

Past-paper walk-through

Watersheds ■ 4.6

eXercise

Questions in this set

- 2024 Set 2 Q3
- 2022 Set 1 Q2
- 2022 Set 2 Q1
- 2022 Set 2 Q3
- 2017 Q3
- 2017 Q4
- 2015 Q1

Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- **//** separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = “or words to that effect” – the wording need not match.

Question 3

2024 Set 2 ■ Q3

The Rocky Mountains, the headwaters for the Colorado River, have experienced a severe drought for many of the past twenty years. States and cities downstream that depend on the river water have had to find solutions to the reduced water flow.

One city located downstream from the Rocky Mountains is Las Vegas, Nevada. In Las Vegas, one solution to reduce the amount of water used for irrigation is to remove landscaping and lawns that use grasses not native to the local area and replace them with desert-tolerant landscaping.

(a) Identify a typical type of plant that would be used in desert-tolerant landscaping.

Question 3

2024 Set 2 ■ Q3

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One city located downstream from the Rocky Mountains is Las Vegas, Nevada. In Las Vegas, one solution to reduce the amount of water used for irrigation is to remove landscaping and lawns that use grasses not native to the local area and replace them with desert-tolerant landscaping.

(b) Justify the removal of landscaping and lawns that use grasses not native to the local area by describing an additional advantage, other than reducing the amount of water needed for irrigation.

Question 3

2024 Set 2 ■ Q3

The Rocky Mountains, the headwaters for the Colorado River, have experienced a severe drought for many of the past twenty years. States and cities downstream that depend on the river water have had to find solutions to the reduced water flow.

One city located downstream from the Rocky Mountains is Las Vegas, Nevada. In Las Vegas, one solution to reduce the amount of water used for irrigation is to remove landscaping and lawns that use grasses not native to the local area and replace them with desert-tolerant landscaping.

(c) Warmer seasonal temperatures in the Rocky Mountains have led to earlier mountain snowmelt and an increased risk of forest fires as soil and vegetation dry out. Describe how a prescribed burn would reduce the severity and spread of forest fires.

Question 3

2024 Set 2 ■ Q3

The Rocky Mountains, the headwaters for the Colorado River, have experienced a severe drought for many of the past twenty years. States and cities downstream that depend on the river water have had to find solutions to the reduced water flow.

One city located downstream from the Rocky Mountains is Las Vegas, Nevada. In Las Vegas, one solution to reduce the amount of water used for irrigation is to remove landscaping and lawns that use grasses not native to the local area and replace them with desert-tolerant landscaping.

(d) Describe a disadvantage of a prescribed burn in a forested ecosystem.

Question 3

2024 Set 2 ■ Q3

The Rocky Mountains, the headwaters for the Colorado River, have experienced a severe drought for many of the past twenty years. States and cities downstream that depend on the river water have had to find solutions to the reduced water flow.

One city located downstream from the Rocky Mountains is Las Vegas, Nevada. In Las Vegas, one solution to reduce the amount of water used for irrigation is to remove landscaping and lawns that use grasses not native to the local area and replace them with desert-tolerant landscaping.

(e) Lake Powell is a large reservoir on the Colorado River. Lake Powell is formed by a dam with a hydroelectric power plant. At full capacity or full pool, Lake Powell contains 25.16 million acre-feet (maf) of water. Currently, Lake Powell is at 36% full capacity.

Question 3

Calculate the number of million acre-feet (maf) of water currently in Lake Powell.
Show your work.

Question 3

2024 Set 2 ■ Q3

The Rocky Mountains, the headwaters for the Colorado River, have experienced a severe drought for many of the past twenty years. States and cities downstream that depend on the river water have had to find solutions to the reduced water flow.

One city located downstream from the Rocky Mountains is Las Vegas, Nevada. In Las Vegas, one solution to reduce the amount of water used for irrigation is to remove landscaping and lawns that use grasses not native to the local area and replace them with desert-tolerant landscaping.

