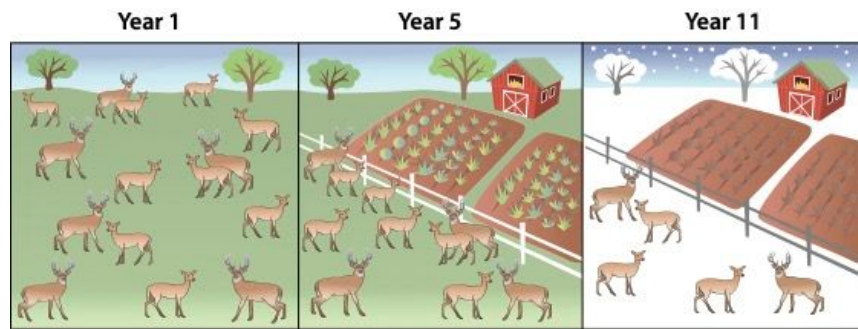


Sample Student Responses for Assessment Items for Life Science 2-1

Item 1 Sample Student Response

Scientists have been collecting data on a deer population in a grassland ecosystem for the past 15 years. People do not hunt this population of deer, but several events have happened during that time that may have affected the deer population. At the beginning of Year 5, 80% of the grassland is converted to farmland and fenced to keep out the deer. In Year 11, there is a very harsh winter, and the plants are not growing as much.



Year	Deer Population	Average Mass per Adult Deer (kg)	Number of Deer Births	% Malnourished (severely underweight) Deer
1	100	30	30	5
2	110	31	25	3
3	97	29	30	4
4	105	31	15	3
5	83	25	5	46
6	57	27	7	32
7	56	23	6	25
8	58	20	8	18
9	55	19	7	15
10	58	20	5	10
11	35	15	3	72
12	40	18	4	43
13	45	20	7	26
14	48	21	7	10
15	53	21	8	7

a. Use the data to describe the effect on the deer population of the grassland being converted to farmland in Year 5.

Expected Student Response

After the ecosystem was converted to farmland in Year 5, the deer population decreased from 105 to 83 in Year 5, then down to 57 in Year 6, and stayed in the 50s for several years. Also, the average mass of adult deer and number of deer births decreased and stayed lower than Years 1-4. The percentage of malnourished deer increased a lot, from 3% to 46%, in Year 5 and stayed high for several years. All of this happened because they had less food to eat.

Scoring notes: Exact numbers are not required in responses. Students may refer to trends in the data and/or exact data points.

b. Use the data to describe the effect on the deer population of the harsh winter in Year 11.

Expected Student Response

After the harsh winter in Year 11, the deer population decreased from 58 to 35, and the average mass of an adult deer decreased by 5 kilograms. The number of deer births went down, and the percent of malnourished deer increased a lot, from 10% to 72%. Overall, the deer population decreased and was less healthy because they had less food and had to compete more for it.

Scoring notes: Exact numbers are not required in responses. Students may refer to trends in the data and/or exact data points.

c. Suppose that in Year 16, a nearby farm that had been fenced off is changed into a nature preserve with no fences. The deer can access the nature preserve for food and other resources. Predict if each of the following will increase, decrease, or stay the same and explain why you think those changes would occur:

- deer population numbers
- average mass of adult deer
- number of deer births
- % malnourished deer

Expected Student Response

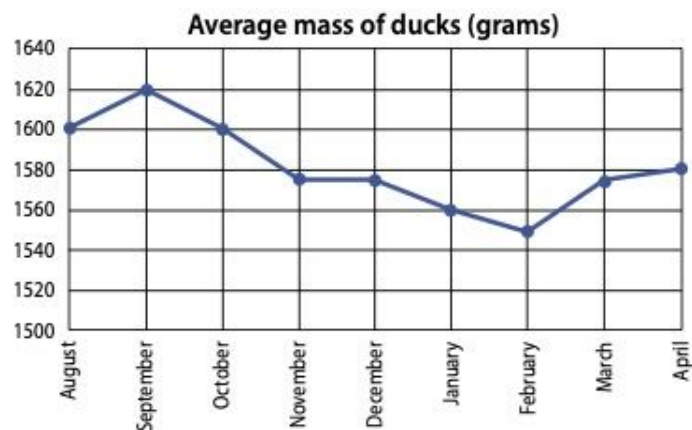
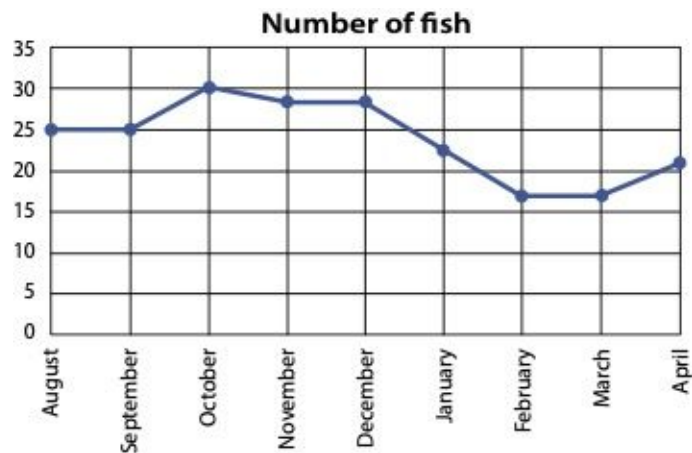
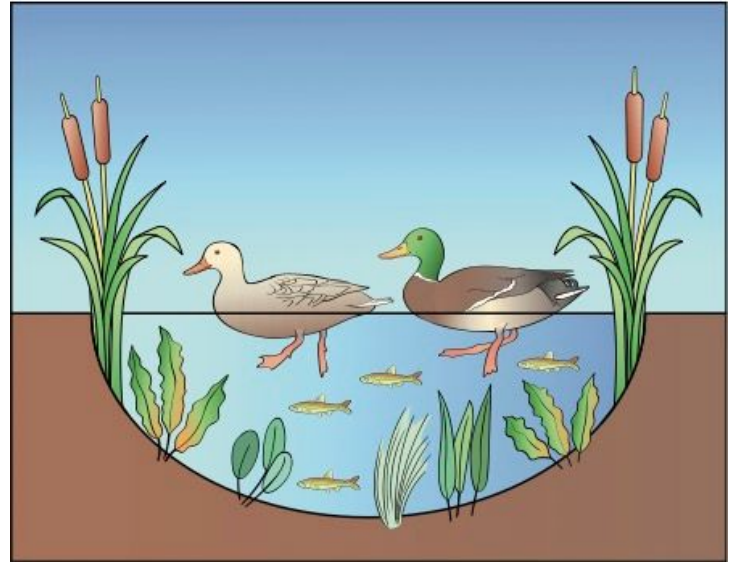
I predict that if a nature preserve was established in Year 16, the deer population numbers, average mass of adult deer, and number of deer births would all increase because they would have more food to eat and the deer would compete less for resources. I predict that the percent of malnourished deer would decrease significantly, also because there would be more food and less competition.

