**Chapter 24 Active Reading Guide: Early Life and the Diversification of Prokaryotes**

***Section 1***

1. How old is the planet?

How old is the earliest evidence of life on Earth?

1. The current theory of the origin of life suggests a sequence of four main stages. Summarize them here.

1.

2.

3.

4.

1. In the previous chart, the first stage is the synthesis of organic molecules. 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?
2. 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?
3. In 1953 at the University of Chicago, Stanly Miller and Harold Urey tested the Oparin-Haldane hypothesis with this apparatus. Explain the elements of this experiment, using arrows to indicate what occurs in various parts of the apparatus.
4. What was collected in the sample for chemical analysis? What was concluded from the results of this experiment?
5. What are protocells? What properties of life do they demonstrate?
6. Which was likely the first genetic material, DNA or RNA?
7. What are ribozymes?

## Section 2

1. Which two domains include prokaryotes?
2. Let’s focus on some general details about prokaryotes.
   1. Are they multicellular or unicellular?
   2. Compare their size relative to eukaryotic cells.
   3. What three shapes are most common? Label them on the figure.
   4. What is the composition of the typical bacterial cell wall?
3. A key feature of prokaryotic cells is the cell wall. What three functions does it provide for the cell?
4. Quick review! What material comprises the cell wall of plants? of fungi?
5. The cell walls of archaeans are different. They lack but contain and .
6. Explain the difference between gram-positive and gram-negative bacteria.
7. What is a bacterial capsule? What functions may it serve?
8. Many prokaryotes are capable of directional movement. What is this called?
9. What structure makes movement of bacteria possible?
10. What are the small, circular, self-replicating pieces of DNA found in bacteria called?
11. Compare prokaryotes to eukaryotes in terms of the following characteristics:

|  |  |  |
| --- | --- | --- |
|  | **Prokaryotes** | **Eukaryotes** |
| Size |  |  |
| Genome |  |  |
| Membranes |  |  |
| Location of Genome |  |  |
| Plasmids |  |  |
| Ribosomes |  |  |

## Section 3

1. You should now have some idea why there is so much potential for genetic diversity with bacterial populations. Although mutation is the major source of genetic variation in prokaryotes, listed below are the other three ways variation is introduced. Explain each one.

|  |  |
| --- | --- |
| **Source of Variation** | **Summary Explanation** |
| Recombination |  |
| Transformation |  |
| Transduction |  |

1. What occurs in bacterial conjugation?