2017

AP CollegeBoard

AP Biology

Sample Student Responses and Scoring Commentary

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AP® BIOLOGY
2017 SCORING GUIDELINES

Question 4

DIETARY COMPOSITION OF ORGANISMS IN AN AQUATIC ECOSYSTEM

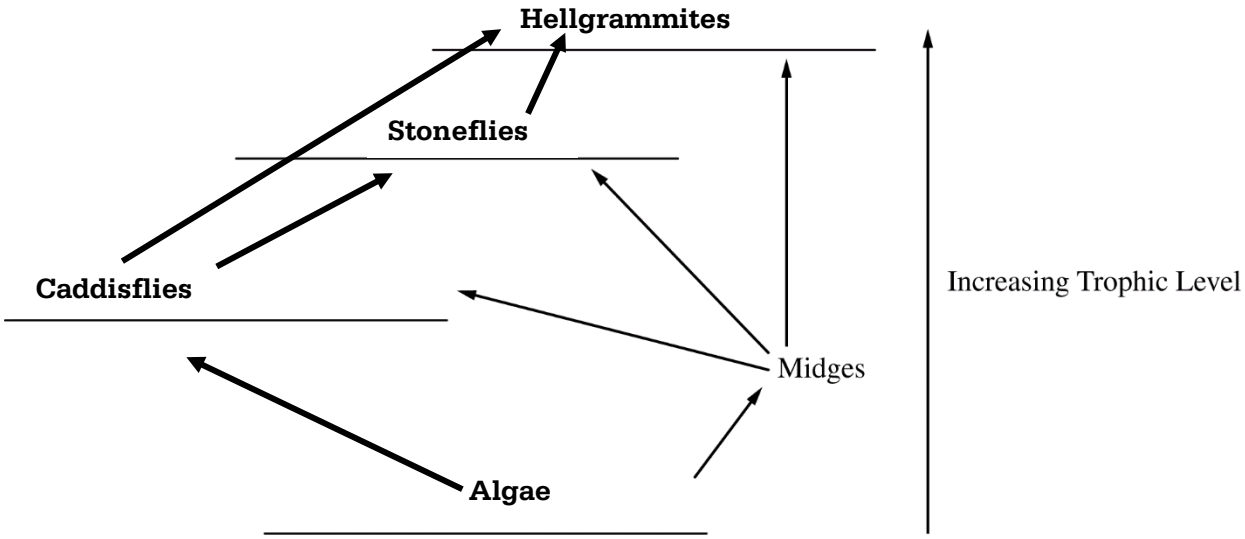
Organism	Food Source (% of diet)				
	Algae	Stoneflies	Midges	Hellgrammites	Caddisflies
Algae					
Stoneflies			90		10
Midges	100				
Hellgrammites		20	10		70
Caddisflies	70		30		

The table above shows how much each organism in an aquatic ecosystem relies on various food sources. The rows represent the organisms in the ecosystem, and the columns represent the food source. The percentages indicate the proportional dietary composition of each organism. High percentages indicate strong dependence of an organism on a food source.

(a) Based on the food sources indicated in the data table, **construct** a food web in the template below. Write the organism names on the appropriate lines AND draw the arrows necessary to indicate the energy flow between organisms in the ecosystem. **(2 points)**

Construction of food web (2 points maximum)

- All four organisms placed on the appropriate lines
- All four arrows correctly drawn between organisms



Question 4 (continued)

(b) In an effort to control the number of midges, an area within the ecosystem was sprayed with the fungus *Metarhizium anisopliae*, which significantly decreased the midge population. Based on the data in the table, **predict** whether the spraying of the fungus will have the greatest short-term impact on the population of the stoneflies, the caddisflies, or the hellgrammites. **Justify** your prediction. **(2 points)**

Prediction (1 point)

- Stoneflies

Justification (1 point)

- Stoneflies have a higher dependence on the midges than do the hellgrammites and caddisflies.
- Midges are 90 percent of the stonefly diet, while 30 percent of the caddisfly and 10 percent of the hellgrammite diet are midges.

