

EVOLUTIONARY THEORY

EVOLUTION:

- Change through time
- Processes that transformed early life forms into the current, vastly diverse forms
- Processes at work today

LAMARCK

- | | |
|---|---|
| <ul style="list-style-type: none">• Life forms have changed over time• Supported evolution | <ul style="list-style-type: none">• Evolution responded to needs of organism Use & disuse<ul style="list-style-type: none">◦ Increase use = parts become larger & stronger◦ Decrease use = parts become smaller & weaker• Inheritance of acquired traits (modifications acquired during lifetime passed onto offspring) |
|---|---|

DARWIN

- | | |
|---|---|
| <p><u>Descent with Modifications</u></p> <ul style="list-style-type: none">• Species not created in present forms• Species evolved from ancestral species• All organisms are related• Organisms descended from a common ancestor | <p><u>Natural Selection</u></p> <ul style="list-style-type: none">• Struggle for survival• Survival of the fittest (best adapted will survive to reproduce)• Unequal success in reproduction leads to gradual change• Differential success in reproduction |
|---|---|

22.1

1. Evolution can be defined as “change through time”. What is changing?

3. Match the description with the correct term.

A. Catastrophism B. Gradualism C. Uniformitarianism

- _____ History of Earth marked by floods or droughts that resulted in extinctions
_____ Profound change is the cumulative product of slow but continuous processes
_____ Geological forces at work today are the same forces that shaped the Earth in the past

4. How did the work of James Hutton and Charles Lyell influence the work of Charles Darwin?

Hutton
Lyell

5. Lamarck proposed a mechanism to explain how specific adaptations evolved. This mechanism incorporated the ideas of use & disuse and acquired traits. Explain each of these ideas.

IDEA	EXPLANATION
USE & DISUSE	
ACQUIRED TRAITS	

6. In what ways does Lamarck's theory of evolution not agree with present evidence?

7. Consider the giraffe's long neck. Explain how this came about using Lamarck's concept of evolution (inheritance of acquired traits.)

8. The embryologist Charles H. Waddington treated fly larvae with heat shock. As a result of this treatment, some of the adult flies showed the abnormal condition "crossveinless" (some of their wing veins were missing.) After several generations of this treatment, he let a generation of flies develop without heat treatment and many of them were also crossveinless. Does this experiment provide convincing proof of Lamarckism? If not, what other explanation can you suggest, and what experiments would you perform to test your suggestions? (This is NOT in text...it is an application question! Use your own knowledge to explain and suggest an experiment).

22.2

9. Consider the giraffe's long neck. Explain how this came about using Darwin's mechanism of evolution (natural selection.)

10. Define natural selection.

11. What is meant by the phrase "survival of the fittest"?

12. Why is there a constant struggle for survival among organisms within a population?

13. What is (are) the difference(s) between natural selection and adaptation?

14. Natural selection occurs through interaction of two factors? What are they?

15. An individual acquires many traits during its lifetime. How important are these acquired characteristics to evolution? Explain.

16. Define the term artificial selection

17. Define the term population.

18. Explain why populations and not individuals evolve.

19. Summarize Darwin's observations that drive change in species over time:

OBSERVATION	CITE AN EXAMPLE
1. Variations in traits exist	
2. These variations (traits) are heritable	
3. Species overproduce	
4. There is competitions for resources; not all offspring survive	

20. From these four observations, which two inferences did Darwin make?

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

22. _____ do not evolve, _____ evolve.

Note: If you are asked to explain Darwin's Theory of Evolution by Natural Selection...do NOT use the phrase "survival of the fittest." Instead cite the points made in question 18-22 and EXPLAIN the inferences that are drawn from them!!!

23. This famous example of Natural Selection is NOT in the text. Read through the scenario carefully and use logic to describe what happened in each case of the light colored and dark colored moths.

The English peppered moth, *Biston betularia*, has two distinct varieties – light colored with speckles of pigments and uniformly dark color. These moths spend their days on trees in the area. Birds feed on the moths.

a. In the late 18th century, the trees in England were a light color.

Which variety of the moth was better able to survive in the environment of the late 18th century?

Why was it better able to survive? _____

- b. In the mid-19th century, the environment changed because of industrialization. During this time, pollutants were released into the air. This pollution darkened the trees.

What happened to the # of light colored moths? _____

Why did this happen? _____

What happened to the # of dark colored moths? _____

Why did this happen? _____

- c. Explain why this is an example of natural selection.

22.3

24. Why is beak size important to the soapberry bug?

25. How does natural selection affect the soapberry bugs ability to survive? Explain.

26. Read over and answer/interpret "What if ?" on soapberry bugs in figure 22.13. When soapberry bug eggs from a population fed on balloon vine fruits were reared on goldentrain tree fruits (or visa versa), the beak lengths of the adult insects matched those in the population from which the eggs were obtained. Think and interpret these results carefully based on what you have learned thus far using terms and ideas discussed in this chapter.

27. What is MRSA? _____

28. Briefly describe why MRSA is so dangerous. _____

29. What does it mean when a bacteria is antibiotic resistant? _____

30. What does it mean when we say that drugs do not create resistant pathogens; it selects for resistant individuals that are already in the population? _____

Now, relate this to the evolution of white blood seen in the *notothenoids* in Antarctica. (If you forgot, go back and watch HHMI film we watched over summer)

31. Read over figure 22.14 on MRSA. Think carefully about what you have learned and interpret the following "What if ?": Efforts are underway to develop drugs that target *S. aureus* specifically and to develop drugs that slow the growth of MRSA but do not kill it. Based on how natural selection works and on the fact that bacterial species can exchange genes, explain why each of these strategies might be effective.

