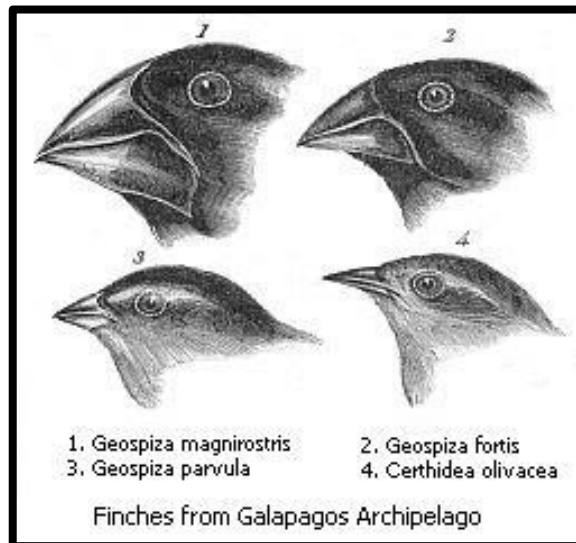




Name: \_\_\_\_\_ Date: \_\_\_\_\_ Group: \_\_\_\_\_

## Grant and Grant

Lexile 1080L



- 1 Most of the living organisms on the planet today look very different than they did tens or hundreds of thousands of years ago. In fact, many organisms that existed that long ago do not exist today. Why? They have either changed form or have gone extinct. Changes in climate, in geography, and in the population distribution of organisms has affected how past organisms have adapted to such changes. You may have heard the phrase “adapt or die”. This phrase does hold true for all organisms over time. As conditions in an organism’s environment change, those organisms within that population must adapt, or those organisms will die. But what exactly does this mean?
- 2 Organisms of all kinds, including plants and animals, live in constantly changing environments. As environments change, the organisms that live in those environments must change also. These changes are known as adaptations. Those organisms with the best adaptations to the environment in which they live are more likely to will survive and pass those traits on to the next generation. Keep in mind that each environment only has a finite amount of resources. These resources include access to food, water, shelter, and other organisms. Those organisms with the best trait adaptations will be more likely to survive to pass those traits on to future generations. Scientists call this process natural selection.
- 3 So what is natural selection? Natural selection is the process by which traits become more or less common in a population based on the reproductive success, over many generations, of individuals carrying the traits. It is very important to note that natural selection occurs to populations of organisms, not to individuals. However, it is the adaptations of individuals that can lead to shifts in populations. But how? If individuals are well adapted to current conditions, they will have greater fitness and reproductive success. If individuals are not well adapted to current conditions, they will have lower fitness and reproductive success. Traits that cause lower fitness and reproductive success will become increasingly rare, and the underlying genes can eventually be lost from the population’s gene pool. It is very important to note that natural selection can only work on existing variation within a population. Such variations often arise by mutation, a change in some part of the genetic code for a trait. Mutations arise by chance and without foresight for the potential advantage or disadvantage of the mutation. In other words, variations do not arise because they are needed.



- 4 In order for natural selection to occur, there are four very important things that must happen. First, there must be variation within the population. This variation is critical, as some organisms within a population will have traits that are more suitable to the environment in which they live than other organisms within the same environment. Second, these traits must be able to be inherited, or passed from one generation to another. Third, there must be a high enough rate of population growth so that more offspring are produced than can survive in a particular environment. This leads to a competition for the available resources within that environment. And fourth, there must be differential survival and reproduction. This means that those organisms that possess the most favorable traits for that environment will be the ones to survive and pass those favorable traits on to the next generation.
- 5 Charles Darwin and Alfred Russell Wallace both conceived of Natural Selection around the same time, and, in 1859, Darwin published his book, *On the Origin of Species*. In this book, he stated that modern organisms have evolved from common ancestors through the process of natural selection. He based this theory on the observations that he made regarding the organisms that he found on the Galapagos Islands. Darwin's interest was particularly sparked by the 15 varieties of finches that he studied on the island. These birds became known as "Darwin's finches". The main feature that distinguished different populations of these finches was the type of beaks that they had. He hypothesized that it must be a difference in the environments of the islands that caused the finches to have a variety of beak traits. It was not until later that there was evidence to support Darwin's hypothesis.
- 6 A husband and wife team of ecologists, Peter and Rosemary Grant, discovered natural selection at work on Darwin's finches. The Grants lived on a very small, 100-acre island called Daphne Major in the Galapagos Island chain. They captured all of the birds that lived on the island and made careful notes of their weight, their diet, and their traits. There was no migration into or out of the island. Since the finches on that island could not leave, their population was isolated. There were several types of food sources on this island, mainly different types of seeds. When the Grant team first began studying the finches in 1973, there was an abundance of small, soft seeds. The majority of birds on the island had small, narrow beaks that were able to break the small, soft seeds. A smaller number of birds had large, powerful beaks. A major drought occurred on the island in 1977. As a result, the type of vegetation on the island changed dramatically. The plants with the small and soft seeds were not able to survive, leaving plants that produced larger, harder seeds. As a result, the birds that had the small and narrow beaks were not able to eat this new food source, and these birds died. However, the finches that had larger, more powerful beaks did survive. This shifted the finch population's traits from small, narrow beaks to large, powerful beaks.
- 7 During the drought, the birds with the larger beaks were the genetic winners. The birds with the large beaks were able to survive and reproduce when only large seeds were available. Thus that trait was favored over the smaller beaks in these environmental conditions. What makes this study so important is that it showed that an adaptation due to a change in an environment lead to a shift in the traits of the finch populations in the generations after the drought. The study did not end then. The rains resumed in the mid-1980s. The small, soft seed plants again dominated. The finch population shifted once again back to small beaked birds, as the smaller beaked birds had the genetically favorable adaptation in that environment. Ah, natural selection



- 1** The environments on earth are constantly changing. What must occur in order for individual organisms within an environment to survive?
- A** They must be larger than other organisms.
  - B** They must adapt or die.
  - C** They must mate with others of their kind.
  - D** They must know where the water is.
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- 2** Which of the following statements is NOT true with respect to natural selection?
- A** Natural selection occurs to populations of organisms, not to individuals.
  - B** It is the adaptations of individuals that can lead to shifts in populations.
  - C** Natural selection occurs only to the individuals within a population.
  - D** Natural selection can only work on existing variation within a population.



**3** There are four very important things that must happen in order for natural selection to occur. Which of the following statements is incorrect with regard to the requirements of natural selection?

- A** There must less offspring produced than can survive.
  - B** There must be variation within the population
  - C** The traits of individuals must be able to be inherited.
  - D** There must be differential survival and reproduction.
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**4** In his 1859 book *On the Origin of Species*, Charles Darwin stated that modern organisms have evolved from common ancestors through the process of —

- A** Adaptation
- B** Evolution
- C** Diversification
- D** Natural Selection



- 5** The husband and wife team of Grant and Grant studied the process of natural selection on a population of finches in the Galapagos Islands. What specific conditions allowed them to study the process of natural selection on that population of birds?
- A** The bird population was isolated.
  - B** There was genetic variation within the population.
  - C** The environmental conditions on the island changed.
  - D** All of the above.
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- 6** What evidence did Grant and Grant find to support the theory of natural selection on the population of Darwin's finches that were observed?
- A** Some birds had small beaks and other birds had large beaks.
  - B** The individuals with the large beaks had an adaptation that allowed them to eat more food.
  - C** A change in the environment led to heritable trait changes within the bird population.
  - D** The birds with the smaller beaks preferred the smaller, softer seeds.