3747. Identify the location where approximately one-third of the world's population relies on rice grown in fields that are flooded by seasonal rains.

Consider the regions labeled A, B, C, and D on the following map of the world.

- 4 regions on the map are labeled by letter as follows:
    - A: Pacific Ocean west of Central America and northwestern South America
    - B: Central Africa
    - C: Southeast Asia
    - D: Pacific Ocean east of Australia

A. Region A

B. Region B

C. Region C

D. Region D

3748. Identify the location where changing temperatures have contributed to widespread coral bleaching and coral reef die-off.

Consider the regions labeled A, B, C, and D on the following map of the world.

- 4 regions on the map are labeled by letter as follows:
    - A: Pacific Ocean west of Central America and northwestern South America
    - B: Central Africa
    - C: Southeast Asia
    - D: Pacific Ocean east of Australia

A. Region A

B. Region B

C. Region C

D. Region D

3749. Identify the location where there is a reduction in fish stocks during an El Niño event because cool, nutrient-rich waters from the deep ocean fail to reach the surface.

Consider the regions labeled A, B, C, and D on the following map of the world.

- 4 regions on the map are labeled by letter as follows:
    - A: Pacific Ocean west of Central America and northwestern South America
    - B: Central Africa
    - C: Southeast Asia
    - D: Pacific Ocean east of Australia

A. Region A

B. Region B

C. Region C

D. Region D

3750. This cycle's primary reservoir is in the oceans; ice caps and groundwater are smaller reservoirs.

Consider the following biogeochemical cycles.

A Carbon cycle
B Nitrogen cycle
C Phosphorus cycle
D Hydrologic cycle

A. Carbon cycle

B. Nitrogen cycle

C. Phosphorus cycle

D. Hydrologic cycle

3751. This cycle has been disrupted by the burning of fossil fuels, where combustion is quickly moving atoms stored in the Earth's crust into the atmosphere.

Consider the following biogeochemical cycles.

A Carbon cycle
B Nitrogen cycle
C Phosphorus cycle
D Hydrologic cycle

A. Carbon cycle

B. Nitrogen cycle

C. Phosphorus cycle

D. Hydrologic cycle

3752. The major reservoir is the atmosphere, and cycling is relatively rapid.

Consider the following biogeochemical cycles.

A Carbon cycle
B Nitrogen cycle
C Phosphorus cycle
D Hydrologic cycle

A. Carbon cycle

B. Nitrogen cycle

C. Phosphorus cycle

D. Hydrologic cycle

3753. This agricultural practice can produce fertile soil for a few years but causes a rapid decrease in biodiversity and a rapid increase in carbon dioxide emissions when land is cleared.

Consider the following agricultural practices.

A Slash-and-burn
B Crop rotation
C Tilling
D Mechanized agriculture

A. Slash-and-burn

B. Crop rotation

C. Tilling

D. Mechanized agriculture

3754. This agricultural practice, popularized during the Green Revolution, can increase profits by increasing efficiency, but it relies heavily on fossil fuels.

Consider the following agricultural practices.

A Slash-and-burn

B Crop rotation
C Tilling
D Mechanized agriculture

A. Slash-and-burn

B. Crop rotation

C. Tilling

D. Mechanized agriculture

3755. This agricultural practice allows soil nutrients to rejuvenate when different crops are planted alternately over time on the same plot of land.

Consider the following agricultural practices.

A Slash-and-burn
B Crop rotation
C Tilling
D Mechanized agriculture

A. Slash-and-burn

B. Crop rotation

C. Tilling

D. Mechanized agriculture

3756. Identify the country that is most likely to have a decreasing number of individuals entering the workforce.

Consider the four age structure diagrams, each for a different country.

- All values are approximate.
- For the Male side of the diagram:
  - The histogram has 17 bars.
  - The population values for the 17 bars are summarized as follows:
    - Ages 0–19: falls gradually from 3 million to 2 million
    - Ages 20–39: falls gradually from 2.2 million to 1 million
    - Ages 40–59: falls gradually from 0.8 million to 0.5 million
    - Ages 60–84: falls gradually from 0.4 million to 0.1 million

- For the Female side of the diagram, the pattern is approximately the same as that on the Male side of the diagram.

- All values are approximate.
- For the Male side of the diagram:
    - The histogram has 16 bars.
    - The population values for the 16 bars are summarized as follows:
        - Ages 0–19: falls gradually from 3.2 million to 2.7 million
        - Ages 20–39: falls gradually from 2.2 million to 1.5 million
        - Ages 40–59: falls gradually from 1.3 million to 0.6 million
        - Ages 60–79: falls gradually from 0.5 million to 0.1 million
- For the Female side of the diagram:
    - The histogram has 18 bars.
    - The pattern is approximately the same as that on the Male side of the diagram for ages 0 through 44.
    - For ages 45 and up, the values are summarized as follows:
        - Ages 45–59: falls gradually from 1.2 million to 0.7 million
        - Ages 60–79: falls gradually from 0.5 million to 0.2 million
        - Ages 80–89: falls gradually from 0.2 million to 0.05 million

- All values are approximate.
- For the Male side of the diagram:
    - The histogram has 20 bars.
    - The population values for the 20 bars are summarized as follows:
        - Ages 0–19: rises gradually from 1.6 million to 1.9 million
        - Ages 20–39: rises gradually from 2.1 million to 2.4 million
        - Ages 40–49: rises gradually from 2.5 million to 3 million
        - Ages 50–64: falls gradually from 2.9 million to 2.4 million
        - Ages 65–74: rises gradually from 2.5 million to 2.9 million
        - Ages 75–99: falls gradually from 2 million to 0.1 million
- For the Female side of the diagram:
    - The histogram has 21 bars.

    - The pattern is approximately the same as that on the Males side of the diagram for ages 0 through 74.
    - For ages 75 and up, the values are summarized as follows:
        - Ages 75–89: falls gradually from 2.4 million to 1.6 million
        - Ages 90–100+: falls gradually from 1 million to 0.1 million

- All values are approximate.
- For the Male side of the diagram:
    - The histogram has 18 bars.
    - The population values for the 18 bars are summarized as follows:
        - Ages 0–14: rises gradually from 2.8 million to 2.9 million
        - Ages 15–29: rises gradually from 2.8 million to 3 million
        - Ages 30–49: falls gradually from 2.7 million to 2 million
        - Ages 50–69: falls gradually from 1.8 million to 1 million
        - Ages 70–89: falls gradually from 1 million to 0.2 million
- For the Female side of the diagram:
    - The histogram has 19 bars.
    - The pattern is approximately the same as that on the Male side of the diagram, with an additional bar for ages 90–94 with a population value of 0.1 million.

A. Country A

B. Country B

C. Country C

D. Country D

3757. Identify the country that is most likely to have a total fertility rate at replacement level.

Consider the four age structure diagrams, each for a different country.

- All values are approximate.
- For the Male side of the diagram:
    - The histogram has 17 bars.
    - The population values for the 17 bars are summarized as follows:
        - Ages 0–19: falls gradually from 3 million to 2 million

        - Ages 20–39: falls gradually from 2.2 million to 1 million
        - Ages 40–59: falls gradually from 0.8 million to 0.5 million
        - Ages 60–84: falls gradually from 0.4 million to 0.1 million
- For the Female side of the diagram, the pattern is approximately the same as that on the Male side of the diagram.

