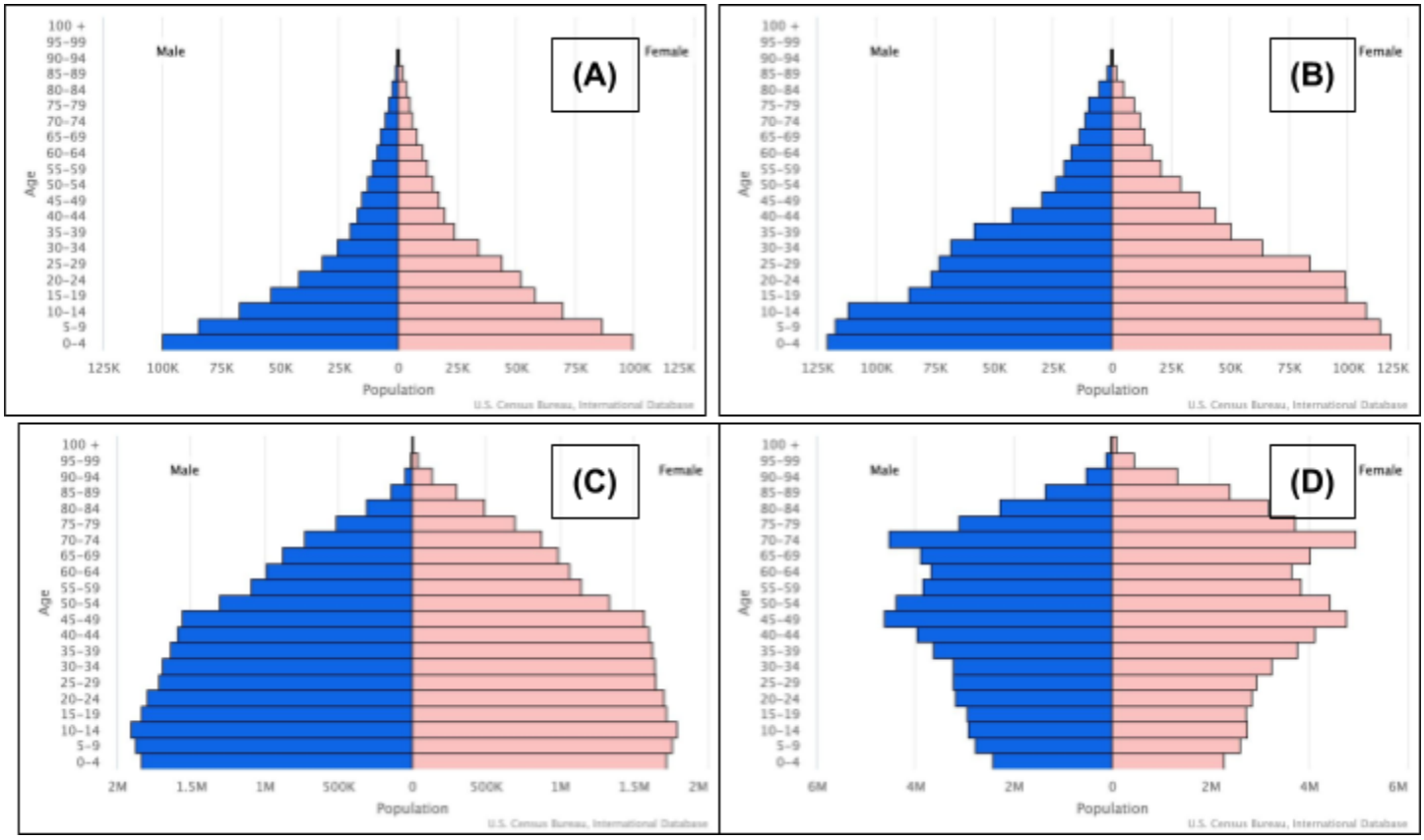
ULTIMATE REVIEW PACKET PRACTICE TEST #1 - ANSWER KEY

Directions: Each set of lettered choices below refers to the numbered questions or statements immediately following it. Select the one lettered choice that best answers each question or best fits each statement. A choice may be used once, more than once, or not at all in each set.

Questions 1 - 3 refer to the age structure diagrams for Countries A, B, C, and D.



Source: U.S. Census International Database

1. Which Country has the highest growth rate?

Key: A	Topic: 3.6	Skill: 1.B
Rationale: Country A has the widest base (pre-reproductive age) on its age structure diagram/population pyramid, which indicates a rapid rate of growth.		

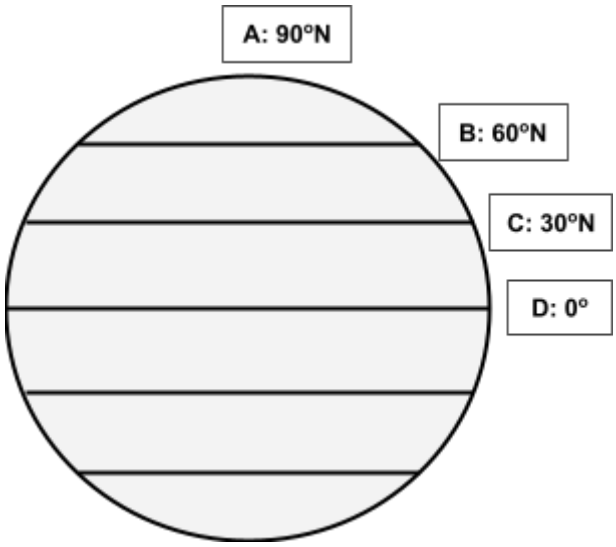
2. Which country has a growth rate closest to zero percent?

Key: C	Topic: 3.6	Skill: 1.B
Rationale: Country C has a nearly equal amount of people at each age group, indicating very slow growth, likely between 0-1%		

3. Which country has a negative growth rate?

Key: D	Topic: 3.6	Skill: 1.B
Rationale: Country D's population pyramid is wider at the top (older age groups), indicating negative growth.		

Questions 4 - 6 refer to the latitudes of earth as labeled in the diagram below.



4. This latitude of Earth receives the most direct rays of the sun.

Key: D	Topic: 4.7	Skill: 2.A
Rationale: the equator (0°) receives the most direct rays of the sun due to the shape of the Earth.		

5. This latitude of Earth experiences 24 hours of daylight on June 21st.

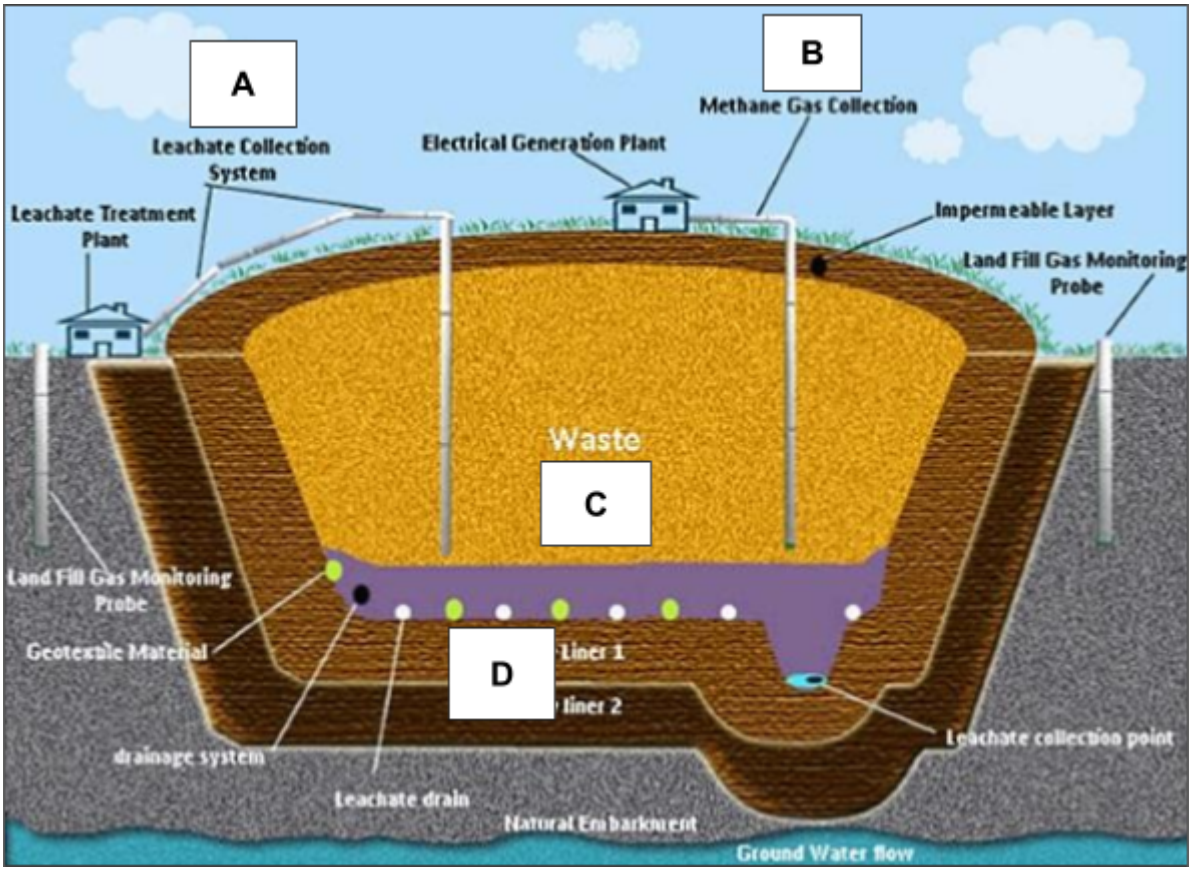
Key: A	Topic: 4.7	Skill: 2.A
Rationale: the North pole (90° N) is tilted directly toward the sun on the first day of summer in the northern hemisphere (June 21st), and receives 24 hours of daylight.		

6. This latitude of Earth is where many of the world's desert biomes are located.

Key: C	Topic: 4.8	Skill: 2.A
Rationale: 30° latitude is where the dry air from the Hadley cell descends and heats up due to adiabatic heating.		

Questions 7 - 9 refer to the diagram below.

The diagram illustrates a sanitary landfill. Four different elements of the landfill are labeled A to D.



Source: South Carolina Department of Natural Resources

7. This landfill element would typically be made of clay.

Key: D	Topic: 8.9	Skill: 2.A
Rationale: Landfill linings are typically made of clay, for its impermeable property.		

