Effects of
Seven Different Liquids on Red and Blue Litmus Paper**

	Test I	Test II
Liquid	One drop of liquid is placed on red litmus paper	One drop of liquid is placed on blue litmus paper
Lemon juice	No colour change	Turns red
Ammonia	Turns blue	No colour change
Water	No colour change	No colour change
Liquid W	No colour change	Turns red
Liquid X	Turns blue	No colour change
Liquid Y	No colour change	Turns red
Liquid Z	No colour change	No colour change

Numerical Response

- 3.** For each of the liquids given below, use the number **1** to indicate if the liquid is an acid, the number **2** to indicate if the liquid is neutral, and the number **3** to indicate if the liquid is a base.

Number: _____ _____ _____ _____
Liquid: Liquid W Liquid X Liquid Y Liquid Z

(Record all four digits of your answer in the numerical-response section on the answer sheet.)