- All values are approximate.
- For the Male side of the diagram:
    - The histogram has 16 bars.
    - The population values for the 16 bars are summarized as follows:
        - Ages 0–19: falls gradually from 3.2 million to 2.7 million
        - Ages 20–39: falls gradually from 2.2 million to 1.5 million
        - Ages 40–59: falls gradually from 1.3 million to 0.6 million
        - Ages 60–79: falls gradually from 0.5 million to 0.1 million
- For the Female side of the diagram:
    - The histogram has 18 bars.
    - The pattern is approximately the same as that on the Male side of the diagram for ages 0 through 44.
    - For ages 45 and up, the values are summarized as follows:
        - Ages 45–59: falls gradually from 1.2 million to 0.7 million
        - Ages 60–79: falls gradually from 0.5 million to 0.2 million
        - Ages 80–89: falls gradually from 0.2 million to 0.05 million

- All values are approximate.
- For the Male side of the diagram:
    - The histogram has 20 bars.
    - The population values for the 20 bars are summarized as follows:
        - Ages 0–19: rises gradually from 1.6 million to 1.9 million
        - Ages 20–39: rises gradually from 2.1 million to 2.4 million
        - Ages 40–49: rises gradually from 2.5 million to 3 million
        - Ages 50–64: falls gradually from 2.9 million to 2.4 million
        - Ages 65–74: rises gradually from 2.5 million to 2.9 million

        - Ages 75–99: falls gradually from 2 million to 0.1 million
- For the Female side of the diagram:
    - The histogram has 21 bars.
    - The pattern is approximately the same as that on the Males side of the diagram for ages 0 through 74.
    - For ages 75 and up, the values are summarized as follows:
        - Ages 75–89: falls gradually from 2.4 million to 1.6 million
        - Ages 90–100+: falls gradually from 1 million to 0.1 million

- All values are approximate.
- For the Male side of the diagram:
    - The histogram has 18 bars.
    - The population values for the 18 bars are summarized as follows:
        - Ages 0–14: rises gradually from 2.8 million to 2.9 million
        - Ages 15–29: rises gradually from 2.8 million to 3 million
        - Ages 30–49: falls gradually from 2.7 million to 2 million
        - Ages 50–69: falls gradually from 1.8 million to 1 million
        - Ages 70–89: falls gradually from 1 million to 0.2 million
- For the Female side of the diagram:
    - The histogram has 19 bars.
    - The pattern is approximately the same as that on the Male side of the diagram, with an additional bar for ages 90–94 with a population value of 0.1 million.

A. Country A

B. Country B

C. Country C

D. Country D

3758. Identify the country that would be expected to have the highest percentage of women in the workforce and the best access to family planning.

Consider the four age structure diagrams, each for a different country.

- All values are approximate.
- For the Male side of the diagram:

    - The histogram has 17 bars.
    - The population values for the 17 bars are summarized as follows:
        - Ages 0–19: falls gradually from 3 million to 2 million
        - Ages 20–39: falls gradually from 2.2 million to 1 million
        - Ages 40–59: falls gradually from 0.8 million to 0.5 million
        - Ages 60–84: falls gradually from 0.4 million to 0.1 million
- For the Female side of the diagram, the pattern is approximately the same as that on the Male side of the diagram.

- All values are approximate.
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        - Ages 60–79: falls gradually from 0.5 million to 0.1 million
- For the Female side of the diagram:
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        - Ages 60–79: falls gradually from 0.5 million to 0.2 million
        - Ages 80–89: falls gradually from 0.2 million to 0.05 million

- All values are approximate.
- For the Male side of the diagram:
    - The histogram has 20 bars.
    - The population values for the 20 bars are summarized as follows:
        - Ages 0–19: rises gradually from 1.6 million to 1.9 million
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        - Ages 40–49: rises gradually from 2.5 million to 3 million
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        - Ages 70–89: falls gradually from 1 million to 0.2 million
- For the Female side of the diagram:
    - The histogram has 19 bars.
    - The pattern is approximately the same as that on the Male side of the diagram, with an additional bar for ages 90–94 with a population value of 0.1 million.

A. Country A

B. Country B

C. Country C

D. Country D

3759. Which of the following is an example of a parasitic relationship?

A. A cheetah that feeds on a gazelle.

B. A worm that lives inside of the intestine of a pig.

C. A cow that must eat plants to survive.

D. Two bird species that use common nesting sites.

3760. Which of the following is a true statement about invasive species?

A. Invasive species are often less able to compete for resources than native species are.

B. Strategies to protect invasive species include criminalizing poaching and protecting habitats.

C. Most invasive species are *K*-selected and are specialist species.

D. Invasive species are often successful in disrupted ecosystems.

3761. The Pacific Plate is moving at a rate of approximately 10 centimeters per year. Based on this information and assuming the rate is constant, which of the following best estimates the number of years it will take for the plate to move 100 meters? (Note: 100 centimeters = 1 meter)

A. 100 years

B. 1,000 years

C. 10,000 years

D. 100,000 years

3762. Which of the following is an unintended consequence of solid-waste incineration?

A. Stratospheric ozone depletion occurs at a greater rate.

B. Clouds of phosphorus compounds form in the atmosphere.

C. Particulate matter is released into the atmosphere.

D. The volume of solid waste in landfills is reduced.

3763. Based on the theory of island biogeography, which of the following islands shown in the diagram would most likely have the highest species richness?

Consider the following map of offshore islands A, B, C, and D.

- Islands A, B, C, and D are identified by size and proximity to a continent as follows:
    - Island A: small island near the continent
    - Island B: large island near the continent
    - Island C: large island far from the continent
    - Island D: small island far from the continent

A. Island A

B. Island B

C. Island C

D. Island D

3764. Which of the following describes an advantage of using energy obtained from the combustion of natural gas compared to energy obtained from solar power?

A. Energy produced from natural gas is more expensive than energy produced from solar power.

B. Energy produced from natural gas is constant over a 24-hour period, whereas energy from solar power can be variable.

C. Solar energy production uses a turbine and a generator, whereas natural gas does not.

D. Solar energy production emits harmful atmospheric pollutants, whereas natural gas does not.

3765. Which of the following is a claim made by the author of the article?

How Marsh Grass Protects Shorelines

Marsh grasses, which are ubiquitous along the world's shorelines, can play a major role in mitigating the damage to coastlines as sea levels rise and storm surges increase.... A new...study provides greater detail about how these protective benefits work under real-world conditions shaped by waves and currents.

The...study combined laboratory experiments using simulated plants in a large wave tank with mathematical modeling.

"This project is a great example of how the outcomes of basic science research can inform climate adaptation in coastal areas," says Laura Lautz, a program director.... "The results guide how restoration efforts can be most effective in mitigating coastal flooding caused by sea level rise and severe storms."

Coastal marsh plants provide significant protection from surges and devastating storms. For example, it's estimated that the damage caused by Hurricane Sandy was reduced by $625 million thanks to the damping of wave energy by extensive areas of marsh along the affected coasts. The new analysis incorporates details of plant morphology, such as the number and spacing of flexible leaves versus stiffer stems, and the complex interactions of currents and waves that may be coming from different directions.

