

Guided Reading: Chapter 22

(p.429)1. How did each of the following sources view the origin of species?

(a) *Aristotle* – Aristotle believed all living forms can be arranged on a scale or ladder, of increasing complexity, later called the "scala naturae" ("scale of nature"). Each form of life has its allotted ring on this ladder, and every rung was taken. In this view of life,, which prevailed for 2,000 years, species are permanent, are perfect, and do not evolve.

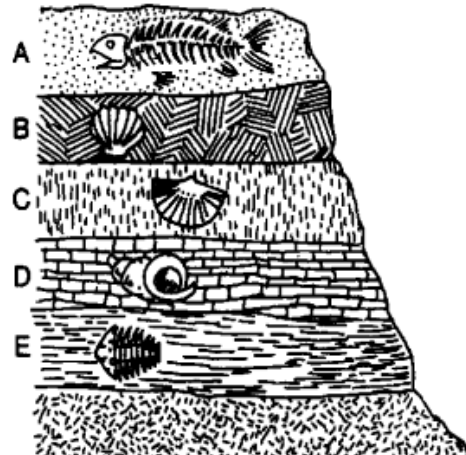
(b) *The Old Testament* – The Old Testament account of creation fortified the idea that species were individually designed and nonevolving.

(c) *Carolus Linnaeus* – To Linnaeus, clustering similar species together implied NO evolutionary kinship, but a century later his taxonomic system would become the focal point in Darwin's argument for evolution.

Paleontologist

(d) *George Cuvier* – Realized that the history of life is recorded in strata (layers of rock) containing fossils, he documented the succession of fossil species in the Paris Basin.

2. Use the diagram to the right to help you explain the role of *fossils in rock strata* as a window to life in earlier times.



(p.430)3. How would *Georges Cuvier* have explained the appearance of the record of life shown in the rock strata?

Fossils within the layers show that a succession of organisms has populated Earth throughout time

4. *Jean-Baptiste de Lamarck* proposed a mechanism for how life changes over time. Explain the two principles of his mechanism.

(p.431) (a) **use and disuse:** the idea that those parts of the body used extensively to cope with the environment become larger and stronger while those that are not used deteriorate.

(p.431) (b) **inheritance of acquired characteristics:** The modifications an organism acquires during its lifetime can be passed along to its offspring.

(p.431) 5. Although Lamarck's mechanism of evolution does not explain the changes in species over time, his thinking has been influential. What is considered to be the great importance of his ideas?

The great importance of Lamarck's ideas was its claim that evolution is the best explanation for both the fossil record and the current diversity of life; in its recognition of the great age of the earth; especially in its emphasis on adaption to the environment as a primary product of evolution.

(p.434) 6. In the first edition of *The Origin of Species*, Darwin did not use the word evolution. What phrase did he use instead?

Decent with Modification

(p.437/438) 7. Charles Darwin proposed that the mechanism of evolution is *natural selection* and that it explains how *adaptations* arise. What are *adaptations*? Give two examples of adaptations and explain if Hal's birthmark would be considered an adaptation.

Adaptations are characteristics or traits that enhance the survival of an organism.

Two examples of adaptations are insects resistant to insecticides and houseflies and mosquitoes resistant to DDT.

Hal's birthmark would not be considered an adaptation because...



"Bummer of a birthmark, Hal."

(City Hal vs Country Hal)

8. Use the cartoon from the previous question to help you explain the process of *natural selection*.

9. Let's try to summarize Darwin's observations that drive changes in species over time:

Observation	Cite an Example
1. Variations in traits exist.	
2. These variations (traits) are inheritable.	
3. Species overproduce.	
4. Limited resources leads to competition and not all offspring survive.	

(p.436-437) From these four observations, which two inferences did Darwin make?

- (1) **The diverse forms of life have arisen with modification from ancestral species.**
- (2) **The mechanism of modification has been natural selection working over enormous tracks of time.**
(Gradualism)

10. It is important to remember that differences in heritable traits can lead to *differential reproductive success*. This means that the individuals who have the necessary traits to promote survival **in the current environment** will leave the most offspring. What can this *differential reproductive success* lead to over time?