(f) In 2021, after years of drought, Lake Powell held 7.9 million acre-feet (maf) of water. One million acre-feet is equivalent to 3.26×10^{11} gallons.

The watershed of the Upper Colorado River contributes an average of 9.60 maf of water to Lake Powell annually. The melted mountain snow found in the watershed contributes 50

Question 3

2024 Set 2 ■ Q3

The Rocky Mountains, the headwaters for the Colorado River, have experienced a severe drought for many of the past twenty years. States and cities downstream that depend on the river water have had to find solutions to the reduced water flow.

One city located downstream from the Rocky Mountains is Las Vegas, Nevada. In Las Vegas, one solution to reduce the amount of water used for irrigation is to remove landscaping and lawns that use grasses not native to the local area and replace them with desert-tolerant landscaping.

(g) The average household in the United States consumes 5.0×10^4 gallons of water in a year. Calculate the number of households that could be supported for one year by the average flow of 9.60 maf of water into Lake Powell. Show your work.

Solution 3

(a)

Mark scheme

- A typical desert-tolerant landscaping plant: cactus/cacti, succulent plants, or other drought-tolerant plants. Full credit for naming one such plant type.

Solution 3

(b)

Mark scheme

- An additional advantage (besides reduced irrigation water) of removing non-native grass lawns: any one of (1) native desert plants support habitat/provide food for local wildlife; (2) less mowing means decreased yard-maintenance time/cost; (3) desert-tolerant plants need less fertilizer/pesticide; (4) it creates jobs for landscapers to remove/replace turf; (5) less use of gas-powered yard tools reduces air pollution/noise pollution/gasoline consumption. Full credit for any one such advantage.

Solution 3

(c)

Mark scheme

- A prescribed burn reduces the severity/spread of forest fires because it removes undergrowth, decreasing available fuel/flammable material, and/or it thins the forest, creating a fire break that reduces the spread of future fires. Full credit for either mechanism.

Solution 3

(d)

Mark scheme

- A disadvantage of a prescribed burn: any one of (1) it reduces habitat for wildlife/can harm or displace animals; (2) it releases carbon dioxide, contributing to climate change; (3) it releases particulates/air pollutants, worsening air quality; (4) runoff after the burn can degrade water quality; (5) it reduces competition, which can help invasive species spread/expand. Full credit for any one such disadvantage.

Solution 3

(e)

Mark scheme

- Setup (1 point): $25.16 \text{ maf} \times 36\% = 25.16 \times 0.36$. Calculation (1 point): $\approx 9.06 \text{ maf}$ (accept 9.0576, 9.058, 9.06, or 9.1). Full credit (2 points) needs both a correct setup showing 25.16 maf multiplied by 36

Solution 3

(f)

Mark scheme

- Setup (1 point): $9.60 \text{ maf} \times 36\% \times 50\% = 9.60 \times 0.36 \times 0.5$. Calculation (1 point): $\approx 1.73 \text{ maf}$ (accept 1.728, 1.73, or 1.7). Full credit (2 points) needs both the correct multiplicative setup (annual average flow times 2021's 36

Solution 3

(g)

Mark scheme

- Setup (1 point): $9.60 \text{ maf} \times \frac{3.26 \times 10^{11} \text{ gallons}}{1 \text{ maf}} \times \frac{1 \text{ household}}{5.0 \times 10^4 \text{ gallons}}$.

Calculation (1 point): $\approx 62,592,000$ households (i.e. 6.2592×10^7). Full credit (2 points) needs both the correct unit-conversion setup (maf to gallons to households) AND the correct resulting value.

Question 2

2022 Set 1 ■ Q2

Developments in advanced hydraulic fracturing (fracking) technologies have allowed the total oil and gas production in the United States to increase rapidly.