That level of detail could enable coastal restoration planners to determine the area of marsh needed to mitigate expected amounts of storm surge or sea level rise, and to decide which types of plants to introduce to maximize protection.

"When you go to a marsh, you often will see that the plants are arranged in zones," says Nepf [one author of the study]. "Along the edge, you tend to have plants that are more flexible, because they are using their flexibility to reduce wave forces. In the next zone, the plants are a little more rigid and have a bit more leaves."

As the zones progress, the plants become stiffer, leafier and more effective at absorbing wave energy, thanks to their greater leaf area. The new modeling allows coastal planners to take these details into account when planning protection, mitigation or restoration projects.

Courtesy: National Science Foundation

A. Marsh plants colonize storm-influenced environments through succession.

B. Coastal planners can use marsh plants to prevent global sea level rise.

C. The impacts of storm surge can be mitigated through the planting of marsh plants.

D. Basic scientific research is incapable of informing planning for climate change.

3766. Which of the following is an assumption the author makes regarding how useful the research will be for restoration planners?

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As the zones progress, the plants become stiffer, leafier and more effective at absorbing wave energy, thanks to their greater leaf area. The new modeling allows coastal planners to take these details into account when planning protection, mitigation or restoration projects.

Courtesy: National Science Foundation

A. Planners can predict with some certainty how large storm surges will be in the future.

B. The wave energy will decrease as marsh-grass levels are reduced.

C. Marsh-grass structure is too complex to be modeled effectively.

D. Sea level rise will cease after about 50 years.

3767. What evidence does the author use to support the claim that planners can maximize coastal protection by choosing certain plants to restore in marshes?

How Marsh Grass Protects Shorelines

Marsh grasses, which are ubiquitous along the world's shorelines, can play a major role in mitigating the damage to coastlines as sea levels rise and storm surges increase.... A new...study provides greater detail about how these protective benefits work under real-world conditions shaped by waves and currents.

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"This project is a great example of how the outcomes of basic science research can inform climate adaptation in coastal areas," says Laura Lautz, a program director.... "The results guide how restoration efforts can be most effective in mitigating coastal flooding caused by sea level rise and severe storms."

Coastal marsh plants provide significant protection from surges and devastating storms. For example, it's estimated that the damage caused by Hurricane Sandy was reduced by $625 million thanks to the damping of wave energy by extensive areas of marsh along the affected coasts. The new analysis incorporates details of plant morphology, such as the number and spacing of flexible leaves versus stiffer stems, and the complex interactions of currents and waves that may be coming from different directions.

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As the zones progress, the plants become stiffer, leafier and more effective at absorbing wave energy, thanks to their greater leaf area. The new modeling allows coastal planners to take these details into account when planning protection, mitigation or restoration projects.

Courtesy: National Science Foundation

A. Cost of damage from Hurricane Sandy

B. Structures and flexibility of plants found in different marsh zones

C. Model projections of future storm surge size

D. Projections of coastal populations for the next 100 years

3768. Which of the following is an advantage to restoring coastal marshland with native plants?

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Marsh grasses, which are ubiquitous along the world's shorelines, can play a major role in mitigating the damage to coastlines as sea levels rise and storm surges increase.... A new...study provides greater detail about how these protective benefits work under real-world conditions shaped by waves and currents.

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As the zones progress, the plants become stiffer, leafier and more effective at absorbing wave energy, thanks to their greater leaf area. The new modeling allows coastal planners to take these details into account when planning protection, mitigation or restoration projects.

Courtesy: National Science Foundation

A. Restored areas with native plants will attract native animals and increase biodiversity.

B. Native plants will decrease the frequency of storm surges generated by hurricanes.

C. Native plant species produce less carbon dioxide than nonnative species and will slow global warming.

D. Restored habitats increase coastal erosion, leading to increased nutrient flow into shallow marine communities.

3769. Which of the following is a consequence of a population exceeding the carrying capacity of its environment?

A. The population will continue to grow until a higher stable number of individuals is reached.

B. Resources will be consumed to the point that the population will experience a dieback.

C. The population will initially decrease and then rebound once an outbreak of disease occurs.

D. Demand for the limited supply of resources will increase, resulting in an increase in the population.

3770. Which of the following roles do African elephants occupy within their ecosystem?

African elephants trample forests and small trees to access their roots to eat, allowing grasses and smaller species to thrive. Herds travel over vast rangelands, and they disperse seeds in their dung, which helps generate new plant growth. Grasslands where elephants have been removed often transition to shrublands or dry forest.

A. Pioneer species

B. Indicator species

C. Keystone species

D. Primary producer species

3771. Based on the data in the graph, which of the following correctly identifies the independent and dependent variables and their relationship?

The following graph shows the percent mortality of radish seeds exposed to different concentrations of a salt solution. Twenty seeds were placed in each of the different solutions prior to planting. Seed mortality was then measured as the percentage of seeds planted that did not sprout during the study period.

Radish Seed Mortality from Salt Exposure

- From left to right, the 8 points have the following approximate (Salt Solution Concentration comma Radish Seed Mortality) coordinates:
  - (1 comma 1)
  - (2 comma 20)
  - (3 comma 60)
  - (4 comma 92)
  - (5 comma 88)
  - (6 comma 98)
  - (7 comma 95)
  - (8 comma 100)

A.

Independent Variable	Dependent Variable	Relationship Between Independent and Dependent Variable
Salt solution concentration	Radish seed mortality	Direct

B.

Independent Variable	Dependent Variable	Relationship Between Independent and Dependent Variable
Salt solution concentration	Radish seed mortality	Inverse

C.

Independent Variable	Dependent Variable	Relationship Between Independent and Dependent Variable

Independent Variable	Dependent Variable	Relationship Between Independent and Dependent Variable
Radish seed mortality	Salt solution concentration	Direct

D.

Independent Variable	Dependent Variable	Relationship Between Independent and Dependent Variable
Radish seed mortality	Salt solution concentration	Inverse

3772. Based on the data in the graph, which of the following would be the approximate concentration of salt solution of the LD_{50} for radish seeds?

The following graph shows the percent mortality of radish seeds exposed to different concentrations of a salt solution. Twenty seeds were placed in each of the different solutions prior to planting. Seed mortality was then measured as the percentage of seeds planted that did not sprout during the study period.

Radish Seed Mortality from Salt Exposure

- From left to right, the 8 points have the following approximate (Salt Solution Concentration comma Radish Seed Mortality) coordinates:
  - (1 comma 1)
  - (2 comma 20)
  - (3 comma 60)
  - (4 comma 92)
  - (5 comma 88)
  - (6 comma 98)
  - (7 comma 95)
  - (8 comma 100)

A. 1.9%

B. 2.7%

C. 3.5%

D. 5.0%

3773. The study was conducted because scientists hypothesized that radish seeds and other crops are negatively affected by increased soil salinity. Which of the following irrigation methods would best prevent the salinization of soils in crop land?

The following graph shows the percent mortality of radish seeds exposed to different concentrations of a salt solution. Twenty seeds were placed in each of the different solutions prior to planting. Seed mortality was then measured as the percentage of seeds planted that did not sprout during the study period.