Those individuals whose inherited traits best fit them to their environment are likely to leave more offspring than less fit individuals.

11. To demonstrate your understanding of this section, complete the following sentences:

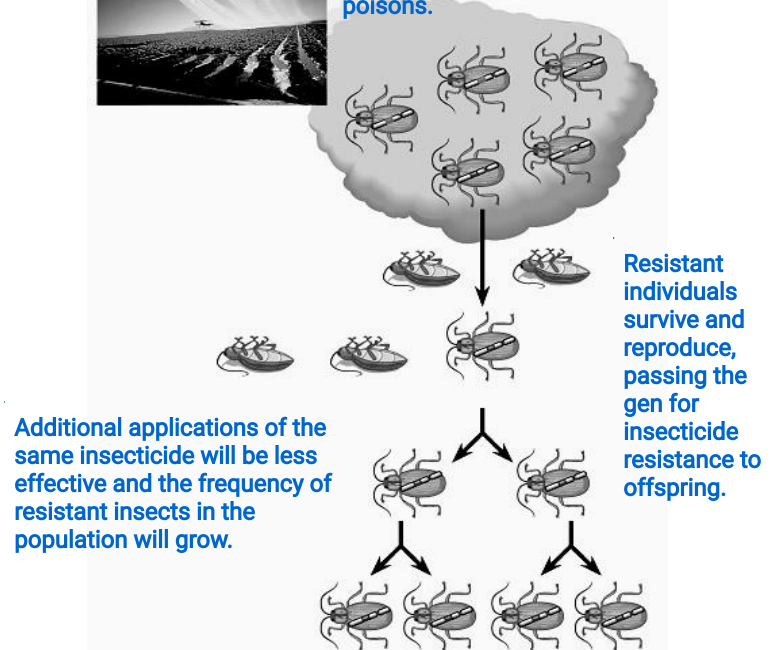
Individuals do not evolve. Populations evolve.

Now, take out your highlighter and mark the information in the box above. Hold these ideas firmly in your brain! Finally, if you are ever asked to explain Darwin's theory of evolution by natural selection (a common AP essay question), do *not* pull out the phrase "survival of the fittest." Instead, cite the points made in question 9 and explain the inferences that are drawn from them.

12. Do pesticides cause insects to become resistant?
Label and use the diagram below to help explain your answer.



By spraying crops with poisons to kill insects, humans have unwittingly favored the reproductive success of insects with inherent resistance to the poisons.



13. Do antibiotics cause bacteria to become resistant? (*Refer to question 12 for help with this question.*)

(p,441) 14. How does the fossil record give evidence for evolution?

The succession of fossil forms is compatible with what is known from other types of evidence about the major branches of descent in the tree of life.

(p.438)15. Define homology. **Homology is the study of characteristics resulting from common ancestry**

16. Give examples of each of the following types of homologies:

(p.439) (a) Embryological - **pharyngeal pouches or gill slits in their throat region**

(p.439) (b) Molecular - **all life species of life use the same genetic machinery of DNA and RNA**

(p.438-439)17. What is meant by each of the following terms? Give an example of each.

Term	Examples
Homologous Structures <small>same structure different function</small>	the forelimbs of humans and cats - flipper of a whale - wing of a bat
"useless" Vestigial Structures	pelvis and hip bones in snakes
<small>similar function different common ancestor</small> Analogous Structures	bird wings and insect wings

18. How do *homologous structures* give evidence for evolution?

Homologous structures that evolved more recently are shared only by smaller branches on the tree of life.

CHAPTER SUMMARY

1. Evolution is change in species over time.
2. Heritable variations exist within a population.
3. These variations can result in differential reproductive success.
4. Over generations, this can result in changes in the genetic composition of the population.

And remember: Individuals do not evolve! Populations evolve.