8. This landfill element collects material that can be used to produce electricity.

Key: B	Topic: 8.9	Skill: 2.A
Rationale: Landfills produce methane gas, which is typically collected and burned to produce electricity.		

9. This landfill element must first be treated before being released into the environment.

Key: A	Topic: 8.9	Skill: 2.A
Rationale: Liquid leachate collected from the bottom of a landfill typically contains toxic materials, which cannot be released into the environment before undergoing wastewater treatment.		

Questions 10 - 12 refer to the following list of waste disposal methods.

(A) Closed-loop recycling
(B) Composting
(C) Open-loop recycling
(D) Landfilling

10. Which waste disposal method is primarily used to dispose of solid waste in the United States?

Key: D	Topic: 8.10	Skill: 1.A
Rationale: Approximately half of all municipal solid waste in the US ended up in landfills.		

11. Which waste disposal method breaks down organic waste into reusable fertilizer?

Key: B	Topic: 8.10	Skill: 1.A
Rationale: Composting is the recycling of organic waste via decomposition to produce nutrient-rich fertilizer.		

12. Which waste disposal method would be able to produce a new aluminum beverage can from a used aluminum beverage can?

Key: A	Topic: 8.10	Skill: 1.A
Rationale: Closed-loop recycling converts used products into the same product with little waste creation.		

Directions: Each of the questions or incomplete statements below is followed by four suggested answers or completions. Select the one that is best in each case.

13. A symbiotic relationship where one species benefits while the other is not affected is
    (A) Commensalism
    (B) Mutualism
    (C) Parasitism
    (D) Predation

Key: A	Topic: 1.1	Skill: 1.A
Rationale: A commensalistic relationship is one in which one species is unaffected, while the other species benefits from the relationship, such as a bird nesting in a tree.		

14. Scientists studying survivorship curves of different animal species set up an investigation to observe parental care in various species over a 2-year period. What is the best hypothesis for the scientists' investigation?
    (A) Increased parental care will result in no survivorship of species.
    (B) All species will provide the same amount of parental care.
    (C) Increased parental care will result in longer survivorship of species.
    (D) No species will provide any parental care.

Key: C	Topic: 3.3	Skill: 4.A
Rationale: This is a valid, testable hypothesis with clear direction on each variable, based on the link between parental care and survivorship.		

15. Which of the following is the most likely source(s) of volatile organic compounds (VOCs)?
    (A) VOCs include formaldehyde and gasoline.
    (B) VOCs exclusively come from anthropogenic sources.
    (C) VOCs include asbestos and radon gas.
    (D) VOCs are stable at room temperature.

Key: A	Topic: 7.2	Skill: 1.A
Rationale: VOCs are volatile, meaning they evaporate or sublimate at room temperature. They include formaldehyde, gasoline, and various plant-based chemicals, such as those that give pine trees their smell.		

16. Why are the world's hot deserts found around 30^{o} North and South latitude?
    (A) The Coriolis Effect causes wind to move from the equator to the poles, which decreases pressure and dries out the air, creating deserts.
    (B) Oceanic gyres cause water to move away from 30^{o} latitudes, which dries out the air, causing deserts.
    (C) The Polar cells cause cold air to sink at 30^{o} latitude, where it loses moisture and heats up due to increased solar radiation.
    (D) Atmospheric convection creates Hadley cells, which cause dry air to descend at 30^{o} latitude and heat up due to increased pressure.

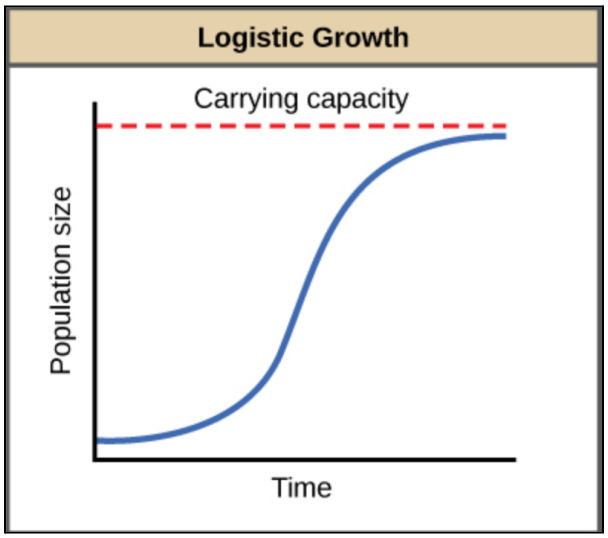
Key: D	Topic: 4.8	Skill: 1.C
Rationale: As air is warmed at the Equator, it rises and cools (adiabatic cooling) and loses its moisture over		

the tropics. The dry air now travels laterally away from the Equator and sinks at 30° latitude, where it undergoes adiabatic heating from increased air pressure and decreased volume, creating hot deserts.

17. Tree plantations often remove large stands of trees utilizing clearcutting, resulting in large amounts of timber for lumber processing. Which of the following represents a direct impact that watersheds near tree plantations might experience as a result of clearcutting?
    (A) Nearby aquifers will fail to recharge due to the change in groundcover of the tree plantation following harvest.
    (B) Cities nearby will see a decrease in flooding events as the tree plantation absorbs excess flood waters.
    (C) Turbidity of local watersheds will increase as soil and sediment begins to erode into waterways.
    (D) Saltwater will begin to fill local aquifers as excessive pumping along the coasts can cause intrusion.

Key: C	Topic: 5.2	Skill: 7.A
Rationale: As tree roots are no longer present, soil and sediment will not be held in place and will wash into waterways due to winds and precipitation.		

Question 18 refers to the diagram of logistic growth below.

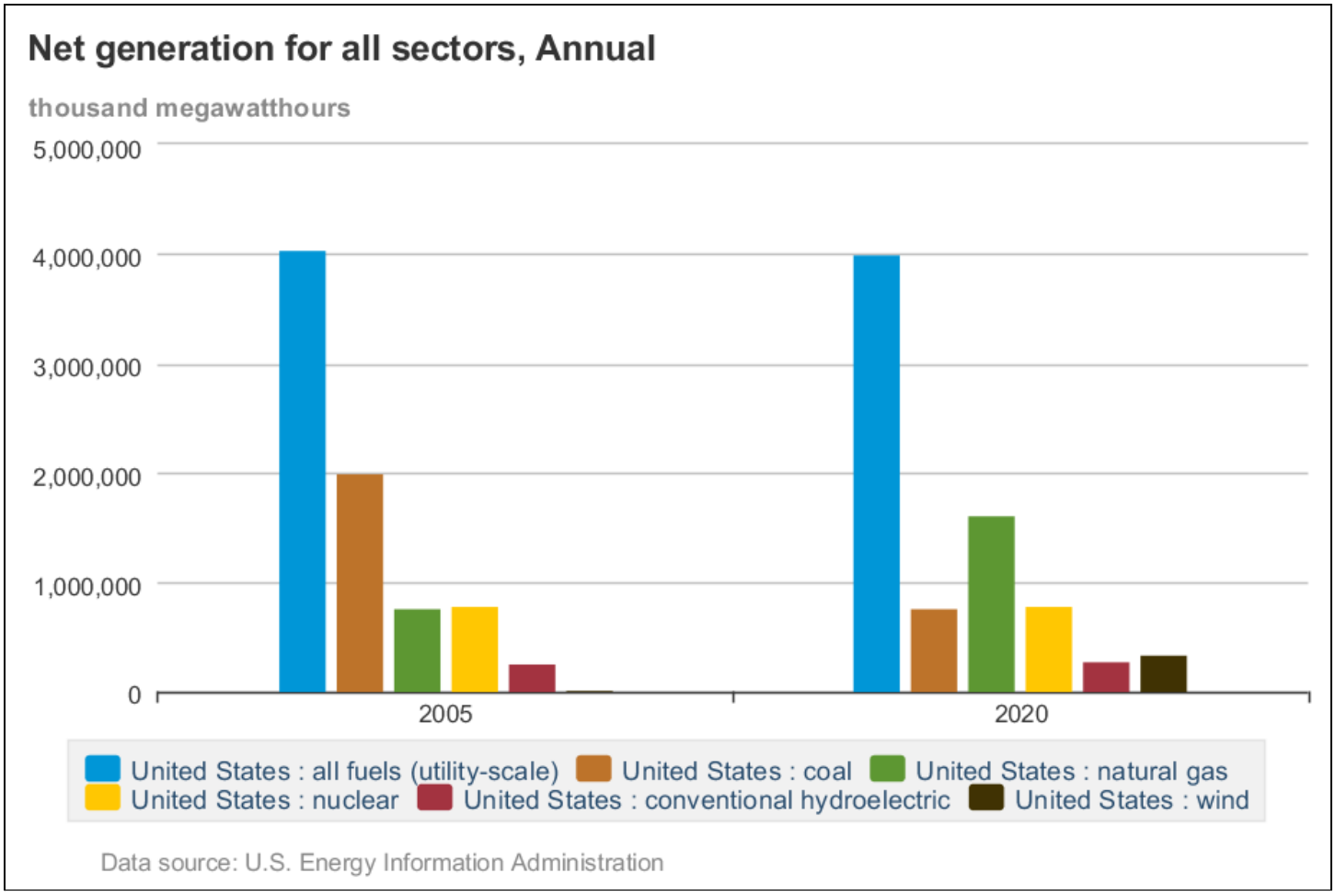


Source: OpenStax Biology library, used under CC BY 4.0.

18. Based on the diagram above,which of the following best describes the relationship between population size and carrying capacity?
    (A) Populations always overshoot their carrying capacity.
    (B) Density-dependent factors directly influence the carrying capacity of a population.
    (C) A population will grow exponentially and then stop suddenly at the carrying capacity.
    (D) The carrying capacity of a population is only influenced by density-independent factors.

Key: B	Topic: 3.5	Skill: 2.B
Rationale: Density-dependent factors (e.g. disease, predation, food, space) exert environmental resistance on population size, playing a role in determining the carrying capacity.		

Questions 19 - 21 refer to the graphs below, which shows the changes in electricity generation in the United States in 2005 and 2020.



Source: Energy Information Administration

19. Based on the data in the graphs, which would be the best setup to calculate the percent difference in coal use from 2005 to 2020?