Radish Seed Mortality from Salt Exposure

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    - (1 comma 1)
    - (2 comma 20)
    - (3 comma 60)
    - (4 comma 92)
    - (5 comma 88)
    - (6 comma 98)
    - (7 comma 95)
    - (8 comma 100)

A. Drip irrigation

B. Furrow irrigation

C. Spray irrigation

D. Flood irrigation

3774. Which of the following describes an additional ecological advantage of planting cover crops?

To decrease the effects of pests, a farmer plants cover crops that support populations of natural predators of pest insects. Cover crops are plants that are grown to cover the bare soil between harvests of the main crop.

A. Cover crops provide habitats for microbial species by decreasing soil pH.

B. Cover crops increase soil quality by decreasing the number of pollinating insects.

C. Cover crops can be harvested to provide additional income for farmers.

D. Cover crops reduce soil erosion by anchoring the soil.

3775. Which of the following provides the most likely explanation for this observation?

Juvenile salmon of a certain species are usually found living in water temperatures ranging between 6°C and 22°C. A scientist studying the species found an individual juvenile salmon living in a water temperature of 24°C.

A. The individual is an indicator species and can survive in a range of conditions as it experiences environmental change.

B. The ecological tolerance range of the species is an average and may not reflect the range of the individual.

C. The scientist's thermometer was incorrect since 24°C is outside of the temperature range for the species.

D. The higher temperature led to higher dissolved oxygen concentrations, allowing the juvenile salmon to survive.

3776. Based on the data in the table, which of the following countries has a fertility rate that is closest to replacement level?

Consider the following fertility rates table.

Fertility Rates of Four Countries

	Total Fertility Rate
Country W	2.1
Country X	3.5
Country Y	1.7
Country Z	4.4

A. Country W

B. Country X

C. Country Y

D. Country Z

3777. Based on the data in the table, which of the following types of livestock requires the greatest amount of water per kilogram to produce?

Consider the following table about the environmental impacts of livestock.

Production Averages for Several Food Sources (per kg of animal)

Food Source	Carbon Dioxide Emissions (kg)	Feed Required (kg)	Land Required (m^2)	Water Required (L)
Beef	175	10.0	250	15,500
Pork	55	5.0	70	6,000
Poultry	40	2.5	70	4,250
Insects	12	1.8	40	2,500

A. Beef

B. Pork

C. Poultry

D. Insects

3778. Scientists hypothesized that raising pork has a lower environmental impact than raising poultry. Which of the following statements correctly interprets the data in the table to evaluate the given hypothesis?

Consider the following table about the environmental impacts of livestock.

Production Averages for Several Food Sources (per kg of animal)

Food Source	Carbon Dioxide Emissions (kg)	Feed Required (kg)	Land Required (m^2)	Water Required (L)
Beef	175	10.0	250	15,500
Pork	55	5.0	70	6,000
Poultry	40	2.5	70	4,250
Insects	12	1.8	40	2,500

A. The hypothesis is supported because the amount of land required for the two sources is the same.

B. The hypothesis is supported because the amount of water required for pork is greater than the amount required to raise the same mass of poultry.

C. The hypothesis is refuted because pork requires less land and water but releases more carbon dioxide.

D. The hypothesis is refuted because poultry requires less feed and water while releasing less carbon dioxide.

3779. An average pig used for pork production weighs about 315 kg. How much feed would be needed to raise and produce 150 pigs?

Consider the following table about the environmental impacts of livestock.

Production Averages for Several Food Sources (per kg of animal)

Food Source	Carbon Dioxide Emissions (kg)	Feed Required (kg)	Land Required (m^2)	Water Required (L)
Beef	175	10.0	250	15,500
Pork	55	5.0	70	6,000
Poultry	40	2.5	70	4,250
Insects	12	1.8	40	2,500

A. 1,575 kg

B. 47,250 kg

C. 118,125 kg

D. 236,250 kg

3780. Based on the diagram, at which location would thermal pollution have the greatest impact on the dissolved oxygen concentration in the river?

Consider the following diagram of a factory near a river.

A. Location A

B. Location B

C. Location C

D. Location D

3781. Which of the following is the most likely reason for the observed increase in flooding in the park?

A park was built 50 years ago in a rural area alongside a small stream. Over the past 10 years, there has been significant development of new housing and retail spaces near the park. While there have been occasional small floods in the park over the years, there have been two major floods in the last three years.

A. The increase in impervious surfaces as a result of development led to increased runoff.

B. With more people living in the area, more household water use caused increased runoff.

C. Elevated temperatures associated with climate change caused an increase in rainfall, which led to increased runoff.

D. High irrigation and low infiltration in the park caused extra water to run off, which caused flooding.

3782. A population of 2.3 million people will double in approximately 47 years. Assuming that the growth rate remains constant, which of the following values represents the growth rate in the country?

A. 1.5%

B. 3.3%

C. 6.7%

D. 30.4%

3783. A town located along a river is looking to increase electricity production while minimizing the possible negative environmental impact. Which of the following claims best supports the installation of a hydroelectric dam to meet the town's goal?

A. Installation of a hydroelectric dam would have minimal effect on terrestrial habitat and decrease upstream flooding.

B. The diversion of water to create a hydroelectric dam would increase spawning opportunities for fish and increase downstream sedimentation.

C. The creation of a reservoir for hydroelectricity generation would lead to an increase in recreational opportunities downstream of the dam.

D. Hydroelectric energy production does not release particulate matter and uses a renewable energy source.

3784. Which of the following best explains how a photovoltaic (PV) system installed on a building could help improve local air quality?

A. PV systems use solar radiation, which is a nonrenewable energy resource.

B. PV systems can be used to charge an electric vehicle, which could reduce the reliance on local fossil-fuel power plants.

C. PV systems cannot produce electricity at night, which would reduce the emission of air pollutants.

D. PV systems require the disposal of hazardous waste, which would decrease the demand for landfills.

3785. Which of the following statements about global warming potential (GWP) is true?

A. CFCs are used as the reference when calculating GWP.

B. CO_2 has a defined GWP value of 1.

C. GWP does not include how long a gas remains in the atmosphere.

D. Gases with high GWP values absorb less energy than gases with low GWP values.

3786. Which of the following best describes a regulating ecosystem service provided by mangrove ecosystems?

A. Areas with mangrove forests can be used for recreation and educational programming.

B. Cities near mangroves will experience economic benefits from increased fish and shrimp habitat.

C. Mangroves provide timber for building materials.

D. Coastlines will benefit from increased protection from flood waters during severe storms.

3787. Based on the data in the graph, which of the following best describes the pattern of invasive species establishment in the watershed?

The following graph shows invasive species in a watershed since the 1910s.

