

Question 1: Design an Investigation**10 points**

A **Describe** one reproductive strategy used by a K-selected species such as the chickadee. **Point 01**

Examples of acceptable responses may include the following:

- (K-selected species) provide considerable parental care for offspring.
- (K-selected species) have few offspring.
- (The parents) expend significant energy for each offspring.
- (Individuals) reproduce more than once in their lifetime.
- (K-selected species) have a long gestation period/reach reproductive maturity later.

B Based on the information provided, **explain** how a decrease in spider populations could affect a lower trophic level. **Point 02**

Examples of acceptable responses may include the following:

- Insects/insect populations would increase because the insects are not being preyed on/eaten as much.
- Plants/plant populations would decrease because the number of insects that eat plants will increase.

C Based on the data in Figure 1, **identify** the number of spiders per sample at 25% nonnative plants. **Point 03**

Examples of acceptable responses may include the following:

- 2.0
- 2

D Based on the data in Figure 1, **describe** the trend in the number of insects per sample in relation to the percentage of nonnative plants. **Point 04**

Examples of acceptable responses may include the following:

- As nonnative plant percentage/percent increases, the number of insects decreases.
- As nonnative plant percentage/percent decreases, the number of insects increases.
- They have an inverse/indirect/negative relationship.

E Scientists hypothesized that the population of chickadees would be stable or growing with fewer than 25% nonnative plants. **Describe** one way that the data in Figure 2 support this hypothesis. **Point 05**

Examples of acceptable responses may include the following:

- Below this level/With fewer than 25%, the growth rate is at/above replacement level.
- Below this level/With fewer than 25%, enough reproduction is occurring to replace the population.
- Below this level/With fewer than 25%, the population growth rate is positive.

F	(i) Identify a likely scientific question for the students' investigation of ant diversity. Examples of acceptable responses may include the following: - Does the number of species/species richness/biodiversity differ between an urban park and a grassland? - Does mowing affect the number of species/species richness/biodiversity?	Point 06
	(ii) Identify the dependent variable in the students' investigation. Examples of acceptable responses may include the following: - Number of ant species - Ant species richness - Presence/absence of different ant species	Point 07
G	(i) Explain why the ant community of the unmowed grassland would be more likely to recover from a disturbance, such as a flood or fire, than the ant community in the mowed urban park would. Examples of acceptable responses may include the following: - With a larger number of species, the grassland is more likely to have some species/individuals with adaptations that allow them to survive. - The grassland is more diverse, so the loss of one species is less likely to cause a collapse (of the whole ecosystem).	Point 08
	(ii) Explain how the results of the investigation could have been altered if students had measured ant biodiversity at a paved playground rather than in the grassland. Examples of acceptable responses may include the following: (The playground) would have fewer species (than the grassland/urban park) because the paved area is not suitable habitat for many ant species. (The playground) would have fewer species (than the grassland/urban park) because humans could trample the ants/ant habitat.	Point 09
H	Describe one effect a paved road in a forest can have on animal species such as deer or bears. Examples of acceptable responses may include the following: - Animals can get hit by cars when trying to cross the road/hunt/migrate. - Fragmentation can lead to isolation of individuals/loss of genetic diversity. - Noise pollution can damage hearing/cause stress/mask the sounds used to communicate/hunt. - The road/noise pollution can cause changes in migratory routes/prevent movement of animals (to access resources). - Species that thrive in edge habitats might increase.	Point 10

Question 2: Analyze an Environmental Problem and Propose a Solution**10 points****(a) (i) Identify** the latitudinal range with the greatest amphibian species richness.**1 point**

Accept one of the following:

- Between the Tropic of Cancer and the Tropic of Capricorn
- The range between 30 degrees N and 30 degrees S latitude
- The range between 10 degrees N and 15 degrees S latitude

(ii) Identify what biome this range most likely represents.**1 point**

- Tropical Rainforest

(iii) Describe one reason amphibian species richness would tend to be highest in this region.**1 point**

Accept one of the following:

- More rainfall/warm temperatures year-round are the preferred conditions for amphibians.
- Greater biodiversity/higher NPP provides more habitat/food sources/niches.

Total for part (a) 3 points**(b)** There are many environmental threats facing amphibians today, such as deforestation.**1 point****Describe** one possible anthropogenic reason for deforestation.

- Human demand for agriculture/housing/firewood/forest products (medicine/food/lumber).

