Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date\_\_\_\_\_\_

 Evolution – Natural Selection

1. In England, the trunks of trees were blackened for many years by soot from factories. After passage of the Clean Air Act in 1959, the trunks became lighter. Scientists in England studied the peppered moth (*Biston betularia*) which rests on these trees and is preyed upon by birds. They noticed the following change in frequencies over a period of time.

Environmental Factor

Environmental Factor

1959

1979

1995

Whiter Tree Trunks/Birds

Whiter Tree Trunks/Birds

Light colored moth Dark colored moth

* 1. Addressing all the parts of our frog wars explanation, write a verbal representation of the events depicted in the storyboards of the peppered moths:
	2. Do you think natural selection is occurring during this time period? Provide a written evidence of your answer.
	3. How would the scenario have changed if there were no birds to eat the moths?
	4. Compare and contrast this scenario to the one we did in the lab.

|  |  |
| --- | --- |
| SIMILARITIES | DIFFERENCES |
|  |  |

* 1. England has continued to maintain the quality of air that it had in 1995, what distribution of moths would you expect to see now, in 25 more years, in 75 more years? Justify your answer.
	2. While realistically impossible, suppose there was no change in the environmental conditions for a population of organisms for thousands of years, what would you expect to happen to Evolution by Natural Selection? Justify your answer by citing evidence from the lab, or the text, or this worksheet.

2) In the story “The Elephant’s Child”, Rudyard Kipling suggests that elephants have long trunks today because one curious elephant (*Loxodonta africana*) had his nose stretched by a crocodile (*Crocodylus niloticus*). The elephant then found that his stretched trunk allowed him to get food more readily than his short-nosed relatives. Suppose that a curious elephant did get his trunk stretched by a crocodile. Finish the storyboard shown below. The frequency of the trait after the curious elephant got his trunk stretched is shown. You need to show the frequency of the long trunk in his children’s generation, and finally, 50 generations after the stretching.

Environmental Factor

Environmental Factor

Curious Elephant’s Generation

His Children’s Generation

50 Generations Later

Key: Short Trunk: Long Trunk:

1. Write a verbal representation of your storyboards in the space below.
2. What scenario (if any) that we did in the lab does this remind you of? If it does not, come up with a modification of the lab to simulate this scenario. Justify your answer.
3. What key concept does this scenario illustrate that may have been left out of the original model of evolution by natural selection? Explain your answer and explain why it is important that we add this element to our model.

3) The American Chestnut Tree in the Appalachian region has very little variation in its population. In the early 1900’s the chestnut blight (a lethal fungal disease) was accidently introduced to the region via the Chinese Chestnut Tree.

* 1. Complete the storyboards to show what might happen to this population over the course of time when this quick spreading lethal disease was introduced.

Environmental Factor

Environmental Factor

Present: Infected with fungus

1 generation later

10 generations later

Lethal fungus

Lethal fungus

Key: infected with fungus

1. Explain and justify your storyboards in the space below.
2. What scenario from the lab (if any) does this scenario remind you of? If it does not, come up with a modification of the lab to simulate this scenario. Justify your answer.

4) Following a cold spell, the distribution of body sizes in a cliff swallow (*Hirundo pyrrhonota*) population shifted as shown in the figure below.

Low High

Body Weight

Percentage

of Birds

Percentage

of Birds

Low High

Body Weight

Distribution of body sizes in cliff swallow

1976

1978

* 1. Storyboard the process of natural selection shown in the graphs. Include a key.

Environmental Factor

Before

After

* 1. Provide a verbal description of the process of natural selection shown in the graphs.