32. Make a list of the four evidences for evolution.

Evidence for Evolution

33. How does the fossil record give evidence for evolution?

34. Define and give examples of each of the following.

STRUCTURE	DEFINITION	EXAMPLES
Homologous		
Vestigial		
Analogous (see pg 465)		

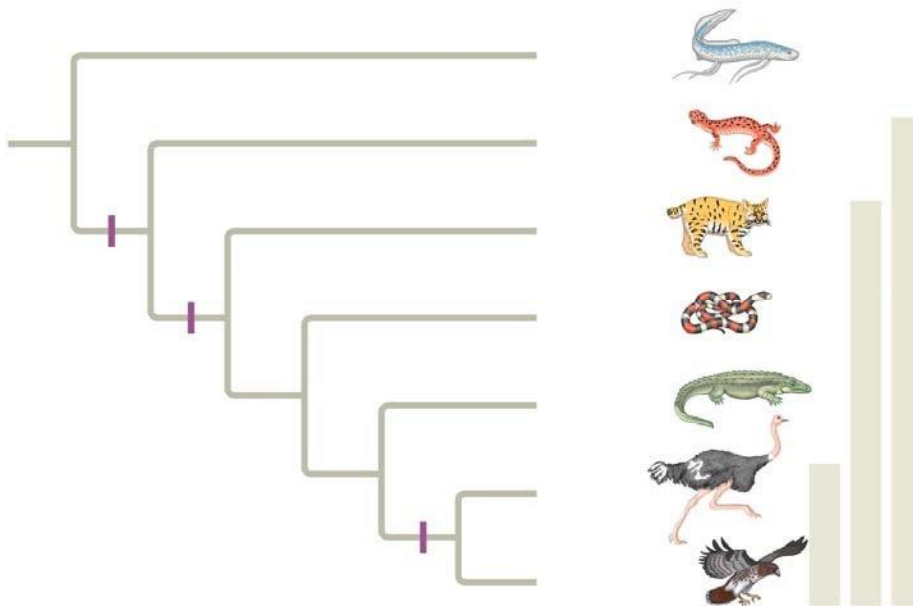
35. How do *homologous structures* give evidence for evolution?

36. What is summarized in an *evolutionary tree*?

37. Figure 22.17 shows an evolutionary tree. What is indicated by each branch point?

38. What is indicated by the hatch marks?

39. Use the tree below to answer this question: Are crocodiles more closely related to lizards or to birds? Explain your response



40. On the evolutionary tree above, label the vertical lines to the right and annotate the key feature that marks each group.
41. Distantly related organisms can resemble one another through *convergent evolution*. Explain convergent evolution and describe how *analogous structures* can arise through this event.
42. *Convergent evolution might be described as similar problem, similar solution*. Give two examples of convergent evolution.

Study Tip

Homologous structures show evidence of relatedness (whale fin, bat wing). *Analogous structures* are similar solutions to similar problems but do *not* indicate close relatedness (bird wing, butterfly wing).

43. Define *Biogeography* _____
44. How is biogeography affected by *continental drift* and the presence of *endemic species*? _____

45. Explain how each of the following provide evidence in support of Darwin's principle of common descent (evolution).

CATEGORY	HOW IT SUPPORTS EVOLUTION
Biogeography	
Fossil record	
Taxonomy	
Comparative anatomy	
Comparative Embryology	
Molecular Biology	

46. There is evidence that the Koala bear uses its appendix to detoxify the leaves it eats. Is the appendix a vestigial organ in this animal? Reread the question, answer the question and explain using your own logic.

Chapter Summary

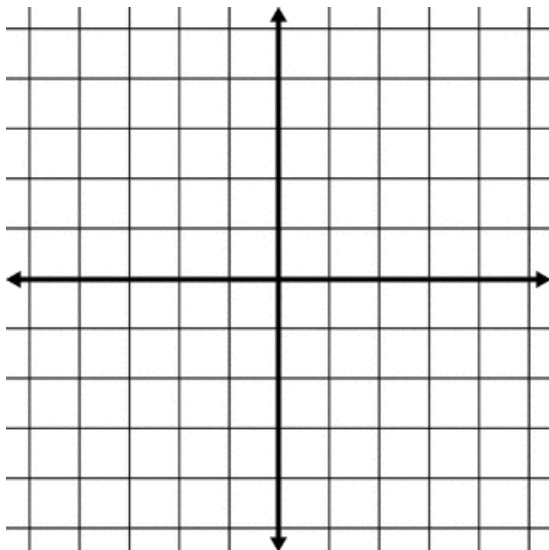
1. Evolution is change in species over time
2. Heritable variations exist within a population
3. These variations can result in differential reproductive success.
4. Over generations this can result in changes in genetic composition of the population.

And remember!!! Individuals do not evolve! Populations evolve!

End of Chapter Synthesis and Evaluation Problems!

Do problems 1-5, 7 and 8. Check and correct your answers to 1-5, 7 in back of text.

1. _____
2. _____
3. _____
4. _____
5. _____
6. Not applicable



7a.

7b. _____

***Question #8 should be typed out, then answered in no more than 100 to 150 words. Turn in separately to the tray. This is worth **20 points!** Do not plagiarize! Use your own words and thoughts...but, use vocabulary terms and ideas taught in this chapter!!!

Study Guide/ISN (20 points)

In your study guide book, review pages 151 to 154. In your ISN, do the following: Title the page **Chapter 22 Theory (Mechanisms) of Evolution Must Know!** In one color, copy down each of the must know items listed on page 151 in study guide leaving space underneath to include in a different color a brief description, diagram, model, or mnemonic device that will help you study for the unit test and more importantly the AP Test in May.

Bozeman Science/ AP Biology/ISN (See Syllabus for format) **(20 points each)**

1. Review Natural selection (Supplemental AP Biology Resources)
2. Scientific questioning (AP Biology Practices)