[Scatter graph titled “METHANE CONCENTRATION IN DRINKING WATER WELLS IN PENNSYLVANIA.” Y-axis: “Methane Concentration in Well Water (mg/L),” scale 0 to 70 in increments of 10. X-axis: “Distance to Nearest Fracking Well (m),” scale 0 to 6,000 in increments of 1,000. A horizontal reference line is drawn at $y = 10$ mg/L, with an upward arrow above it labeled “Hazardous concentrations, mitigation required” and a downward arrow below it labeled “No mitigation required.” Data points (labeled “Well water sample” in the legend, shown as filled circles) are heavily concentrated at small distances (roughly 0–500 m) with methane concentrations ranging widely from near 0 up to about 64 mg/L (points near approximately 64, 60, 53, 52, 51, 42, 34, 33, 29, 24, 20, and several points below 10 clustered near $x = 0$ –300 m). A few points

Question 2

appear farther out: around $x = 1,300\text{--}1,500$ m with $y = 13\text{--}17$ mg/L, and isolated lower points scattered out to about $x = 3,600$ m ($y = 6$), $x = 3,700$ m ($y = 3$), and $x = 4,300$ m ($y = 1$), with most points beyond about $x = 1,000$ m sitting at or near $y = 0$, extending out to about $x = 5,700$ m.]

(a)(i) The graph shows the methane concentration in drinking water from home wells and the distance to the nearest fracking well in Pennsylvania. Based on the data in the graph, **identify** the highest methane concentration found in well water in Pennsylvania.

(a)(ii) Based on the data in the graph, **describe** the relationship between the concentration of methane in well water and the distance to a fracking well.

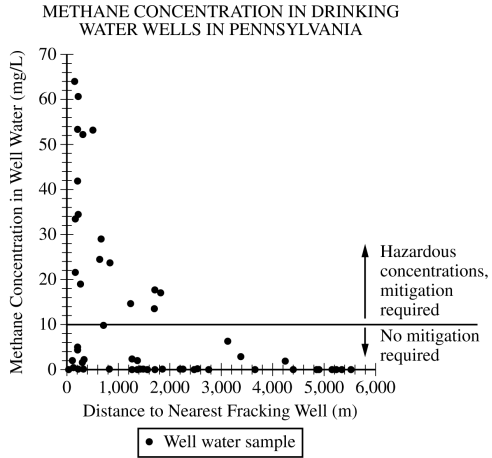
(a)(iii) Based on the data in the graph, **identify** the minimum safe distance that a new water well should be located from an existing fracking well.

(a)(iv) **Explain** how fracking fluid is used to access oil and natural gas in sedimentary rock, such as shale, during the fracking process.

Question 2

(a)(v) Identify one negative geologic effect in an area where hydraulic fracturing (fracking) occurs.

Question 2



Question 2

2022 Set 1 ■ Q2

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Question 2

mg/L, and isolated lower points scattered out to about $x = 3,600$ m ($y = 6$), $x = 3,700$ m ($y = 3$), and $x = 4,300$ m ($y = 1$), with most points beyond about $x = 1,000$ m sitting at or near $y = 0$, extending out to about $x = 5,700$ m.]

(b)(i) The volume of water used for oil and gas extraction is 28 times greater than it was fifteen years ago. Much of the water used for oil and gas extraction comes from groundwater sources in arid or semiarid regions. This increased use of water for fracking may mean that less water is available for local use. The use of groundwater for fracking is an example of individuals using a shared resource for their own self-interest. **Identify** the environmental concept illustrated by this example of overuse of a shared resource.

(b)(ii) Describe one environmental problem that may result from increased use of groundwater for fracking in arid or semiarid regions.

Question 2

(b)(iii) Describe how overuse of coastal groundwater supplies can result in water that is unsuitable for human consumption.

Question 2

2022 Set 1 ■ Q2

Developments in advanced hydraulic fracturing (fracking) technologies have allowed the total oil and gas production in the United States to increase rapidly.

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Question 2

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(c)(i) In addition to water quality issues caused by fossil fuel extraction, air quality can also be negatively affected by combustion of oil and natural gas. **Make a claim** for a realistic governmental action to improve air quality by reducing consumption of oil.