(c) (i) Explain how the species richness of an ecosystem influences its response to environmental stressors.**1 point**

- An ecosystem with greater species richness/diversity is more resilient/resistant to environment stressors because some species will survive helping to restore/stabilize the ecosystem.

(ii) Explain why amphibian biodiversity is declining globally, other than from deforestation. **1 point**

Accept one of the following:

- Increasing water pollution including:
 - Pollution from pharmaceuticals that cause reproductive harm/decrease reproductive success.
 - Pesticide pollution that is absorbed via the skin and is toxic to amphibians leading to death.
 - Endocrine disruptors (such as atrazine) can alter reproductive development leading to decreased number of successful offspring.
- Pesticide use reduces food sources for amphibians (insects), leading to decreasing population size.
- Microclimatic changes from overall global climate change (e.g., warmer, drier conditions in previously cool, moist areas, loss of wetlands) decreases available habitat leading to a decline in population size.
- Illegal amphibian trafficking removes species from an area leading to a decline in population sizes.
- Introduction of invasive species that compete for niche space leading to a decline in population sizes.
- Habitat fragmentation from human activity would limit range/reduce the ability to access resources, decreasing survival.
- Fungal infections (such as Chytrid) cause their skin to dry out, and they cannot breathe.

Total for part (c) 2 points

(d) (i) Identify one specific piece of legislation that has been designed to protect species threatened by extinction. **1 point**

Accept one of the following:

- Endangered Species Act (ESA)
 - Convention on the International Trade of Endangered Species (CITES)
 - Lacey Act
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- (ii) **Explain** how the requirements of the legislation identified in part (d)(i) specifically protect species threatened by extinction. **1 point**

Accept one of the following:

Legislation identified in (d)(i)	Explanation of requirements that specifically protect species threatened by extinction
Endangered Species Act (ESA)	- Lists endangered/threatened plant and animal species and prevents them from being killed or harmed. - Designates/protects critical habitat to promote survival and recovery of listed species. - Creates plans to restore populations to healthy sizes. - Identifies species that are threatened before they become endangered to provide protections.
Convention on the International Trade of Endangered Species (CITES)	A global agreement that protects endangered/threatened plants and animals (including goods such as ivory, shark fins, or rhinoceros' horns) by banning/regulating the trade of these species.
Lacey Act	Prohibits the trade of wildlife, fish, and plants that have been illegally taken, possessed, transported, or sold.

Total for part (d) 2 points

- (e) (i) **Propose** a viable solution that will result in the protection of the endemic frog species while still allowing for maximum profit of the property development. **1 point**

Accept one of the following:

- Move/transplant the frog populations to an adjacent undeveloped area prior to development.
- A portion of the wetland can be designated as a park/preserve.
- Wildlife corridors (land/bridges) can be built/created on a portion of the wetlands.
- Restrict development within a minimum setback away from the wetland.
- Project developers can group buildings together/can build up, not out.

- (ii) **Justify** the solution proposed in (e)(i) by describing a potential advantage of the plan, other than frog protection. **1 point**

Accept one of the following:

Solution proposed in (e)(i)	Justification of how solutions offer potential advantages, other than frog protection
Move/transplant frogs	- Developers will only have a one-time disruption during the removal but will not have to deal with continued disruptions (such as increasing human population, increasing use of fertilizer/pesticides). - Developer will have the maximum amount of land available.
Designate as a park/preserve	- By protecting areas, animal species will have more food and space availability increasing survival rates. - Potential educational/environmental draw of living near a park/preserve may allow the developer to charge higher rents for the apartments. - There is aesthetic value of the wetland and its species for the people that live there. - The preserved wetland area will help prevent flooding.
Use of wildlife corridors	- By establishing corridors, the other species will also not be as greatly affected by multiple habitat fragments. - The animal species can continue to move back and forth for food, shelter, and reproduction by way of the habitat corridors.
Setback	- By establishing setbacks, a buffer zone will be created between the development and the wetland area, filtering runoff into the wetland. - A buffer zone will add privacy for residents between the two developments.
Project development	By developing the apartments in groups/clusters and leaving preserved wetlands, the species will not be as affected by multiple habitat fragments.

Total for part (e) 2 points

Total for question 2 10 points

2018

AP[®]

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AP Environmental Science

Scoring Guidelines

2018 SCORING GUIDELINES

Question 1

Read the following article from the *Fremont Daily Times* and answer the questions that follow.

(a) The students want to reduce the school's carbon footprint.