    (A) $\frac{7.75x10^{7}\ MWh - 2\ x10^{9}\ MWh}{2\ x10^{9}\ MWh} x100$

    (B) $\frac{2\ x10^{9}\ MWh}{7.75x10^{7}\ MWh} x100$

    (C) $\frac{2\ x10^{9}\ MWh - 7.75x10^{7}\ MWh}{7.75x10^{7}\ MWh} x100$

    (D) $\frac{2\ x10^{9}\ MWh - 7.75x10^{7}\ MWh}{2020-2005} x100$

Key: A	Topic: 6.2	Skill: 6.A
Rationale: Percent difference/change is calculated by using $\frac{Final\ value - Initial\ value}{Initial\ value}\ x\ 100$		

20. Based on the data in the graph, what is the total electricity generation from coal and natural gas in 2020 in kilowatt hours?

    (A) 7.75 x10^{12} kWh

    (B) 6.15 x10^{12} kWh

(C) 2.08 $x10^{12}$ kWh
(D) 1.67 $x10^{12}$ kWh

Key: D	Topic: 6.2	Skill: 6.C
Rationale: In 2020, the amount of electricity generated by coal was approximately 7.75 $x10^{7}$ MWh, or 7.75 $x10^{10}$ kWh. The amount of electricity generated by natural gas was approximately 1.6 $x10^{9}$ MWh, or 1.6 $x10^{12}$ kWh. In total, 1.67 $x10^{12}$ kWh were generated in 2020 from coal and natural gas combined.		

21. Which is the best explanation of the trend in US electricity generation from 2005 to 2020?
    (A) Overall electricity generation in the US decreased significantly from 2005 to 2020 due to the decrease in the use of fossil fuels.
    (B) Electricity generation from hydroelectric power increased significantly from 2005 to 2020 due to tax incentives available to power companies.
    (C) Electricity generation from wind power increased significantly from 2005 to 2020 due to improved efficiency of wind turbines.
    (D) Overall electricity generation from fossil fuels increased significantly from 2005 to 2020 due to decreased fuel prices.

Key: C	Topic: 6.2	Skill: 5.C
Rationale: The efficiency of wind power has been improving over time, and this has increased the total number of turbines in the US as well as the total electricity produced from wind.		

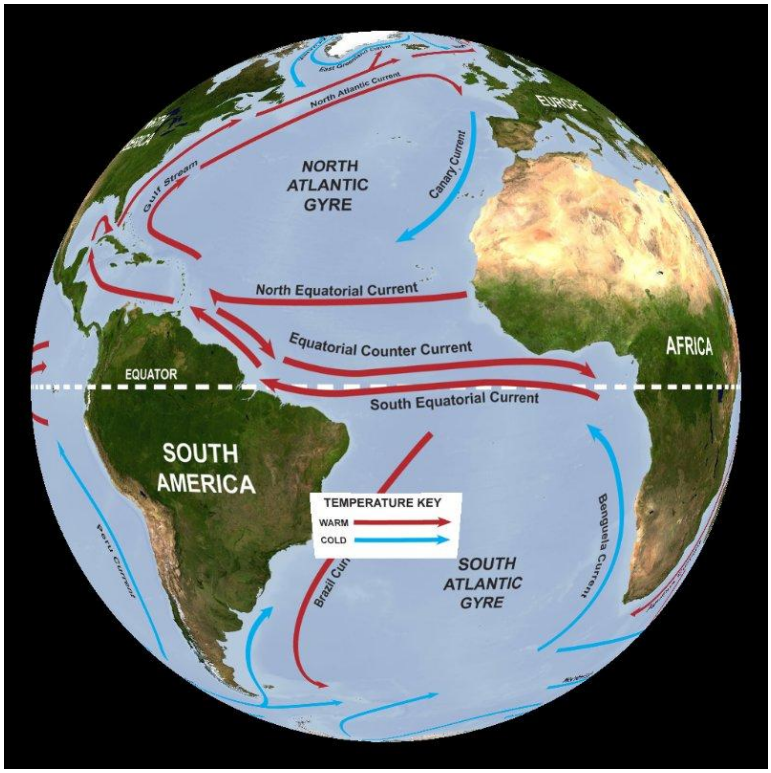
22. Which of the following is a greenhouse gas that only has anthropogenic sources?
    (A) Carbon dioxide
    (B) Carbon monoxide
    (C) Chlorofluorocarbons
    (D) Nitrous oxide

Key: C	Topic: 9.3	Skill: 1.A
Rationale: Chlorofluorocarbons (CFCs) and hydrofluorocarbons (HFCs) are human-made substances that have no natural source.		

23. Which of the following most accurately represents an environmental problem due to coal combustion?
    (A) Decline in dissolved oxygen levels in nearby waterways
    (B) Decline in pH of waterways due to acid deposition
    (C) Decline in ozone formation in the stratosphere
    (D) Decline in nitrate levels in nearby farms.

Key: B	Topic: 7.7	Skill: 7.A
Rationale: Coal may release NOx and SOx which will react with water vapor to create nitric and sulfuric acid (acid deposition) which results in a decline in pH levels of waterways.		

Question 24 refers to the diagram below of gyres in the Atlantic Ocean.



Source: NOAA

24. Which ocean current in the diagram is an example of an area that would experience frequent upwelling?
    (A) Equatorial Counter Current

(B) Gulf Stream
(C) Canary Current
(D) North Atlantic Current

Key: C	Topic: 4.8	Skill: 2.B
Rationale: Upwelling occurs frequently on the west coasts of continents where gyres will pull warmer surface water away from the coast and allow cooler, nutrient-rich water to rise from the ocean floor.		

25. Which of the following could be used to reduce the environmental impact of raising animals for meat production?
    (A) Educate ranchers on the need to rotate herds of animals through various portions of lands to prevent them from feeding in any one area for too long.
    (B) Providing tax incentives to companies to raise large numbers of animals together in smaller portions of land with the use of hormones and antibiotics.
    (C) Removing laws that prohibit the storing of large amounts of animal waste in unlined waste lagoons or dumping of waste into waterways.
    (D) Artificially lower the price of meat that has been raised in feedlots to encourage consumers to purchase meat.

Key: A	Topic: 5.7	Skill: 7.B
Rationale: Rotational grazing prevents animals from staying in one area for too long, thus preventing overgrazing that leads to desertification.		

26. Which of the following harvesting methods would continue to allow humans to utilize an old-growth forest for recreation while still preserving biodiversity?

    (A) Clear cutting of the entire national forest.
    (B) Selectively cutting older trees within a national forest.
    (C) Utilizing slash and burn to allow for livestock production.
    (D) Utilize seed tree harvesting to allow for sun-loving trees to prosper.

Key: B	Topic: 5.17	Skill: 7.B
Rationale: Selectively cutting will remove only specific trees therefore the forest can be used for recreation and preserve biodiversity.		

Question 27 refers to the data in the table below.

Net Primary Productivity in a Freshwater Ecosystem during Spring

Net Primary Productivity (g C/m^3/yr)	**Depth of Water (meters)**
1500	0
1450	10
150	20

0	30
-150	40

27. Which of the following conclusions is best supported by the data in the table?
    (A) Water depth has no effect on net primary productivity in a freshwater ecosystem.
    (B) Net primary productivity increases with water depth, because gross primary productivity increases with a decrease in sunlight.
    (C) Net primary productivity decreases with water depth, because gross primary productivity increases.
    (D) As depth increases, net primary productivity decreases, because gross primary productivity decreases.

Key: D	Topic: 1.8	Skill: 5.C
Rationale: As depth increases, the rate of gross primary productivity (photosynthesis) decreases due to a reduction in sunlight, which decreases net primary productivity (NPP) with increasing depth.		

28. Which of the following is the best setup to determine the population density of 5 million people in a 124 square mile area?
    (A) $\frac{5\ million\ people}{124\ mi^2}\ x100$

    (B) $5\ million\ people\ -\ 124\ mi^2$

    (C) $\frac{124\ mi^2}{5\ million\ people}$

    (D) $\frac{5\ million\ people}{124\ mi^2}$

Key: D	Topic: 3.5	Skill: 6.A
Rationale: Population density is determined as the number of individuals present in a particular area.		

29. Which of the following describes an action a rancher might take to preserve nearby water sources?

    (A) Using excessive amounts of nitrogen fertilizer to provide healthy grass for cattle.
    (B) Utilizing slash and burn agriculture to remove trees to allow for livestock production.
    (C) Ensuring proper rotational grazing of cattle to prevent overgrazing and maintain plant growth.
    (D) Collecting livestock waste in unlined lagoons that allows for waste to seep into groundwater.

Key: C	Topic: 4.2	Skill: 7.B
Rationale: By moving cattle frequently, plant roots hold soil in the ground, preventing wind or water from transporting soil into nearby waterways.		

30. Which of the following is an advantage represented by photovoltaic (PV) cells?
    (A) PV cells operate using fossil fuels that result in stratospheric ozone depletion.

(B) PV cells can store electricity within the cell to allow for future use.
(C) Installation of PV cells can occur on rooftops or parking garages, preventing habitat destruction.
(D) Construction of PV cells requires mined minerals and emits CO_2, a greenhouse gas.

Key: C	Topic: 6.8	Skill: 7.C
Rationale: PV cells don't necessarily have to be in large arrays, therefore no additional habitat destruction occurs since they are placed on already existing structures.		

31. Which of the following best explains an impact of rising sea levels?
    (A) Polar regions may experience a buildup of sea ice causing organisms that hunt from the ice to increase in population.
    (B) Habitats that were previously freshwater may now fill with saltwater beyond an organism's range of tolerance.
    (C) Polar regions may see an increase in icebergs, resulting in an opening of shipping channels around the arctic.
    (D) Increased volumes of water may increase the amount of light that is available in photic zones, causing a decline in photosynthesis.

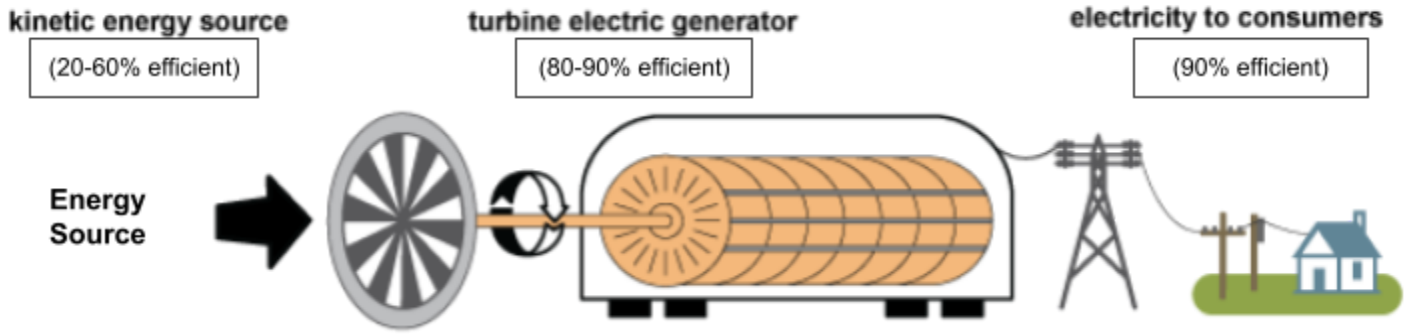
Key: B	Topic: 9.5	Skill: 1.C
Rationale: Saltwater from marine ecosystems may seep into freshwater ecosystems as water levels rise due to melting sea ice and thermal expansion of water.		

