

Evolution Study Guide 2 Answers

“Evidence for Evolution”

1. What are 4 major topics for evidence for evolution?

1. Fossil Record
2. Anatomical Record (e.g. Homologous, Vestigial, and Analogous structures)
3. Molecular Record
4. Artificial Selection

2. How old is life on Earth estimated to be?

- 4.2 Billion Years Old

3. Is the fossil record a complete guide to the history of life? If not why?

No, not all life forms have the ability to become fossilized due to anatomical constraints such as not having dense bones or exoskeleton. Thus, the fossil record is incomplete and can appear as if changes in species occur quickly due to lack of transitional fossils

4. What 3 things does the fossil record tell us?

1. Earth is Old
2. Life is Old
3. Life has changed

5. What is carbon dating and how can we use it to determine age of things millions of years old?

Carbon dating is the process of calculating the half-life percentage of Carbon-14 from dead organic matter up to 50,000 years old. Scientist must use other isotopes such as Potassium-40 and Uranium- 238 to determine age of fossilized specimens millions of years.

6. What is plate tectonic theory?

Plate tectonics is the theory that Earth's outer shell is divided into several plates that glide over the mantle, the rocky inner layer above the core.

7. What is biogeography?

Evidence for evolution as it is the study of the distribution of flora (plants) and fauna (animals) over geographical areas

8. What is the "Wallace's line"?

An imaginary line that separates two major ecozones/classes of animals between Asia and Australia due to Gondwana breaking up.

9. What is adaptive radiation and how can it be used to explain the differences in equestrian (horse) evolution?

The diversification of a group of organisms as they fulfilled different niches. As ancestral horses diversified from their small, forest dwelling roots, they adapted to fulfill niches in the more open grassland prairies. One major adaptation was the keratinization of a hoof from their toed ancestors.

10. What are homologous structures? Are they from direct ancestral relationships?

Homologous structures are structures that are similar internally (e.g. humerus, radius, ulna, and carpels) from a direct ancestral relationship. They can serve different functions. For example, the wings of birds and bats, and arm of humans are homologous due to sharing a more recent common ancestor

11. What are vestigial structures?

A "vestigial structure" or "vestigial organ" is an anatomical feature or behavior that no longer seems to have a purpose in the current form of an organism of the given species

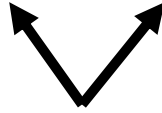
Examples: Goosebumps, wisdom teeth, human tail bone, eye spots in cave-dwelling animals

12. What are analogous structures? Are they from direct ancestral relationships?

Analogous structures are similar structures that serve the same purpose such as wings on birds, bats, and bees. However, wings have evolved independently as they do not share a direct ancestral relationship

13. What is the difference between convergent and divergent evolution?

Divergent evolution is species diverging/splitting from a recent common ancestor (i.e. homologous)



Convergent evolution is species that converge/arrive at same function such as how would one fly...wings. Thus, wings do not necessarily guarantee a direct ancestral relationship (i.e. analogous)



14. What is embryology?

The study of anatomical similarities during development from embryo to birth.

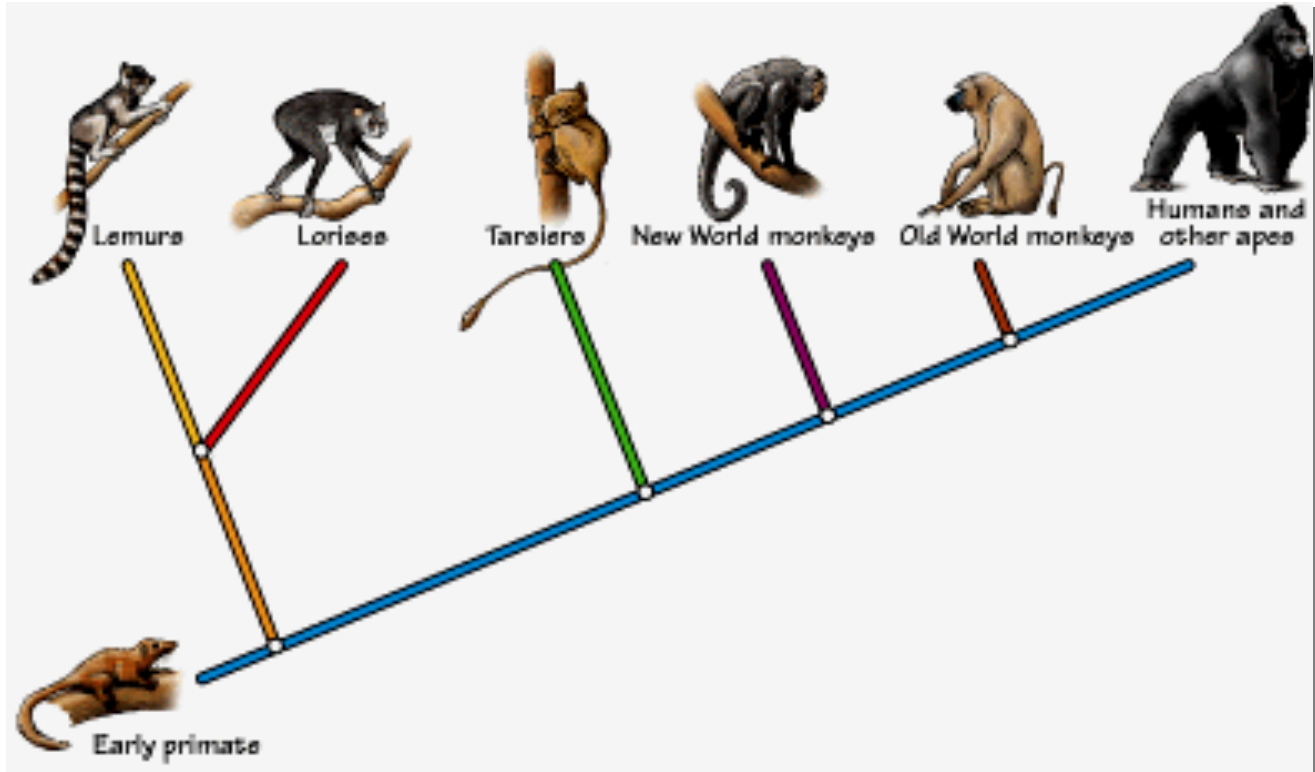
15. What do homeotic genes control?

