

2025



AP[®] Environmental Science

Scoring Guidelines

Set 1

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

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

Examples of acceptable responses may include the following: <ul style="list-style-type: none">• (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. | Point 01 |
| B | Based on the information provided, explain how a decrease in spider populations could affect a lower trophic level.

Examples of acceptable responses may include the following: <ul style="list-style-type: none">• 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. | Point 02 |
| C | Based on the data in Figure 1, identify the number of spiders per sample at 25% nonnative plants.

Examples of acceptable responses may include the following: <ul style="list-style-type: none">• 2.0• 2 | Point 03 |
| 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.

Examples of acceptable responses may include the following: <ul style="list-style-type: none">• 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. | Point 04 |
| 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.

Examples of acceptable responses may include the following: <ul style="list-style-type: none">• 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. | Point 05 |

F	(i) Identify a likely scientific question for the students' investigation of ant diversity. Point 06 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?
	(ii) Identify the dependent variable in the students' investigation. Point 07 Examples of acceptable responses may include the following: - Number of ant species - Ant species richness - Presence/absence of different ant species
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. Point 08 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).
	(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. Point 09 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.
H	Describe one effect a paved road in a forest can have on animal species such as deer or bears. Point 10 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.

Question 2: Analyze an Environmental Problem and Propose a Solution

10 points

A	Identify the sea surface condition for the eastern equatorial area of the Pacific Ocean illustrated in Figure 1. Point 01 Acceptable identification point: (Ocean water) cooler than average
B	Based on the information in Figure 1, identify the climate phenomenon associated with the sea surface conditions shown in the equatorial area of the Pacific Ocean. Point 02 Acceptable identification point: La Niña
C	Based on the information in Figure 2, describe a difference in climate patterns between the regions A and B. Point 03 Examples of acceptable responses may include the following: - Region A has an increased chance of precipitation, while Region B has a decreased chance of precipitation. - Region A will be wetter, while Region B will be drier.
D	Describe one reason why there is an increased risk of flooding in urban areas during extended periods of precipitation. Point 04 Examples of acceptable responses may include the following: - Impervious/paved surfaces increase runoff/reduce infiltration/reduce absorption. - Parking lots/roads/buildings/sidewalks increase runoff/reduce infiltration/reduce absorption. - There is less vegetation and, therefore, less infiltration/absorption.
E	Propose a realistic solution a city could implement to decrease the risk of flooding in urban areas. Point 05 Examples of acceptable responses may include the following: - Use permeable pavement - Plant vegetation/establish parks/create rain gardens/build green roofs - Install retention ponds/stormwater basins

- F** **Justify** the solution proposed in part E by providing an additional advantage other than a reduction in the risk of flooding. **Point 06**

Examples of acceptable responses may include the following:

Solution from part E	Justification of solution with additional advantages
Use permeable pavement	- Increased recharge of nearby aquifers/groundwater - Decreased pollution in runoff
Plant vegetation/establish parks/create rain gardens/build green roofs	- Vegetation absorbs pollutants - Vegetation stores carbon dioxide/produces oxygen - Decreased erosion - Increased/restored habitat for wildlife - Increased biodiversity - Helps reduce urban heat island effect - Aesthetic enjoyment/improved quality of life - Creates jobs (in landscaping/park maintenance)
Install retention ponds/stormwater basins	- Decreased pollution in runoff - Increased habitat/biodiversity

- G** **Describe** one difference between the climate of a temperate seasonal forest and that of a savanna. **Point 07**

Examples of acceptable responses may include the following:

- Temperate seasonal forests have a cooler climate than a savanna.
- Temperate seasonal forests have a stronger/colder winter than a savanna.
- Temperate seasonal forests have four distinct seasons while savannas do not.
- Temperate seasonal forests receive more annual precipitation than savannas.
- Temperate forests receive precipitation throughout the year while savannas have a rainy season/dry season.

- H** **Identify** the ecological process that occurs following a forest fire that leaves the soil intact. **Point 08**

Acceptable identification point:

- Secondary succession

- I** **Describe** one way burning forests contribute to atmospheric pollution. **Point 09**

Acceptable description point:

- Burning of trees releases CO₂/CO/NO_x/particulate matter/VOCs.