32. In which step of the nitrogen cycle are ammonia and nitrate taken up by plants?
    (A) Ammonification
    (B) Assimilation
    (C) Nitrification
    (D) Nitrogen fixation

Key: A	Topic: 1.5	Skill: 1.A
Rationale: Plants cannot take in atmospheric nitrogen, which must first be fixed in the soil by nitrogen fixing bacteria. This converts atmospheric nitrogen (N_2) into ammonium (NH_4^+) and nitrate (NO_3^-), which can then be assimilated into plant tissues.		

Questions 33 - 35 refer to the diagram below.

The diagram shows the basic steps used to generate electricity in a thermoelectric power plant.



Source: U.S. Energy Information Administration

33. Based on the diagram, what process could be used as an energy source to produce electricity in this power plant?
    (A) Decomposition of organic material
    (B) Nuclear fusion
    (C) Burning natural gas to heat water
    (D) Solar energy

Key: C	Topic: 6.5	Skill: 2.B
Rationale: The turbine electric generator requires a kinetic energy source, such as steam, to turn the turbine to produce electricity.		

34. Based on the diagram, which of the following is the best explanation of a consequence of electricity production?
    (A) When too much electricity is produced it is wasted, as there is no way to store it.
    (B) The combustion of fuel produces wasted heat energy, making the process very inefficient.
    (C) A spinning turbine produces greenhouse gasses, which contribute to the greenhouse effect.
    (D) Using nuclear reactions to produce heat always results in the release of radiation into the environment.

Key: B	Topic: 6.5	Skill: 2.C
Rationale: The process of burning fuel to produce electricity is a very inefficient process, approximately 35% on average.		

35. Another energy source for electricity production is flowing water in a hydroelectric dam. Which of the following provides the best explanation of an environmental problem that can be caused by a hydroelectric plant?
    (A) Hydroelectric plants can cause an increase in downstream flooding when placed in a river.
    (B) Hydroelectric power uses a large amount of water, which is used up in the electricity production process.
    (C) Dams block sunlight from reaching ecosystems in the river, which reduces productivity.
    (D) Dams reduce the amount of water reaching wetlands, which provide various ecosystem services.

Key: D	Topic: 8.4	Skill: 2.C
Rationale: Water diversion projects can decrease the amount of water downstream, which can affect wetlands and mangroves by reducing their ability to perform key ecosystem services such as water filtration, habitat, and flood protection.		

36. Scientists are considering establishing a geothermal electrical power plant in California. Which of the following best explains a concern that nearby residents might have about the plant?

(A) Hydrogen sulfide, a respiratory irritant, is often released as a byproduct of geothermal energy.
(B) Carbon dioxide, a greenhouse gas, is released in the production of electricity from geothermal energy.
(C) Geothermal plants release chlorofluorocarbons which may contribute to the thinning of the ozone layer.
(D) Thermal pollution may be released into nearby waterways, increasing dissolved oxygen levels.

Key: A	Topic: 6.10	Skill: 1.C
Rationale: The production of geothermal energy is known to release hydrogen sulfide gas.		

37. Coal companies may consider installing which of the following pieces of equipment to decrease the formation of secondary air pollutants?
(A) Catalytic Converter
(B) HCFCs
(C) Leachate sensor
(D) Scrubber

Key: D	Topic: 7.6	Skill: 7.B
Rationale: Scrubbers are used to remove sulfur, which if released can react with water vapor to create sulfuric acid.		

Question 38 refers to the data in the table below for two different areas in an ecosystem.

Species	Area 1	Area 2
A	10 individuals	5 individuals
B	12 individuals	7 individuals
C	17 individuals	12 individuals

38. Which of the following best describes the biodiversity of the ecosystem according to the data in the table above?
(A) Area 2 has an equal biodiversity to Area 1.
(B) Area 1 has a higher species evenness than Area 2.
(C) Area 1 has a higher species richness than Area 2.
(D) Area 2 has a higher number of individuals than Area 1.

Key: B	Topic: 2.1	Skill: 5.A
Rationale: Species evenness refers to the relative abundance of species in an ecosystem. Area 1 has a closer relative abundance of each species as compared to Area 2, meaning its evenness is higher.		

39. Which of the following is an advantage of using a methane collection system in a sanitary landfill?
    (A) Collected methane does not need to be sent to a wastewater treatment plant.
    (B) Methane that is collected can be used to produce pesticides
    (C) Methane can be used as a raw material to produce plastic products.
    (D) Methane, a greenhouse gas, is prevented from entering the atmosphere.

Key: D	Topic: 8.9	Skill: 7.C
Rationale: Methane is produced by methanogenic bacteria in anaerobic conditions. This methane is collected, combusted along with water to create steam, which turns a turbine attached to a generator to generate electricity.		

40. Which step in the phosphorus cycle releases phosphorus into waterways?
    (A) Erosion of phosphorus-containing rocks
    (B) Assimilation by plants to produce nucleic acids
    (C) Runoff from soils and fertilizer use
    (D) Incorporation of marine sediments into rock

Key: C	Topic: 1.6	Skill: 1.B
Rationale: Geologic upheaval exposes phosphorus-containing rocks, which experience weathering and erosion to deposit phosphorus in the soil. This phosphorus can either be assimilated by plants or run off into waterways.		

Questions 41 - 43 refer to the article below.

Range of tolerance may be changing for Florida's iguanas

Green iguanas are large reptiles that are native to South America, including parts of Brazil and Paraguay. Florida has become home to many invasive species due to the warm weather and ample pet trade. It has been proposed that populations of iguanas may have been unintentionally released as early as 1964, as iguanas outgrew their cages and became larger than their owners had intended. Iguanas are very skilled climbers and may spend much of their day basking in the sunlight on tree branches.

When temperatures in the area fall below 50 degrees Fahrenheit, which they rarely do, iguanas, which are endothermic, may become dormant, causing them to lose their grip on tree branches and fall to the ground. In fact, residents in Florida are often warned of falling frozen iguanas when temperatures drop below 45 degrees Fahrenheit. Residents are warned of falling lizards due to the physical harm they may cause. Additionally, residents are warned not to try to touch or aid the fallen lizards as they may bite when frightened.

Previously, iguanas were able to tolerate temperatures as low as 48-50 degrees Fahrenheit, although now research has suggested that they are able to withstand temperatures into the mid 40s. This has researchers concerned because previously, cold spells could limit the population growth of these invasive species. This is also concerning as it may allow iguanas to to spread northward as average temperatures continue to rise.

Iguanas have a large number of offspring and consume large amounts of vegetation, including ornamental plants that homeowners may place in their yards and gardens. When these iguanas eat, they also leave behind large amounts of waste that may make a mess in yards, on sidewalks, and even in docked boats.

41. Which of the following best describes the author's claim in the article?
    (A) Invasive green iguanas are showing an increased range of tolerance toward colder temperatures.
    (B) Warming temperatures throughout Florida will provide a good home into which iguanas can migrate.
    (C) Iguanas must migrate northward throughout the southeastern US to search for temperatures they can tolerate.
    (D) Iguanas were introduced as a biological control to limit the spread of invasive ornamental plants in yards and gardens.

Key: A	Topic: 9.8	Skill: 3.A
Rationale: Green iguanas used to have a lower threshold of 48 degrees, although now they are tolerant to 44 degrees.		

42. Which of the following represents a practical solution to addressing invasive species in Florida?
    (A) Introduce hawks and large birds of prey to the Florida ecosystem that may hunt and kill juvenile iguanas for food.
    (B) Release broad spectrum pesticides into the environment that may bioaccumulate and biomagnify within the food chain to kill the iguana.
    (C) Release a public service announcement about contacting companies that can responsibly kill and harvest iguanas whenever they are seen.
    (D) Warm up and heat iguanas that are found cold and stunned so that they may be cared for and kept as part of the pet trade.

Key: C	Topic: 9.8	Skill: 7.B
Rationale: Public service announcements can help educate the community on appropriately responding to iguanas. Releasing organisms or pesticides may create additional problems other than dealing with invasive iguanas.		

43. Which of the following is an appropriate description of a possible cause for the change in iguana range of tolerance in Florida?
    (A) Iguanas spread northward, allowing them to tolerate colder temperatures, and then migrated south again.
    (B) A few iguanas decided they preferred the warmer temperatures of Florida, so they survived and reproduced, passing along the preference for warm weather.
    (C) A few individuals were able to tolerate the cooler temperatures. They didn't freeze to death, and passed on their genes for cold weather tolerance.
    (D) Iguanas from South America are generalists and therefore were able to survive off of different vegetation that is present in Florida.

Key: C	Topic: 9.8	Skill: 3.C
Rationale: Evolution works by a few individuals that naturally can survive and pass along their genes.		