Number of Invasive Aquatic Species, by Decade

- Each bar is stacked with the following 5 data sets:
  - Bacteria/Viruses
  - Protists
  - Plants
  - Invertebrates
  - Fishes
- All values are approximate.
- The Number of Invasive Species data for the 10 data categories are as follows:
  - 1910s:
    - Bacteria/Viruses: 1
    - Protists: 1
    - Plants: 40
    - Invertebrates: 10
    - Fishes: 10
  - 1920s:

        - Bacteria/Viruses: 2
        - Protists: 2
        - Plants: 40
        - Invertebrates: 10
        - Fishes: 10
    - 1930s:
        - Bacteria/Viruses: 2
        - Protists: 4
        - Plants: 46
        - Invertebrates: 16
        - Fishes: 16
    - 1940s:
        - Bacteria/Viruses: 2
        - Protists: 6
        - Plants: 46
        - Invertebrates: 16
        - Fishes: 16
    - 1950s:
        - Bacteria/Viruses: 2
        - Protists: 6
        - Plants: 52
        - Invertebrates: 22
        - Fishes: 18
    - 1960s:
        - Bacteria/Viruses: 2
        - Protists: 12
        - Plants: 54
        - Invertebrates: 24
        - Fishes: 18
    - 1970s:
        - Bacteria/Viruses: 2

- Protists: 24
- Plants: 54
- Invertebrates: 30
- Fishes: 20

- 1980s:
  - Bacteria/Viruses: 2
  - Protists: 26
  - Plants: 54
  - Invertebrates: 40
  - Fishes: 24
- 1990s:
  - Bacteria/Viruses: 4
  - Protists: 30
  - Plants: 54
  - Invertebrates: 54
  - Fishes: 26
- 2000s:
  - Bacteria/Viruses: 6
  - Protists: 36
  - Plants: 56
  - Invertebrates: 56
  - Fishes: 26
- 2010s:
  - Bacteria/Viruses: 6
  - Protists: 36
  - Plants: 56
  - Invertebrates: 56
  - Fishes: 26

A. Fish constituted the majority of the invasive species identified in the 2010s.

B. The number of invasive plants identified in each decade increased from the 1910s to the 2010s.

C. The number of invasive species identified per category remained the same from the 2000s to the 2010s.

D. There were twice as many invasive species identified in the 2010s than there were in the 1960s.

3788. A potential solution to reduce the negative impact of invasive species within the watershed is to introduce pesticides that are modified to specifically target and kill invasive invertebrate and plant species.

Which of the following statements best describes how the data in the graph support the use of pesticides for the greatest reduction in invasive species in the watershed?

The following graph shows invasive species in a watershed since the 1910s.

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        - Bacteria/Viruses: 2
        - Protists: 26
        - Plants: 54
        - Invertebrates: 40

        - Fishes: 24
    - 1990s:
        - Bacteria/Viruses: 4
        - Protists: 30
        - Plants: 54
        - Invertebrates: 54
        - Fishes: 26
    - 2000s:
        - Bacteria/Viruses: 6
        - Protists: 36
        - Plants: 56
        - Invertebrates: 56
        - Fishes: 26
    - 2010s:
        - Bacteria/Viruses: 6
        - Protists: 36
        - Plants: 56
        - Invertebrates: 56
        - Fishes: 26

A. In the 2010s, invasive invertebrate and plant species accounted for the majority of all invasive species identified in the watershed.

B. The number of invasive invertebrate and plant species identified in the watershed has remained relatively constant since the 1910s.

C. The number of invasive plant species identified since the 1910s has more than doubled.

D. In the 2010s, invasive invertebrate species accounted for the lowest percentage of all invasive species identified in the watershed.

3789. Which of the following values represents the number of new invasive species identified between the 1960s and 1970s?

The following graph shows invasive species in a watershed since the 1910s.

Number of Invasive Aquatic Species, by Decade

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        - Fishes: 26
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        - Bacteria/Viruses: 6
        - Protists: 36
        - Plants: 56
        - Invertebrates: 56
        - Fishes: 26

A. 2

B. 10

C. 20

D. 138

3790. Which of the following is a secondary air pollutant that forms in the troposphere?

A. Carbon monoxide

B. Particulate matter

C. Methane

D. Ozone

3791. The following graphs represent different countries' growth rates shown on the same scale. Which country will be the first to double in size if the same trends continue in the future?

A.

B.

C.

D.

3792. Assuming the results of the experiment supported the original hypothesis, which of the following was the most likely hypothesis for the experiment?

To investigate the effects of traffic noise pollution on the diversity of songbirds, scientists developed an unoccupied road next to a walking trail in a park. To mimic an actual road, scientists affixed speakers to trees along an 800-meter segment of the road at 25-meter intervals. Speakers played road noise at a constant volume for 4-day intervals for 2 months. Bird counts were conducted daily. Scientists recorded a 25% decrease in the number of birds on days when the speakers were playing the road noise.

A. The number of birds present along the road will decrease in the presence of road noise.

B. The number of birds present along the road will increase as the road noise decreases the number of predators.

C. The number of birds present along the road will decrease as the volume of road noise decreases.

D. The number of birds present along the road will increase as the road noise increases migration routes through the park.

3793. The interaction between wind and waves in the ocean produces sea spray aerosols that often include airborne sea salt. Which of the following best describes sea spray aerosols, including sea salt?

A. Sea spray aerosols are a category of volatile organic compounds.

B. Sea spray aerosols often become tertiary pollutants.

C. Sea spray aerosols often become atmospheric particulates.

D. Sea spray aerosols are a precursor of thermal pollution.

3794. Which of the following explains the most likely cause for this trend?

A class of environmental science students monitors the water quality of a stream in an agricultural area. The students notice that the stream's nitrogen levels, as measured by the concentration of nitrate ions, significantly increase each spring.

A. Nitrates from increased emissions during the winter months at manufacturing plants are deposited in the stream.

B. As atmospheric ice crystals melt in the spring, the ozone layer thins and nitrates deposit in the stream.

C. Carbon dioxide levels decrease in the atmosphere as new leaves sprout on the trees in the spring, resulting in nitrate deposition in the stream.

D. Each spring, fertilizer is applied to agricultural fields and runoff carries increased nitrates into the stream.

3795. Which of the following is the author's primary claim in the article?

California's Drought Killed Almost 150 Million Trees

The epic drought that began in the state of California in December 2011 and only officially ended in March of [2019] will have many lasting impacts—but one of the most severe is what it did to the trees in the central and southern Sierra Nevada mountains. A new study...reports that by the drought's peak, a combination of factors...led to mass die-offs [totaling] almost 150 million trees....

[R]esearchers analyzed various forest communities...including areas where 80 percent of the trees died and other [sites] where as few as 2 percent of the trees were lost. They found that a number of factors came together to deal a devastating blow in the worst-hit areas of the forests....

[T]he roots of Sierra Nevada forests stretch down 15 to 50 feet, meaning that even during droughts trees can access moisture

locked deep underground.... “Parts of the Sierra Nevada reached a ‘tipping point’...where annual precipitation plus stored subsurface water were not enough to meet the water demand of the forest,” co-author Roger Bales of the University of California, Merced says.... “This forest die-off can be viewed as a ‘perfect storm’—the intersection of four years of low precipitation, hotter temperatures than in past droughts, and a heavily overstocked forest from centuries of fire suppression.”

Jacob Margolis at *LAist* reports that a similar drought between 1987 and 1992 was as dry as the recent drought period... [However, this] time around, temperatures averaged 2.16 degrees higher.... That led to a cascade effect; the heat caused accelerated evapotranspiration, in which water evaporates from leaves, leading to increased water consumption by the trees. Once the trees used up all available moisture and the roots began to dry out, the green canopies above also began to shrink. The stress also made the trees more susceptible to pathogens and insects, like bark beetles. All of that added up to major tree mortality.... Fifty-five percent more trees died off than the typical annual average—with nearly 80 percent of trees above 3,800 ft of elevation dying....

