2024



# **AP<sup>°</sup> Biology** Sample Student Responses and Scoring Commentary

# **Inside:**

**Free-Response Question 4** 

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#### **Question 4: Conceptual Analysis**

The common wild oat is native to regions of Europe and Asia but is an invasive species in central California grasslands. In California, the common wild oat has almost completely replaced some species of native bunchgrass. Researchers found that aphids, a type of small insect that often carries plant viruses, have a much higher reproductive rate in grasslands that include the common wild oat than in grasslands composed of only native bunchgrass species. Additionally, the viruses carried by the aphids appear to affect only the native bunchgrasses and not the common wild oat. Native bunchgrasses infected by the virus have much higher death rates than do native bunchgrasses that are not infected.

(a)	a) <b>Describe</b> the change in the resilience of an ecosystem when there is a decrease in the						
	number of species.						
	(The resilience of the ecosystem) will decrease.						
(b)	Explain how the addition of the common wild oat affects the number of native	1 point					
	bunchgrass plants that can be supported by the California grasslands ecosystem.						
	Accept one of the following:						
	• (The addition of the wild oat) limits the resources available (to the native plants),						
	resulting in a decrease (in the population size).						
	<ul> <li>(The addition of the wild oat) enables the aphid population to increase/increases the</li> </ul>						
	exposure to viruses, resulting in a decrease (in the population size of the native						
	bunchgrass).						
(c)	Researchers suggest adding ladybugs, predators of aphids, to the California grasslands.	1 point					
	Predict the effect of adding ladybugs on the abundance of the native bunchgrass						
	population.						
	<ul> <li>(The native bunchgrass population) will increase (in abundance).</li> </ul>						
(d)	Justify your prediction in part (c).	1 point					
	• (Adding ladybugs) will decrease the number of aphids, which will cause a decrease in						
	the <u>transmission of/infection by</u> plant viruses.						
	Total for question 4	4 points					

# Q4 Sample A 1 of 1

Q5218/10

## **BEGIN Question 4**

Begin your response to QUESTION 4 on this page. Do not skip lines. A). The ecosystem will have less biodicersity which would lower the resillionce and sustainability of an ecosystem. B). The number of native bunchgross plants with demose that can be supported would decrease due to the wild oat population cut-competing them for resources. C). The abundance of the noutive bunch gross population would increase. D). due to los aphids due to them being consumed by the ladybugs which would result in less notice buncharas dying due to loss transmittance of plant arrus by Aphids. Unauthorized copying or reuse of this page is illegal. Page 10 GO ON TO THE NEXT PAGE. Use a pen with black or dark blue ink only. Do NOT write your name. Do NOT write outside the box. 0159541

# Q4 Sample B 1 of 1

Begin your response to QUESTION 4 on this page. Do not skip lines. a) When there is a decrease in the number of species, the realitence of an ecosystem degreeses. b) The comman wild oat decreases the number of native burdgrass plants that can be supported by the Californita. grasslods easystem. c) The Adding ladybugs will increase the aburdance of the native burdgrass population d) Adding ladybugs will decrease the number of aphids in the ecosystem since they prey on aphids. Since aphids carry unvies that affect the native burdgrasses, <b>Burder</b> will decrease in the native burdgrasses, <b>Burder</b> of rative burdgrasses interfeet, causing the notive burdgrass population will decrease interfeet the native prey on aphids. Since aphids the rative the number of rative burdgrasses interfeet, causing the notive burdgrasses interfeet, causing the notive burdgrass population will decrease population will decrease the number of rative burdgrasses. Unsutherized copying or reuse of this page is litegal. Page 10 <b>GO ON TO THE NEXT PAGE</b> Use a pen with black or dark blue link only. Do NOT write your name. Do NOT write outside the box. 0219362			an An Station	BEGI	N Question	<b>4</b>		
Unauthorized copying or reuse of this page is illegal. Page 10 <b>GO ON TO THE NEXT PAGE</b> Use a pen with black or dark blue ink only. Do NOT write your name. Do NOT write outside the box.	a) b) d)	) Men H of an The co burcharing grasslow The Ad notive Adding eeosyste invies He An Notive	Begin your resp ere is a ecosywten nmon vild ass plants ds ecosyste Wing ladyb burchgross ladybugs m since the that affect ercoase in aber of n burchgross	Nonse to QUES decrease in A dearca Oat dea that can m. Ngs will s popula will dear ey prey et the nationative bio s popula	TION 4 on this A He number Newses to be suppli- increase tion bese He on aphic hive bunck we aphid unchgrouse Nan to increase	s page. Do not sk er of specifi the number of orted by th the about number of ds, Since grasses, St population s integled, crause.	ip lines. e, the realities of native e Californic lance of the aphids can will deares causing the	nce He me tre tre tre tre
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Q4 Sample C 1 of 2

