USA #7 Study Guide

1. Know that more than 99% of species on Earth have gone extinct; those populations did not adapt quickly enough to a changing environment. A population's rate of evolutionary change is (generally) determined by the length of its life cycle. Populations that reproduce quickly, e.g. mosquitos, evolve more quickly. Populations that reproduce slowly, e.g. whales, evolve slowly.

2. Know that the fossil record is incomplete, but that the fossil record provides overwhelming evidence that species have changed over time.

3. Some species in the fossil record are *transitional* fossils because they share traits from different types of animals. For example, archaeopteryx had feathers like a bird, but looked like a dinosaur. Transitional fossils are evidence of common ancestry between organisms in the fossil record and organisms alive today.

4. Populations do not evolve better adaptations because those adaptations are useful or helpful. Populations evolve adaptations because the individuals with lower fitness in the environment die before they can reproduce.

5. Adaptations reflect selective pressures from the environment. Some of the easiest adaptations to understand are anatomical structures that help an organism escape predators, e.g. the spring-like legs of a frog increase its chance of escaping from a snake.

6. The best way to understand Natural Selection is not to think of it as preferring or choosing the most fit, or the most well adapted to the environment. Instead, Natural Selection removes the unfit from the population. Natural Selection is never a random or chance process.

7. Extinction can happen for many reasons, but lack of food and starvation is a possible cause. Species that eat a variety of foods are less likely to go extinct because if they lose one food source they have others to fall back on.

8. Know the difference between a scientific theory and a law. Laws *describe* phenomena, while theories *explain*. A theory is not like the word you hear on Netflix. In science, a theory is an explanation for which there is overwhelming evidence. Scientists accept theories as true, but are willing to change theories to fit new evidence.

9. Know the basic process of scientific research. After conducting his research, a scientist presents his findings to other scientists by publishing his work in a journal, or discussing his work at a conference (a big meeting between dozens or hundreds of scientists). The other scientists probably won't be convinced the first time they hear about this research and will want additional evidence.

10. Sexual selection is a type of natural selection that acts on the ability of an organism to find a mate. For example, male peacocks have bright feathers that attract females (some peacocks have brighter feathers than others), but the feathers make it easier for a predator to spot the male peacock. Predict how this trait would change over time depending on the presence or absence of predators.