Lesson 7.3	Natural Selection	Name
		Date
		Period

Key Terms	
Natural selection	Variation
Predator	Adaptation
Fitness	

Engage

1. Consider the leopard frogs shown above. All are the same species. How do a variety of appearances benefit this species?

Explore I – Leafhoppers

http://media.pearsoncmg.com/bc/bc_campbell_concepts_5/media/assets/interactivemedia/investigations/LPOS22/LPOS2201/index.html

Darwin's theory of natural selection states that individuals that are better adapted to their environment are more likely to survive and reproduce. Over the generations, the favored traits tend to accumulate in the population, resulting in adaptive evolution. In this activity we will look at this process in a hypothetical population of leafhoppers.

Within a population of leafhoppers, one can observe individuals of different sizes and colors. These differences may grant advantages or disadvantages for the different individuals. For example, differences in coloration may affect predation by birds or reptiles. Offspring with small bodies may have advantages over larger bodied individuals by needing fewer resources to survive. If the environment changes, however, different traits may become advantageous. In this activity we will investigate how environmental changes affect the proportion of each trait in this population of leafhoppers.

2. Why are some leafhoppers green and others brown and some are small and some are large?

First we will investigate the effect of global warming on the leafhopper population. Complete the table below as we watch the population over several generations.

Climate Change (Global Warming) Data Table				
	Size			Color	
	Large	Medium	Small	Green	Brown
Parent Generation					
10th Generation					
20th Generation					
30th Generation					

3. How did the populations change by the 30th generation under global warming conditions?

4. Suggest a reason why the traits of the 30th generation make this population better adapted to a warmer environment?

A change in the predator of a population can occur when a new organism is introduced into the environment. The new organism can compete with and possibly displace the original main predator. Let's see what happens when the leafhopper's main predator, a bird, is replaced with a snake.

5. Why would you expect a change in predators to cause a difference in the types of leafhoppers being selected?

Predator Change Data Table					
	Size			Color	
	Large	Medium	Small	Green	Brown
Parent Generation					
10th Generation					
20th Generation					
30th Generation					

6. Note the differences between the generations when the predator changed from a bird to a snake. What evidence supports the view that leafhopper size is not affected by a change in predators?

7. Suggest a reason why the traits most common in the 30th generation make this population better adapted to the new predator, a snake.

The next study looks at the effects of a change in vegetation on a leafhopper population. This change can occur as a result of natural causes such as severe weather, earthquakes, or a shift in the path of a river, or as a result of human disturbances such as agriculture and development.

Vegetation Change Data Table					
	Size			Color	
	Large	Medium	Small	Green	Brown
Parent Generation					
10th Generation					
20th Generation					
30th Generation					

8. Suggest a reason why the traits of the 30th generation make this population better adapted to the new environment.

Pesticides can directly poison the leafhoppers or kill off predators or competitors. Various pesticides work in different ways to control insects. Mild pesticides irritate the insect's respiratory system and may scare them off or cause them to suffocate. Stronger pesticides interfere with the insect's metabolism by either affecting cellular respiration or altering nervous system function.

Pesticide Use Data Table					
	Size			Color	
	Large	Medium	Small	Green	Brown
Parent Generation					
10th Generation					
20th Generation					
30th Generation					

9. What happened to the traits of the leafhopper population after thirty generations when pesticides were added to the environment? Explain why all the leafhoppers were not killed by the pesticide application.

Explore II - Geekfeazels

In this activity, we will simulate how changes in the environment and the process of natural selection can influence the occurrence of these traits within a "geekfeazel" population.

A geekfeazel is a flightless bird that lives only on an uninhabited tropical island in the South Pacific. When biologists first described this animal, three traits were immediately recognized as causing dramatic variation in the geekfeazel population. These traits are (1) **the size of the eyes**, (2) **the length of the neck**, and (3) **the color of their strange hair-like feathers**, which are either green or crimson red.

Each student will begin as a geekfeazel with some combination of these three traits. There will be roughly an equal number of each of the eight possible combinations of traits at the start.

As each environmental condition is read by your teacher, you may be required to toss a coin to see if you live, die, or reproduce. If you die, you are to join the other dead geekfeazels in the "dead pool" at the center of the room. If you successfully reproduce, your group should choose a fellow student from the dead pool to join your group as a geekfeazel of your own "type."

10. My **original** geekfeasel description was (**circle one** in each category):

Eyes	Neck	Color
Big	Long	Green
Small	Short	Red

Population Analysis

GROUP	Description	Starting Numbers	After Round 1	After Round 2	After Round 3	After Round 4	After Round 5	After Round 6	After Round 7	After Round 8	Ending Numbers
1											
2											
3											
4											
5											
6											
7											
8											

11. My **FINAL** geekfeasel description is (**circle one** in each category):

Eyes	Neck	Color
Big	Long	Green
Small	Short	Red

Explain II

12. Did any of the original "types" become extinct? Explain why you believe this happened.

13. Are any of the original types in danger of becoming extinct? Explain why you believe this happened.

14. Is there still the same amount of variation in the geekfeazel population? Explain what differences, if any, you see.

15. Did any trait or traits (i.e. long necks, red feathers, etc) become more abundant in the population? If so, explain why each of these traits was "selected out" or "favored by" the environment.

16. If current environment conditions continue, what do you think the average geekfeazel will look like in another 500 years in the future? Why?

17. Name a trait that is now rare in the geekfeazel population. Describe a change in the environment that could possibly cause this trait to be favored in the future so that it becomes more abundant in the population.

18. Is it good for a species to have individuals that are different (variation)? Why?