

Section 1

Astronomy 330

Spring 2010

Exam 1

Test Form A

1. **DO NOT OPEN THIS EXAM UNTIL INSTRUCTED TO DO SO.**
2. Write the multiple-choice answers on your Scantron form.
3. Make sure to mark your test form and your name on your form. 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

1. What will happen when the Sun runs out of hydrogen in the core?
 - A) It will burn silicon into iron.
 - B) It will be dead.
 - C) It will become a planetary nebula.
 - D) It will become a red giant, burning a shell of hydrogen around a smaller core.
 - E) Nothing.

2. Dark energy is
 - A) growing weaker as the Universe expands.
 - B) 25% of all matter.
 - C) necessary to explain galaxy clusters.
 - D) the stored energy of dark matter through $E = mc^2$.
 - E) the dark side of the force
 - F) accelerating the expansion of the Universe.

3. Circumstellar or protoplanetary disks around young stars are
 - A) likely the work of advanced civilizations using the stellar energy output of the star.
 - B) only seen in very old stars.
 - C) common.
 - D) rare.
 - E) observed with special telescopes, but they can not be explained.

4. What will ultimately determine the fate of the Universe?
 - A) Bright Matter.
 - B) Dark Matter.
 - C) Hubble's Law.
 - D) The mass of the Universe.
 - E) Dark Energy.

5. Our Sun is at least a
 - A) second generation star.
 - B) fourth generation star.
 - C) We don't know.
 - D) first generation star.
 - E) third generation star.

6. A light year is
 - A) the time it takes light to travel from the Earth to the Sun.
 - B) the distance from the Earth to the Sun.
 - C) the time it takes light to travel.
 - D) the distance light travels in one year.
 - E) impossible to understand.

7. A star is born. Which of the following did **not** happen?
- A) An outflow or jet of material is ejected from the system
 - B) A protoplanetary or circumstellar disk forms due to conservation of momentum
 - C) Fusion begins due to heat and pressure
 - D) The strong force created a gravity instability
 - E) A gas cloud clumped because of gravity and began to collapse
8. Why do all the planets in our Solar System orbit the Sun in the same direction and plane?
- A) We don't know.
 - B) They formed in the circumstellar disk.
 - C) They don't. It is more or less random.
 - D) Coincidence, suggesting that life is less common than we thought.
 - E) From conservation of angular momentum, requiring anything orbiting to cancel out the spin of the Sun.
9. What keeps the Sun from changing size today?
- A) Gravity.
 - B) Giant winds.
 - C) Orbital friction.
 - D) Hydrostatic equilibrium.
 - E) Fusion.
10. Which of the following is **not** important when considering a value for R_* ?
- A) The fact that the Milky Way is accreting new hydrogen gas from our satellite galaxies.
 - B) The age of the Universe or the age of the Galaxy.
 - C) The likelihood of a time of more than usual star formation in the Galaxy.
 - D) The number of low-mass stars found in clusters.
 - E) The number of stars in the Galaxy.
11. How are the stars forming today different than the first stars?
- A) Stars today have heavier elements in them, inherited from the earlier generation of stars.
 - B) Stars today are powered by fusion, while the first stars used fission
 - C) Stars today do not burn as bright, because they are more massive and harder to heat up than the first stars
 - D) Stars today burn brighter, as they have better fuel sources
 - E) Stars today are smaller because most of the hydrogen is gone
12. Which of the following does **not** well describe pseudoscience?
- A) Assertion of claims of a conspiracy to suppress the results.
 - B) Over-reliance on testimonial, anecdotal evidence or personal experience.
 - C) Assertion of claims of secrecy or proprietary knowledge.
 - D) Experiments must be well described so that they can be duplicated.
 - E) Misuse of apparently technical jargon.

13. What will the Sun turn into at the end of its evolution?
- A) Nothing, complete explosion.
 - B) A White Dwarf.
 - C) Supernova.
 - D) A blackhole.
 - E) A Red Dwarf.
14. Why is Pluto now called a Dwarf Planet?
- A) New observations of Pluto showed that it was a lot smaller in size than we previously thought.
 - B) We found out that Pluto was never a planet.
 - C) We found an object that was actually bigger and more massive than Pluto.
 - D) The definition of planet was changed.
 - E) Its rotational energy decreased, which pushed it out of planetary orbits into the Oort Cloud.
15. Which of the following is the best evidence today that Panspermia is feasible?
- A) Bacteria are yucky.
 - B) Bacteria can live on the Moon.
 - C) Bacteria can live in the Space Station.
 - D) Bacteria last a long time since they have no enemies.
 - E) Bacteria can live forever.
16. The first stars formed. Why?
- A) Something triggered a collapse of a molecular cloud.
 - B) The initial density clumps (think CMB) became more and more condensed until the centers were hot enough for fusion.
 - C) Necessary to make C and O.
 - D) Rotation of the proto-galaxies created friction that sparked fusion.
 - E) The nuclear strong force snowballed material into hot clumps of gas.
17. Compare a 1 solar mass star (star A) to a 50 stellar mass star (star B).
- A) Born at exactly the same time.
 - B) Both will burn for about the same amount of time.
 - C) Star A will last longer.
 - D) The same color.
 - E) Star B is not as bright.
18. What is the importance of the Drake Equation?
- A) Gives us the number of advanced civilizations in the Universe.
 - B) Helps provide a strong argument for ET life that can be used as proof of ETs.
 - C) It gives us an exact number of alien lifeforms (intelligent or not) in the Galaxy.
 - D) Helps guide our thinking about the important questions concerning the existence of ET life.
 - E) Gives us the number of advanced civilizations in the Galaxy.
19. Why isn't Brooklyn expanding?
- A) Its waveform is collapsed, quantum mechanically speaking, since we are observing it all the time.
 - B) It is held together by stronger local forces.
 - C) It is, but it will take 14.7 billion years to notice it.
 - D) It is held together by the nuclear strong force.
 - E) It is, but the motion is so small that we can only see it over large distances.

