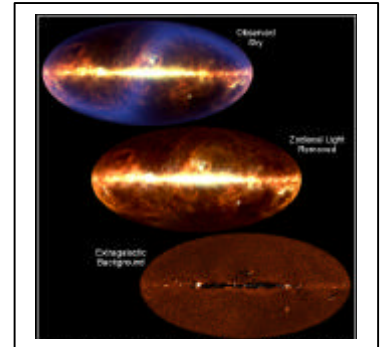


I. Short Answer Questions DO ALL OF THEM, PLEASE

SAQ #1. According to the syllabus, what are the 4 major objectives of the course? (Please list AND briefly explain each one in about 5-10 words)

SAQ #2. Currently, astronomers theorize that the Universe began with a “big bang” approximately how many years ago?

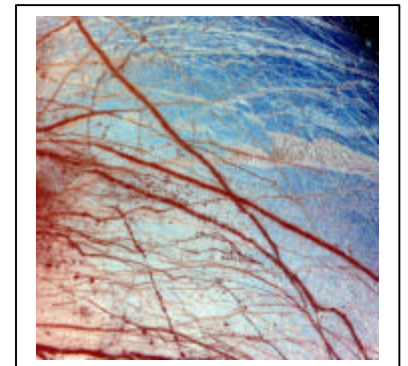
SAQ #3. Please briefly describe ONE specific line of evidence that astronomers use to support the “Big Bang” Theory. (one hint: remember the photo below?)



SAQ #4. Where AND how were all of the heavier atoms that make up most of our planet and the molecules of our bodies originally formed? (one hint: remember the photo?)



SAQ #5. Please examine the photo at of the fractured surface of the moon Europa, which is the second closest moon of Jupiter. What is the visible evidence in this photo that water is in liquid form on Europa?



SAQ #6. Please explain how it is that despite Europa’s small size and vast distance to the sun, there could possibly be liquid water there? Explain what is the heat source that could be melting Europa’s ice?

SAQ #7. What are the pros and cons of the hypothesis that the life first evolved at or very near to the Earth’s surface?

SAQ #8. What are the pros and cons of the hypothesis that the life first evolved at deep ocean hydrothermal vents?

SAQ #9. What is the most likely explanation for the origin of the short term high energy carrier molecule, ATP? Why might adenine have been “selected” as the object attached to the triphosphate as opposed to one of the other nucleic acids?

SAQ #10. What exactly caused “banded iron” formations to form, and what major event in the evolution of life occurred to cause “banded iron”?



SAQ #11. Please briefly explain the concept of “natural selection” and specifically explain why it is true that natural selection cannot create variation – it can only destroy it.

SAQ #12. What are some of the principal arguments for why RNA “ribozymes” were likely to have been the first organic molecules to function as catalysts of the biosynthesis of organic polymers (protein enzymes evolved later)?

SAQ #13. **CHOOSE ONE of the two questions on this page** and answer it below in the space provided. A short answer is sufficient, however, you must use a sketch and supporting details to illustrate your answer.

(A) Please briefly outline the key steps that may have led to the evolution of photosynthesis from heterotrophic bacterial ancestors.

(B) Please briefly outline the key steps that may have led to the evolution of aerobic respiration.

which Q are you answering ? _____ (HINT: you are welcome to draw inspiration from the figures on the next page, however, make sure you answer either (A) or (B) from this page.)

SAQ #14. Please compare and contrast the biological and phylogenetic species concepts. Briefly define and give at least one pro and one con for each concept.

Part II. Longer Answer Questions (12 points each). You must ANSWER LAQ#1 and then CHOOSE ANY 2 of the remaining 3. Please, put a big "X" across the 2 questions you do NOT want me to grade.

LAQ #1. Part A. Describe the process of generating phylogenetic trees. Your answer should include the use of the word "homology" (along with other relevant terminology).

Part B. Besides the species concept employed, how else does phylogenetic classification differ from traditional classification?

LAQ #2. State what are the four challenges for the earliest life forms to have solved? AND, for each problem, please list key details of the solution found among the first life forms (heterotrophic bacteria) that provide evidence for the common ancestry of all life.

statement of challenge 1 / list evidence of common ancestry from the solution to 1 -

statement of challenge 2 / list evidence of common ancestry from the solution to 2 -

statement of challenge 3 / list evidence of common ancestry from the solution to 3 -

statement of challenge 4 / list evidence of common ancestry from the solution to 4 -

LAQ #3. Stuart Kaufmann wrote that life is “an expected, emergent collective property of complex systems of polymer catalysts” (Kaufmann 1993. p 287). Please explain in your own words what he meant by this and include in your answer what were some of his key supportive arguments.

LAQ #4. Please explain the endosymbiotic hypothesis for the origin of eukaryotic life forms.

What were the key steps involved, in what order did they occur, and what are some of the key lines of evidence for your scenario?

LAQ #5 This question will assess your understanding of ribosomes and the origin of the genetic code.

Please briefly explain the evolution of the “generalized ribosome” for protein synthesis. What were the precursors? How exactly were the precursors “specialized”? And, what was the basic sequence of steps to may have led to the generalization of this critical sub-cellular component. Please use the following terms (DNA, mRNA, rRNA, tRNA, ribozymes, nucleic acids, protein enzymes, amino acids, and genetic code) in your answer.