(c)(ii) **Justify** the action proposed in part (c)(i) by stating a potential environmental advantage of that action, other than slowing global climate change.

Solution 2

(a)(i)

Mark scheme

- The highest methane concentration found in well water in Pennsylvania is 64 mg/L.

(a)(ii)

Mark scheme

- Methane concentration in well water decreases as distance from the fracking well increases — an inverse/nonlinear, negative relationship between the two variables.

Solution 2

(a)(iii)

Mark scheme

- Any value between 1,800 and 2,200 meters is an acceptable minimum safe distance for a new water well from an existing fracking well.

Solution 2

(a)(iv)

Mark scheme

- Fracking fluid is injected/pumped into the well under high pressure, opening fissures in the shale/sedimentary rock and releasing the oil and natural gas; sand grains suspended in the fluid prop open the newly formed cracks/fractures so the oil and gas can flow up the well.

(a)(v)

Mark scheme

- One negative geologic effect of fracking: earthquakes/increased seismic activity, or ground subsidence/sinkholes.

Solution 2

(b)(i)

Mark scheme

- The environmental concept illustrated is the Tragedy of the Commons.

Solution 2

(b)(ii)

Mark scheme

- One environmental problem from increased groundwater use for fracking in arid/semiarid regions: loss of habitat/productivity in spring-fed ecosystems as springs dry up; loss of habitat/productivity or degraded water quality in streams and estuaries fed by groundwater discharge; soil erosion as vegetation dies due to a lowered water table and roots no longer hold soil; or desertification resulting from a lowered water table.

Solution 2

(b)(iii)

Mark scheme

- Overuse of coastal groundwater lowers the water table, allowing ocean water to flow into the aquifer (saltwater intrusion), contaminating it with saltwater and making it unfit for human consumption.

Solution 2

(c)(i)

Mark scheme

- A realistic governmental action to improve air quality by reducing oil consumption, e.g.: increase fuel economy standards for motor vehicles; invest in renewable energy resources; use tax incentives to encourage hybrid/electric vehicle sales; subsidize public transportation/walking/cycling projects; create tax incentives for work-from-home options; or increase the gasoline tax/reduce oil subsidies.

Solution 2

(c)(ii)

Mark scheme

- Justification must state a benefit (other than slowing climate change) tied to the action named in (c)(i) — e.g. decreased oil/fuel consumption leads to reduced particulates, surface ozone/photochemical smog, or acid rain; decreased oil consumption leads to fewer oil spills and decreased groundwater depletion/contamination from fracking/drilling; or decreased oil consumption leads to less disruption to wildlife/habitats (fragmentation, noise pollution) from drilling operations.

Question 1

2022 Set 2 ■ Q1

The dead zone in the Gulf of Mexico occurs every summer when winter snow melts and spring rain flows into the Mississippi River. Recent studies have shown that both the total area covered by algae and the depth of the algal mass in the dead zone are increasing.

[Map titled “LAND USE WITHIN THE MISSISSIPPI RIVER WATERSHED”: a map of the continental United States showing the Mississippi River watershed shaded by land use type, with the Gulf of Mexico labeled at the bottom. A point labeled “X” is marked in the upper-central part of the watershed (near the Great Lakes region), connected by a line from the map. Legend “Land Use”: Forest (dark gray shading), Grassland (light gray shading), Agriculture/cropland (dotted/stippled shading), Urban (solid black shading, scattered small patches throughout the watershed, especially clustered in the east and around the Great Lakes).]

Question 1

(a)(i) Various land use practices can have different effects on the waters that surround a dead zone.

