

25.1 The early Earth made the origin of life possible

How old is the planet? _____ How old is the earliest evidence of life on Earth?

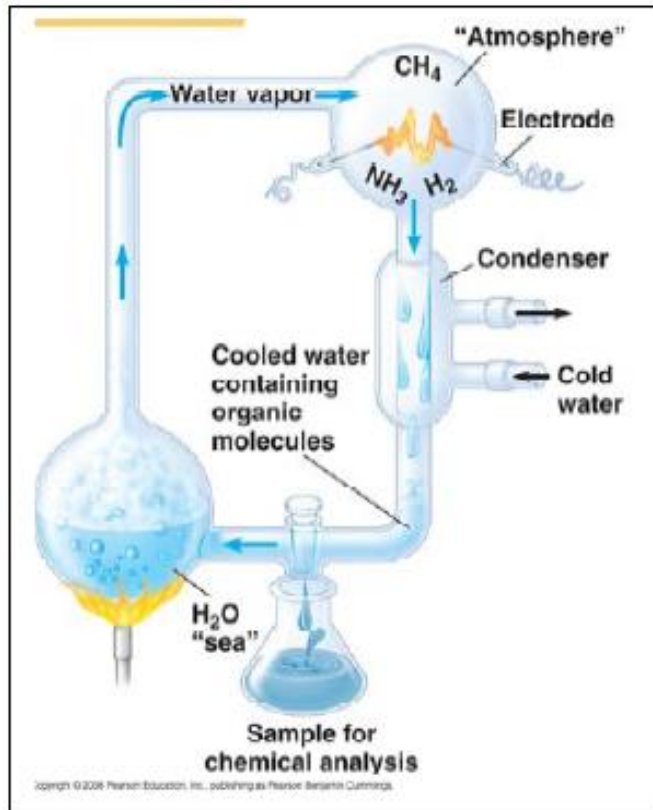
The current theory of the origin of life suggests a sequence of four main stages. Summarize them here.

1.	
2.	
3.	
4.	

In your chart above, 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?

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 the early organic synthesis?

In 1953 at the University of Chicago, *Stanly Miller* and *Harold Urey* tested the *Oparin-Haldane hypothesis* with this apparatus. (It is shown in Chapter 4, Figure 4.2, so you have seen it before.) Explain the elements of this experiment, using arrows to indicate what occurs in various parts of the apparatus.



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

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

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

What are *ribozymes*?

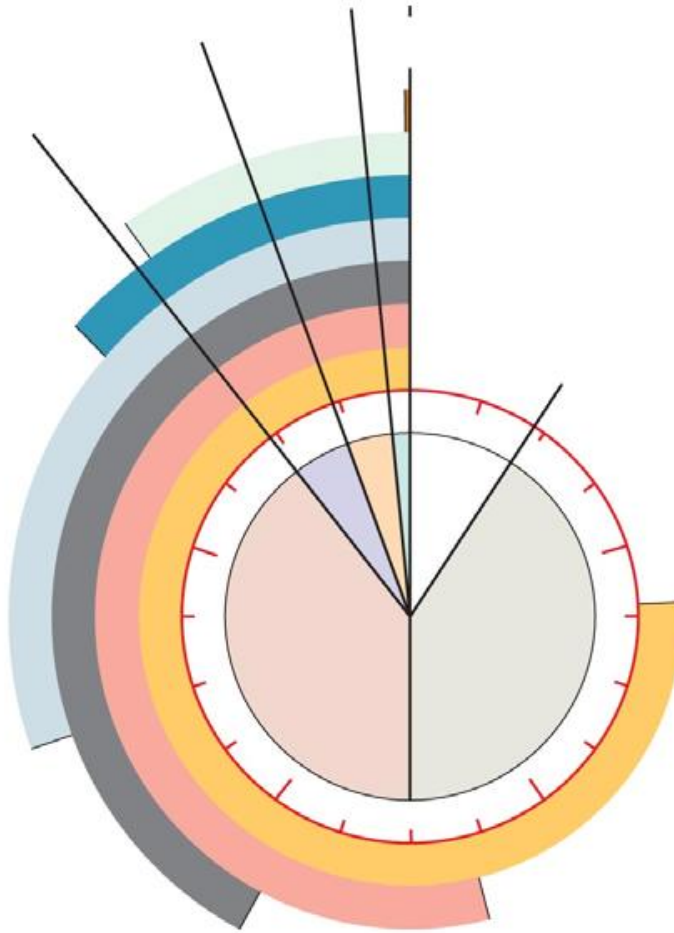
Explain the evidence for an early "RNA world."

25.2 Fossil Record

R_____ d _____ is a common technique for determining the age of rocks and fossils. It is based on the h_____ - l_____ of isotopes.

25.3 The History of Life

Use the clock model to note the following events in the life of the planet: *origin of the Earth*, *appearance of prokaryotes*, *evolution of atmospheric oxygen*, *occurrence of eukaryotic cells*, *multicellularity*, and *life moves onto land*. For each event, also label the number of years ago it occurred.



25.4 Rise and fall due to speciation and extinction rates

Summarize Plate Tectonics:

What is a mass extinction and how many have we experienced?

What is adaptive radiation and when does it occur?

Give an example of a global adaptive radiation:

Give an example of a regional adaptive radiation:

25.6 Evolution is not goal oriented

What is an exaptation?

- An example of an **exaptation** is the changing function of lightweight, honey-combed bones of birds.
- The fossil record indicates that light bones predated flight.
- Therefore, they must have had some function on the ground, perhaps as a light frame for agile, bipedal dinosaurs.
- Once flight became an advantage, natural selection would have remodeled the skeleton to better fit their additional function.

Evolutionary trends can be guided by “species selection.”
How is this similar to natural selection?