[R]esearchers say to expect more tree die-offs in the future as the planet warms. “We expect climate change to further amplify evapotranspiration and ground moisture overdraft...during drought,” co-author Michael Goulden of the University of California, Irvine says.... “This effect could result in a 15 percent to 20 percent increase in tree death for each additional degree of warming.... We need to manage the forest like we would agriculture or other systems that are water limited, and not have as many trees there,” he suggests....

[T]here is a small silver lining to the mass forest die-offs.... It gives land managers the chance to start with a clean slate and manage forests so they are more diverse, less dense and more resilient....

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A. The management of forested areas using fire suppression techniques will help to decrease the frequency of wildfires and increase the health of California forests.

B. Frequent drought conditions combined with higher-than-average temperatures are increasing evapotranspiration rates in California forests, leading to stressed trees that are more susceptible to pests and disease.

C. Decreasing temperatures in California are causing more frequent periods of drought and a decline in a few tree species that have narrow tolerance ranges.

D. The overuse of forests for international exports is significantly reducing the size of forests in California and causing a decline in biodiversity.

3796. Based on the article, which of the following pieces of evidence best supports the claim that trees at higher elevations have an increased risk of mortality compared with those at lower elevations?

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A. By the end of 1992, about 55% more trees died than the typical annual average.

B. Increased evapotranspiration rates can result in a 20% increase in tree mortality.

C. The roots of trees in Sierra Nevada forests can extend 15–50 feet into the soil.

D. During a drought from 1987 to 1992, about 80% of trees above 3,800 feet died.

3797. Based on the article, which of the following is the most likely perspective the author has about the future of forests in California?

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A. Droughts will continue to happen, and there are minimal, if any, realistic solutions that will mitigate the effects of droughts on forest communities.

B. Forest management techniques that mimic agricultural methods will be the most successful at improving forest biodiversity by decreasing competition for water.

C. The use of fire suppression methods will be most effective at increasing groundwater reserves because fewer trees will use water through transpiration.

D. Decreased insect infestations during droughts will improve the overall health of forests because the insects are a source of food in the ecosystem.

3798. Which of the following methods would best decrease the vulnerability of forests to the effects of climate change?

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A. Reforesting areas with tree species that have high evapotranspiration rates and grow best in low-to-moderate temperatures

B. Decreasing the use of plant-based products and increasing the consumption of animal-based foods

C. Using selective cutting practices to decrease forest density and planting tree species that have a wide tolerance range

D. Transitioning from the use of fossil fuels for energy generation to the use of biomass, specifically using trees that have died during droughts

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3799. Which of the following statements correctly describes a component of Earth’s atmosphere?

A. The atmosphere has three layers that are separated by a gradient of carbon dioxide.

B. The troposphere is the densest atmospheric layer and is closest to Earth’s surface.

C. The ozone layer, which absorbs ultraviolet radiation from the Sun, is found in the mesosphere.

D. Weather events and meteor showers occur in the stratosphere.

3800. Based on the data in the graph, which of the following best describes Species A and Species B based on their relative population sizes over time?

Consider the following population graph for two species.

Relative Population Sizes of Species A and Species B Over Time

- All values are approximate.
- The following 2 lines are shown:
  - Species A
  - Species B
- The Species A line:

- Begins at a point of high relative population size on the vertical axis and fluctuates slightly to the end of the horizontal axis while maintaining roughly the same size

- The Species B line:
  - Begins at a point of low relative population size on the vertical axis
  - Rises sharply to a point of medium population size, about halfway up the vertical axis
  - Falls sharply to a point of low population size
  - Rises sharply to a point of high population size near the top of the vertical axis and higher than the maximum population size of species A
  - Falls sharply to a point of low population size
  - Rises sharply to a point of point of medium population size, about halfway up the vertical axis
  - Falls sharply to a point of low population size
  - Rises in a gradual curve to about halfway up the vertical axis

A.

Species A	**Species B**
Keystone species	Indicator species

B.

Species A	**Species B**
Type III survivorship	Type I survivorship

C.

Species A	**Species B**
K-selected species	*r*-selected species

D.

Species A	**Species B**

Species A	Species B
Parasite	Host

3801. Which of the following statements best explains the appearance of golden plover chicks?

The Pacific golden plover is a medium-sized wading shorebird that breeds in the Arctic tundra. Males and females build shallow nests in the ground for their eggs and line the nest with pebbles, lichen, and moss. Once hatched, golden plover chicks have yellow-green backs with dark patterns, contrasting them from the usual solid blacks, browns, and grays of most other newly hatched shorebirds that do not use ground nests.

A. The coloration of the chicks helps the parent birds recognize their own chicks from those of other shorebirds that lay eggs in the nests of the golden plovers.

B. Adult golden plovers lay their eggs in the nests of other shorebirds so that the golden plover chicks blend in better with the chicks of the other birds.

C. The chicks have adaptations that best suit the ground cover of the tundra, which helps camouflage them from predators.

D. The down feathers of the newly hatched chicks become yellow-green from the food they consume along the shoreline of the coastal tundra.

3802. Which of the following best describes phosphorus in an ecosystem?

A. It is found only in living organisms.

B. It is a major component of the atmosphere.

C. It undergoes fixation within the soil to make it available to plants.

D. It cycles through aquatic and terrestrial environments.

3803. Which of the following best describes the amount of solar radiation at a location of 30° S latitude in December compared to the amount of solar radiation at the same location in June?

A. The amount of solar radiation would be less in June because it passes through a thinner layer of atmosphere at that time.

B. The amount of solar radiation would be less in December because the South Pole is tilted away from the Sun at that location.

C. The amount of solar radiation would be greater in December because the angle of sunlight is closer to perpendicular at that location.

D. The amount of solar radiation would be greater in June because Earth is closest to the Sun at that point in time.

3804. Based on the diagram, which of the following best supports the claim that building taller wind turbines in the future would increase electricity generation from wind?

Consider the following wind turbine diagram.

Comparing the Heights of Wind Turbines

- The diagram shows 2 turbines: one at the current height and a taller turbine at a future height.
- A stack of arrows representing wind velocity points toward the turbines.
- From bottom to top, each arrow in the stack is longer than the previous.
- The stack of arrows is taller than the height of the current turbine.

A. Taller turbines are less expensive to build than shorter turbines.

B. Migratory animals, such as birds, will be less affected by taller turbines than by shorter turbines.

C. Wind speed increases as altitude above Earth's surface increases.

D. Trees and buildings block a portion of the prevailing winds that rise over mountains.

3805. Which of the following best describes a problem associated with these small aquatic plastics?

Very small plastic beads, called microbeads, are often found in cosmetics and beauty care products. These plastics can enter aquatic ecosystems when used by consumers because they are not often captured by wastewater treatment.

A. They dissolve in water and are absorbed by large sea mammals.

B. They are ingested by organisms and the chemicals they contain are transferred through food webs.

C. They become chemically bonded to fishing nets and reduce the number of fish that are caught.

D. They increase survival and reproduction of invasive fish once consumed.

3806. In which location in the diagram would air flowing through the wet scrubber have the greatest concentration of air pollutants?

The following diagram shows the process of a wet scrubber in a coal-fired power plant. The solid arrows indicate the direction of air flow.