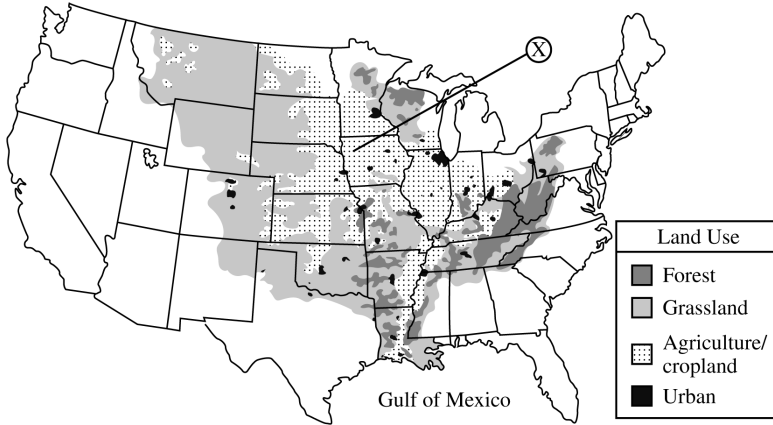
Identify the land use that covers the least amount of area in the Mississippi River watershed, based on the diagram.

(a)(ii) Describe one way that the land use practice at location X in the diagram could contribute to the dead zone in the Gulf of Mexico.

(a)(iii) Describe one way that urban areas in the Mississippi River watershed could contribute to the dead zone in the Gulf of Mexico.

Question 1

LAND USE WITHIN THE MISSISSIPPI RIVER WATERSHED



Question 1

2022 Set 2 ■ Q1

The dead zone in the Gulf of Mexico occurs every summer when winter snow melts and spring rain flows into the Mississippi River. Recent studies have shown that both the total area covered by algae and the depth of the algal mass in the dead zone are increasing.

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Question 1

(b)(i) The dead zone in the Gulf of Mexico has both economic and environmental effects for coastal communities.

Describe how a dead zone affects marine organisms living in the Gulf of Mexico.

(b)(ii) Describe one economic effect on communities along the Gulf of Mexico that can result from the presence of the dead zone.

(b)(iii) Describe one factor that causes the area of the dead zone in the Gulf of Mexico to increase in the summer months.

Question 1

2022 Set 2 ■ Q1

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Question 1

(c)(i) Researchers want to examine the effect of riparian vegetation buffers on water quality in streams in agricultural areas. Researchers will measure the water nutrient concentrations over the course of one year. The study sites are located 100 meters downstream from areas either with or without riparian vegetation buffers.

Identify a testable hypothesis for the study.

(c)(ii) Describe a control that the researchers could use in the study.

(c)(iii) Identify one water quality test, other than measuring nitrates or phosphates, that the researchers could use to evaluate how riparian vegetation buffers affect water quality.

(c)(iv) During the investigation, researchers discovered that some of the land next to one of the streams with a riparian vegetation buffer is going to be converted from cornfields into a large-scale concentrated animal feeding operation. **Explain** one way that this change in land use could alter the results of the study.

Solution 1

(a)(i)

Mark scheme

- Urban — urban land use covers the least area of the Mississippi River watershed shown in the diagram.

Solution 1

(a)(ii)

Mark scheme

- Any one way land use at location X could contribute to the dead zone: fertilizer applied to croplands washes into streams/rivers and feeds algae growth once it reaches the Gulf; concentrated animal feeding operations (CAFOs) generate large amounts of organic waste that moves into streams and rivers, feeding algae growth in the Gulf; treated or untreated (overflow) sewage released from wastewater treatment plants feeds algae growth in the Gulf.

Solution 1

(a)(iii)

Mark scheme

- Any one way urban areas could contribute to the dead zone: wastewater treatment facilities in urban areas may release nutrients in treated wastewater and/or overflows that flow into the Gulf; impervious surfaces in urban areas increase runoff of lawn fertilizers or high-phosphate detergents that move onto pavement and flow into the Gulf.

Solution 1

(b)(i)

Mark scheme

- Any one effect: many organisms are forced to migrate or die because of low dissolved oxygen levels in the water (hypoxia); many organisms are forced to migrate or die because algal blooms block sunlight from reaching submerged aquatic vegetation.