(i) **Define** carbon footprint.

(1 point for correct definition of carbon footprint)

- The amount of carbon dioxide and/or other carbon compounds released to the environment by a product, process, or activity
- A measurement of the amount of carbon released by human activities

(ii) **Identify** one way the school's heating system is likely adding to the school's carbon footprint.

(1 point for correct identification of a way the school's heating system is adding to its carbon footprint)

- The burning/combustion of fossil fuels releases carbon dioxide
- The incomplete combustion of fossil fuels releases carbon monoxide

(iii) **Describe** one realistic way to reduce the contributions of the heating system to the school's carbon footprint

(1 point for correct description of a realistic way to reduce the contributions of the heating system)

- Switch to renewables (solar, wind, etc.)/switch to a more efficient fossil fuel (natural gas, propane)/switch to a provider that uses nuclear energy.
- Decrease the temperature/thermostat in the school during the winter/program thermostat to lower energy consumption during certain times.
- Purchase credits through environmental agencies for carbon-offsetting projects.
- Increase insulation or implement other efficiency/design methods to reduce energy demand (green roof, double paned glass, south-facing windows for passive solar heating, change air filters, etc.).

(b) **Identify** TWO environmental benefits of a living green roof, such as that suggested by Councilperson Fassler.

(2 points; 1 point for each correct identification of an environmental benefit of a green roof)

- Insulation/reduced use of fossil fuels for heating and/or cooling
- Habitat for wildlife and/or plants/increases biodiversity
- Area to grow crops/production of food locally
- Reduction in the number of heat islands in the environment/urban heat island mitigation
- Photosynthesis/carbon capture/CO₂ storage/oxygen release
- Stormwater treatment/runoff reduction
- Filters particulates, VOCs, O₃ from air

2018 SCORING GUIDELINES**Question 1 (continued)**

- (c) **Describe** TWO practices the cafeteria's food service could use to decrease the environmental impacts of Fremont High School.

(2 points; 1 point for each correct description of a practice that decreases the environmental impact of the school)

- Offer more vegetarian options/serve fewer animal products, etc. to reduce impact from meat production.
- Use some locally sourced food to reduce transportation.
- Grow food at the school to reduce transportation.
- Compost food waste to reduce the amount disposed in landfills.
- Donate leftover food to reduce food waste.
- Use energy-friendly practices (LED lighting, serve more cold-cut sandwiches, etc.) to decrease energy use.
- Purchase bulk packaged items to reduce material waste.
- Use recyclable food containers/don't use disposable straws/food containers/trays to reduce material waste.
- Install a water fountain/stop selling single-serving water bottles to reduce material waste.
- Use reusable take-out containers/offer savings or credit for reusing containers to reduce material waste.
- Allow students to choose appropriate portions to reduce food waste.
- Purchase organic foods to reduce pesticide use.
- Use gray water to irrigate landscaping to reduce potable water use.

- (d) **Discuss** TWO benefits of using native plants for landscaping at Fremont High School.

(2 points; 1 point for each correct discussion of benefits of using native plants)

- Native plants require less pesticides because they are better adapted to their environment.
- Native plants require less fertilizer because they are better adapted to their environment.
- Native plants require less irrigation water because they are better adapted to their environment.
- Native plants increase biodiversity by providing native habitat areas.
- Native plants support native food webs/native food production by providing native habitat areas.
- Native plants reduce the amount of land available for the establishment/spread of invasive species.
- Native plants save the school money by requiring less water/fertilizer/pesticides/upkeep.

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Question 1 (continued)

- (e) During the renovation, the carpeting must be replaced. **Discuss** one environmental benefit of using flooring made of plant material, such as cork or bamboo, instead of carpet made of synthetic fibers.

(1 point for correct discussion of benefits of using flooring made of plant material)

- Plant-based material is more easily compostable/is biodegradable/can be reused/repurposed, unlike carpet.
- Plant-based material is from a renewable resource making it more sustainable than carpet. Plant-based material is a carbon sink/reservoir, so growing plant materials removes CO₂ from the atmosphere, unlike carpet.
- Plant-based materials require less fossil fuels/toxic chemicals for production than synthetic fibers found in carpets.
- Plant-based materials produce less indoor pollutants (off-gas pollutants/VOCs/release toxins) than carpet.
- Plant-based materials harbor fewer pathogenic vectors/diseases/allergens (fleas, ticks, dust mites, mold spores, etc.) than carpets.
- Plant-based material when cultivated provides habitat for native species.