20. Why are molecules good for life compared to elements?
- A) Molecules survive better in all environments.
 - B) Plethora of molecules to choose from.
 - C) The electromagnetic force is stronger than the nuclear strong force.
 - D) Easier to eat.
 - E) When put together, they are harder to break apart than elements.
21. Which of the following is **not** evidence of the Big Bang?
- A) Big Bang Nucleosynthesis.
 - B) Expansion of the Universe.
 - C) Dark Energy.
 - D) Hubble's Law.
 - E) Cosmic Microwave Background.
22. In this class we assume that the Universe is homogenous and isotropic because
- A) It gives the best chance for finding extraterrestrial life because if they are there, then they might be here.
 - B) It assumes that the laws of nature are different everywhere.
 - C) It allows us to apply our understanding of astronomy and biology (and all science in general) to other stars, other planets, and ET life.
 - D) It will probably be assumed by aliens too.
 - E) It assumes that the rules for life on our planet will be very different from other planets, which implies that ETs will look very different than humans.
23. Which of the following is **not** a possible fate of the Universe?
- A) The Peter Out (Flat Universe)
 - B) The Big Crunch (Closed Universe)
 - C) The Casimir Effect (Zero Point Energy Universe)
 - D) The Big Chill (Open Universe)
 - E) none of the above
24. What determines the length of a year?
- A) The time it takes from January to December.
 - B) The time it takes the Sun to orbit the Galactic Center.
 - C) The time it takes the Earth to rotate once.
 - D) The time it takes the Earth to orbit the Sun.
 - E) The time it takes the Moon to orbit.
25. Our Universe could be one of three types: Open, Closed, or Flat. What would happen to a Flat Universe?
- A) It would expand for a while, and then eventually begin to re-collapse on itself.
 - B) It would just barely expand forever.
 - C) It would expand for a while, and then stop.
 - D) It would expand forever.
 - E) It would expand, then slow down, and then expand faster.

26. What is fusion?
- A) Taking a heavy nucleus apart to make two lighter ones.
 - B) Putting two light nuclei together to make two lighter ones.
 - C) Putting two heavy nuclei together to make a heavier one.
 - D) Putting two light nuclei together to make a heavier one.
 - E) Taking a light nucleus apart to make protons.
27. What makes up a proton?
- A) A neutron and an electron.
 - B) Gluons.
 - C) Quarks.
 - D) It is a sub-atomic particle, indivisible.
 - E) Electrons.
28. Which element in HONC was the last to be produced in great quantities in the Universe?
- A) All produced at the same time
 - B) H
 - C) O
 - D) N
 - E) C
29. Near the end of a massive star's life, what does the interior elemental makeup look like?
- A) An upside down cake, with layers of alternating fillings.
 - B) It is all mixed up, like an Ogre.
 - C) We don't know, but a supernova explosion scatters them into the Universe.
 - D) Layers of different elements from the ashes of the fusion.
 - E) An orange, wedges of elements.
30. Which of the following is **not** a structure in star formation?
- A) Envelope.
 - B) Protostar.
 - C) Circumstellar disk.
 - D) Circumstellar rhombus.
 - E) Outflow or jet.
31. Where did the Big Bang happen?
- A) We don't know.
 - B) An explosion into empty space, that then filled that empty space.
 - C) Here, there, everywhere.
 - D) At the edge of the observable Universe.
 - E) Right outside of the observable Universe, behind the era of recombination.
32. Which of the following is **not** a lesson learned from interstellar molecules?
- A) At least 13-atom molecules can form in space.
 - B) What we call soot and dust also exists in space; playing an important role in the formation of molecules in space.
 - C) Panspermia explains the origin of life on Earth via molecules in space.
 - D) Carbon dominates interstellar chemistry.
 - E) Complex molecules (even pre-biotic) can form without being destroyed by UV light.

33. Which of these statements about the early Universe is **true**?
- A) The early Universe was cooler than today.
 - B) The early Universe was dominated by energy.
 - C) The early Universe was only dark energy.
 - D) The early Universe was less dense than today.
 - E) The early Universe had a distinct edge.
34. We observe the CMB. What caused the small variations in brightness?
- A) The Big Bang.
 - B) The era of recombination.
 - C) We don't know.
 - D) Small sub-atomic fluctuations that were inflated.
 - E) Proto-galaxies.
35. Soon after the Big Bang, one out of every billion protons was destroyed. Why?
- A) Big Bang Nucleosynthesis.
 - B) The Era of Recombination.
 - C) Matter/anti-matter annihilation.
 - D) Gluons forced them into prison for 10^{31} years.
 - E) Inflation.
36. Consider two galaxies. Galaxy B is twice as far away as Galaxy A. What can we say about their velocity?
- A) Galaxy A is moving toward us twice as fast as Galaxy B.
 - B) Without measuring redshift, we can't say anything specific about the two Galaxies.
 - C) Galaxy A is moving away from us twice as fast as Galaxy B.
 - D) Galaxy B is moving away from us twice as fast as Galaxy A.
 - E) Galaxy B is moving toward us twice as fast as Galaxy A.
37. Where did the element iron in your blood come from?
- A) The ground.
 - B) CNO cycle.
 - C) A planetary nebula.
 - D) A supernova.
 - E) Made in your food.