Solution 1

(b)(ii)

Mark scheme

- Any one economic effect: decreased fish catch / decreased income for the fishing industry; decreased tourism / lower tourism revenues; increased fuel costs for fishing vessels that must travel farther to find fish, decreasing income/profits; increased costs for consumers due to a limited supply of fish.

Solution 1

(b)(iii)

Mark scheme

- Any one factor: increased runoff of nitrates/phosphates/potassium from fertilizer used during the growing season increases algal growth in summer; increased precipitation/snowmelt/water volume carries more fertilizer runoff from urban or agricultural areas, increasing algal growth; higher water temperatures in summer decrease dissolved oxygen concentration (warm water holds less DO than cold water); increased runoff of fertilizer or high-phosphate detergents used in urban areas increases algal growth in summer.

Solution 1

(c)(i)

Mark scheme

- Any testable hypothesis of the form: if riparian vegetation buffers are present in agricultural areas, then the level of nitrates/phosphates/nutrients downstream will be lower (or higher, or the same) than in areas without riparian buffers.

(c)(ii)

Mark scheme

- The control is stream sites located 100 meters downstream from areas WITHOUT riparian vegetation buffer zones.

Solution 1

(c)(iii)

Mark scheme

- Any one water quality test other than nitrates or phosphates: turbidity; total suspended solids (TSS); dissolved oxygen; water temperature; fecal coliform; conductivity; pH; biological oxygen demand (BOD).

Solution 1

(c)(iv) Mark scheme

- Any one explanation: water quality would decline from increased nutrients/coliform bacteria in runoff because animal waste near the new CAFO is high in nutrients/coliform bacteria; water quality would decline from increased turbidity/total suspended solids because particles from animal waste enter the stream / streambed disruption increases; water quality would decline from increased water temperature because the increased turbidity/suspended solids absorb more sunlight/heat; water quality would decline from increased conductivity because of increased water temperature/dissolved salts near the CAFO; water quality would decline from antibiotics/veterinary drugs present in runoff from livestock operations (not used on the original cornfield crop). This

Solution 1

confounds the study because conditions change at the riparian-buffer site independent of the buffer treatment itself.

Question 3

2022 Set 2 ■ Q3

North Carolina is one of the fastest-growing states by population in the United States, with most growth concentrated in major cities like Charlotte. Increased population leads to increased demands for resources such as power and water.

The majority of electrical energy in North Carolina is produced during the combustion of coal.

(a) Identify one negative human health effect linked to the exposure to pollutants resulting from the combustion of coal.

Question 3

2022 Set 2 ■ Q3

North Carolina is one of the fastest-growing states by population in the United States, with most growth concentrated in major cities like Charlotte. Increased population leads to increased demands for resources such as power and water.

The majority of electrical energy in North Carolina is produced during the combustion of coal.

(b)(i) Coal ash, the powdery, solid substance that remains after coal combustion, presents a variety of potential environmental issues. Disposal of toxic coal ash is a growing concern in the state. Coal ash can be mixed with water and disposed of in large, unlined pits or as dry ash in landfills.

Describe an environmental problem associated with coal ash waste disposal.

(b)(ii) A proposed solution is to dispose of North Carolina's coal ash in clay-lined pits.

Justify this solution by providing one advantage of using clay soil.

Question 3

2022 Set 2 ■ Q3

North Carolina is one of the fastest-growing states by population in the United States, with most growth concentrated in major cities like Charlotte. Increased population leads to increased demands for resources such as power and water.

The majority of electrical energy in North Carolina is produced during the combustion of coal.

(c)(i) The population of Charlotte, North Carolina, has grown over the last few decades. The table shows the increase in the population size of Charlotte from 2013 to 2019.

Population of Charlotte, North Carolina, 2013–2019

Year	Population
2013	757,278
2014	774,807
2015	792,137
2016	808,834
2017	826,060
2018	841,611
2019	857,425

Question 3

Calculate the percent change in Charlotte's population from 2013 to 2019. **Show** your work.

(c)(ii) Based on Charlotte's 2019 growth rate of 1.88%, **calculate** the year when the population of Charlotte will double, assuming the growth rate stays the same. **Show** your work.