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Question 2

An offshore wind farm project using turbines to generate electricity is to be built along the Atlantic coast of the United States. It will be located about 13 km from the coast in water with an average depth of 10 m.

- (a) **Describe** one environmental benefit associated with an offshore wind project.

(1 point for correct description of an environmental benefit associated with an offshore wind project)

- Reduced environmental damage from decreased reliance on fossil fuels, such as:
 - Less habitat/ecosystem destruction due to less exploration and extraction (less mining or drilling, etc.)
 - Less air/soil/water pollution (less exhaust emissions, pipeline leaks, tanker leaks) due to less transportation of fossil fuels
 - Less air pollution (no/fewer particulates, VOCs, NO_x, SO_x, CO₂, or greenhouse gases) due to less fossil fuel combustion
- Reduced environmental damage from decreased reliance on nuclear power, such as:
 - No risk of radioactive releases with accidents
 - No hazardous/radioactive wastes to store
 - Less exploration/ extraction/processing for uranium ore
- Increased aquatic habitat/artificial reefs for barnacles, sponges, other invertebrates, fish

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Question 2 (continued)

(b) **Identify** and **describe** one potential economic effect of an offshore wind project.

(2 points; 1 point for correct identification of a potential economic effect and 1 point for correct description of an identified economic effect. The description point cannot be earned without correct identification of a potential economic effect.)

Identify one potential economic effect	Describe one potential economic effect
Job creation (+)	Jobs will be created in construction, operation, maintenance, etc.
Additional income (+)	- Local municipalities receive more taxes (income, sales, property) paid by utility and workers - Wind power company will make money/profits in the long run
Decreased electricity costs (+)	Electrical production costs will be lower, which will reduce electricity rates for consumers
Less reliance on foreign energy resources (+)	Transportation costs to deliver fuels will be reduced
High initial construction/high maintenance costs (-)	- Local taxes/fees/rates will increase to support construction costs associated with building of facility - Parts and personnel must be transported off-shore for construction, repairs and maintenance
Decreased property value (-)	Property values will decrease in coastal areas due to unfavorable aesthetics
Loss of income (-)	- Turbines negatively affect the aesthetics, which negatively impacts tourism, fishing, whale watching, etc. - Local fishing opportunities will be disrupted - Less revenue for fossil fuel companies as demand decreases
Job loss (-)	Jobs will be lost in the traditional energy production sectors (coal, nuclear)
Subsidies cost (-)	State subsidies to offset cost of building offshore and transmission lines to coast will increase; costs may be recovered with increased taxes

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Question 2 (continued)

- (c) **Describe** one additional way, other than wind power, that oceans can provide renewable energy for the generation of electricity.

(1 point for correct description of energy source from ocean)

- Use of tidal movement/currents to turn turbines
- Utilize a device designed to capture energy from wave motion
- Harness the solar energy absorbed by the oceans/use natural thermal gradient in tropical and temperate oceans to create electricity (OTEC — Ocean Thermal Energy Conversion)
- Harvest algae and convert to biofuel

The project will consist of 200 wind turbines, each with a capacity of 4 megawatts (MW). Each turbine costs \$1.2 million to build. Electrical demand in the area to be served by the project is expected to be 2.0×10^6 MWh per year.

- (d) **Calculate** how much electricity (in MWh) the wind project needs to generate per year in order to provide 80% of the annual electrical demand in the service area. Show all work.

(2 points; 1 point for the correct setup and 1 point for the correct answer)

$$(0.80) \times (2.0 \times 10^6 \text{ MWh}) = 1.6 \times 10^6 \text{ MWh}$$

- (e) Customers in the service area pay \$0.20/kWh for electricity. **Calculate** how much revenue will be produced if the wind turbines provide 80% of the annual electrical demand in the service area. Show all work.

(2 points; 1 point for the correct setup and 1 point for the correct answer)

$$1.6 \times 10^6 \text{ MWh} \times \frac{\$(2 \times 10^{-1})}{\text{kWh}} \times \frac{1 \times 10^3 \text{ kWh}}{1 \text{ MWh}} = \$3.2 \times 10^8 = \$320,000,000 = \$320 \text{ million}$$

- (f) Assuming all turbines are operating, **calculate** how many hours the wind turbines must operate to provide 80% of the annual electrical demand in the service area. Show all work.