- Air enters through an opening in the bottom of the cylindrical chamber, flows up through 2 rows of water sprinklers, then exits through an opening at the top.
- A reservoir at the bottom collects the falling water.
- 4 locations on the diagram are labeled A through D as follows:
    - A: Air output
    - B: Sprinklers
    - C: Air intake
    - D: Water reservoir

A. Location A

B. Location B

C. Location C

D. Location D

3807. Which of the following would most likely result from the process illustrated in the diagram?

The following diagram shows the process of a wet scrubber in a coal-fired power plant. The solid arrows indicate the direction of air flow.

- Air enters through an opening in the bottom of the cylindrical chamber, flows up through 2 rows of water sprinklers, then exits through an opening at the top.
- A reservoir at the bottom collects the falling water.
- 4 locations on the diagram are labeled A through D as follows:
    - A: Air output
    - B: Sprinklers
    - C: Air intake
    - D: Water reservoir

A. A reduction in photochemical smog formation because of a decrease in particulates released

B. A decrease in acid rain formation because of a decrease in sulfur dioxide released

C. A reduction in stratospheric ozone depletion because of a decrease in CFCs released

D. A decrease in global temperature because of a decrease in greenhouse gas emissions

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3808. Based on the data in the table, approximately how many tons of nitrogen oxide were emitted by gasoline-powered and diesel-powered on-road vehicles in 2011?

In 2011, the total annual nitrogen oxide emissions in the United States were estimated to be 362,209 tons. The table shows the different sources of nitrogen oxide emissions and how much each source contributed to the total annual emissions.

Emissions Source	Percent of Total Emissions, 2011
On-road gasoline	28%
On-road diesel	19%
Residential oil and gas combustion	7%
Commercial marine	6%

Emissions Source	Percent of Total Emissions, 2011
Electric utilities	4%
Waste disposal	3%
Other	33%

A. 69,000 tons

B. 101,000 tons

C. 170,000 tons

D. 192,000 tons

3809. Which of the following describes how wildlife bridges, such as in Salt Lake City, can be used to combat the problem of human activities affecting biodiversity?

A wildlife bridge near Salt Lake City, Utah, was recently built to help reduce collisions between vehicles and wildlife. Scientists confirmed 23 species of animals that used the wildlife bridge to cross over the interstate, including 414 mule deer, 54 coyotes, 27 porcupines, 8 black bears, and 10 moose.

A. The bridges allow wildlife to migrate more safely within their habitat.

B. The bridges require less maintenance than street level wildlife crossings.

C. The bridges reduce vehicle emissions of nitrogen oxides in the Salt Lake City region.

D. The bridges help to increase habitat fragmentation, resulting in more population bottlenecks.

3810. A school wants to increase the water-holding capacity of the soil in its vegetable garden to increase yields and to reduce the need for watering the plants as often. Which of the following approaches would best help the school reach its goal?

A. Tilling the area frequently

B. Compacting the soil in the area

C. Adding organic fertilizers and compost

D. Installing a drip-irrigation system

3811. Which of the following conditions will most likely occur if a storm system arrives on the windward side of the mountains?

The Santa Cruz Mountains in California are along the Pacific Ocean, where winds can bring precipitation into the area. The side that faces the ocean is the windward side, and the side away from the ocean is the leeward side.

A. Wet conditions will occur in the leeward watersheds from La Niña.

B. Wet conditions will occur in the windward watersheds from El Niño.

C. Dry conditions will occur in the leeward watersheds from the rain shadow effect.

D. Dry conditions will occur in the windward watersheds from the rain shadow effect.

3812. Which of the following methods should be used to determine approximately how many houses in the United States could have their entire yearly electricity needs met by the nuclear power plant?

A nuclear power plant produces an average of 13,968 megawatt-hours (MWh) per day, and an average house in the United States uses 10,715 kilowatt-hours (kWh) per year. (Note: 1,000 kWh = 1 MWh)

A. 13,968 MWh per day×1 MWh1,000 kWh×1 year365 days

B. (13,968 MWh per day - 10,715 kWh per house per year)10,715 kWh per house per year×100

C. 13,968 MWh1 day×365 days1 year×1,000 kWh1 MWh÷10,715 kWh per house per year

D. 13,968 MWh per day × 10,715 kWh per house per year365 days÷1,000 kWh

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3813. Based on the data in the graph, which of the following years had the highest number of wolves in the state of Minnesota?

The following graph shows changes in the populations of gray wolves in two states over time.

Changes in Wolf Populations in Two States in the United States

- All values are approximate.
- The following 2 lines are shown:
  - Minnesota
  - Wisconsin
- The Minnesota line:
  - Begins at 1988, 1,600
  - Rises gradually to 2004, 3,000
  - Falls gradually to 2009, 2,800
  - Falls sharply to 2014, 2,250
  - Rises sharply to 2015, 2,400
  - Falls sharply to 2016, 2,250
  - Rises sharply to 2018, 2,800
- The Wisconsin line:
  - Begins at 1988, 0
  - Rises gradually to 2014, 800
  - Falls sharply to 2015, 600

- Rises gradually to 2018, 900

A. 1988

B. 2004

C. 2013

D. 2017

3814. Based on the information given, which of the following terms best describes this species?

The cui-ui (*Chasmistes cujus*) is a freshwater sucker fish found only in Pyramid Lake and the lower Truckee River in Nevada. The cui-ui population began to decline in the early 1900s following the construction of Derby Dam and the reduction of upstream migration pathways for the fish to reach their spawning grounds. When blocked from migrating, the cui-ui may attempt to spawn in Pyramid Lake but are unsuccessful because of the salinity levels in the lake.

A. Pioneer species

B. Specialist species

C. *K*-selected species

D. Invasive species

3815. Which of the following best describes a country likely to be a developing country in Stage 2 of the demographic transition model, characterized by a rapidly growing population and improved medical care?

A. A country with a high birth rate and a high death rate

B. A country with a low birth rate and a high death rate

C. A country with a high total fertility rate and a low infant mortality rate

D. A country with a low total fertility rate and high life expectancy

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3816. Which of the following correctly pairs an indoor air pollutant with its source?

A. Carbon monoxide is released from paint.

B. Smog is released from motor vehicles.

C. Formaldehyde is released from houseplants.

D. Volatile organic compounds are released from new carpet.

3817. Which of the following best explains how increased ocean temperatures affect marine organisms?

A. Ocean warming affects coral reefs by increasing the number of parasitic algae that live inside each coral polyp, resulting in the death of the coral.

B. Ocean warming increases the availability of food for migrating fish species, resulting in increased competition for habitat by top predators.

C. Ocean warming decreases the stability of coral reefs that form barriers near coastlines, resulting in a loss of habitat for marine species.

D. Ocean warming decreases the amount of flooding in estuaries, resulting in the loss of populations of fish and macroinvertebrates.

3818. Which of the following would be the most effective strategy to protect streams from excess sedimentation in urban watersheds?

A. Requiring that scrubbers be installed at coal-fired power plants

B. Requiring that sanitary landfills have leachate collection systems

C. Requiring that wastewater treatment plants include tertiary treatment

D. Requiring that parking lots be constructed of permeable pavement

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3819. Which of the following best explains why a layer of clay is often used to line the bottom of sanitary landfills?