4A,

DIETARY COMPOSITION OF ORGANISMS IN AN AQUATIC ECOSYSTEM

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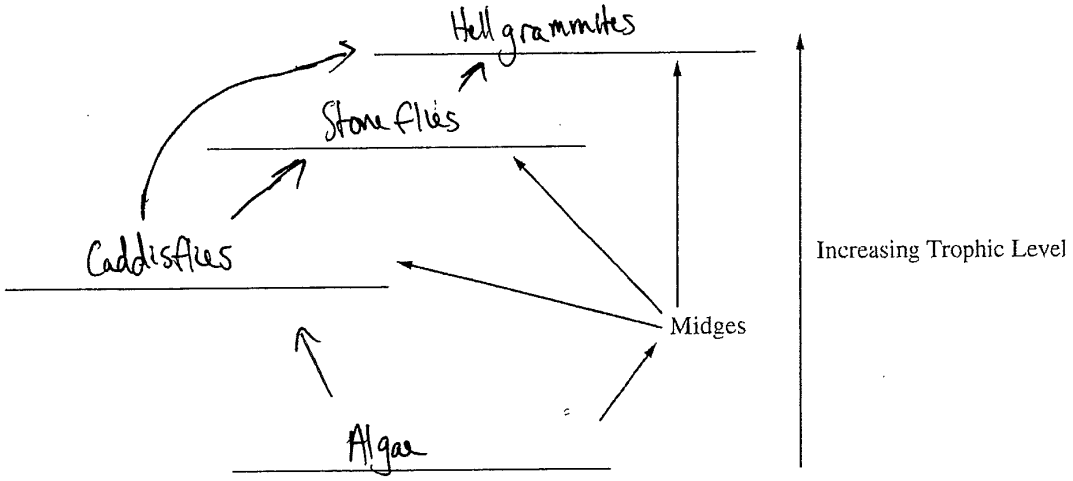
4. The table above shows how much each organism in an aquatic ecosystem relies on various food sources. The rows represent the organisms in the ecosystem, and the columns represent the food source. The percentages indicate the proportional dietary composition of each organism. High percentages indicate strong dependence of an organism on a food source.

   (a) Based on the food sources indicated in the data table, **construct** a food web in the template below. Write the organism names on the appropriate lines AND draw the arrows necessary to indicate the energy flow between organisms in the ecosystem.

   (b) In an effort to control the number of midges, an area within the ecosystem was sprayed with the fungus *Metarhizium anisopliae*, which significantly decreased the midge population. Based on the data in the table, **predict** whether the spraying of the fungus will have the greatest short-term impact on the population of the stoneflies, the caddisflies, or the hellgrammites. **Justify** your prediction.

PAGE FOR ANSWERING QUESTION 4



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ADDITIONAL PAGE FOR ANSWERING QUESTION 4

b) The spraying of the fungus would have the greatest short-term impact on the stoneflies. This is because 90% of the stoneflies' diet uses the midges as the food source. So, the stoneflies are more dependent on midges than either the caddisflies (30%) or the hellgrammites (10%).

DIETARY COMPOSITION OF ORGANISMS IN AN AQUATIC ECOSYSTEM

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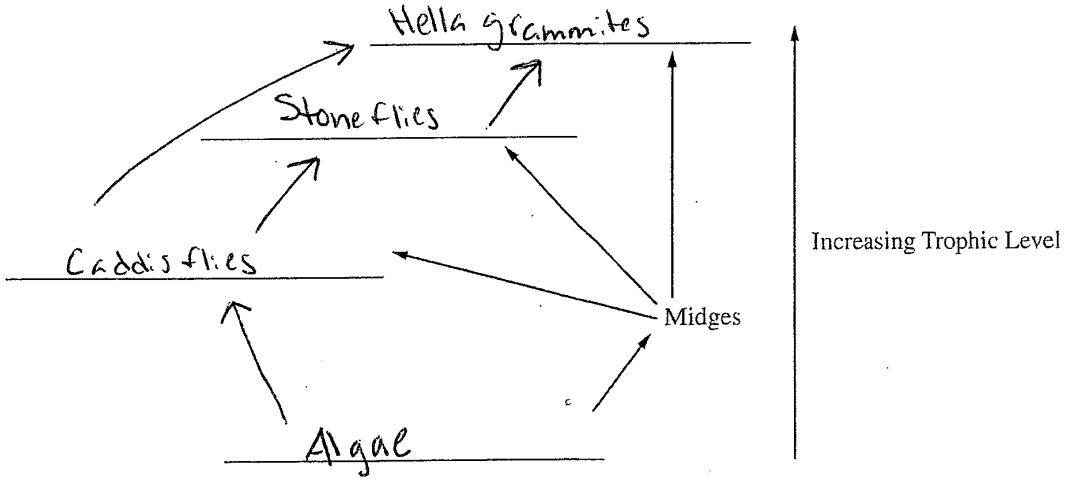
   (a) Based on the food sources indicated in the data table, **construct** a food web in the template below. Write the organism names on the appropriate lines AND draw the arrows necessary to indicate the energy flow between organisms in the ecosystem.

   (b) In an effort to control the number of midges, an area within the ecosystem was sprayed with the fungus *Metarhizium anisopliae*; which significantly decreased the midge population. Based on the data in the table, **predict** whether the spraying of the fungus will have the greatest short-term impact on the population of the stoneflies, the caddisflies, or the hellgrammites. **Justify** your prediction.

