**How Can Natural Selection Be Modeled?**

**I. Introduction**

 In the mid-1800s, an English scientist named Charles Darwin developed the theory of evolution by natural selection. Although minor changes have been made to Darwin´s theory as new information has been gathered, this theory is accepted today as one of the most important concepts in the study of life science.

 Natural selection explains how populations of organisms evolve. Populations are groups of organisms in the same species that live in a defined area. Natural selection means that organisms with traits best suited to their environments are more likely to survive.

 Organisms tend to produce more offspring than can survive. For example, fish lay thousands of eggs, ensuring that a small percentage will survive to adulthood. A variation is the appearance of a genetic trait that makes an individual different from other members of its species. These variations result from mutations, random changes in an organism´s DNA. For example, mutation in a species of fish may produce individuals that differ from the rest of the species in color, fin and tail size, and speed. Some mutations enable members of a population to better survive and reproduce. Such beneficial variations may enable individuals to obtain food and space and to escape from predators. A fast fish with a skin color that allows it to blend in with its surroundings is more likely to survive and reproduce than a slow fish with more conspicuous coloring.

 Over time, offspring of individuals with adaptations that allow them to survive better make up more and more of a population. Depending on the type of adaptation and the rate of reproduction of the organism, as well as environmental conditions, it may take many generations for an adaptation to become predominant in an entire population.

 In this Virtual Lab you will examine how animals with different mutations survive in specific environmental conditions. You will discover how natural selection changes populations.

**II. Procedure**

 1. Start the activity by going to the following website :

<http://www.glencoe.com/sites/common_assets/science/virtual_labs/LS06/LS06.html> .

 2. Choose a mutation to investigate by clicking the arrow at the bottom of the Mutations

 window. Select animals with Large Body/Long Legs, Small Body/White Fur, or

 Claws for Climbing.

 3. Click the arrow at the bottom of the Conditions window and select a condition that

 will affect the survival of the selected animals.

 4. Click the Begin Natural Selection button to observe what happens to the animals after

 five generations given the selected condition. Note: The small number of animals

 shown is intended to represent the whole population.

 5. Click the Population Graph button to open a graph of data for the entire population´s

 changes over five generations. The yellow line represents the population of animals

 with the mutation (mutant animals). The blue line represents the population of

 animals without the mutation (normal animals). In the Table, record the values from

 the Population Graph.

 6. Repeat the Virtual Lab and investigate different mutations and conditions.

**III. Data**

 1. Record your data in the Table below.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Generation** **0** | **Generation** **1** | **Generation** **2** | **Generation** **3** | **Generation** **4** | **Generation** **5** |
| 1/A Normal |  |  |  |  |  |  |
| 1/A Mutant |  |  |  |  |  |  |
| 1/B Normal |  |  |  |  |  |  |
| 1/B Mutant |  |  |  |  |  |  |
| 2/A Normal |  |  |  |  |  |  |
| 2/A Mutant |  |  |  |  |  |  |
| 2/C Normal |  |  |  |  |  |  |
| 2/C Mutant |  |  |  |  |  |  |
| 3/A Normal |  |  |  |  |  |  |
| 3/A Mutant |  |  |  |  |  |  |
| 3/B Normal |  |  |  |  |  |  |
| 3/B Mutant |  |  |  |  |  |  |

**IV. Analysis & Conclusions**

 **1. Look at the information you recorded in your Table for a particular Mutations /**

 **Conditions combination. Describe how the population of animals changed over time.**

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 **2. Using your understanding of natural selection, explain why the population changed the**

 **way it did.**

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 **3. Invent a new type of mutation and a new environmental condition that might affect this**

 **population of animals. How might natural selection operate on a population with this**

 **new mutation and new condition? How would the population change over time?**

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 **4. Scientists have discovered by looking at fossil records that the ancestors of giraffes had**

 **shorter necks than giraffes today. Make a hypothesis about how long necks evolved in**

 **giraffes through the process of natural selection.**

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_