44. Invasive species most often thrive outside of their native habitat because
    (A) they are K-strategists with narrow ranges of tolerance to abiotic factors
    (B) they are K-strategists with wide ranges of tolerance to abiotic factors
    (C) they are r-strategists with narrow ranges of tolerance to abiotic factors
    (D) they are r-strategists with wide ranges of tolerance to abiotic factors

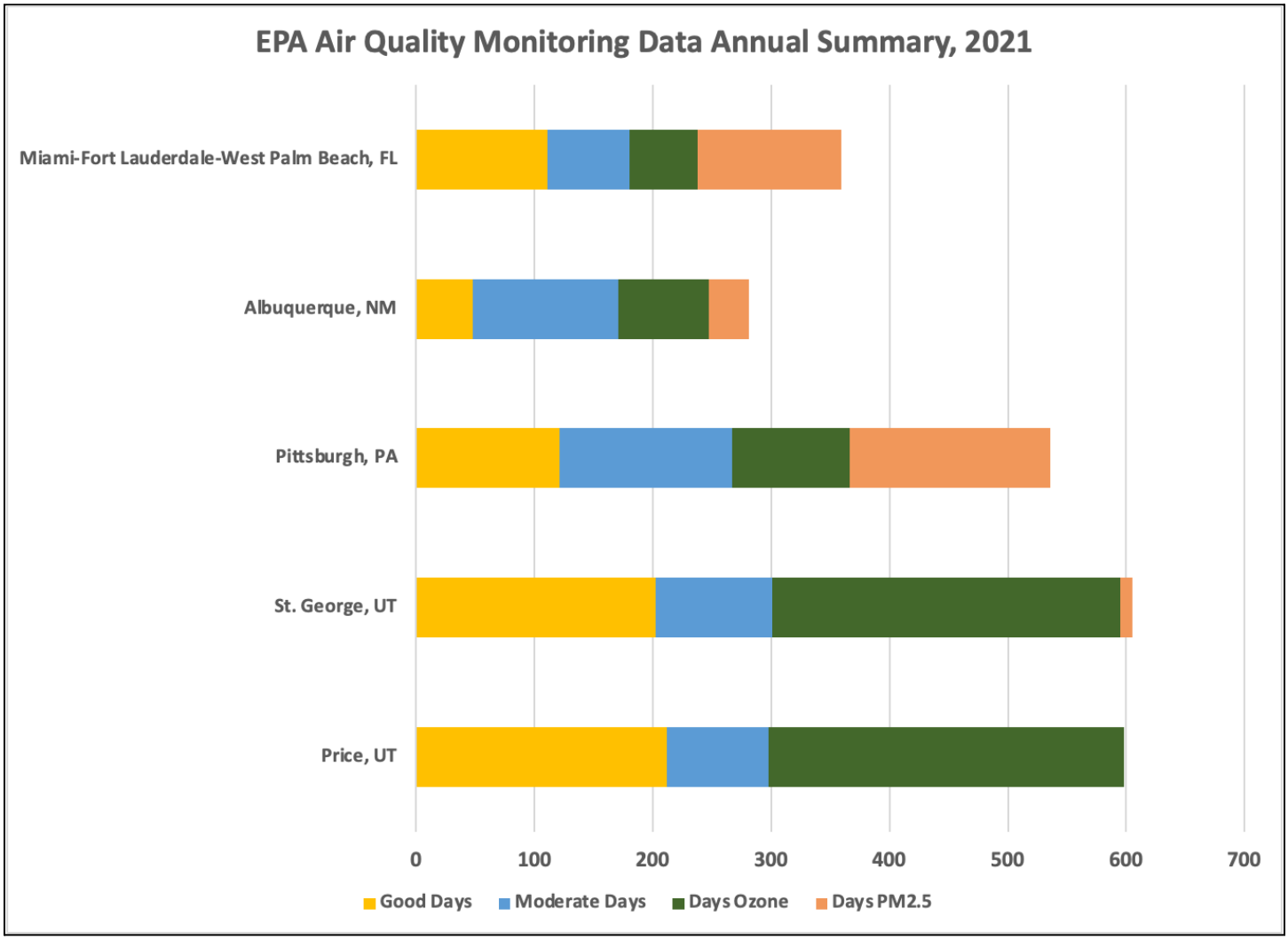
Key: D	Topic: 9.8	Skill: 1.A
Rationale: Invasive species are able to be successful in new environments due to their generally rapid reproductive rates and wide ranges of tolerance to abiotic factors such as temperature or pH		

45. At which type of plate boundary would volcanic mountains be found?
    (A) A hot spot, which creates volcanic mountains that become islands.
    (B) A collision zone, where two plates push each other upwards at a convergent boundary.
    (C) A rift valley, where two plates diverge and magma rises up through the lithosphere.
    (D) A subduction zone, where oceanic crust is driven under continental crust at a convergent boundary.

Key: D	Topic: 4.1	Skill: 1.B
Rationale: More dense oceanic plates are forced underneath less dense continental plates, where they are melted and rise to the surface, forming volcanic mountains (such as the Andes and Cascades).		

Questions 46 - 48 refer to the graph below.

The graph below shows Air Quality Index data from five metropolitan areas in the United States in 2021, including the number of “Good” and “Moderate” air quality days. Also included are the number of days that the ozone and Particulate Matter ($PM_{2.5}$) measurements exceeded the Air Quality Index standard level concentration.



Source: US EPA

46. Which of the following conclusions could be drawn from the data in the graph?
    (A) Construction and mining may be greatest in Pittsburgh, PA
    (B) Ozone days were greatest in Miami- Ft.Lauderdale-West Palm Beach, Fl due to their large population.
    (C) Utah has high levels of acid precipitation due to the large number of moderate days.
    (D) New Mexico will have the highest amounts of ozone thinning due to the fewest number of good days.

Key: A	Topic: 7.1	Skill: 5.C
Rationale: Pittsburgh had high levels of particulate matter which are released during construction and mining.		

47. Based on the data in the graph, which of the following indicates how many times more ozone days Price, Utah has as compared to Miami-Ft.Lauderdale-West Palm Beach, Florida?
    (A) 2 times more
    (B) 4 times more
    (C) 6 times more
    (D) 8 times more

Key: C	Topic: 7.2	Skill: 5.B
Rationale: Miami-Ft.Lauderdale-West Palm Beach, Florisa has approximately 50 ozone days, while Price, Utah has approximately 300, roughly six times as many.		

48. Which of the following is an aspect of the investigation that researchers would need to keep constant when collecting Air Quality Index data?
    (A) Temperature
    (B) Time of day
    (C) Humidity
    (D) Length of day

Key: B	Topic: 7.2	Skill: 4.C
Rationale: As ozone tends to increase in the morning, time of data that data was collected should be held consistent between all data collection points.		

49. Which of the following best explains the role of an indicator species?
    (A) A decline in lichen species may indicate the increased presence of secondary air pollutants.
    (B) An increase in the number of amphibian species indicates a rise in pesticide use.
    (C) A decline in bird species may suggest that indoor air pollutants are on the rise.
    (D) An increase in various species of benthic macroinvertebrates indicates a decrease in dissolved oxygen levels.

Key: A	Topic: 2.7	Skill: 1.B
Rationale: Lichen are sensitive to air pollution, specifically acid rain so a decline may suggest a rise in air pollution.		

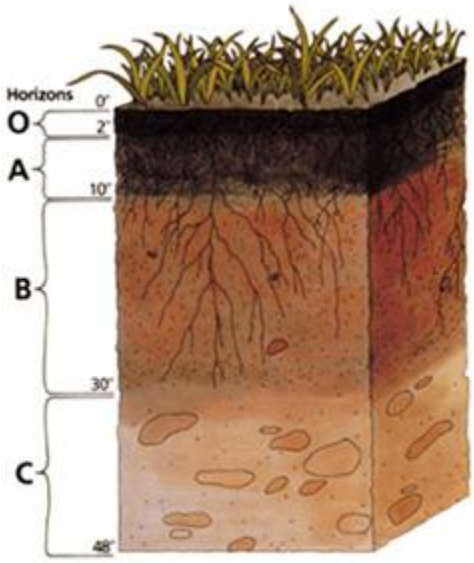
50. Which of the following techniques is a realistic response for farmers to decrease the amount of topsoil loss due to erosion?
    (A) Utilize prescribed burns to engage in slash and burn agriculture to grow grain for livestock.
    (B) Invest in alternative equipment that will allow for conservation tillage.
    (C) Switch to alternative methods of pest management, such as pheromone trapping.
    (D) Make use of flood irrigation to help maximize crop yields.

Key: B	Topic: 5.4	Skill: 7.B
Rationale: Conservation tillage is a practice that requires specialized equipment but allows for new crops to be planted in fields with previous growth that has not been tilled.		

51. An El Niño event can have an impact on weather across the world. Which of the following best explains the effects of El Niño in Australia?
    (A) The Trade Winds in the tropical Pacific ocean weaken, which reduces the warm surface water reaching Australia, leading to prolonged droughts and increased fire risk.
    (B) The Trade Winds in the tropical Pacific ocean weaken, which increases the warm surface water reaching Australia, resulting in increased precipitation and flooding events.
    (C) The gyre in the Southern hemisphere reverses direction, bringing cooler and drier air to Australia, causing prolonged periods of drought.
    (D) The Hadley Cell in the Southern hemisphere weakens, causing more tropical moisture to reach Australia, which increases the frequency of flooding.

Key: A	Topic: 4.9	Skill: 1.C
Rationale: El Niño events occur in the tropical Pacific, where the Trade Winds weaken or reverse direction. The warm surface waters that usually bring moisture to Australia are slowed or reversed, which causes a period of dry conditions and drought in Australia.		

Question 52 refers to the diagram of the soil profile below.

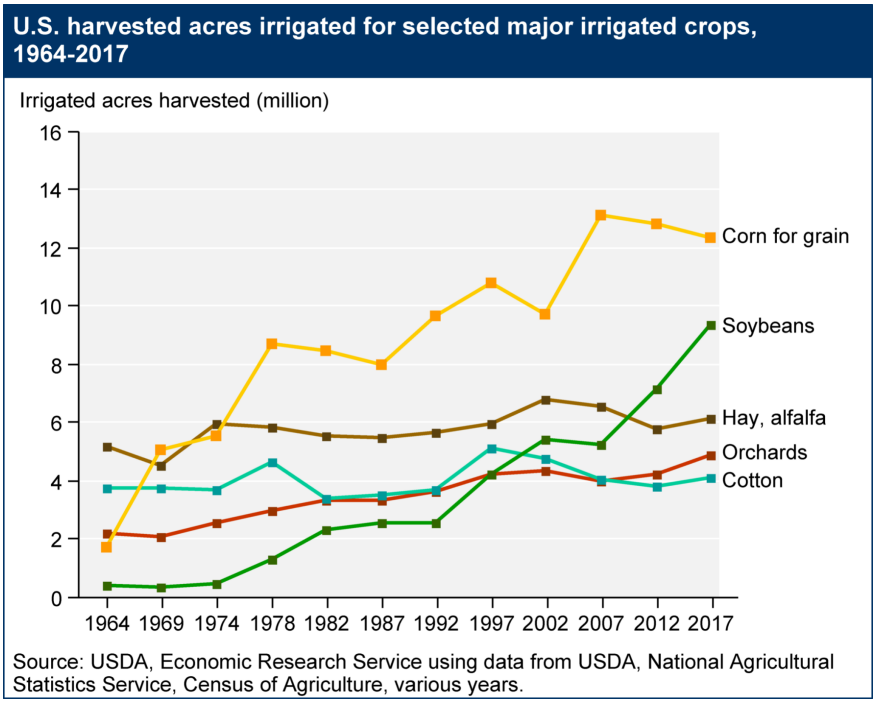


Source: US Department of Agriculture

52. Which soil horizon in the diagram represents the topsoil?
    (A) O Horizon
    (B) A Horizon
    (C) B Horizon
    (D) C Horizon

Key: B	Topic: 4.2	Skill: 2.A
Rationale: A Horizon, or topsoil, occurs just under the O Horizon, and is a layer of mixed decomposed organic material and minerals from the subsoil.		