- J** **Describe** one sustainable forestry practice that could be used to reduce the occurrence or severity of forest fires. **Point 10**

Examples of acceptable responses may include the following:

- Prescribed burns can remove excess fuel/dead leaves/underbrush.
- Brush removal can remove excess fuel/dead leaves/underbrush.
- Selective cutting can create a fire break.
- In agroforestry, ground crops that might otherwise be fuel can be harvested/removed.

**Question 3: Analyze an Environmental Problem
and Propose a Solution (Doing Calculations)****10 points****A Identify** an anthropogenic source of particulate matter, other than from motor vehicles. **Point 01**

Examples of acceptable responses may include the following:

- Coal/fossil fuel combustion
- Industrial exhaust
- Construction/demolition
- Waste incineration
- Mining
- Burning of biomass
- Anthropogenically caused wildfires
- Unpaved roads
- Agricultural fields

B One way to reduce pollutants associated with motor vehicles is to use a vapor recovery nozzle. **Describe** one way a vapor recovery nozzle is used to reduce atmospheric pollution. **Point 02**

Acceptable description point:

- It prevents fumes/vapors from escaping into the atmosphere when gassing/fueling (a motor vehicle).

C Explain how a decrease in the number of people commuting to work in their personal vehicles could lead to a reduction in acid rain. **Point 03**

Examples of acceptable responses may include the following:

- (A decrease in commuting) would result in lower nitrogen oxide/sulfur oxide emissions from cars/vehicles.
- (A decrease in commuting) would lead to less nitric acid/sulfuric acid in the atmosphere.

D Calculate the percent change in gas mileage between the gasoline-powered SUV and the hybrid SUV based on the data provided. **Show** your work. **Point 04**

One point for the correct setup to calculate the percent change in gas mileage.

Examples of acceptable responses may include the following:

- $(36 \text{ mpg} - 22 \text{ mpg}) / 22 \text{ mpg} \times 100$
- $(36 - 22) / 22 \times 100$

One point for the correct calculation of the percent change in gas mileage. **Point 05**

Examples of acceptable responses may include the following:

- 63.6% increase
- 63.6%
- 63.6
- 64%
- 64

E Calculate how many more miles the owner can drive in the hybrid SUV in the city than they could have driven in the gasoline-powered SUV. **Show** your work. **Point 06**

One point for the correct setup to calculate how many more miles the hybrid SUV can drive than the gasoline-powered SUV.

Examples of acceptable responses may include the following:

- $(14 \text{ gallon} \times 36 \text{ mpg}) - (14 \text{ gallon} \times 22 \text{ mpg})$
- $(14 \times 36) - (14 \times 22)$
- $14 \times (36 - 22)$

One point for the correct calculation of how many more miles the hybrid SUV can drive than the gasoline-powered SUV. **Point 07**

Examples of acceptable responses may include the following:

- 196
- 200

F Propose a realistic solution that schools could implement to decrease energy use for heating and cooling, other than a reduction in the amount of time the school building is occupied. **Point 08**

Examples of acceptable responses may include the following:

- Implement green building design features
- Open windows to reduce use of air conditioning
- Use energy-efficient heating and cooling equipment
- Adjust the thermostat to reduce use of heat and air conditioning
- Install conservation landscaping

G **Calculate** the energy use in the school building in kilowatts per year using LED light bulbs. **Point 09**
Show your work.

One point for the correct setup to calculate the energy use in the school building in kWh/year using LED light bulbs.

Examples of acceptable responses may include the following:

- $(2.8 \times 10^4 \text{ bulbs}) \times 0.0085 \text{ kilowatt} \times 2,340 \text{ hours}$
- $(2.8 \times 10^4) \times 0.0085 \times 2,340$

One point for the correct calculation of the energy use in the school building in kWh/year using LED light bulbs. **Point 10**

Examples of acceptable responses may include the following (if units are included in the response, kWh/year or kW/year are accepted):

- 556,920
 - 5.6×10^5
 - 5.6E5
-