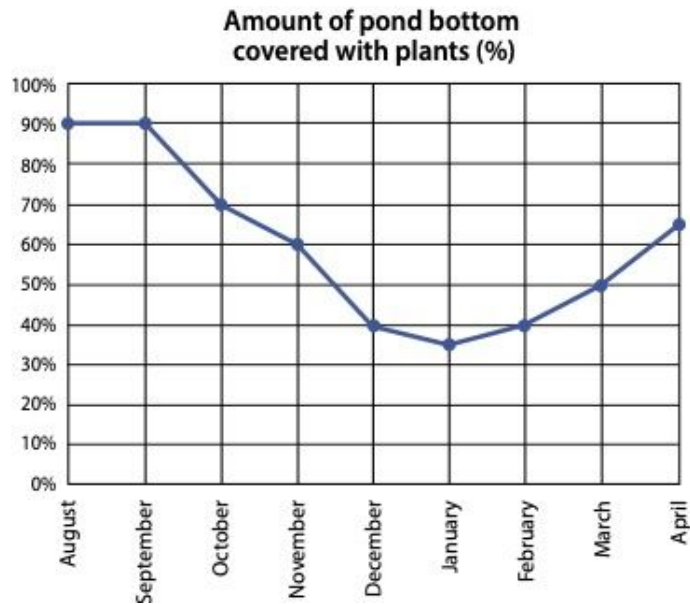
Scoring notes: Students may have a range of feasible responses. Answers should be accepted as long as their predictions are explained using sound reasoning (e.g. a student might suggest that the population increases immediately with access to more food, or might suggest that there would be a lag in population increases depending on whether deer found the new resources right away).

Item 2 Sample Student Response

In Lucy's backyard there is a pond with small fish, a pair of pet ducks, and plants growing on the bottom of the pond. Lucy knows that the ducks and fish eat the plants, and the ducks do not eat fish. Where Lucy lives, summer is warm and sunny, while in winter it gets cold but the pond does not freeze. Spring and fall are rainy and sometimes cold. Lucy has noticed that the number of fish and the amount of plants seem to change throughout the year.

Knowing that she has to do a science fair project this year, Lucy decides to start collecting data on the organisms in the pond and see if she notices any patterns in the data over the seasons. Lucy collected data on the number of fish, the mass of the ducks, and the amount (percentage) of the pond bottom covered by plants. Using the graphs of Lucy's data below, answer the questions that follow.





a. Give an example of competition between organisms in the pond, based on Lucy's observations. In your answer, include which organisms are competing and what resource they are competing for.

Expected Student Response

The fish and the ducks are competing for food (the plants). The plants are competing for space.

Scoring notes: Most students will probably focus primarily on competition for food, depending on which PEs have been covered already in instruction. Other acceptable responses could include competition for nutrients, oxygen, and/or carbon dioxide (plants).

b. Based on the data Lucy collected, do you think competition is affecting the organisms in the pond? Why or why not?

Expected Student Response

I think that competition for food is affecting the ducks and the fish. The amount of plants starts to decrease in September, and then the number of fish and the average mass of the ducks start to decrease in October. This pattern continues until February when the plants start to increase, and then the number of fish and the average mass of the ducks increase a little later in March and April. Because the fish and the ducks all eat plants, if there are less plants for all of them to eat, some fish will die and the ducks will lose mass from not getting enough food. When there is more food available, the fish will start to reproduce, the babies will be able to survive, and the ducks' average mass will increase. I don't think the plants are being affected by competition because they never cover 100% of the pond, probably because the ducks and fish are eating them.

c. Suppose Lucy was worried about the organisms in the pond in the winter, and she decided to give them extra food from December through February. Predict what would happen to the ducks and the fish population if Lucy did this.

Expected Student Response

I think if they got extra food during the winter, the ducks would not lose as much mass, and not as many fish would die. Depending on how much extra food there was, the ducks might even gain mass and the fish might reproduce, increasing their population.