Question 53 refers to the graph of harvested acres irrigated in the US.



53. Which of the following hypotheses is best supported by the data shown in the graph?
    (A) Fewer irrigated acres were used for soybeans than cotton in 1997.
    (B) Corn requires the least amount of irrigation in the U.S.
    (C) In 2009, soybeans surpassed alfalfa in the number of irrigated acres.
    (D) Alfalfa has had the fastest increase from 1964 to 2017.

Key: C	Topic: 5.5	Skill: 5.D
Rationale: The data for soybeans increased from 2007 to 2012, while that of alfalfa decreased during the same time period.		

54. Which of the following best explains an environmental problem associated with ocean acidification?
    (A) Sea levels may begin to rise which would lead to habitat destruction of freshwater ecosystems.
    (B) Rising ocean temperatures may cause coral to expel their bacteria, leading to bleaching.
    (C) Decline in coral reefs may result in a decrease in ecotourism in nearby countries.
    (D) Acidic oceans may prevent corals from growing new shells leading to stress and even death.

Key: D	Topic: 9.7	Skill: 1.C
Rationale: Decrease in pH causes there to be a decline in calcium carbonate available for corals and other organisms to form carbonate shells.		

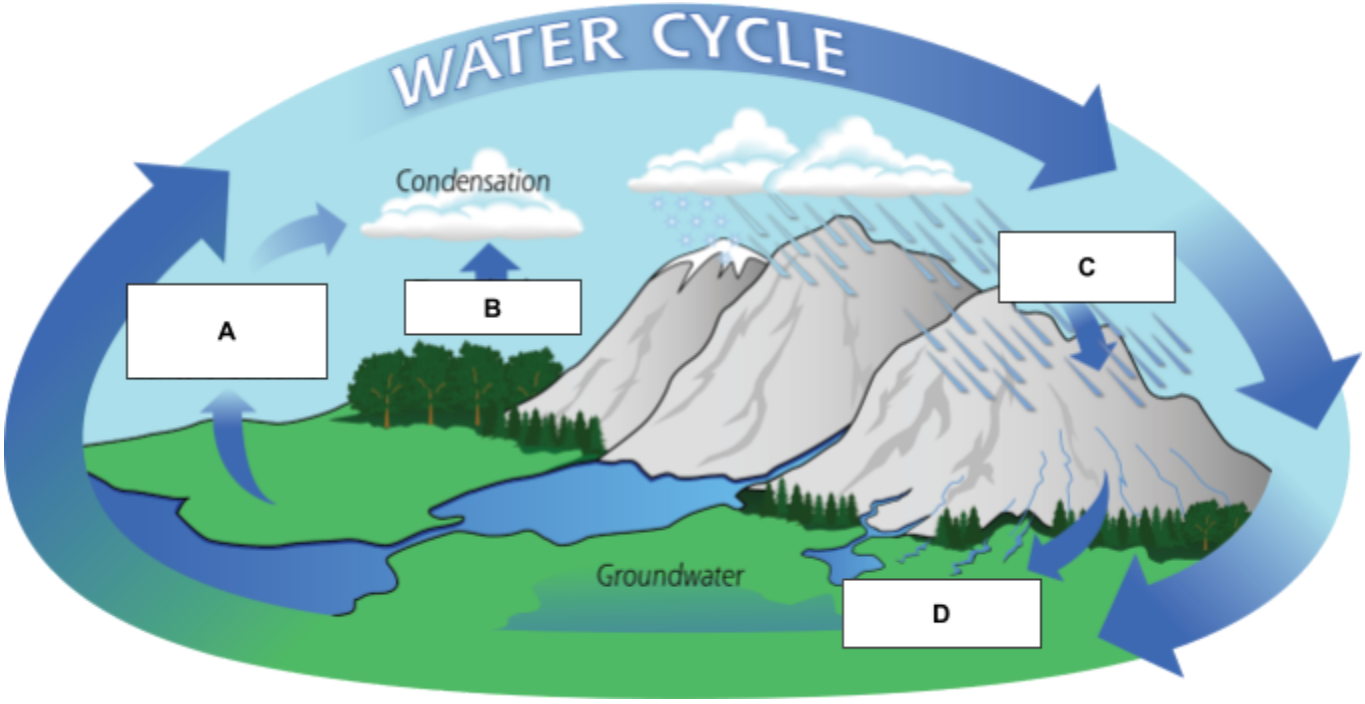
55. An AP Environmental Science class is conducting a laboratory investigation to determine how soil particle size affects soil permeability. In their investigation, the size of soil particles best represents the:
    (A) Independent variable
    (B) Dependent variable
    (C) Controlled variable
    (D) Confounding variable

Key: A	Topic: 4.3	Skill: 4.B
Rationale: An increase or decrease in the size of the soil particles will affect the permeability of the soil, which is being manipulated by the students in their investigation, making it the independent variable.		

56. Given the statements below, which most accurately explains a possible advantage to continued use of broad spectrum pesticides?
    (A) Increasing use of pesticides can lead to pesticide resistance due to artificial selection.
    (B) Pesticide use may prevent mosquito-borne diseases from spreading to vulnerable populations.
    (C) High levels of pesticides can result in bioaccumulation and biomagnification in aquatic populations.
    (D) Crops may be genetically engineered to resist pesticides, thereby increasing pesticide use.

Key: B	Topic: 5. 6	Skill: 7.C
Rationale: Pesticides may kill a variety of insects, such as mosquitoes or fleas that are known to carry disease.		

Question 57 refers to the diagram of the water cycle.



Source: NASA

57. The part of the water cycle labeled “B” in the diagram refers to what process?
    (A) Condensation
    (B) Evaporation
    (C) Runoff
    (D) Transpiration

Key: D	Topic: 1.7	Skill: 2.A
Rationale: Water entering the atmosphere from vegetation is called transpiration.		

Question 58 refers to the data of energy use in the table below.

	November 2021	% Change from November 2020
Total net generation (thousand MWh)	315,634	4.8%
Residential retail price (cents/kwh)	14.12	6.1%
Retail sales (thousand MWh)	286,144	3.2%
Coal consumption (thousand tons)	32,749	-4.4%
Natural gas consumption (thousand cubic feet)	907,457	14.1%

Source: Energy Information Administration Electricity Monthly Update

58. Based on the data in the table, which of the following indicates the relationship between natural gas use and total net generation of electricity from November 2020 to November 2021?
    (A) Natural gas consumption decreased as electricity generation increased, which caused an overall decrease in coal consumption.
    (B) Total net generation of electricity increased due to the similar decrease in coal consumption.
    (C) Natural gas consumption increased more than coal decreased, which caused total net generation to increase.
    (D) Coal consumption decreased, which increased the retail sales of electricity by 3.2%.

Key: C	Topic: 6.2	Skill: 5.B
Rationale: Natural gas consumption increased by 14.1% and coal consumption decreased by 4.4%, but total net generation increased by 4.8%, which indicates the increase in natural gas consumption had an effect on the total net generation of electricity over that year.		

59. Which description below most accurate describes a risk to wild fish populations if an aquaculture farm was established nearby?
    (A) Diseases due to high fish density within the aquaculture farm may spread into nearby wild fish populations.
    (B) Wastewater from the aquaculture farm may cause an increase in DO levels.
    (C) Genetically modified fish from wild fisheries may cause a decrease in biodiversity within the aquaculture farm.
    (D) Excessive use of antibiotics within the aquaculture farm may keep wild fish populations from growing.

Key: A	Topic: 5.16	Skill: 7.C
Rationale: Due to the high population of fish, diseases such as sea lice, may be easily transmitted to unmedicated fish populations which may begin to decline.		

60. A forest ecosystem converts 2000 grams of carbon per square meter per year through photosynthesis. If the ecosystem's carbon use efficiency is 40%, which of the following is the best representation of the amount of energy that would be available to tertiary consumers in this forest?
    (A) 1200 $g/m^2/yr$
    (B) 120 $g/m^2/yr$

(C) 12 g/m^2/yr
(D) 1.2 g/m^2/yr

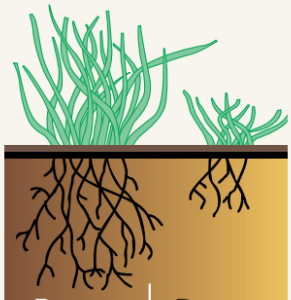
Key: D	Topic: 1.10	Skill: 6.C
Rationale: A 40% carbon use efficiency means that 40% of the GPP (2000 g/m^2/yr) is available to the ecosystem as NPP, or 1200 g/m^2/yr. Due to the 10% rule, the primary consumers can use 120 g/m^2/yr, secondary consumers 12 g/m^2/yr, and tertiary consumers 1.2 g/m^2/yr.		

61. In typical atmospheric patterns, air cools as it rises leaving higher altitudes with cooler temperatures. However, there may be times in which cool air becomes trapped under a layer of warmer air, often trapping pollutants near the ground. Which of the following terms below can be used to describe this phenomenon?
    (A) Tropospheric Ozone
    (B) Thermal Inversion
    (C) Eutrophication
    (D) Thermohaline Circulation

Key: B	Topic: 7.3	Skill: 7.A
Rationale: Thermal inversion is when air temperatures at the Earth's surface is cooler than air at higher altitudes, often trapping pollution close to the Earth's surface.		

Questions 62-64 refer to the data table below.

Researchers collected data on the effects of grazing animals on the root depth of grasses. The study was done on a leaf volume with the mass of 100 grams, subjected to clipping to simulate grazing animals. Their data is shown in the table below.



