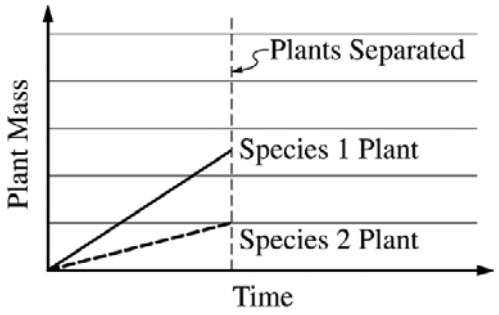
AP® BIOLOGY
2016 SCORING GUIDELINES

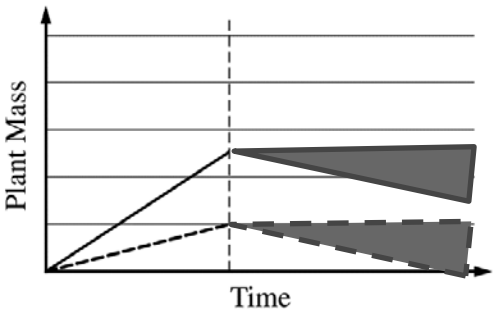
Question 5



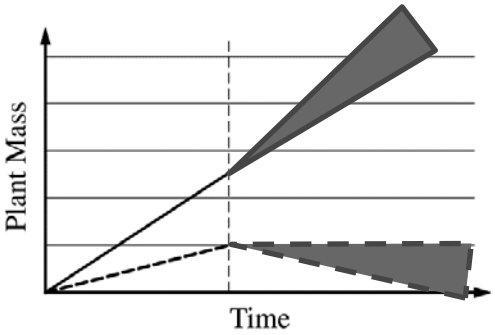
The graph above shows the mass of plants from two different species over time. The plants grew while attached to each other. The plants were separated at the time indicated by the vertical line in the graph.

Using template 1, **graph** the predicted shape of the plant-mass lines after separation of the two plants if the plants were in an obligate mutualistic relationship. On template 2, **graph** the predicted shape of the plant-mass lines if the species 2 plant was a parasite of the species 1 plant. **Justify** each of your predictions. **(4 points)**

TEMPLATE 1: OBLIGATE MUTUALISM

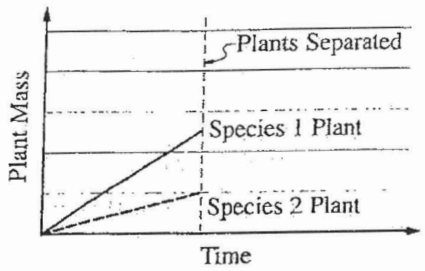


TEMPLATE 2: PARASITISM



	Graph characteristics (1 point each graph; 2 points maximum)	**Justification (1 point each box; 2 points maximum)**
Obligate Mutualism	Both of the growth curves level off or decline.	• Each species depends on the other for survival. • Without the relationship, both species are harmed.
Parasitism	Species 1 continues to increase while species 2 levels off or declines.	• The parasite requires an association with the host to survive but harms the host. • Without the relationship, the parasite cannot survive while the host continues to grow.

5A,



5. The graph above shows the mass of plants from two different species over time. The plants grew while attached to each other. The plants were separated at the time indicated by the vertical line in the graph.

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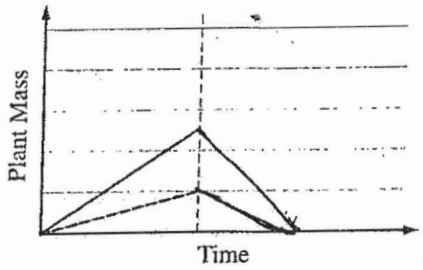
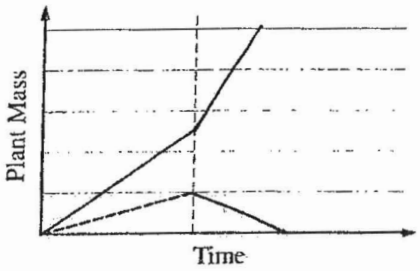
PAGE FOR ANSWERING QUESTION 5

TEMPLATE 1: OBLIGATE MUTUALISM



TEMPLATE 2: PARASITISM



If both plant species 1 and 2 ~~are~~ had an obligate mutualism relationship, they would ~~not~~ need the other to survive, so they would both die out when separated. If plant species 2 was a parasite of plant species 1, then ~~it~~ the species 2 plant would be harmful to the species 1 plant but need it to survive, ~~There~~ so the species 2 plant would die out due to a lack of a host while the species 1 plant would thrive without the harmful parasite of the

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5A2

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two plants were separated.

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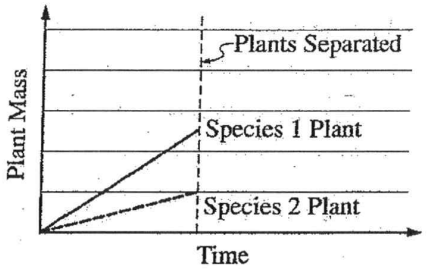

5. The graph above shows the mass of plants from two different species over time. The plants grew while attached to each other. The plants were separated at the time indicated by the vertical line in the graph.