(2 points; 1 point for the correct setup and 1 point for the correct answer)

$$1.6 \times 10^6 \text{ MWh} \times \frac{1 \text{ turbine}}{4 \text{ MW}} \times \frac{1}{2 \times 10^2 \text{ turbines}} = 2 \times 10^3 \text{ hr} = 2,000 \text{ hours}$$

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Question 3

An Arctic food web includes the following organisms.

- (a) Refer to the diagram above to complete the following table.

(3 points; 1 point for correct identification of each organism in the table)

	Organism from Arctic food web
(i) Identify a primary producer	Diatom (phytoplankton)
(ii) Identify a primary consumer	Krill (zooplankton)
(iii) Identify a secondary consumer	Cod or seal

- (b) Other than showing which organisms are consumed by others, **describe** what is indicated by the direction of the arrows in the diagram.

(1 point for correct description of what is indicated by the direction of the arrows)

- Shows the flow of energy among trophic levels
- Shows the flow of matter through trophic levels

As the amount of sea ice has decreased, larger expanses of the Arctic Ocean are now completely free of sea ice for several weeks each summer. Ringed seals, the preferred prey of polar bears, come to holes in the sea ice to breathe.

- (c) **Describe** how the change in sea ice habitat is affecting polar bears' ability to hunt and feed.

(1 point for correct description of how the change in sea ice habitat affects ability to hunt and feed)

- Decreasing area of hunting ground (area of ice used for hauling out/fewer seal breathing holes/seals are a less available food source because of more open water) makes it more difficult for polar bears to get food
- Increasing area/distance between hunting ground means the polar bears have to exert more energy to swim to find food/physical exhaustion from swimming results in less energy available for hunting
- Increasing physiological stress (dehydration, exhaustion, cub mortality, etc.) because polar bears are not physiologically adapted to warmer temperatures
- Increasing the time between successful kills results in bears spending more time waiting/hunting for prey

2018 SCORING GUIDELINES**Question 3 (continued)**

- (d) **Explain** how melting sea ice leads to a feedback loop that increases Arctic warming.

(2 points; 1 point for correct explanation of the connection between melting ice and the increased absorption of sun's energy and 1 point for correct explanation that increased absorption of sun's energy leads to increased melting of ice. For the second point the student must complete the positive feedback loop.)

- Melting of sea ice leads to a decrease in albedo, or reflectivity, leads to water surfaces absorbing more of the sun's energy.

AND

- Increasing absorption of sun's energy warms the water surface further, which leads to further ice melt (completes positive feedback loop).

- (e) Many species, including some whales and birds, will travel thousands of kilometers during annual migrations.

- (i) **Provide** one reason a species may migrate a long distance.

(1 point for a correct reason why a species may migrate a long distance)

- Limited food/water supply leads to migration to locations with more food/water supply
- Food supply migrates and species follow prey
- More hospitable climate during certain seasons
- Availability of mates/breeding/birthing occurs in different location
- Protection of offspring from predators

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Question 3 (continued)

- (ii) The North Atlantic right whale migrates between subtropical and polar waters annually. Nearly 50 percent of right whale deaths are due to human activities. **Describe** one commercial activity, other than whaling, that may result in the death of right whales.

(1 point for correct description of one commercial activity, other than whaling)

- (iii) **Describe** one strategy that could reasonably be implemented to decrease right whale deaths caused by the commercial activity you described in part (ii).

(1 point for correct strategy linked to activity in (ii))

Description of commercial activity	Description of one strategy
- Fishing nets entangle whales as by-catch. - Fishing gear can accidentally trap.	- Require change of fishing method (location, timing, or materials) that traps whales to reduce the number of whales trapped in nets/gear - Fines for discarded fishing gear (long-line gear, ropes for hauling pots up, etc.) so less gear is discarded reducing the number of whales trapped in gear
Ships and whales use the same channels, which can increase number of ship strikes.	- Improved navigational technology to spot whales that are close to ships in order to avoid collisions - Increased education of ship captains and crews about whale habitat/migration routes/feeding behaviors in order to reduce ship collisions with whales - Expansion of low-speed navigational zones around ports to reduce ship collisions with whales
Noise pollution from seismic surveys/sonar/engine noise can disrupt a whale's internal navigational system.	- Reduction of seismic survey activity/sonar use in coastal areas to reduce exposure to noise pollution - Installation of quieter motors to reduce or eliminate noise pollution

2018 SCORING GUIDELINES

Question 4

In many parts of the world, biomass like peat, wood, and animal waste is burned indoors for cooking and home heating. Combustion of these fuels releases harmful household air pollutants that pose a health threat to billions of people, mostly in less developed countries.

