Name: \_\_\_Key\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**EVOLUTION UNIT 2 STUDY GUIDE**

**\_G\_\_\_** 1. Population (same species) a. Two populations cannot interbreed due to separation by mountains or rivers

\_D\_\_\_ 2. Speciation b. Consists of all the different genes, including all alleles, of a population for a trait

\_J\_\_\_ 3. Reproductive Isolation c. Two populations cannot interbreed because they breed at different times

\_A\_\_\_ 4. Geographic Isolation d. Formation of a new species

\_I\_\_\_ 5. Behavioral Isolation e. Individuals at ONE END of a range of phenotypes curve have a higher fitness

\_C\_\_\_ 6. Temporal Isolation f. Individuals in the CENTER of a range of phenotypes curve have a higher fitness

\_B\_\_\_ 7. Gene Pool g. A group of organisms that can breed with one another and produce fertile offspring

\_E\_\_\_ 8. Directional Selection h. Individuals at BOTH ENDS of a range of phenotypes curve have a higher fitness

\_H\_\_\_ 9. Disruptive Selection i. Two populations cannot interbreed because they have different courtship rituals

\_F\_\_\_ 10. Stabilizing Selection j. When members of two populations cannot interbreed and produce fertile offspring

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\_G\_\_\_ 11. Divergent Evolution a. When a population’s size is reduced drastically due to chance in a short time period

\_C\_\_\_ 12. Convergent Evolution b. The process of a gene pool of a population changing due to some random event

\_J\_\_\_ 13. Coevolution c. A process where unrelated organisms become more similar over time

\_A\_\_\_ 14. Bottleneck Effect d. Allele frequencies in a population remain constant unless some factor causes it to change

\_F\_\_\_ 15. Founders Effect e. The idea that organisms change slowly and steadily over time.

\_B\_\_\_ 16. Genetic Drift f. The reduced genetic diversity when a population is descended from a small number

\_D\_\_\_ 17. Genetic Equilibrium g. A process where related organisms become more and more dissimilar over time

\_E\_\_\_ 18. Gradualism h. The idea that there are long periods of equilibrium followed by rapid change.

\_H\_\_\_ 19. Punctuated Equilibrium i. One species has evolved into many diverse life forms. Ex: Darwin’s finches.

\_I\_\_\_ 20. Adaptive Radiation j. A process where two species change in response to each other over time

Part A. Natural Selection

1. Identify the following types of natural selection as directional selection, disruptive selection, or stabilizing selection.

1.  \_\_\_Directional\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2.  \_\_\_\_Stabilizing\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3.  \_\_\_Disruptive\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Within a certain species of butterfly, there are the following variations in the gene pool: light colored, medium colored, and dark colored. The spruce forest the butterflies live in contain light and dark trees. The light and dark butterflies are able to survive because they blend in with the light and dark trees when hiding from predators, but the medium colored butterflies are dying out because they cannot hide from predators- they are too dark to hide on the light colored trees and too light to hide on the dark colored trees.

 \_\_\_\_\_\_Disruptive\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. There are three variations of thickness of a clam shell in a certain species of clam: thin, medium, thick. The thin and medium thickness clams have shells that are easily broken open by their predators. The thick shelled clams are better able to survive and reproduce.

 \_\_\_\_\_Directional\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Infants with average birth weight are more likely to survive than those who are too small or too large.

 \_\_\_\_\_Stabilizing\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. Classify each of the following types of reproductive isolation as geographical, behavioral, or temporal.

1. The blue-footed booby shares its habitat with several other similar species but never mates with them because the male blue-footed booby has an elaborate courtship dance that the female blue-footed booby will watch for. Only after this special dance is completed will the female mate with the male.

\_\_\_\_Behavioral\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. The northern spotted owl and the western spotted owl are two closely related species that both live along the western coast of the United States. The two are prevented from reproducing from one another, however, due to the barrier of mountain ranges.

\_\_Geographical\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Closely related American toads and Fowler’s toads do not interbreed, despite living in the same area, because American toads mate in early summer and Fowler’s toads mate in late summer.

\_\_\_Temporal\_\_\_\_\_\_\_\_\_\_\_\_\_

1. It is difficult to distinguish between the eastern meadowlark bird and the western meadowlark based on their appearance. However, each has a distinct mating call that each type of species will only recognize.

\_\_\_Behavioral\_\_\_\_\_\_\_\_\_\_\_\_

1. Two closely related firefly species have a special pattern of light pulses to signal to the females of their species. The females will only choose males with their specific light pattern, preventing the two species from mating with each other.

\_\_\_\_Behavioral\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. The pygmy three-toed sloth is closely related to the brown-throated sloth of Ecuador. However the pygmy three-toed sloth is isolated to an island off the coast and is prevented from reproducing with the brown-throated sloth due being separated from the mainland of Panama by the Caribbean Sea.

\_\_\_Geographical\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Canada lettuce and grassleaf lettuce are both closely related species of lettuce plants found in the southeastern United States. They do not interbreed, however, because Canada lettuce flowers in early summer and grassleaf lettuce flowers in early spring.

