

Astronomy 305: Life in the Universe  
Homework 6: Chapter 6

Total points: 60

1. (10 pts) [a] What are the three lines of fossil evidence that point to an early origin of life on Earth? Discuss each line and what it tells us about when life arose. [b] What are the implications of an early origin for the possibility of life elsewhere?
2. (6 pts) [a] Based on current evidence, what locations on Earth seem likely for the origin of life? [b] What locations can we rule out?
3. (14 pts) [a] What was the Cambrian explosion? [b] When was the Cambrian explosion? [c] Briefly discuss ideas about what might have caused it and why no similar event has happened since.
4. (10 pts) [a] What was the K-T impact, and how is it thought to have led to the demise of the dinosaurs? [b] What evidence supports this scenario? [c] How did this event pave the way for our existence?
5. (2 pts) The origin of life on Earth most likely occurred
  - (a) before 4.5 billion years ago;
  - (b) between about 4.5 and 3.5 billion years ago;
  - (c) between about 3.0 and 2.5 billion years ago.
6. (2 pts) The first living organisms probably were
  - (a) cells without nuclei that used RNA as their genetic material;
  - (b) cells with nuclei that used RNA as their genetic material;
  - (c) cells with nuclei that used DNA as their genetic material.
7. (2 pts) The importance of the Miller-Urey experiment is that
  - (a) it showed beyond doubt that life could have arisen naturally on the young Earth;
  - (b) it showed that natural chemical reactions can produce building blocks of life;
  - (c) it showed that clay can catalyze the production of RNA.
8. (2 pts) "RNA world" refers to
  - (a) the possibility that life migrated from Mars;
  - (b) the idea that RNA was life's genetic material before DNA;
  - (c) the idea that early life was made exclusively from RNA, needing no other organic chemicals.
9. (2 pts) Early life arose in an oxygen-free environment, but if any of these microbes had somehow come in contact with oxygen, the most likely effect would have been
  - (a) nothing at all;
  - (b) to increase their metabolic rates;
  - (c) to kill them.
10. (2 pts) The oxygen in Earth's atmosphere was originally released by
  - (a) outgassing from volcanoes;
  - (b) plants;
  - (c) cyanobacteria.
11. (2 pts) The Cambrian explosion refers to
  - (a) a dramatic increase in animal diversity beginning about 542 million years ago;
  - (b) the impact that killed the dinosaurs;
  - (c) the sudden emergence of eukaryotic life in the geological record dating to about 2.1 billion years ago.
12. (2 pts) Which statement about Earth's ozone layer is true?
  - (a) It formed only after the atmosphere became rich in oxygen.
  - (b) It has existed since life first arose on Earth.
  - (c) It first formed a few hundred million years after life colonized

the land.

13. (2 pts) The hypothesis that an impact killed the dinosaurs seems
  - (a) well supported by geological evidence;
  - (b) an idea that once made sense but now can be ruled out;
  - (c) just one of dozens of clear examples of impacts causing mass extinctions.
14. (2 pts) According to the fossil evidence, modern humans
  - (a) evolved from chimpanzees;
  - (b) evolved on a lineage that split from other apes 6 million years ago or more;
  - (c) lack any known ancestors during the past few million years.