2025

AP® Environmental Science

Sample Student Responses and Scoring Commentary Set 1

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Free-Response Question 1

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Question 1: Design an Investigation — 10 points

A — **Point 01**

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

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 — **Point 02**

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:

- 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 — **Point 03**

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:

- 2.0
- 2

D — **Point 04**

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:

- 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 — **Point 05**

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:

- 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. **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.

----Response A----
A K-selected species focuses on extended lifespan over total offspring. Mothers bare few offspring but care for them much longer and overall they survive much longer and live to reproduce.
----Response B----
the removal of spiders could cause an increase in insect poputaltion as one of their predators has been removed from the ecosystem
----Response C----
approxamatly 2
----Response D----
The number of insects per sample decreases at a decreasing rate as percentage of nonnative plants increases
----Response E----
The data in figure 2 supports the hypothosis as before 25% nonnative species the chickadee population growth rate is above replacment level thus the population must be stable or growing.
----Response F----
i) does the frequency of mowing of habitat decrease ant diversity
ii) Number of ant species found in the traps
----Response G----
i) since the grassland has more species richness than the urban park the grassland would be more likely to recover as the gene pool of the grassland is higher due to more species richness. This means a genotype that can survive the environmental change is more likely to exist in the grassland ecosystem. aslo increased neich partitioning due to increased diversity in the grassland means that more food sources are likely to surrvive an environmental change.
ii) Diversity would most likely be lower at a paved playground than the grassland as the lack of primary producers at a paved park that would limit the number of species that could survive in that environment
----Response H----
A paved road could inhibit migratory patterns of large mammals cutting off accsess to water or food sources that were once avalible

----Response A----
A. One reproductive strategy of a K-selected species is that they produce many offspring but have a shot lifespan
----Response B----
B. A decreas in spider populations can change a lower trophic level by creating in increase in the plants and insects that are being eaten by the spiders.
----Response C----
C. 2 spiders per sample
----Response D----
D. As the percentage of Nonnative Plants increases the averageg number of insects decreases.
----Response E----
E. This hypothesis is supported by the chickadee population growth rate intersecting with the replacement level at 25% nonnative plants, as well as anything less than 25% nonnative plants has the chickadee population growth rate above the replacment level line.
----Response F----
Fi. A likley question that the students could be looking to answer is: What will the difference in biodiverity be within 20 total patches of grass split up evently between a frequently mowed urban park and an unmowed grassland look like?
Fii. The dependent variable in the students investigation would be the amount of ant species found in each patch of grass
----Response G----
Gi. The ant community in the unmowed grassland is more likely to recover because there is a greater biodiversity in the species types than there is in the frequently mowed urban park.
Gii. The results would have been different because the paved playground would have a similar outcome to the frequently mowed urban park. This is because there is a constand disturbance on the playground and on the frequesntly mowed urban park.
----Response H----
H. Habitat fragmentation in forests can have negitive effects on species such as deer and bears because it creates a barrier that splits up the forest. This barrier makes it hard for the animals to cross safley into the other part of the forest. This can also decrease the biodiversity that is in each part of the forest.

----Response A----
They may build nests and lay eggs for reproduction.
----Response B----
A decrease in spider poulations means that the lower trophic levels may increase in population because they are preyed on less.
----Response C----
There were on avergae 2 spiders present when the sample was at 25% nonnative plants.
----Response D----
The higher percentage of nonnative plants, the lower the amount of insects there were present.
----Response E----
In figure 2, the growth rate of chickadees at 25% nonnative plants was at 0, meaning that the population would stay mostly stable.
----Response F----
i. Does a lawn being mowed effect the population of ant insects.
ii. The dependent variable was whether the the lawn was frquently mowed or unmowed.
----Response G----
i. The ant population in the unmowed grassland is bigger and more diverse, which will assist in the recovery of a disturbance.
ii. The population results from the paved playground would have been even lower than the urban park.
----Response H----
The road acts as a barrier whuch does not allow for species like bears or deers to cross without danger. The road seperates the ecosystem, leading to some resources being cutoff from the other side.

Question 1

Note: Student samples are quoted verbatim and may contain spelling and grammatical errors.

Overview

NEW for 2025: The question overviews can be found in the *Chief Reader Report on Student Responses* on AP Central.

Sample: 1A
Score: 10

One point was earned in part A for describing "Mothers bare few offspring" as a reproductive strategy used by a K-selected species. One point was earned in part B for explaining "the removal of spiders could cause an increase in insect poputaltion as one of their predators has been removed" as how the decrease in spider populations could affect a lower trophic level. One point was earned in part C for identifying "approxamatly 2" as the number of spiders per sample at 25% nonnative plants. One point was earned in part D for describing "The number of insects per sample decreases … as percentage of nonnative plants increases" as the trend in the number of insects per sample in relation to the percentage of nonnative plants. One point was earned in part E for describing "before 25% nonnative species the chickadee population growth rate is above replacment level" as one way the data in Figure 2 supports the hypothesis. One point was earned in part F (i) for identifying the scientific question "does the frequency of mowing of habitat decrease ant diversity." One point was earned in part F (ii) for identifying the dependent variable "Number of ant species." One point was earned in part G (i) for explaining "the grassland has more species richness … the gene pool of the grassland is higher … a genotype that can survive the environmental change is more likely to exist" as why the grassland ant community would be more likely to recover from a disturbance that the urban community park. One point was earned in part G (ii) for explaining "Diversity would most likely be lower at a paved playground than the grassland as the lack of primary producers ... would limit the number of species that could survive" as how the results would be different if students had measured ant biodiversity at a paved playground rather than in the grassland. One point was earned in part H for describing "A paved road could inhibit migratory patterns of large mammals" as an effect a paved road in a forest could have on an animal species.

Question 1 (continued)

Sample: 1B
Score: 6

No point was earned in part A. No point was earned in part B. One point was earned in part C for identifying “2 spiders” as the number of spiders per sample at 25% nonnative plants. One point was earned in part D for describing “As the percentage of Nonnative Plants increases the averageg number of insects decreases” as the trend in number of insects per sample in relation to the percentage of nonnative plants. One point was earned in part E for describing “anything less than 25% nonnative plants has the chickadee population growth rate above the replacment level.” One point was earned in part F (i) for identifying the scientific question “What will the difference in biodiverity be … between a frequently mowed urban park and an unmowed grassland.”One point was earned in part F (ii) for identifying the dependent variable “the amount of ant species.” No point was earned in part G (i). No point was earned in part G (ii). One point was earned in part H for describing “it creates a barrier that… makes it hard for the animals to cross safley” as the effect a paved road in a forest has on animal species.

Sample: 1C
Score: 3

No point was earned in part A. No point was earned in part B. One point was earned in part C for identifying “2 spiders” as the number of spiders per sample at 25% nonnative plants. One point was earned in part D for describing “The higher percentage of nonnative plants, the lower the amount of insects” as the trend in the number of insects per sample in relation to the percentage of nonnative plants. No point was earned in part E. No point was earned in part F (i). No point was earned in part F (ii). No point was earned in part G (i). No point was earned in part G (ii). One point was earned in part H for describing “The road acts as a barrier whuch does not allow for species like bears or deers to cross without danger” as the effect a paved road in a forest has on animal species.