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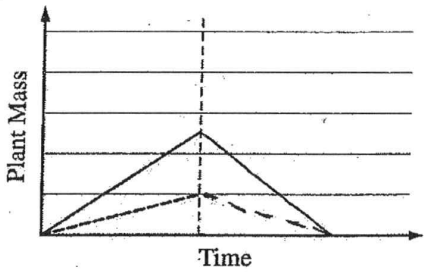
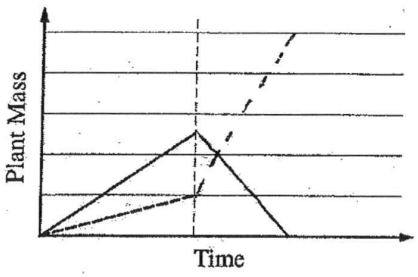
TEMPLATE 1: OBLIGATE MUTUALISM



TEMPLATE 2: PARASITISM



If the two species express obligate mutualism, then both species are dependent on eachother for survival, and separation would cause ~~both~~ plants ~~would~~ to experience hindered growth. However, if the plants lived symbiotically in parasitism where plant 2 is the parasite, then separation would cause plant ~~2~~ species

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2 to die or experience hindered growth, while plant 1 would thrive and experience increased growth now that plant 2 is not hindering its growth.

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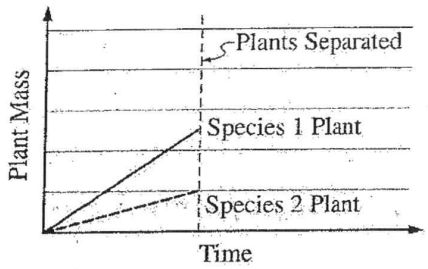

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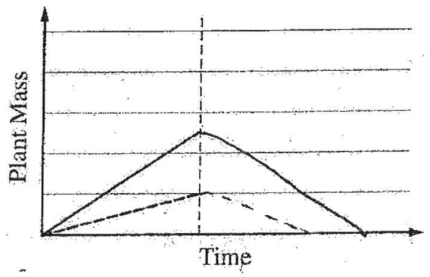
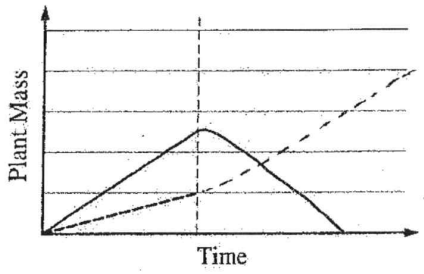


TEMPLATE 2: PARASITISM



In template 1, I predicted that both species of plants would ~~not~~ not survive due to the reliance they have on each other. A mutualistic relationship means that each species benefits from the other. If the two species are separated, they will not be able to receive these benefits and will not be able to survive. In template 2, I predicted that species 1 would not survive and that species 2 would thrive. ~~Parasitism~~ A relationship in which one individual is the parasite of the other means that an individual benefits from another individual, but harms this

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other individual while doing so. Since species 2 is a parasite of species 1, species 2 will continue to survive by harming species 1, who will soon die out.

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AP® BIOLOGY
2016 SCORING COMMENTARY

Question 5

Question 5 was written to the following Learning Objectives in the AP® Biology Curriculum Framework: 4.13, 4.15, and 4.16.

Overview

This question focused on the topics of mutualism and parasitism. Students were given a graph showing the mass over a given time period of two plant species that grow while attached to one another. Students were given two templates and asked to graph the predicted shape of the lines following the separation of the plants if the plants are in an obligate mutualistic relationship, and the shape of the lines if one plant is a parasite of the other. Finally, students were asked to justify each of their predicted graphs.

Sample: 5A
Score: 4

The response earned 1 point for the graph in template 1 by predicting that both of the lines in the obligate mutualism graph will have a negative slope after the plants are separated. The response earned 1 point for the graph in template 2 by predicting that the species 1 line will have a greater positive slope, and the species 2 line will have a negative slope after the plants are separated. The response earned 1 point for providing justification for the prediction on template 1 that both species need each other to survive. The response earned 1 point for providing the justification for the prediction on template 2 that separation will result in the death of the parasite without its host, while the host will thrive without the harmful parasite.

Sample: 5B
Score: 3

The response earned 1 point for the graph in template 1 by predicting that both of the lines in the obligate mutualism graph will have a negative slope after the plants are separated. The response earned 1 point for providing justification for the prediction on template 1 that both species are dependent on each other for survival. The response earned 1 point for providing the justification for the prediction on template 2 that separation will cause the parasite to die, while the host will thrive without being hindered by the parasite.

Sample: 5C
Score: 2

The response earned 1 point for the graph in template 1 by predicting that both of the lines in the obligate mutualism graph will have a negative slope after the plants are separated. The response earned 1 point for providing justification for the prediction on template 1 that both species would not survive due to their reliance on each other.