**Name Period**

**Chapter 25: The History of Life on Earth**

***Overview***

1. In the last chapter, you were asked about *macroevolution*. To begin this chapter, give some examples of *macroevolution.* Include at least one novel example not in your text.

***Concept 25.1 Conditions on early Earth made the origin of life possible***

2. How old is the planet?

 How old is the earliest evidence of life on Earth?

3. Consider the early planet, probably thick with water vapor and stinky with methane, ammonia, and hydrogen sulfide. What gas was missing from this early mix? Why?

4. A. I. Oparin and J. B. S. Haldane hypothesized that the early atmosphere was a *reducing environment*. What did they suggest was the source of energy for early organic synthesis?

5. In 1953 at the University of Chicago, *Stanly Miller* and *Harold Urey* tested the *Oparin- Haldane hypothesis* with the apparatus shown in Chapter 4, Figure 4.2. Explain the elements of this experiment.

6. What was collected in the sample for chemical analysis? What was concluded from the results of this experiment?

7. What are *protocells*? What properties of life do they demonstrate?

8. What did *Thomas Cech* propose was the first genetic material, DNA or RNA?

9. What are *ribozymes*?

10. Explain the evidence for an early “RNA world.”

***Concept 25.2 The fossil record documents the history of life***

11. In what type of rock are fossils found?

12. Rocks and fossils are dated in several ways. *Explain the difference between Relative Dating and Radiometric Dating.*

13. What is the age range for which carbon-14 dating may be used?

14. To date fossils outside the rage of carbon-14 dating, researchers use indirect methods of establishing absolute fossil age. Explain how this could be done using radioisotopes with longer half-lives.

15. What are three groups of *tetrapods*?

***Concept 25.3 Key events in life’s history include the origins of single-celled and multicelled organisms and the colonization of land***

16. What was the earliest form of life on the planet? How long ago did this life-form first occur?

17. What unique ability was originated with *cyanobacteria*? How did this alter life on Earth and lead to a wave of mass extinctions?

18. The first *eukaryotes* did not appear until approximately 2.1 billion years ago. Explain the evolution of eukaryotes by *endosymbiosis*.

19. Summarize three lines of evidence that support the model of endosymbiosis.

***Concept 25.4 The rise and fall of groups of organisms reflect differences in speciation and extinction rates***

20. If you have not studied geology, you will find this concept introduces a fascinating look at the changes in our planet as explained by *continental drift*. Define *continental drift*. How can continents move?

21. A *mass extinction* is the loss of large numbers of species in a short period, caused by global environmental changes. What caused the *Permian mass extinction* 250 million years ago (mya)? Summarize the species that were lost.

22. A second important mass extinction is the *Cretaceous mass extinction* that happened about 65 mya. Everyone’s favorite group, the dinosaurs, was lost, along with more than half of all marine species. What caused it?

23. What are *adaptive radiations*?

24. Why did a large-scale adaptive radiation occur after each mass extinction?

***Concept 25.5 Major changes in body form can result from changes in the sequences and regulation of developmental genes***

25. What two areas of biology are merged in the field of study commonly called evo-devo?

26. *Homeotic genes* are master regulatory genes that determine the location and organization of body parts. Mutations in a *homeotic gene* can have a profound effect on morphology. Homeotic gene mutations can contribute to the potential for evolutionary change. The *Hox* genes are one class of homeotic genes. What do they control?