PAGE FOR ANSWERING QUESTION 4



ADDITIONAL PAGE FOR ANSWERING QUESTION 4

b.) Spraying the fungus will have greatest short-term impact on Stoneflies because midges is 90% of their diet.

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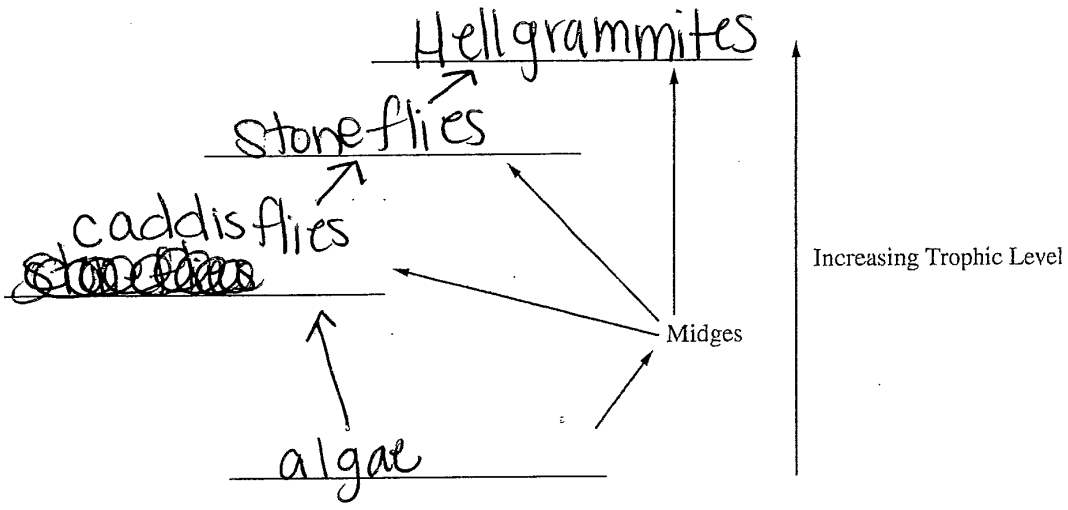
   (a) Based on the food sources indicated in the data table, **construct** a food web in the template below. Write the organism names on the appropriate lines AND draw the arrows necessary to indicate the energy flow between organisms in the ecosystem.

   (b) In an effort to control the number of midges, an area within the ecosystem was sprayed with the fungus *Metarhizium anisopliae*, which significantly decreased the midge population. Based on the data in the table, **predict** whether the spraying of the fungus will have the greatest short-term impact on the population of the stoneflies, the caddisflies, or the hellgrammites. **Justify** your prediction.

PAGE FOR ANSWERING QUESTION 4



ADDITIONAL PAGE FOR ANSWERING QUESTION 4

B) The spraying will have the greatest impact on the stoneflies because 90% of the stoneflies diet is the midges.

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2017 SCORING COMMENTARY

Question 4

Overview

This question focused on a quantitative food web involving an aquatic ecosystem. Students were presented with a data table quantifying the interactions between species by showing the percentage each species relied on others in the ecosystem as a food source. Students were asked to use this information to construct a food web by writing in the names of the organisms in the appropriate trophic levels on the template provided. Students were also asked to draw arrows to indicate the direction of energy flow between the organisms in the ecosystems. Then, students were told that an area within ecosystem was sprayed with a fungus that eliminated one of the species. Students were then asked to predict which population of organisms would experience the greatest short-term impact due to the elimination of this species and to justify their prediction.

Sample: 4A
Score: 4

The response earned 1 point in part (a) for constructing a food web with each of the four organisms in the appropriate trophic level. The response earned 1 point in part (a) for drawing four arrows correctly indicating energy flow between the organisms. The response earned 1 point in part (b) for predicting that the spraying of the fungus will have the greatest short-term impact on the stoneflies. The response earned 1 point in part (b) for justifying its prediction by stating that the stoneflies are more dependent on midges than are either the caddisflies (30 percent) or the hellgrammites (10 percent).

Sample: 4B
Score: 3

The response earned 1 point in part (a) for constructing a food web with each of the four organisms in the appropriate trophic level. The response earned 1 point in part (a) for drawing four arrows correctly indicating energy flow between the organisms. The response earned 1 point in part (b) for predicting that spraying the fungus will have the greatest short-term impact on stoneflies.

Sample: 4C
Score: 2

The response earned 1 point in part (a) for constructing a food web with each of the four organisms in the appropriate trophic level. The response earned 1 point in part (b) for predicting that spraying will have the greatest impact on the stoneflies.