

## Topic 1 Review: History of life

## Topic 1 learning targets

- Describe the methods used in each of the origin of life experiments and explain the results of each experiment.
- Create a basic timeline of the history of living organisms

1. Explain the difference between relative dating and absolute dating.

**Relative dating involves looking at layers- the deeper in the earth something is found, the older it is/longer ago it lived (the closer to the surface, the more recent); Absolute dating gives a near-exact age and involves radioactive decay (isotopes/half-life)**

2. What do scientists hypothesize about early Earth and the origin of life?

**They have hypothesized that conditions on early earth allowed for amino acids to form spontaneously (leads to proto-cells and eventually prokaryotic cells); Earth's early atmosphere did not have FREE oxygen**

3. What is spontaneous generation and which scientist supported it?

**Spontaneous generation is the idea that life can come from non-living matter (frogs arise from mud, when in actuality they were previously tadpoles that underwent metamorphosis). John Needham supported this belief and tested it by boiling broth to remove microbes. He then left his flasks out, uncovered, and saw them teeming with life after a matter of days.**

4. What is biogenesis and which scientist first found evidence to support it?

**Biogenesis is the belief that life can only come from other living things (bio = life, genesis= start or origin). Redi was the first scientist discussed in class to test and support this (jars with meat- one covered/sealed, one covered with a porous cover, and one left open... the only meat that later had flies on it was the open jar).**

5a. Which animal life was dominant in the Mesozoic Era? **Reptiles (meso = middle)**

5b. Which animal life was dominant in the Cenozoic Era? **Mammals (ceno = new or current)**

5c. Which animal life was dominant in the Paleozoic Era? **Amphibians (paleo = ancient; life began in water)**

6. What is the endosymbiosis theory and what are two lines of evidence to support it?

**Endo = within; Symb= together or relationship**

**Endosymbiosis is the theory that explains how eukaryotic cells evolved from prokaryotic cells. A large prokaryotic cell engulfed a smaller one, but didn't digest/break it down. Instead, it began acting as an organelle within the larger cell (mitochondria/chloroplast). Evidence supporting this includes the mitochondria and chloroplast each having a double membrane (original cell membrane + the membrane that developed as it was engulfed); presence of ribosomes within each the chloroplast and mitochondria; presence of DNA in both chloroplast and mitochondria. They also reproduce independently of just cellular reproduction.**

7. Number the events from history of life on earth (number 1 being oldest, 7 youngest):

- | #        | Event   |
|----------|---|
| <u>3</u> | Cyanobacteria evolve; modify atmosphere                                   |
| <u>4</u> | Eukaryotes evolve   |
| <u>5</u> | Complex multicellular organisms evolve, and first land plants appear      |
| <u>2</u> | Unicellular life (prokaryotic heterotrophs)                               |
| <u>1</u> | First organic molecules form from components of early atmosphere + energy |
| <u>7</u> | Mammals evolve  |
| <u>6</u> | Reptiles dominate; angiosperms (flowering plants) and insects co-evolve   |

8. Who conducted the following experiment?

Miller and Urey (Stanley Miller and Harold Urey)

9. How did they model conditions that existed on early Earth in their experiments?

They filled their apparatus with gases that represented what was present in Earth's early atmosphere. Additionally, they simulated lightning by adding electric sparks.

10. What question did they experiment seek to answer?

Could life have begun on early earth under these conditions? How would it have begun? What did these conditions give rise to?

11. What were the results of their experiment?

They were able to produce amino acids! Organic compounds could generate under conditions present on early earth.

12. Describe or draw Pasteur's experiment and explain how it showed evidence to support biogenesis.

Pasteur used swan-neck (aka S-neck or curved) flasks and filled them with broth. He boiled the broth to remove any microbes present and then allowed the flasks to sit out, looking to see if life began to appear in the flasks. The curves of the necks allowed for air to enter and exit (gas exchange between flask and environment), but they captured/trapped any microbes that entered before they touched the broth. Pasteur didn't see any microbial growth until he removed the neck (or tilted the flask). After removal or tipping, microbes entered the flask and began to reproduce.

