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

**Evolution WebQuest:** Please use the websites provided below to answer the questions about evolution.

This webquest is due on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**PART I: EVOLUTION AND THE THEORY OF NATURAL SELECTION**

**SECTION A:** Learn about the basics of evolution at [**http://evolution.berkeley.edu/evolibrary/article/evo\_14**](http://evolution.berkeley.edu/evolibrary/article/evo_14)

1. What is evolution and what is it responsible for?
2. **Click next**. When does evolution take place?
3. Compare the two examples of changes in beetle populations.

|  |  |
| --- | --- |
| Beetles on a Diet | Beetles of a Different Color |
|  |  |

Which of the two scenarios is an example of evolution? **Defend** your answer with an explanation.

Mechanisms of Change

1. **Click next**. Identify and describe the four basic mechanisms for evolutionary change.



1. Genetic drift and natural selection only take place if there is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. **Click next.** What are the three sources of genetic variation?
   1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. **Click next**. Mutations are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
4. **Click next.** Which mutations are important to evolution and why?
5. Describe the effects of germ line mutations.



1. **Click next.** Complete the paragraph below regarding gene flow.

Gene flow, also called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, is any movement of \_\_\_\_\_\_\_\_\_\_\_\_\_\_ from one \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to another. Gene flow includes lots of different kinds of events, such as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ being blown to a new destination or people moving to new cities or countries. If \_\_\_\_\_\_\_\_\_\_\_\_\_\_ are carried to a population where those genes previously did not \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ can be a very important source of genetic \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. In the graphic on the website, the gene for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ coloration moves from one population to another.

1. **Click next** and read until you get to Genetic Drift. Summarize the idea behind genetic drift.
2. **Click next**. Natural selection is the most important mechanism behind evolution. This webpage gives you an example of natural selection involving beetles. Read the descriptions and look at the cartoons. Explain what has happened to this population of beetles, using the following terms: Adaptation, Survive, Reproduce, Gene, Natural Selection, Species, and Evolution.
3. **Click next**. Fitness does not necessarily mean “strongest.” Defend this statement.

Section B: have some fun at <http://www.mhhe.com/biosci/genbio/virtual_labs/BL_12/BL_12.html>

1. Read the background text under “How does natural selection affect allelic frequencies” to the left of the picture.
2. Record the colors (phenotype) of each set of alleles:

AA: \_\_\_\_\_\_\_\_\_\_\_\_

Aa: \_\_\_Green\_\_\_\_\_\_

aa: \_\_\_\_\_\_\_\_\_\_\_\_

**Note that this gene shows incomplete dominance, meaning the heterozygote (Aa) shows a mixture of the dominant and recessive alleles.**

1. Choose two different environments which are located in the top left hand drop down menu. For example, you may choose rocky and grassland, rocky and desert, or desert and grassland.
2. Write the type of environment in the left hand column below. You should have three rows for each environment with each type of genotype listed next to it.
3. Keep allelic frequencies (drop down menu in top right corner) the same for all habitat types.
4. Click on the “generation 1” tab and then the “natural selection” tab. Record the number of alleles for each allele type in each habitat.
5. Click on the “generation 2” tab and then the “natural selection” tab. Record the number of alleles for each allele type in each habitat. Repeat for the remaining generations.

Table 1: Frequency of alleles in various habitats.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Environment | Genotype | Generation 1 | Generation 2 | Generation 3 | Generation 4 | Generation 5 |
|  | AA |  |  |  |  |  |
|  | Aa |  |  |  |  |  |
|  | aa |  |  |  |  |  |
|  | AA |  |  |  |  |  |
|  | Aa |  |  |  |  |  |
|  | aa |  |  |  |  |  |

Answer the following questions:

1. What type of environments did you choose?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Which genotype was most common at the end of generation 5 for each environment? Environment: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Most Common Genotype: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Environment: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Most Common Genotype: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Which genotype was least common at the end of generation 5?\_

Environment: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Least Common Genotype: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Environment: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Least Common Genotype: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Make a conclusion about the relationship between genotype and environment. Use specific data to support your conclusion.

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

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**PART II: EVIDENCE FOR EVOLUTION**

Directions: Use the links below to research information on the following topics:

**SECTION A. Fossil Evidence** <http://www.zoomschool.com/subjects/dinosaurs/dinofossils/Fossiltypes.html>

1. What are fossils?

<http://biologos.org/common-questions/scientific-evidence/fossil-record/>

1. Describe how scientists use fossils to show an evolutionary relationship.

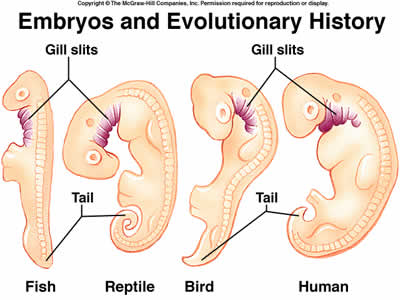
**SECTION B. Embryological Evidence** <http://necsi.edu/projects/evolution/evidence/embryos/evidence_embryo.html>

1. What is an embryo?

2. Use this image and list two similar features that are seen in the early stages of embryonic development.

(a) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(b) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



1. What did the gill slits in a fish embryo develop in to?
2. How do similarities in developing embryos provide evidence of evolution?

**SECTION C: Anatomical Evidence.**

<http://www.amnh.org/exhibitions/darwin/evolution-today/how-do-we-know-living-things-are-related/homologies>

1. What do homologies result from?
2. How do homologies support evolution?
3. Provide an example of a homology.

Click on the “Vestigial Organs” tab on the left (<http://www.amnh.org/exhibitions/darwin/evolution-today/how-do-we-know-living-things-are-related/vestigial-organs>)

1. How do we know snakes descended from an ancestor with legs?
2. Define Vestigial:
3. Why are vestigial structures evidence of evolution?
4. Provide an example of a vestigial structure:

Click on the “Tree of Life” tab on your left. (<http://www.amnh.org/exhibitions/darwin/evolution-today/how-do-we-know-living-things-are-related/tree-of-life>)

1. What is a phylogenetic tree?
2. How do scientists use DNA to determine evolutionary relationships?
3. Are chickens or mosquitos more closely related to humans? Provide anatomical and DNA data to support your argument.
4. Why does DNA sequences support the idea that “all life descended from a common ancestor”?