(a) Air pollutants are released during the burning of biomass indoors for cooking and heating.

- (i) **Identify** TWO air pollutants released during the burning of biomass indoors for cooking and heating.

(2 points; 1 point for each correct identification of an air pollutant released during the burning of biomass)

- (ii) **Identify** a specific human respiratory illness that one of the pollutants you identified may cause.

(1 point for correct identification of a specific respiratory illness linked to identified pollutant)

Identification of TWO air pollutants	Identification of a specific human respiratory illness linked to identified pollutant
Carbon monoxide (CO)	CO poisoning
Particulate matter (PM)	- Asthma - Chronic obstructive pulmonary disease (COPD) - Emphysema - Bronchitis - Lung cancer
Nitrogen oxides (NO_x)	- Pneumonia - Asthma
Sulfur oxides (SO_x)	- Bronchitis - Emphysema - Asthma
Trace metals, such as lead, mercury, arsenic, and cadmium	Bronchitis
Methane (CH₄)	Bronchitis
Volatile organic compounds (VOCs)	- Bronchitis - Asthma

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Question 4 (continued)

- (b) **Identify** one realistic approach, other than banning the practice of burning biomass indoors, which could be used to reduce the impact of biomass combustion indoors on human respiratory health. **Describe** how this approach could reduce the incidence of respiratory illness.

(2 points; 1 point for correct identification of a realistic approach to reducing the impact and 1 point for correct description of reduction of illness linked to identified approach)

Identify one realistic approach	Describe how this approach would reduce the incidence of respiratory illness
Ventilate through structural change (chimney construction, opening windows and doors)	Removes some or all of the air pollution from indoors/transfers pollutants out of the home, leading to less respiratory illness
Switch to cleaner-burning/more efficient cooking stove	Requires less fuel to be burned releasing fewer air pollutants into the home, leading to less respiratory illness
Switch to a different energy source (solar, natural gas, biogas, electric)	Produces less or no indoor air pollutants, leading to less respiratory illness
Cook outdoors	Move the source of the air pollutant outside/leads to less or no concentrated air pollution inside, leading to less respiratory illness

In 2016 approximately four million people died from illnesses attributed to household air pollutants from burning biomass indoors. More than 10 percent of these deaths occurred in children under the age of five in less developed countries.

- (c) **Discuss** one reason children under the age of five are at a greater risk than adults for illnesses linked to household air pollutants.

(1 point for correct discussion of why children under the age of five are at a greater risk)

- Children have an underdeveloped or less-developed immune systems leading to a greater risk of illness following exposure.
- Children have a lower body mass leading to a higher relative dose of air pollution.
- Children spend more time indoors leading to higher exposure to air pollution.
- Children have smaller respiratory systems (narrow airways) so mild inflammation may cause more severe respiratory distress.

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Question 4 (continued)

In more developed countries, indoor air pollution is also a problem. Common indoor air pollutants in developed countries include:

- asbestos
- radon
- mold

(d) Choose TWO of the three common indoor air pollutants (asbestos, radon, or mold) listed above and complete the following table.

(i) **Identify** a source for each indoor air pollutant

(2 points; 1 point for correct identification of a source of each indoor air pollutant chosen)

(ii) **Describe** a method for reducing exposure to each of the two pollutants you chose.

(2 points; 1 point for correct description of method of reduction for each indoor air pollutant chosen)

	Identification of a source	Description of a method for reducing exposure
Asbestos	• Building materials (cement, floor tiles, ceiling panels, drywall, popcorn ceiling) • Insulation • Naturally occurring in soil and rocks in a dirt-floor basement or crawlspace	• Safely remove asbestos-containing materials/abatement • Encapsulate/cover and seal materials/construct temporary enclosure • Leave undisturbed
Radon	• Soil, rocks, Earth's crust • Gas from uranium containing rocks • Gas penetrates foundation	• Seal floors, walls, and joints • Install structural exhaust venting • Install subfloor depressurizing system
Mold	• Water from flooding, natural disasters, or leaks • Poorly vented or maintained damp environments	• Replace or repair damaged surfaces/structures • Clean and/or disinfect affected areas • Dehumidify or ventilate inside air • Improve drainage (from roof or yard, sump pump the basement)