\_\_\_\_Temporal\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. There are two species of fruitflies that are closely related but do not interbreed with one another because one species breeds in the morning hours and the other species breeds in the evening hours.

\_\_\_\_\_Temporal\_\_\_\_\_\_\_\_\_\_\_\_\_

3. Genetic Drift

1. Explain how the founder effect leads to genetic drift in this case with the ladybugs. A small portion of the original population became isolated from the rest of the population. It begin reproducing within the new smaller population. As this new population increased in size it still lacked the diversity of the original population.

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b) What is the Bottle neck effect? When due to some drastic rapid random event, only a small number of individuals leave a population to form a new population with reduced variations.

c) How do the numbers of variations compare in the new populations? \_They are reduced.

d) Is the new population formed through natural selection or some random event? The new population is formed by a random chance event.

Part B. Darwin’s Theory of Evolution

1. Darwin’s Theory of Evolution rests on two assumptions:

* That the Earth must be billions of years old. Give the age that evolutionary scientists have given the Earth:

 \_\_\_\_\_4.7 Billion Years\_\_\_

* That the sources of genetic variation between organisms must have been beneficial. Name the two sources of genetic

variations among organisms: \_\_\_mutations\_\_\_ and \_\_\_crossing over (gene shuffling)\_\_\_ (during meiosis).

2. Types of Evolution

1. The type of evolution that occurs when two closely related organisms become more and more dissimilar is called

\_\_\_\_\_divergent\_\_\_ evolution.

1. The type of evolution that occurs when two unrelated organisms develop similar structures and appearances is called \_convergent\_\_ evolution.
2. The type of evolution that occurs when two or more species in close interaction change in response to each other changing over time is called coevolution\_.
3. Adaptive Radiation is a type of divergent evolution where one species evolves into many diverse life forms.
4. Identify the following examples as either divergent evolution, convergent evolution or coevolution.
	1. Grizzly bears and polar bears are very similar, genetically speaking. They share a common ancestor, but have evolved different characteristics as adaptations in their different habitats.

\_\_\_\_\_\_\_Divergent Evolution\_\_\_\_\_\_\_

* 1. Giraffes have evolved a long neck through the process of natural selection. Those that had the longest necks survived better to pass on their traits. However, trees have also grown taller along with the neck of the giraffe. Trees that were tallest were less affected by giraffes, and survive better to pass on their traits.

\_\_\_\_\_\_\_\_\_\_\_\_Coevolution\_\_\_\_\_\_\_\_\_\_

* 1. On the Galapagos Islands, Darwin studied the beaks of finches found on each island. Although fossil evidence suggests there was a single ancestral species of finch, the modern-day finches consist of a wide variety of species, each with a distinct beak shape adapted for the food present on each island.

\_\_\_\_\_\_\_\_Divergent Evolution (More specifically Adaptive Radiation)\_\_\_\_\_\_\_

* 1. Dolphins, whales, and sharks all have similar body shapes and characteristics, adapted for life in an aquatic environment. However, dolphins and whales are mammals, and sharks are fish.

\_\_Convergent\_\_\_\_

* 1. Monarch butterflies have a mimic. There is another species of butterfly that looks very similar to the Monarch, but does not belong to the same species. The bold colors of the Monarch are an adaptation to avoid predators. Although the other butterfly did not always (in history) look like the Monarch, it was an adaptation to have warning coloration similar to that of the Monarch. Natural selection caused the mimic species to shift its characteristics to become more similar to the Monarch.

\_\_\_\_\_\_\_\_\_\_\_Coevolution\_\_\_\_\_\_\_\_\_

1. Homologous vs. Analogous Structures – Label each statement as pertaining to homologous structures or analogous structures.

 i. Formed from similar tissue/same internal structure, but different function. \_\_\_\_\_ Homologous \_\_\_\_

 ii. Formed from different tissue/different internal structure, but same function. \_\_\_\_ Analogous \_\_\_\_

 iii. Results from having a common ancestor. \_\_\_\_\_\_\_ Homologous \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 iv. Results from having unrelated organisms that live in similar environments. \_\_\_\_ Analogous \_\_\_\_

 v. Associated with divergent evolution/adaptive radiation. \_\_\_\_\_ Homologous \_\_\_\_

 vi. Associated with convergent evolution. \_\_\_\_ Analogous \_\_\_\_\_\_\_\_\_

 vii. Formed when related organism look different due to differing environmental pressures. \_\_Homologous\_\_\_

 viii. Formed when unrelated organisms look similar due to similar environmental pressures. \_\_\_Analogous\_\_\_

3. Gradualism vs. Punctuated Equilibrium

 a. The idea that organisms change slowly and steadily over time is known as \_\_gradualism\_\_\_.

b. The idea that for most of the time, species are stable. But every now and then there is a disruptive event that promotes rapid change is known as \_\_\_\_punctuated equilibrium\_\_\_\_\_\_\_.

c. In the box below, label which change in the bird organisms are represented by gradualism and which is represented by punctuated equilibrium. Punctuated Equilibrium (On Left) Gradualism (On Right)