Percent Leaf Volume Removed	Percent Root Growth Stopped
10%	0%
20%	0%
30%	0%
40%	0%
50%	2 to 4%
60%	50%
70%	78%
80%	100%
90%	100%

Source: U.S. Department of Agriculture

62. Based on the data in the table, which of the following methods would be used to calculate the mass, in milligrams, of leaf volume removed by overgrazing if 78% of root growth is stopped?
    (A) $100\ g\ x\ 0.7\ x\ \frac{1000\ mg}{1\ g}$
    (B) $\frac{1\ g}{1000\ mg}\ x\ 70\%\ x\ 100g$
    (C) $100\ g\ x\ 0.78\ x\ \frac{1\ g}{1000\ mg}$
    (D) $78\%\ x\ \frac{1000\ mg}{1\ g}\ x\ 100g$

Key: A	Topic: 5.7	Skill: 6.C
Rationale: 78% of root growth is stopped due to 70% of leaf volume removal. If the study contained leaf volume with a mass of 100 grams, 30 grams would remain, which equals 30,000 mg. The proper setup to achieve this result is option A.		

63. Which of the following statements concerning raising meat for food production is best supported by the data above?
    (A) When raising meat by grazing, animals should be moved frequently to prevent overgrazing, which can stunt root growth in grasses.
    (B) Animals should be raised in large grassy areas to avoid their waste running off and contaminating nearby waterways.

(C) Animals should be raised in confined areas so that their waste can be collected and used to power nearby power plants.
(D) Raising animals in open areas reduces the impact of greenhouse gasses such as methane which has been tied to ozone thinning.

Key: A	Topic: 5.7	Skill: 7.D
Rationale: If animals are left in areas for too long, they tend to overeat grasses, reducing leaf volume and reducing root growth.		

64. Which of the following explains the most likely outcome if overgrazing continues, according to the data?
(A) Raising animals on grasses reduces the output of methane which contributes to climate change.
(B) Excess waste from meat production can runoff into waterways resulting in low oxygen levels.
(C) Soil may be more prone to erosion in grazed areas as plant roots are no longer present.
(D) Antibiotics used in grazing animals may contaminate groundwater leading to disease.

Key: C	Topic: 5.7	Skill: 5.C
Rationale: Desertification is a likely result of overgrazing, as plant roots are no longer present to hold soil in place, resulting in a loss of topsoil.		

65. About 12,000 years ago, there was an extinction event that led to decline in large mammals, including cheetah populations. As a result these large cats experienced large amounts of inbreeding and are genetically very similar to each other. Which statement below explains why this is troubling for conservationists working with cheetah populations?
    (A) Cheetahs are apex predators in the area and therefore help lower biodiversity of surrounding populations.
    (B) Cheetahs are specialist species that are capable of surviving in a variety of locations.
    (C) Cheetahs serve as an indicator species that may warn researchers about diseases faced by other large cat populations.
    (D) Cheetah populations have low genetic diversity and therefore may be unable to survive an environmental stressor.

Key: D	Topic: 2.1	Skill: 1.C
Rationale: When genetic diversity is low, the population becomes at risk for things such as disease or habitat destruction as there is not enough variation for evolution to act on.		

66. Which sequence of events best explains a positive feedback loop found in the Arctic ecosystem?
    (A) Permafrost melts → higher temperatures → methane levels decrease → more melting of permafrost → lowering of temperatures.
    (B) Higher temperatures → loss of sea ice → lower albedo → increase in energy absorption → higher temperatures
    (C) Melting of sea ice → lowering of temperatures → increased albedo → increase in energy absorption → higher temperatures → more melting of sea ice
    (D) Permafrost thickness increases → increase in methane released → higher temperatures → loss of sea ice → lower albedo → decrease in energy absorption.

Key: B	Topic: 9.5	Skill: 1.C
Rationale: A decline in Arctic sea ice would decrease the Arctic's albedo and result in more energy being absorbed, increasing temperatures.		

TEXT SET 2

Questions 67 - 70 refer to the article below.

Trouble for the reintroduction of the gray wolf in Colorado

Gray wolves have been in the news a lot lately in Colorado. The gray wolf was a mainstay in the Rocky Mountains of the western US and Canada for thousands of years before it was nearly wiped out by the 1940s due to widespread hunting, poisoning, and trapping. Throughout much of the early 20th century, ranchers, landowners, and even the federal government worked to dramatically dissipate the wolf's population.

Gray wolves hunt large grazing mammals and in the early 1900's began to prey upon livestock as large ranches were established in the states of Colorado, Montana, Wyoming, and Idaho. They were placed on the endangered species list in the 1970's and only a small population remained in Michigan. They were reintroduced into Yellowstone National Park in 1995 and gained widespread fame as they helped reenforce existing food webs and increase overall biodiversity in their role as a keystone species. Following their reintroduction to Yellowstone, wolves naturally migrated into parts of Washington, Montana, Oregon and even California, however, they have yet to make their way to Colorado.

In November 2020, Colorado voters agreed to reintroduce wolves back into Colorado by 2023. This was around the same time that they were removed from the Endangered Species list. Ranchers, who make up much of the western and southern portions of the state opposed the move, but it was popular in the cities and urban areas. Hunters also opposed the move as they are concerned that wolf packs may lower elk numbers; hunters in Colorado rely on elk for food and permits to hunt elk generate revenue for the state.

There have been previous sightings of wolves in Colorado throughout the 1990's and early 2000's, but their numbers have been small and not enough to repopulate the state. Advocates of the reintroduction argue that this is their natural territory and reintroduction will increase overall biodiversity like it did to Yellowstone.

In January 2022 the first wolf pup born in Colorado was tagged, suggesting that their populations are spreading now even without reintroduction. The pup belongs to a pack of six wolves that is responsible for killing a dog and two cows in northern Colorado. Ranchers and residents of Colorado can harass the wolves, shooting them with rubber bullets, but it is illegal to shoot them.

In February of 2022, wolves were placed back on the Endangered Species list, making any wolf packs in Colorado fall into federal jurisdiction. This means that wildlife officials in the state will now need special permission to continue to work and monitor the wolf populations. They will be unable to collar new pups and the use of rubber bullets by ranchers is also no longer permitted. Much has changed for the gray wolf in Colorado in just a few short years. Only time will tell how their populations, and the residents of Colorado will adjust.

67. Which of the following identifies a claim made by the author of the article?
    (A) Gray wolves were reintroduced in Colorado in 1996 in order to increase overall biodiversity in the state.
    (B) Reintroduction of the gray wolf to Colorado may threaten livestock and domesticated pets.
    (C) Gray wolves are important keystone species in Colorado that work to increase livestock and elk populations.

(D) Gray wolves are not native to Colorado and their reintroduction will throw off food chains and webs.

Key: B	Topic: 9.9	Skill: 3.A
Rationale: Wolves hunt livestock like cows, and domesticated pets		

68. Which statement below describes evidence the author uses to claim that wolves can be a threat to the ranchers of Colorado.?
    (A) Ranchers, hunters, and the federal government eliminated wolf populations in the western USA by the 1940's.
    (B) In 2022 an identified wolf pack in northern Colorado was found to have killed two cows and a rancher's dog.
    (C) Hunters are concerned that wolves may prey on elk, lowering their population sizes and removing a vital food source.
    (D) Wildlife biologists have recently tagged a wolf pup that belongs to a pack that resides in northern Colorado.

Key: B	Topic: 9.9	Skill: 3.C
Rationale: Wolves prey on large mammals, such as cows, bison, or elk.		

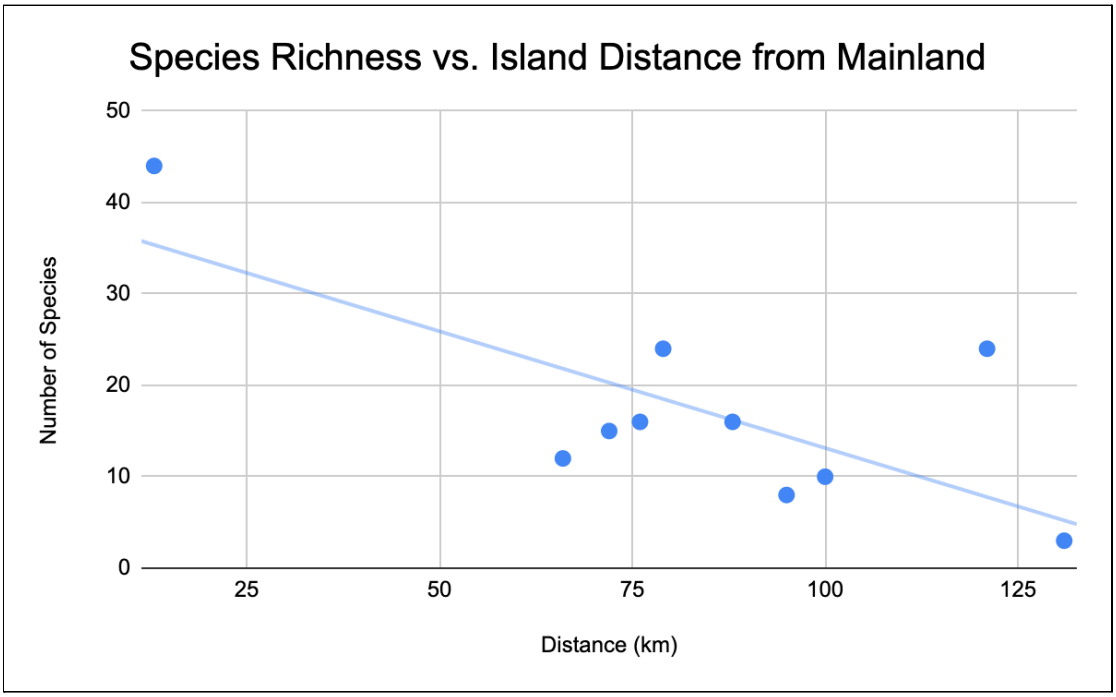
69. Which of the strategies has led to an increase in population sizes for endangered species?
    (A) Public service announcements warning the general population of the risks endangered species pose.
    (B) Implementing captive breeding programs to increase populations of predators of the endangered species.
    (C) Protecting endangered species from hunting or harassment by placing them on the Endangered Species list.
    (D) Remove hunting limits and promote hunting permits for the gray wolves and other apex predators.

Key: C	Topic: 9.9	Skill: 7.B
Rationale: Endangered Species act limits the hunting or bothering of species placed upon the endangered species list.		

70. The author assumes that environmentalists are mostly in favor of reintroducing the gray wolf because
    (A) Gray wolves can help limit livestock populations whose waste can contaminate groundwater.
    (B) Hunters can over hunt elk, causing their populations to fall and become endangered.
    (C) Gray wolves help to limit the population of other predators, such as bears, but eating their cubs.
    (D) Gray wolves promote biodiversity in the area by acting as a keystone species.

