

Astronomy 305: Life in the Universe  
Homework 7: Chapter 7

Total points: 60

1. (4 pts) [a] How does the strength of sunlight vary with distance from the Sun? [b] Discuss the implications for photosynthetic life.
2. (16 pts) [a] Why is a liquid medium important for life? [b] What are the four reasons that water seems the most favorable liquid medium for life? [c] Briefly discuss a few other potential liquids for life.
3. (10 pts) [a] Summarize the three major environmental requirements for life. [b] Overall, what "litmus test" seems appropriate for constraining our search for habitable worlds, and why?
4. (10 pts) [a] Describe and distinguish between space missions that are "flybys", "orbiters", "landers", or "probes", and "sample return missions". [b] What are the advantages and disadvantages of each mission type?
5. (2 pts) Oxygen and carbon are
  - (a) rarer than almost all other elements;
  - (b) found only on worlds that are the closest to a star;
  - (c) the third- and fourth-most-abundant elements in the universe.
6. (2 pts) On an asteroid that is twice as far as Earth from the Sun, the strength of sunlight would be
  - (a) twice as great as on Earth;
  - (b) 1/2 as great as on Earth;
  - (c) 1/4 as great as on Earth.
7. (2 pts) Compared to liquid water, liquid methane is
  - (a) colder;
  - (b) hotter;
  - (c) a better solvent.
8. (2 pts) Frozen lakes often have liquid water beneath their icy surfaces primarily because
  - (a) Earth's internal heat keeps the water liquid;
  - (b) ice floats and provides insulation to the water below;
  - (c) sunlight penetrates the ice and warms the water below.
9. (2 pts) Temperatures on Mercury are
  - (a) always very hot;
  - (b) very hot in the day and very cold at night;
  - (c) about the same as those on Venus.
10. (2 pts) On Venus, liquid water
  - (a) does not exist anywhere;
  - (b) exists only deep underground;
  - (c) exists only high in the atmosphere.
11. (2 pts) The reason that Venus is so much hotter than Earth is
  - (a) it has many more volcanoes;
  - (b) its closer distance to the Sun makes sunlight dozens of times stronger;
  - (c) its thick, carbon dioxide atmosphere creates a far stronger greenhouse effect.
12. (2 pts) Life is probably not possible in Jupiter's atmosphere because
  - (a) it is too cold there;
  - (b) there is no liquid water at all;
  - (c) winds are too strong.
13. (2 pts) Which of the following are you most likely to find if you randomly choose a small moon of one of the Jovian planets to examine?
  - (a) water ice;

- (b) organic molecules;
- (c) an abundance of heavy metals, such as gold

14. (2 pts) The Cassini spacecraft

- (a) flew past Pluto;
- (b) landed on Mars;
- (c) is orbiting Saturn.