A. A layer of clay allows liquids to pass through easily, which increases the movement of toxins out of the landfill.

B. A layer of clay can be both porous and nonporous, which is more beneficial compared to the porosity of many types of bedrock.

C. A layer of clay tends to be nonpermeable, which prevents leachate from polluting groundwater.

D. A layer of clay contains larger particles than a layer of sand, which can trap heavy metals in the pore spaces.

3820. Which of the following is the most likely consequence of the environmental process illustrated in the diagram?

The following diagram shows amounts of methylmercury found within a marine food chain.

Relative Amount of Methylmercury in Individual Organisms in a Marine Food Chain

- The diagram shows 5 organisms, with an arrow leading from each to the next.
- In order, the organisms are as follows:
    - Bacteria
    - Mayfly
    - Bluegill
    - Bass
    - Human
- Each organism is labeled with its relative amount of Methylmercury as follows:
    - Bacteria: 1 unit
    - Mayfly: 2 units
    - Bluegill: 3 units
    - Bass: 6 units
    - Human: 9 units

- A note indicates the figure is not drawn to scale.

A. Birds of prey that eat bluegill and bass will experience abnormal thickening of their eggshells.

B. A trophic cascade will occur when the mayfly population goes extinct from exposure to the mercury found in e-waste.

C. Bacteria will metabolize methylmercury into mercury, decreasing the toxic effect on consumers in the food chain.

D. Humans who frequently consume large amounts of bluegill or bass may be exposed to toxic levels of methylmercury.

3821. Based on the data in the graph, which of the following was the approximate wind energy capacity for Germany in 2015?

The following graph shows the wind energy capacity, measured in gigawatts (GW), in five countries from 2000 to 2020.

Wind Energy Capacity in Five Countries, 2000–2020

- All values are approximate.
- The following 5 lines are shown:
  - Germany
  - India
  - Spain
  - Italy
  - Japan
- Each line shows a general upward trend. Greater detail is provided for Germany and India, and data for Spain, Italy, and Japan are summarized.
  - Germany:
    - 2000, more than halfway between 0 and 10 GW
    - 2005, more than halfway between 10 and 20 GW
    - 2010, more than halfway between 20 and 30 GW
    - 2015, about halfway between 40 and 50 GW
    - 2020, less than halfway between 60 and 70 GW
  - India:
    - 2000, less than halfway between 0 and 10 GW
    - 2005, about halfway between 0 and 10 GW
    - 2010, less than halfway between 10 and 20 GW
    - 2015, about halfway between 20 and 30 GW
    - 2020, more than halfway between 30 and 40 GW
  - Spain:

        - 2000, less than halfway between 0 and 10 GW
        - 2020, more than halfway between 20 and 30 GW
    - Italy:
        - 2000, less than halfway between 0 and 10 GW
        - 2020, 10 GW
    - Japan:
        - 2000, less than halfway between 0 and 10 GW
        - 2020, about halfway between 0 and 10 GW

A. 40 GW

B. 45 GW

C. 50 GW

D. 55 GW

3822. Which of the following methods should be used to determine the percent change in wind energy capacity in India from 2005 to 2020?

The following graph shows the wind energy capacity, measured in gigawatts (GW), in five countries from 2000 to 2020.

Wind Energy Capacity in Five Countries, 2000–2020

- All values are approximate.
- The following 5 lines are shown:
    - Germany
    - India
    - Spain
    - Italy
    - Japan
- Each line shows a general upward trend. Greater detail is provided for Germany and India, and data for Spain, Italy, and Japan are summarized.
    - Germany:
        - 2000, more than halfway between 0 and 10 GW
        - 2005, more than halfway between 10 and 20 GW
        - 2010, more than halfway between 20 and 30 GW
        - 2015, about halfway between 40 and 50 GW

        - 2020, less than halfway between 60 and 70 GW
    - India:
        - 2000, less than halfway between 0 and 10 GW
        - 2005, about halfway between 0 and 10 GW
        - 2010, less than halfway between 10 and 20 GW
        - 2015, about halfway between 20 and 30 GW
        - 2020, more than halfway between 30 and 40 GW
    - Spain:
        - 2000, less than halfway between 0 and 10 GW
        - 2020, more than halfway between 20 and 30 GW
    - Italy:
        - 2000, less than halfway between 0 and 10 GW
        - 2020, 10 GW
    - Japan:
        - 2000, less than halfway between 0 and 10 GW
        - 2020, about halfway between 0 and 10 GW

A. 38 GW×5 GW38 GW×100

B. 38 GW2020-5 GW2005

C. 38 GW-5 GW2020-2005

D. 38 GW-5 GW5 GW×100

3823. Which of the following environmental problems would most likely result from the trends in the graph?

The following graph shows the wind energy capacity, measured in gigawatts (GW), in five countries from 2000 to 2020.

Wind Energy Capacity in Five Countries, 2000–2020

- All values are approximate.
- The following 5 lines are shown:
    - Germany
    - India
    - Spain
    - Italy

    - Japan

- Each line shows a general upward trend. Greater detail is provided for Germany and India, and data for Spain, Italy, and Japan are summarized.
    - Germany:
        - 2000, more than halfway between 0 and 10 GW
        - 2005, more than halfway between 10 and 20 GW
        - 2010, more than halfway between 20 and 30 GW
        - 2015, about halfway between 40 and 50 GW
        - 2020, less than halfway between 60 and 70 GW
    - India:
        - 2000, less than halfway between 0 and 10 GW
        - 2005, about halfway between 0 and 10 GW
        - 2010, less than halfway between 10 and 20 GW
        - 2015, about halfway between 20 and 30 GW
        - 2020, more than halfway between 30 and 40 GW
    - Spain:
        - 2000, less than halfway between 0 and 10 GW
        - 2020, more than halfway between 20 and 30 GW
    - Italy:
        - 2000, less than halfway between 0 and 10 GW
        - 2020, 10 GW
    - Japan:
        - 2000, less than halfway between 0 and 10 GW
        - 2020, about halfway between 0 and 10 GW

A. An increase in bird and bat habitat fragmentation

B. An increase in the percentage of forest cover

C. An increase in the eutrophication of nearby waterways

D. An increase in acid deposition

3824. In which of the following atmospheric layers would this reaction lead to environmental problems?

The following chemical reaction can occur in the atmosphere, leading to environmental problems.

A. Thermosphere

B. Mesosphere

C. Stratosphere

D. Troposphere

3825. Based on the data in the table, which of the following countries is most likely experiencing a decline in the population size?

The following table shows population data for four countries.

Birth Rates and Death Rates of Four Countries

	Birth Rate (per 1,000 population)	Death Rate (per 1,000 population)
Country Q	12.0	7.6
Country R	8.1	10.9
Country S	15.3	6.9
Country T	9.9	9.9

A. Country Q

B. Country R

C. Country S

D. Country T

3826. Which of the following best describes the interaction that occurs between two tectonic plates at a transform fault?

A. Mechanical energy is released as a dense plate moves under a denser plate.

B. Kinetic energy is stored as one plate subducts beneath the other.

C. Potential energy is converted to kinetic energy as the plates slide past each other.

D. Heat energy is stored as the plates move alongside one another.
