

**Chapter**  
**14**
**The History of Life, *continued***
**Reinforcement and Study Guide**
**Section 14.2 The Origin of Life**

*In your textbook, read about origins: the early ideas.*

Use each of the terms below just once to complete the passage.

microorganisms	vital force	Louis Pasteur	biogenesis
nonliving matter	S-shaped	disproved	Francesco Redi
organisms	broth	microscope	spontaneous generation
spontaneously	air		

Early scientists believed that life arose from **(1)** \_\_\_\_\_ through a process they called **(2)** \_\_\_\_\_. In 1668, the Italian physician **(3)** \_\_\_\_\_ conducted an experiment with flies that **(4)** \_\_\_\_\_ this idea. At about the same time, biologists began to use an important new research tool, the **(5)** \_\_\_\_\_. They soon discovered the vast world of **(6)** \_\_\_\_\_. The number and diversity of these organisms was so great that scientists were led to believe once again that these organisms must have arisen **(7)** \_\_\_\_\_. By the mid-1800s, however, **(8)** \_\_\_\_\_ was able to disprove this hypothesis once and for all. He set up an experiment, using flasks with unique **(9)** \_\_\_\_\_ necks. These flasks allowed **(10)** \_\_\_\_\_, but no organisms, to come into contact with a broth containing nutrients. If some **(11)** \_\_\_\_\_ existed, as had been suggested, it would be able to get into the **(12)** \_\_\_\_\_ through the open neck of the flask. His experiment proved that organisms arise only from other **(13)** \_\_\_\_\_. This idea, called **(14)** \_\_\_\_\_, is one of the cornerstones of biology today.

**Determine if the statement is true. If it is not, rewrite the italicized part to make it true.**

**15.** Biogenesis *explains* how life began on Earth.

\_\_\_\_\_

**16.** For life to begin, simple *inorganic* molecules had to be formed and then organized into complex molecules.

\_\_\_\_\_

**17.** Several billion years ago, Earth's atmosphere had no free *methane*.

\_\_\_\_\_

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- 18.** Primitive Earth's atmosphere may have been composed of water vapor, hydrogen, methane, and *ammonia*. \_\_\_\_\_
- 19.** In the early 1900s, Alexander Oparin proposed a widely accepted hypothesis that life began *on land*. \_\_\_\_\_
- 20.** *Pasteur* hypothesized that many chemical reactions occurring in the atmosphere resulted in the formation of a primordial soup. \_\_\_\_\_
- 21.** In 1953, Miller and Urey tested Oparin's hypothesis by simulating the conditions of *modern* Earth in the laboratory. \_\_\_\_\_
- 22.** Miller and Urey showed that organic compounds, including *nucleic acids* and sugars, could be formed in the laboratory, just as had been predicted. \_\_\_\_\_
- 23.** This "life-in-a-test-tube" experiment of Miller and Urey provides support for some modern hypotheses of *biogenesis*. \_\_\_\_\_
- 24.** Sidney Fox took Miller and Urey's experiment further and showed how amino acids could cluster to form *protocells*. \_\_\_\_\_

*In your textbook, read about the evolution of cells.*

**Answer the following questions.**

- 25.** Describe the likely characteristics of the first organisms on Earth.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- 26.** What is an autotroph? What factors helped them thrive on Earth?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- 27.** What present-day organisms may be similar to the first autotrophs? Why?  
\_\_\_\_\_  
\_\_\_\_\_
- 28.** What change occurred in Earth's atmosphere after the evolution of photosynthesizing prokaryotes? Why?  
\_\_\_\_\_  
\_\_\_\_\_