Homeotic genes control the pattern of body formation during embryological development

16. What is phylogenetics?

The study of evolutionary relationships by studying differences in individual genes or genomes

17. Who is the closest living ancestor to humans and other apes based off the phylogenetic tree below?



Old World Monkeys

18. How can phylogenetics base relatedness from amino acid or DNA sequences?

The assumption that mutation rate is quasi steady in relation to codon position with the wobble base occurring more mutations than 1st or 2nd positions. Thus organisms that have more similar proteins and/or genetic sequence are more closely related than ones with different proteins/ or lots of genetic differences.

19. What is artificial selection?

Artificial selection is man selecting traits in plant or animal populations that they deem most “fit” or “sexy”. For example, breeds of dogs, rose petals, and bigger fruit sizes are all examples of how humans have continued to select phenotypes that nature provided that best suited humans needs or wants.

20. What are some unintended consequences from artificial selection?

- herbicide and pesticide resistance weeds (e.g. Round-up resistance weeds)
- Antibiotic resistant bacteria

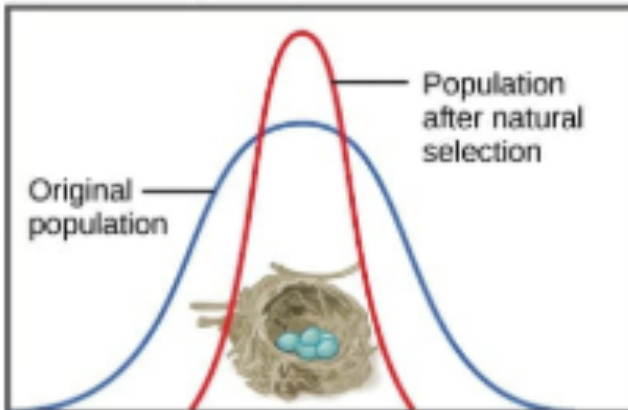
21. Draw the graphs for the three types of selection below and explain how allelic frequency has changed?

Stabilizing

Disruptive

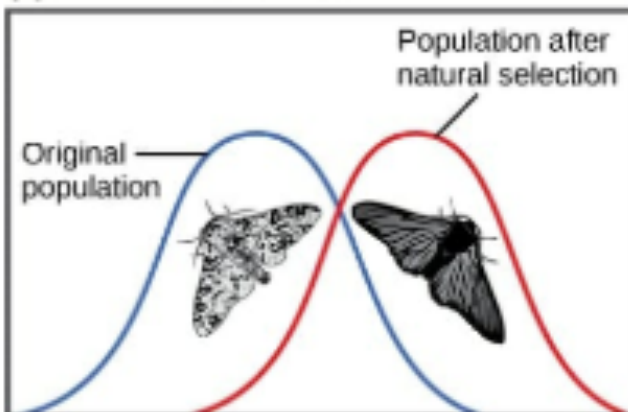
Directional

(a) Stabilizing selection



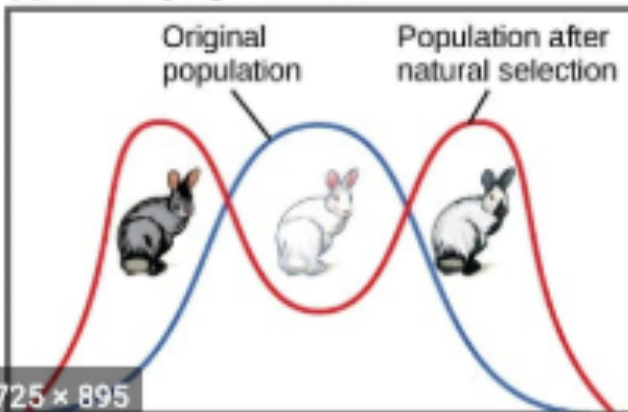
Robins typically lay four eggs, an example of stabilizing selection. Larger clutches may result in malnourished chicks, while smaller clutches may result in no viable offspring.

(b) Directional selection



Light-colored peppered moths are better camouflaged against a pristine environment; likewise, dark-colored peppered moths are better camouflaged against a sooty environment. Thus, as the Industrial Revolution progressed in nineteenth-century England, the color of the moth population shifted from light to dark, an example of directional selection.

(c) Diversifying selection



In a hypothetical population, gray and Himalayan (gray and white) rabbits are better able to blend with a rocky environment than white rabbits, resulting in diversifying selection.