Key: D	Topic: 9.9	Skill: 3.B
Rationale: Wolves are a keystone species; by lowering the population of elk and other herbivores, vegetation increases, which promotes the growth of other primary consumer populations, which has a trophic cascade effect.		

Question 71 refers to the graph below of species richness vs. island distance from the mainland.



71. The graph above shows the species richness on ten islands of varying distances from the mainland. Which of the following conclusions is best supported by the data in the graph?
    (A) The biodiversity is lower on islands that are farther from the mainland, because fewer species can arrive there by chance.
    (B) The species evenness is higher on islands that are farther from the mainland, because these islands can support more niches.
    (C) On islands closer to the mainland, the number of species present decreases, because there are fewer resources available.
    (D) Islands closer to a mainland have lower species evenness, because they have more space in which to spread out.

Key: A	Topic: 2.3	Skill: 5.C
Rationale: The Theory of Island Biogeography explains that islands farther from a mainland will have a lower species richness, as fewer species are able to migrate there.		

72. Which of the following explains why wood is most often used for heat in developing countries?
    (A) Combustion of wood is carbon neutral and therefore does not release CO_2, which is a greenhouse gas.
    (B) Wood is readily available and is easy to obtain so that it may be used for both cooking and heating.
    (C) Wood can be used in cogeneration in which electricity can be generated and the building is heated.
    (D) Since wood is composed of organic material it can be burned for fuel to be used in transportation.

Key: B	Topic: 6.3	Skill: 1.C
Rationale: Wood is used for heating and cooking since it is easy to obtain. Wood is not used to generate		

electricity or provide energy for transportation.

73. Which of the following best explains why various ponds may not see the same change in pH when exposed to similar levels of acid rain?
    (A) Some ponds may have high levels of oxygen which prevent large shifts in pH from occurring.
    (B) Ponds that have high levels of biodiversity are more resistant to environmental changes.
    (C) Cities may treat their ponds with high amounts of ozone, preventing changes in pH.
    (D) Ponds that have limestone bedrock have the ability to neutralize the effects of acid rain.

Key: D	Topic: 7.7	Skill: 1.B
Rationale: Oxygen levels, ozone and levels of biodiversity have no impact on buffer capacities of ponds. Ponds that sit on limestone or other basic bedrock may be able to buffer or neutralize the acid rain preventing changes in pH.		

74. Which of the following is a disadvantage of the construction of a hydroelectric power plant?
    (A) Greenhouse gasses are released due to the use of construction equipment.
    (B) Reservoirs must be dredged every 150-200 years as they fill with sediment
    (C) Dams and reservoirs are able to provide flood control upstream from their location.
    (D) Electricity produced from the hydroelectric dam does not release CO_2, a greenhouse gas.

Key: A	Topic: 6.9	Skill: 7.C
Rationale: Construction of dams is expensive and requires heavy amounts of machinery, which run on fossil fuels and therefore emit greenhouse gasses.		

75. Aye Ayes are small nocturnal primates that are native to the forests of Madagascar. Similar to woodpeckers, they are able to create holes in trees to scoop out insects using their long fingers. Aye Ayes are thought to be evil and cultures native to Madagascar often kill these organisms as they believe they bring bad luck. Previously thought to be extinct, a small population of Aye Ayes was discovered in 1967. They are currently listed as endangered. Which of the following characteristics is best supported by the information above?

    (A) Aye Ayes would not benefit from a captive breeding program as their populations are on the rebound.
    (B) Aye Ayes have been able to adapt to their changing environment and are now able to exploit a different food source.
    (C) Aye Ayes have a specific niche and environment and may face threats from deforestation and loss of habitat.
    (D) Aye Ayes would be outcompeted if woodpeckers came into the area, causing their population to rise.

Key: C	Topic: 9.9	Skill: 1.C
Rationale: Endangered species reside in specific areas and are threatened by habitat fragmentation. Madagascar, as a developing country, may not have the resources to prevent deforestation.		

Question 76 refers to the picture of a forest fire below.

Source: US Department of Agriculture

76. Which of the following best explains the picture above?
    (A) The forest fire is a density-dependent factor that can affect larger populations more than smaller populations.
    (B) The forest fire can affect all populations, because it is a density-independent factor.
    (C) The forest fire can affect all populations, because it is a density-dependent factor.
    (D) The forest fire is a density-independent factor that can affect larger populations more than smaller populations.

Key: B	Topic: 3.5	Skill: 2.B
Rationale: Forest fires, floods, and other natural disasters can affect populations regardless of their size, making them density-independent factors.		

77. Zebra mussels were first accidentally introduced into the Great Lakes of the US in the 1980s and have since spread southward, reaching parts of Texas and Louisiana. Zebra mussels attach to hard surfaces and may completely block pipes that are used to distribute fresh water. These organisms may also filter out algae needed for productive food webs, and even attach to and incapacitate native mussel populations.

    Which of the following best explains why Zebra mussels have been so successful in spreading throughout the US?

    (A) Zebra mussels can only survive in areas where humans are found such as near cities.
    (B) Zebra mussels can tolerate large amounts of pesticide and are immune to bioaccumulation.
    (C) Zebra mussels require extremely clean water, such as reservoirs used for drinking.
    (D) Zebra mussels have adaptations that allow them to outcompete native species.

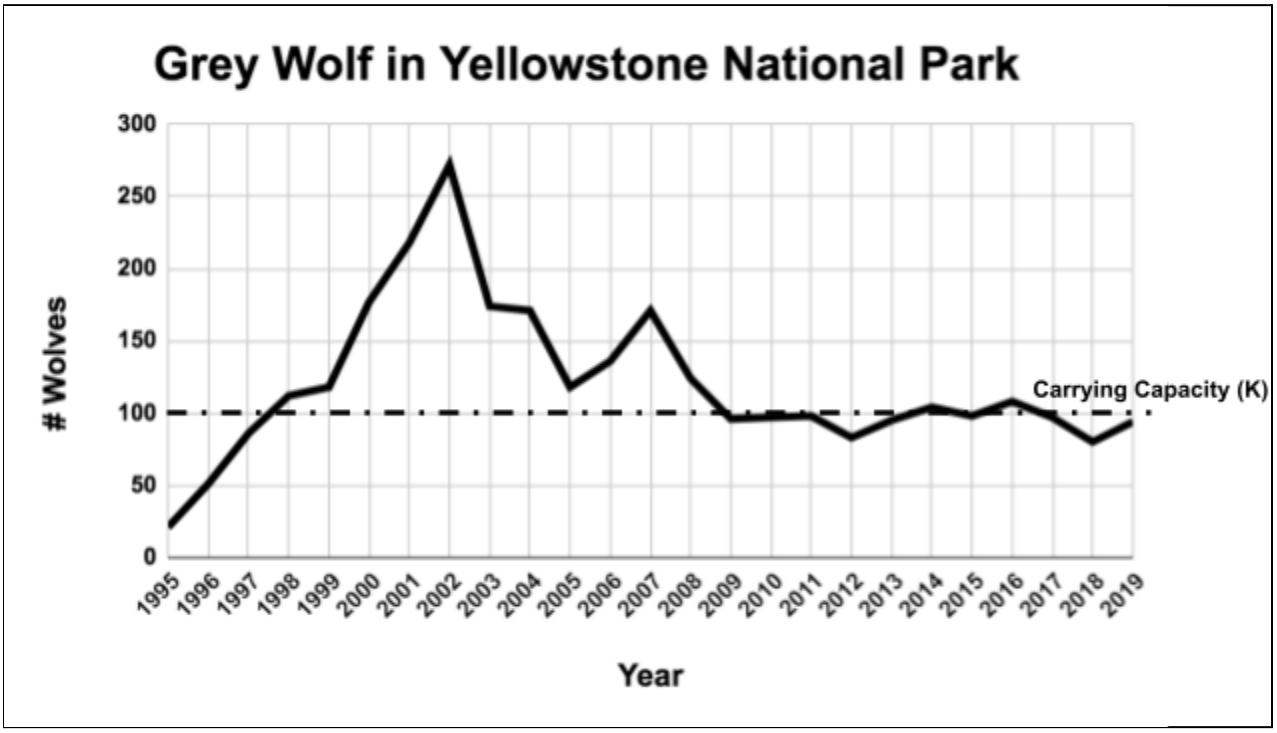
Key: D	Topic: 3.2	Skill: 1.C
Rationale: Because invasive species are generalists, they typically have adaptations that native species do not, allowing them to be better adapted to the new area and outcompete native species.		

78. Which of the following best describes a unique advantage of fossil fuel use?

(A) Fossil fuels are found throughout the earth and are all easily accessible.
(B) Fossil fuels have widespread uses such as electricity, heating, and transportation.
(C) Renewable resources do not emit CO_2 in the production of electricity, which can help prevent climate change.
(D) Fossil fuels release air pollutants that contribute to the thinning of the ozone layer.

Key: B	Topic: 6.3	Skill: 1.B
Rationale: Fossil fuels can be made into specific fuel types such as fuel for motor vehicle use.		

Questions 79-80 refer to the graph below of the population of the gray wolf in Yellowstone National Park from 1995 to 2019.



Data source: US National Park Service

79. Which of the following represents a conclusion that can be drawn from the data in the graph?
    (A) The population of wolves in Yellowstone grew exponentially after reintroduction due to an abundance of resources, overshooting their carrying capacity.
    (B) The wolf population in Yellowstone grew slowly and leveled off at carrying capacity, because wolves are K-strategist species.
    (C) The carrying capacity of wolves in Yellowstone is determined by the speed at which they reproduce.
    (D) The carrying capacity of wolves in Yellowstone is approximately 200 wolves.

Key: A	Topic: 3.5	Skill: 5.C
Rationale: Species with an abundance of resources grow exponentially (at their biotic potential), and often overshoot their carrying capacity. This occurred in Yellowstone with reintroduced wolves, as they culled the overpopulated elk in the Park.		

80. Which of the following is closest to the population growth rate per year in the wolf population from 1997 to 2002?
    (A) 275 wolves per year
    (B) 195 wolves per year
    (C) 80 wolves per year
    (D) 39 wolves per year

Key: D	Topic: 3.5	Skill: 6.C
Rationale: In 1997, the wolf population was approximately 80 and five years later in 2002, it was		

approximately 275: $\frac{275\ wolves - 80\ wolves}{5\ years} = 39\ wolves\ per\ year$