KEY
Evolution Review Worksheet | Chapters 10 -12

Early Ideas about Evolution and Darwin’s Observations

1. What do scientists call the process of biological change, by which descendants come to differ from their ancestors? **Evolution**

2. A horse and a donkey can produce a mule; therefore, horses and donkeys are of the same species. Circle one: True or False

3. For the following choose either: VARIATION or ADAPTATION
   a. Variation The difference in the physical traits of an individual from those of other individuals in the group to which it belongs.
   b. Adaptation A feature that allows an organism to better survive in its environment.
   c. Adaptation A tortoise population lives in an area with tall grass. These tortoises have longer necks than tortoises that live in other areas. Having a long neck is an example of this.
   d. Variation One fish in a population has slightly darker scales than its relatives. The relative in color of scales is an example of this.

4. What observations did Darwin notice between the finches on Equator and those on the different islands of the Galapagos? **There was much VARIATION between the finch species, depending on the food available - The common ancestor must have been a mainland species.**

The Theory of Natural Section

5. Fill in the blanks: Artificial selection is where certain traits are manipulated by **humans**, while in natural selection, nature/the environment is the selective agent.

6. Natural selection explains how evolution can occur. Match the 4 main principles of natural selection with the correct definition: Variation Overproduction Adaptation Descent with Modification
   a. Overproduction Producing many offspring, some of which may not survive.
   b. Variation Heritable differences that make an individual unique.
   c. Adaptation An advantageous trait; one well-suited for the environment.
   d. Descent with Modification A heritable, advantageous, trait becoming more common in a population.

7. Circle one: **Natural selection acts on existing traits** or **Natural Selection works directly on DNA**

8. Complete the sentence: In biology, an organism is said to have a high fitness if... they can survive and produce many offspring.

9. Fill in the blanks: Sexual selection occurs when certain traits increase mating success. **Intrasexual** selection involves fighting (competition) among males for a female, whereas **intersexual** selection involves males displaying traits to impress females.

10. What are the 5 factors that can lead to evolution?
    a. **Natural Selection**
    b. **Sexual selection**
    c. **Mutations**
    d. **Gene Flow**
    e. **Genetic Drift**

Evidence for Evolution

11. Match the type of evidence to its description.

<table>
<thead>
<tr>
<th>Fossils</th>
<th>Geography</th>
<th>Embryology</th>
<th>Anatomy</th>
<th>Biochemical</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Anatomy</td>
<td>Different organisms share similar structures that have very different functions, or have remnants of structures/organs that had a function in the past.</td>
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<tr>
<td>b. Biochemical</td>
<td>In DNA sequencing, the more closely related two organisms are, the more similar their DNA.</td>
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<td>c. Fossils</td>
<td>Fossil organisms found in bottom (older) layers are more primitive than those in the upper (newer) layers; often times, these extinct fossils resembled modern life.</td>
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<tr>
<td>d. Embryology</td>
<td>During the early stages of life, embryos of very different organisms appear to be very similar. As they continue to develop, they become increasingly different.</td>
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<tr>
<td>e. Geography</td>
<td>Different habitats favor different traits and can establish separate populations that have a common ancestor.</td>
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</tbody>
</table>

12. Which types of structures in organisms have evolved separately and are NOT evidence of a common ancestor? **Analogous Structures** (hint: wings of a bat and of a fly would be an example of this)

13. Compare and Contrast: Radiometric Dating and Relative Dating

   ![Radiometric Dating](chart1.png)

   ![Relative dating](chart2.png)
Speciation through Isolation

14. Define: Gene Flow The transfer of alleles from one population to another (think: THE FLOW OF GENES BETWEEN POPULATIONS)

15. Name the three barriers than can isolate populations & list an example of this barrier:
   a. Geographic barrier- like a mountain, canyon, or ocean
   b. Behavioral barrier- like different mating calls, displays
   c. Temporal barrier- like having different mating seasons

16. Fill in the blanks with the words below:

   Speciation  Environment  Gene Flow  Mutation  Species  Mate  Genetic Drift

   Two populations are said to be isolated if there is no longer any gene flow between them. Over generations, the members of isolated populations may become more and more different. Isolated populations may become genetically different as those that are better adapted to the new environment survive and reproduce. Random processes such as mutations & genetic drift can also affect evolution. When members of two isolated populations can no longer successfully mate, the populations are said to be reproductively isolated. Reproductive isolation is the final step prior to speciation, which is the evolution of a new species.

Patterns in Evolution

17. Compare and Contrast: Background Extinction and Mass Extinction

   Background Extinction
   - Less severe
   - Happens locally
   - Occurs at the same rate as speciation

   Mass extinction
   - More severe
   - Happens on a global level
   - Due to catastrophic events
     - Ice age, volcanic activity, meteorite
   - Only 5 in the last 600 million years

18. Describe convergent evolution using an example. Would structures in this example be homologous or analogous? Whales (mammals) and sharks (fish) are not closely related; however, they have similar body plans and both have fins. Their fins would be ANALOGOUS structures because while they are both used to swim, they are actually very different structurally (in their bones...remember, the bones in a fin of a whale actually look like a hand.

19. Describe divergent evolution using an example. Would structures in this example be homologous or analogous? The kit fox and the red fox share a common ancestor, but are different species living in different environments. The kit fox has evolved to stay cool in the desert, and the red fox warm- this is a homologous structure (similar coats, but perform different functions)

20. In the table below, fill in the spaces about the two ways in which species can co-evolve.

<table>
<thead>
<tr>
<th>Type of Coevolution</th>
<th>How it works</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beneficial Relationship</td>
<td>Two or more organisms live in a way where they benefit each other and evolve in response to changes in each other.</td>
<td>Insects and flowers (insects help the flowers reproduce, the flowers provide food), or hummingbird beaks &amp; flowers.</td>
</tr>
<tr>
<td>Evolutionary Arms Race</td>
<td>Two or more organisms evolve in response to changes in each other; however, this is in a competitive sense- in order to survive.</td>
<td>Bacteria and doctors/medication (antibiotics). The best adapted bacteria can survive in the presence of the antibiotic, so Drs have to create stronger meds.</td>
</tr>
</tbody>
</table>

21. Mammal evolution exploded after the age of dinosaurs. This rapid period of growth was followed by a slow period of speciation. Circle the letter of the TWO patterns that explain this.
   a. Convergent evolution
d. Coevolution
g. Gradualism
b. Divergent evolution
e. Mass extinction
h. Background extinction
   c. Adaptive radiation
   f. Punctuated equilibrium

Origin of Life

22. Match the correct term to the proper hypothesis:

   Ribozymes  Miller-Urey  Iron-sulfide bubbles  Meteorite  Endosymbiosis  Lipid Membrane

   a. Miller-Urey Demonstrated organic compounds could be made by passing electrical current (simulate lightning) through a closed system that held a mixtures of gases (early atmosphere).
   b. Meteorite Amino acids may have arrived on Earth through meteorite/asteroid impacts.
   c. Endosymbiosis A relationship in which one organism lives within the body of another, and both organisms benfit from the relationship.
   d. Iron sulfide bubbles Biological molecules combined in compartments of chimney like structures on the ocean floor. The compartments acted as the first cell membranes.
   e. Lipid membrane Lipid spheres, or liposomes, could form around a variety of organic molecules, acting as early cell membranes.
   f. Ribozymes RNA molecules that can catalyze specific chemical reactions without the use of additional enzymes. May have been the first genetic material of cells.