(c)(iii) The average Charlotte resident uses 90 gallons of water per day. **Calculate** the gallons of water used by the population of Charlotte in the year 2018. **Show** your work.

Question 3

2022 Set 2 ■ Q3

North Carolina is one of the fastest-growing states by population in the United States, with most growth concentrated in major cities like Charlotte. Increased population leads to increased demands for resources such as power and water.

The majority of electrical energy in North Carolina is produced during the combustion of coal.

(d) Drought periods are becoming more frequent in North Carolina, causing water resources to become more scarce. **Describe** one realistic action that citizens could take to reduce domestic outdoor water use.

Solution 3

(a)

Mark scheme

- Any one negative human health effect linked to pollutant exposure from coal combustion: lung/respiratory disease (asthma, COPD, bronchitis, lung cancer); neurological damage; birth defects; heart disease; eye irritation/respiratory irritation/headaches.

Solution 3

(b)(i)

Mark scheme

- Any one environmental problem associated with coal ash waste disposal: leaching from landfills/clay-lined pits; overflowing of coal ash into bodies of water; leaking and contamination of groundwater, soil, or nearby bodies of water; coal ash washing into bodies of water during severe weather events; dry ash blowing/carrying into nearby bodies of water, increasing turbidity/decreasing photosynthesis.

Solution 3

(b)(ii)

Mark scheme

- Clay is less permeable than unlined pits and can prevent the leaching of coal ash into soil/groundwater.

Solution 3

(c)(i)

Mark scheme

- Percent change = $[(857,425 \text{ people} - 757,278 \text{ people}) / 757,278 \text{ people}] \times 100$, equivalently $[(857,425/757,278) - 1] \times 100$. One point for this correct setup; one point for the correct result: 13% (13.22%, or 13.224602%).

(c)(ii)

Mark scheme

- Doubling time = $70 / \text{growth rate}(\%) = 70 / 1.88 \approx 37$ years. One point for this correct setup. Adding 37 years to 2019 gives the doubling year: one point for the correct result, 2056.

Solution 3

(c)(iii)

Mark scheme

- Gallons used in 2018 = 90 gallons/person/day $\times$ 841,611 people $\times$ 365 days.
One point for this correct setup. One point for the correct result:
27,646,921,350 gallons (accept 2.76×10^{10} , 2.8×10^{10} , or 3×10^{10} gallons).

Solution 3

(d)

Mark scheme

- Any one realistic action to reduce domestic outdoor water use: plant drought-resistant species/use artificial landscaping/xeriscaping to reduce irrigation needs; eliminate/reduce nonessential water use such as washing cars or power washing; reduce sprinkler/irrigation use by monitoring soil/weather conditions or reducing frequency; collect rainwater or greywater for irrigation; water plants/lawn before sunrise/after sunset to limit evaporation; switch to drip irrigation to limit evaporation.

Question 3

2017 ■ Q3

Haiti shares a border with the Dominican Republic on the Caribbean island of Hispaniola.

(a)(i) The border between the two countries can be seen using satellite images because of the severe deforestation in Haiti.

Provide one reason why deforestation commonly occurs in a less developed country such as Haiti.

(a)(ii) Describe one realistic strategy to reduce deforestation in a less developed country.

DEMOGRAPHIC DATA FOR HAITI

Measure	1995	2015
Fertility rate (number of children per woman)	5.2	2.7
Life expectancy (years)	55	64
Infant mortality (deaths per 1,000)	85	48

Question 3

2017 ■ Q3

Haiti shares a border with the Dominican Republic on the Caribbean island of Hispaniola.

(b) Deforestation can affect water quality. Identify one change that can occur in the water quality of streams within a watershed that has been deforested. Explain how deforestation can lead to this change.

Question 3

2017 ■ Q3

Haiti shares a border with the Dominican Republic on the Caribbean island of Hispaniola.

