Section 1 Astronomy 230 Fall 2006

Hour Exam 1

Test Form A

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1. **DO NOT OPEN THIS EXAM UNTIL INSTRUCTED TO DO SO.**
2. Write the multiple-choice answers on your test booklet.
3. Make sure to mark Test Form A and your name in your test booklet. I do not need your social security number.
4. Answer *ALL* of the questions. There is no penalty for guessing.
5. Don't get stalled on any one question.
6. Choose the **best** answer for each problem.

DO NOT FORGET TO FILL IN "TEST FORM" A

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1. Which of these statements about the early Universe is **true**?
   A) The early Universe had no matter, only energy.
   B) The early Universe had a distinct edge.
   C) The early Universe was cooler than today.
   D) The early Universe was less dense than today.

2. How are the stars forming today different than the first stars?
   A) stars today do not burn as bright, because they are more massive and harder to heat up than the first stars
   B) stars today have heavier elements in them, and mostly live longer
   C) stars today burn brighter, as they have better fuel sources
   D) stars today are smaller because most of the hydrogen is gone
   E) stars today are powered by fusion, while the first stars used fission

3. Imagine that we receive our first ET visitor, but their stomachs do not agree with Earth food. Why might this be true?
   A) They actually eat humans, but are too polite to destroy our race.
   B) As we are farther out in the Galaxy, our food has less iron.
   C) ETs will probably be allergic to water, and our food is mostly water.
   D) Chirality: they are right handed life.
   E) None of the above.

4. About 1 millisecond after the Big Bang, why did elementary particles, such as quarks, begin to form more complex particles?
   A) The First Stars forged them due to hydrostatic equilibrium.
   B) The Cosmic Microwave Background radiation forced them together.
   C) Intense heat and pressure forced them together.
   D) The Universe cooled, which allowed them to coalesce.
   E) None of the above.

5. We have only detected Jupiter sized planets around other stars because
   A) smaller planets collide with the star
   B) Jupiter-type planets are just nicer to look at
   C) the technology of the detection techniques can not detect smaller planets yet
   D) they represent burned up corpses of binary star systems
   E) small planets like those in our solar system are freak occurrences

6. String theory is a nice theory of everything because the strings only exist in 2 dimensions.
   A) false
   B) true

7. Future humans will probably only mine the Moon for expensive metals like Gold.
   A) false
   B) true

8. Which of the following is **not** a possible fate of the Universe?
   A) The Casmir Effect (Zero Point Energy Universe)
   B) The Big Crunch (Closed Universe)
   C) The Big Chill (Open Universe)
   D) The Peter Out (Flat Universe)
   E) none of the above

9. In the Early Universe, the dark age was due to
   A) the lack of intelligent life to see
   B) the cosmic microwave background not being very bright
   C) the gas being too hot to collapse into stars
   D) the lack of any matter
   E) the electrons, which could not escape their atom bonds

10. A star is born. Which of the following did not happen?
   A) fusion begins due to heat and pressure
   B) an outflow or jet of material is ejected from the system
   C) a protoplanetary disk forms due to conservation of momentum
   D) the strong force created a gravity instability
   E) a gas cloud clumped because of gravity and began to collapse

11. The number of stars in the Universe is equal to all the grains of sand on all the beaches and deserts on Earth.
   A) false
   B) true

12. Which atom in HONC was the last to be produced in great quantities in the early Universe?
   A) C
   B) N
   C) H
   D) All produced at the same time
   E) O

13. Carbon is important to life on Earth because
   A) it is part of the crucial amino group
   B) it easily forms strong long chains
   C) it has bonds that are nearly indestructible
   D) it is common in the Earth's crust
   E) it performs well in solvents

14. DNA uses 4 possible bases in combinations of three to encode an amino acid because
   A) three bases in a row allow one to encode up to 64 amino acids; two bases would only allow 16 amino acids
   B) there are only 3 amino acids in a typical protein
   C) three is more stable than two or four, so nature chose it
   D) three is the general chain of carbohydrate groups to make lipids
   E) three is the nearest integer to pi

15. Dark energy is
    A) the dark side of the force
    B) 25% of all matter
    C) the stored energy of dark matter
    D) necessary to explain galaxy clusters
    E) growing weaker as the Universe expands
    F) accelerating the expansion of the Universe

16. The best type of life sustaining stars are
    A) Low mass stars (less than 0.5 solar masses), as life can exist nearer the star where more terrestrial planets are probably located.
    B) Binary stars, as they double the chances of life.
    C) Stars off the main sequence, as they have lived the longest, they are the best chance for finding intelligent life.
    D) Middle mass stars (less than 1.25 and more than 0.5 solar masses), as they live longer and don't require the planets to be too close.
    E) Massive stars (more than 2 solar masses), as they have more mass from which to form planets.

17. Life on Earth
    A) arose quickly after the period of bombardment in the early solar system ceased
    B) is clearly the only life in the Universe
    C) was an easy transition that can be followed by fossils
    D) based on the fossil record, primarily occurred due to viruses, the simplest form of life today.
    E) could only have been due to panspermia

18. **Essay Question (40 points):** Discuss the origin of the crucial elements of life (H, O, N, and C) and what life on Earth has done with them. You **must** use the following terms: quarks, first stars, proto-galaxies, CNO cycle, nucleic acids, proteins, Miller-Urey experiment, and polymer synthesis. Make sure to underline and briefly define each term used.

    Underline the terms above in your discussion. Points are given for good descriptions of above terms, and for the general story.

19. **Essay Questions (25 points total):** Pick **two** of the following 3 questions and answer using about 1-2 paragraphs.

    a) We are not certain how monomers were created on Earth; we do have a few plausible formation scenarios. Explain two of these possibilities.

    b) Describe how a protoplanetary disk forms and why it is important to the search for extraterrestrial life.

    c) How are the planets in our solar system ordered? Explain how we think that happened. Compare to extrasolar planets.