**Guided Notes: How Evolution Works**

1. Can individuals evolve? \_\_\_\_\_\_\_\_! Within an individual’s lifetime, it cannot evolve a new \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ by natural selection in response to its environment. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ acts on the range of phenotypes in a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

2. Just like all individuals make up a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, all of the genes of the population’s individuals make up the population’s \_\_\_\_\_\_\_\_\_\_\_. Evolution occurs as a population’s genes and their \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ change over time.

3. **Gene Pool** = all of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ in a population

**Allelic Frequency** = % of any specific \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the population

**Genetic Equilibrium** = when \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of alleles remains the same over time

Does evolution occur when a population reaches genetic equilibrium?? \_\_\_\_\_\_\_\_\_\_

4. Mechanisms of Genetic Change

1. Mutation
	1. Most mutations are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	2. Occasionally, mutations result in a useful \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	3. Example of a useful \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: different coloration in butterflies

1. Genetic Drift
	1. Changes in allelic \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ by chance events
	2. Can greatly affect \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ populations
	3. Genetic drift has been observed in some small \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ populations that are \_\_\_\_\_\_\_\_\_\_\_\_\_\_ due to reasons like religious practice. EX: polydactyl in the Amish community

1. Migration

 Movement of individuals in and/or out of a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Transport of genes by migrating individuals is called *\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_*.

5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ evolution is the development of similar appearance, structures, or behavior in unrelated species and populations by similar natural selection pressures EX: \_\_\_\_\_\_\_\_\_\_ structure in bats, birds, insects, and pterosaur

6. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ evolution occurs when species that were once similar to ancestral species diverge. This occurs when populations change as they adapt to different \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ conditions. Divergent evolution results in the creation of a new \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. EX: Darwin’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ radiate out into descendent species with similar and different traits. Finches look different based on the types of \_\_\_\_\_\_\_\_\_ they eat.

7. How do the changes in the makeup of a \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ result in the evolution of a new species? Evolution of a new species is called *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.* Speciation occurs when members of similar \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ no longer interbreed to produce viable offspring.

8. Geographic \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ prevents interbreeding

 Occurs whenever a physical barrier divides a population. EX: Tree Frogs in rain forest separated by a river; new gene pools formed

9. Humans can affect \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ if the environment is altered as a result of our activities. This was first seen with the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ during the Industrial Revolution. The air \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ created during The Industrial Revolution that a layer of \_\_\_\_\_\_\_\_\_\_\_ laid on the trees, camouflaging the dark moth and allowing \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to be passed on.

**Role of Disease Agents in Natural Selection**

10. Most physiological \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ can occur very quickly. EX: When \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ was first used, it was called a wonder drug because it killed many types of disease-causing \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Today penicillin is no longer as effective because some \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ have evolved physiological adaptations to become \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to the drug.

11. In addition to bacteria, scientists have observed physiological \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in species of insects and weeds that are pests. After years of exposure to specific \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, many species of insects and weeds have become \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to the chemicals that used to kill them.

12. Cells of your \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ system are constantly on the lookout for foreign invaders. When a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is detected, these cells begin defending your body immediately. At the same time, some white blood cells gradually develop the ability to recognize a specific foreign substance. Defending against a specific pathogen by gradually building up a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to it is called *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*.

13. The process of acquiring immunity to a specific ­­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ can take days or weeks. Aquired immunity to a disease can be either \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

14. Develops as a result of acquiring antibodies that are generated in another host.

 a. **Natural passive immunity**– antibodies \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from mother to unborn child

 b. **Artificial passive immunity**– \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ antibodies into the body that come from an animal or a human who is already \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to the disease. EX: bit by a snake and injected with antivenom

15. **Active immunity**is obtained \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ when a person is exposed to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The body then produces \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that correspond directly to the antigens. Occurs after you get over an infection. Can also induce artificial \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ by vaccines.