

Exam of course "Astrobiology",

1. In order to have life, we first need a planet. This is a statement made during the course.

a) Can you say why? Give some reasons why you need a planet. Argue also why you may not need the planet.

b) Discuss how a planet is formed, the different stages and fundamental steps. The steps should be detailed. There should also be at least an indication of the timescale.

c) Are there unaltered remnants of this process present in the Solar system today? Where? Can they be used to further elucidate the early stages of solar system building in any way?

Answer: e.g. Comets in orbits thought to be ~ primordial (Kuiper Edgeworth belt, Oort cloud). In situ or spectroscopic analysis can say something about material and distribution in early solar system

2.

a) Describe the conditions and evolution of the young Earth. How do you date different phenomena?

b) What do we know about the early life? What are the different indicators of about when the first life occurred on the Earth?

c) What are the hypotheses of the atmosphere of the young Earth?

3.

a) What is the Miller experiment?, What is its history?, how is the experiment performed?, and what is its results?

b) How does the Miller experiment results relate to conditions we thought occurred on the Early Earth and its atmosphere?

4. Why is water (and in liquid form) considered to be important for the presence of life as we understand it? What are the properties of water that make it so important?

5. Describe a possible pathway for life as it could have occurred 4 Gyrs ago, based on Carbon and resulting in a first cell
6. Give a definition of what Astrobiology is. What are its aims and ambition. Suggest at least two ways that one can make progress in this new discipline
7. Provide a timeline of life's history on the Earth describing some of the important evolutionary steps from the first cell ~4 Gyr ago until now
8.
 - a) Describe what the role of DNA and RNA are in the biology of life. What do these two molecules do? How does transcription work?
 - b) What is a ribosome?
 - c) What is a chromosome?
 - d) What is a peptide?, A protein? What are the building blocks of these molecules?
 - e) What does a cell look like? What are its fundamental components?
9.

Outline a roadmap for how to search for biomarkers. What are biomarkers?
10. The Universe is tending towards larger degree of disorder (higher entropy), while life is continuously being formed with higher degrees of structure than its components. Does life contradict the 2 law of thermodynamics? Give a brief analysis of this issue.