(c) Identify TWO environmental benefits, other than those related to water quality, of maintaining forest ecosystems.

The table below contains demographic data for Haiti in 1995 and 2015.

DEMOGRAPHIC DATA FOR HAITI

Measure	1995	2015
Fertility rate (number of children per woman)	5.2	2.7
Life expectancy (years)	55	64
Infant mortality (deaths per 1,000)	85	48

Question 3

2017 ■ Q3

Haiti shares a border with the Dominican Republic on the Caribbean island of Hispaniola.

(d) Identify and discuss one factor in a less developed country that could contribute significantly to a change in life expectancy, similar to what occurred in Haiti from 1995 to 2015.

Question 3

2017 ■ Q3

Haiti shares a border with the Dominican Republic on the Caribbean island of Hispaniola.

(e) Identify and discuss one economic or cultural factor in a less developed country that could contribute significantly to a change in the fertility rate, similar to what occurred in Haiti from 1995 to 2015.

Question 4

2017 ■ Q4

Dams are built by humans for various purposes including hydroelectric power generation and control of downstream flooding.

- (a)** Explain how electricity is generated at a hydroelectric dam.
- (b)** Identify TWO economic benefits, other than hydroelectric power generation and control of downstream flooding, associated with dams.
- (c)** Describe one ecological benefit of seasonal flooding of the floodplain of a free-flowing river.
- (d)(i)** Some dams have been removed from rivers.
Explain how removal of a dam can benefit fish populations.
- (d)(ii)** Describe one negative environmental consequence of removing a dam from a river (other than effects on fish populations).

Question 4

(e)(i) Dams are also built by beavers, a keystone species in some North American ecosystems.

Define keystone species.

(e)(ii) Describe how dams built by beavers can make beavers a keystone species in some ecosystems.

Question 1

2015 ■ Q1

Read the article below and answer the questions that follow.

[Newspaper clipping: “The Floridian Daily”, dated May 21, 2013]

The small community located on the edge of the magnificent wetlands of Florida’s Everglades was the site of a press conference today where Governor Gayle Moss announced that the restoration of the Everglades is successfully underway. She noted that the Everglades ecosystem has suffered threats to its water quality, water quantity, and habitats in recent decades. Moss noted that intensive urban and agricultural development in adjacent areas has diverted substantial amounts of freshwater resources and impaired water quality. Governor Moss then emphasized that the preservation and enhancement of the Everglades, key goals of the restoration program, are absolutely essential for the continued environmental and economic health of the state. She closed the press conference by saying, “The Everglades is a gem not only for Florida but for

Question 1

the entire world. Each of us has the responsibility to do our part to preserve this magnificent resource.”

(a) Describe how TWO human activities, other than those that result in anthropogenic climate change, have resulted in a decrease in the amount of freshwater flowing into the Everglades ecosystem.

Question 1

The Floridian Daily

May 21, 2013

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Question 1

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Question 1

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(b) In addition to water quantity problems, the Everglades is faced with a variety of water quality issues. For example, phosphorus concentrations in the Everglades have increased since the 1960s.

(b)(i) Describe how one specific human activity contributes to increased phosphorus levels in the Everglades.

(b)(ii) Explain one way in which an increase in phosphorus levels can adversely affect the Everglades ecosystem.

(b)(iii) Describe one step that could be taken to reduce phosphorus inputs from the activity you identified in part (i).

Question 1

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Question 1

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(c) Climate change could have a variety of impacts on water quantity, water quality, and habitat. For EACH of these three factors, identify and describe one specific example of an impact on the Everglades likely to result from climate change.

Question 1

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Question 1

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(d) The article states that Governor Moss believes that the “preservation and enhancement of the Everglades, key goals of the restoration program, are absolutely essential for the continued environmental and economic health of the state.”

(d)(i) Describe one way that restoring water quantity and water quality in the Everglades is expected to improve the structure and function of the ecosystem.

(d)(ii) Describe one way that restoring the Everglades is expected to provide economic benefits to Florida.