BEGIN Question 4 Begin your response to **QUESTION 4** on this page. Do not skip lines. A) The ecosystem becomes less resilient when there is a decrease in number of speeles. This is because there is less garetic theready and more likelyhood that one catastrophic event can wipe out the whole ecosyster, rather than if there were more species, Herefore increasing the chance that some species have a trait that could survive a cadosstraphic event. B) when common wild oat is added, the number of notive bunchgross plants that can be supported by the California grasslands ecosystem increases. This is because when there is more common wild out the aphilis, who reproduce better in the common wild oat, will leave the Lunchgress for the common wild out when the aphilits leave the bunchgrass, so does the viruses increasing the number of surviving plants. () Adding kedy bugs would increase the Unauthorized copying or reuse of this page is illegal. Page 10 GO ON TO THE NEXT PAGE Use a pen with black or dark blue ink only. Do NOT write your name. Do NOT write outside the box. 0096111 Q6218/10

Additional page for answering Question 4 Continue your response to QUESTION 4 on this page. Do not skip lines. abundance of the native bunch grass population. The ladybugs Icill the elphids who are harming the bugch gross increasing the abundance as the burch gross. D) The ladybugs kill the alphids who harm the native grass, increasing the obundance of the bunchgrass. Unauthorized copying or reuse of this page is illegal. Page 11 GO ON TO THE NEXT PAGE. Use a pen with black or dark blue ink only. Do NOT write your name. Do NOT write outside the box. Q5218/11

# **Question 4**

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

#### **Overview**

Question 4 presented a report about the effects of an invasive species, the common wild oat, on a grassland community in central California. The stimulus of the question explained that aphids, which often carry plant viruses, have higher reproductive rates in grasslands invaded by the common wild oat than in grasslands with only native bunchgrass species and that the viruses appear to negatively affect native bunchgrasses but not affect the invasive species of plant.

Responses to part (a) were expected to describe "the change in resilience of an ecosystem when there is a decrease in the number of species" (Skill 1.A; LO SYI-3.F).

Responses to part (b) were expected to explain "how the addition of the common wild oat" affects the carrying capacity of the ecosystem (Skill 1.C; LOs SYI-1.H and SYI-2.A).

Part (c) described a suggested addition of ladybugs, predators of aphids, to the ecosystem. Responses were expected to predict that the effect of this disruption would be the increased abundance of the native bunchgrass population (Skill 6.E; LOs SYI-1.H and ENE-4-B).

Responses to part (d) were expected to justify the prediction in part (c) by reasoning that ladybug predation on aphids would decrease the abundance of aphids, which would decrease virus transmission to the plants (Skill 6.C; LO SYI-1.H).

## Sample: 4A Score: 4

The response earned 1 point in part (a) for describing "the ecosystem will have less biodiversity...would lower the resilliance." The response earned 1 point in part (b) for explaining that the addition of the wild oat caused a decrease in the number of native bunchgrass plants "due to the wildoat population out-competing them for resources." The response earned 1 point in part (c) for predicting an increase in the abundance of the native bunchgrass population. The response earned 1 point in part (d) for justifying the increase in the native bunchgrass population "due to less aphids" causing "less transmittance of plant virus by Aphids."

## Sample: 4B Score: 3

The response earned 1 point in part (a) for describing a decrease in the resilience of the ecosystem. The response did not earn a point in part (b) because it does not explain how the addition of the common wild oat limits available resources, enables an increase in the aphid population, or increases exposure to the viruses. The response earned 1 point in part (c) for predicting an increase in the abundance of the native bunchgrass population. The response earned 1 point in part (d) for justifying a decrease in the number of aphids "will decrease the number of native bunchgrasses infected."

# **Question 4 (continued)**

## Sample: 4C Score: 2

The response earned 1 point in part (a) for describing that "The ecosystem becomes less resilient." The response did not earn a point in part (b) because it explains that the native bunchgrass population will increase. The response earned 1 point in part (c) for predicting an increase in the abundance of the native bunchgrass population. The response did not earn a point in part (d) because it does not justify the prediction by including a decrease in both the aphid population and the transmission of or infection by plant viruses.