

R01 D

Astronomy 1504/1514 Section 10
Final Exam, Version 2
May 10, 2010

Choose the answer that best completes the question. Read each problem carefully and read through all the answers. Take your time. If a question is unclear, ask for clarification during the exam.

Mark your answers on the scantron sheet and on your copy of the exam. Keep your copy of the exam and check your grade with the posted answers on my website and the grade posted on D2LRN. You will have until Wednesday May 12 to ask for corrections.

1. What kind of eclipse occurs in a place where only the moon's penumbral shadow comes in contact with the surface of the earth
 - a) partial solar eclipse
 - b) partial lunar eclipse
 - c) total solar eclipse
 - d) total lunar eclipse
2. The statements below refer to changes in the Copernican theory from that of Ptolemy. Which is a true difference?
 - a) Copernicus got rid of epicycles completely
 - b) Copernicus got rid of uniform circular motion
 - c) Copernicus' theory was more accurate
 - d) Copernicus put the sun at the center
3. Which of the following is NOT a fundamental property of a black hole?
 - (a) mass
 - (b) electrical charge
 - (c) temperature
 - (d) baryon number
4. The Hubble constant is related to the ____ of the universe:
 - (a) size
 - (b) mass
 - (c) age
 - (d) luminosity

5. Which type of star is the most massive?
- (a) main sequence B stars
 - (b) main sequence O stars
 - (c) white dwarfs
 - (d) main sequence M stars
 - (e) neutron stars
6. Standard Candles of choice for measuring the nature of the dark energy are:
- (a) RR Lyra stars
 - (b) Type Ia Supernovae
 - (c) M dwarf stars
 - (d) Extra solar giant planets
 - (e) Cepheid Variables
7. The "cosmological constant" was introduced by Einstein to:
- (a) Make the universe static
 - (b) Make his equations stable
 - (c) Explain Hubble's Law
 - (d) Make his equations pleasing to the eye
8. The percentage of stars thought to be binary is ____ per cent.
- (a) 10%
 - (b) 30%
 - (c) 50%
 - (d) 75%
 - (e) 95%
9. The solution to Olber's paradox requires that:
- (a) The universe is expanding
 - (b) The universe has no center
 - (c) The universe has no edge
 - (d) The universe had a beginning
10. In an infinite static Newtonian universe that has existed forever, the night sky should be:
- (a) Dark
 - (b) Infinitely bright
 - (c) About as bright as the surface of an average star
 - (d) none of the above

11. Choose the proper values of Ω based on our current knowledge.
- (a) $\Omega_b = 0.50, \Omega_{DM} = 0.50, \Omega_{DE} = 0.0$
 - (b) $\Omega_b = 0.05, \Omega_{DM} = 0.30, \Omega_{DE} = 0.1$
 - (c) $\Omega_b = 0.05, \Omega_{DM} = 0.25, \Omega_{DE} = 0.7$
 - (d) $\Omega_b = 0.05, \Omega_{DM} = 0.03, \Omega_{DE} = 0.97$
12. The total number of extrasolar planets that have been detected to date is about:
- (a) one
 - (b) two
 - (c) none
 - (d) 500
13. Scientists are worried about increases in the amount of CO_2 in the earth's atmosphere due to the burning of fossil fuels because:
- (a) CO_2 is a greenhouse gas
 - (b) it could lead to global warming
 - (c) it could lead to melting of the ice in Antarctica
 - (d) all of the above
14. The intersection of the plane that is defined by the orbit of the earth around the sun with the celestial sphere is the same as:
- a) the celestial equator
 - b) the vernal equinox
 - c) right ascension
 - (d) the ecliptic
15. We know that the seasons have nothing to do with the change in distance between the earth and the sun because:
- a) The moon goes through its phases in winter and summer.
 - b) Spring tides are stronger in both winter and summer.
 - (c) It is winter in Norman when the earth is closest to the sun
 - d) rivers would all flow east-west
16. The sun passes through the vernal equinox heading which direction in the sky (with respect to the celestial equator)?
- a) East
 - b) West
 - (c) North
 - d) South

17. The ecliptic is farthest from the celestial equator at (THINK!):
- a) the north and south celestial poles
 - b) the vernal and autumnal equinoxes
 - c) the summer and winter solstices
 - d) lunar and solar eclipses
18. The condensation sequence suggests that ____ should condense farthest from the sun:
- (a) Terrestrial Planets
 - (b) metals and metal oxides
 - (c) silicates
 - (d) ices of water, methane, and ammonia
19. The earth's moon likely formed via:
- (a) impact of a mars sized body with the earth
 - (b) fission of the proto-earth
 - (c) capture of the moon by the earth
 - (d) the earth and moon formed together
20. Liquid water is important for life because:
- (a) Water expands when it freezes
 - (b) Water has a large latent heat
 - (c) Water has a large temperature range where it stays liquid
 - (d) all of the above
21. Silicon is unlikely to be the basis of extraterrestrial life because:
- (a) It forms far fewer compounds than carbon
 - (b) The bond between two silicon atoms is weaker than that between two carbon atoms
 - (c) Silicon has a strong affinity for oxygen
 - (d) all of the above
22. The most likely region of the electromagnetic spectrum for communication with other civilizations is:
- (a) UV
 - (b) Gamma-rays
 - (c) the "water hole"
 - (d) Optical

23. The high abundance of oxygen in Earth's current atmosphere is due to:
- (a) Volcanism
 - (b) Cometary impacts
 - (c) Photosynthesis from plants
 - (d) all of these
 - (e) none of these
24. Which of the following is *not* a property of the Jovian planets?
- (a) rings
 - (b) low density
 - (c) many satellites
 - (d) slow rotation
25. Neil de Grasse Tyson didn't include Pluto as a planet in a display at the Rose Planetarium in New York. Why?
- (a) Pluto is dramatically different than its Jovian neighbors
 - (b) Pluto is similar to a class of objects called Kuiper belt objects
 - (c) Pluto's orbit is tilted with respect to the plane of the ecliptic
 - (d) all of the above
 - (e) none of the above
26. It is unlikely that habitable planets will form around O stars because:
- (a) They don't live long enough
 - (b) They live too long
 - (c) They are too hot
 - (d) The life zone is so close that the planet's rotation period would be tidally locked to its orbital period
 - (e) none of the above
27. One of the most important differences between the terrestrial planets and the Jovian planets is:
- (a) the number of moons
 - (b) the existence of rings
 - (c) the presence of liquid water
 - (d) their uncompressed densities
28. The Drake Equation:
- (a) is an extension of Newton's laws
 - (b) is an extension of general relativity
 - (c) expresses the number of technological civilizations per galaxy
 - (d) is incomprehensible to General Astronomy students

29. The stars whose planets have the greatest chance of harboring intelligent life are
- (a) O stars
 - (b) red giants
 - (c) protostars
 - (d) G stars
30. Stars spend 90 percent of their lives in what region of the HR diagram?
- a) The subgiant branch
 - b) The supergiant branch
 - c) The instability strip
 - d) The asymptotic giant branch (AGB)
 - (e) The main sequence
31. One way to estimate a star's surface temperature is to measure its:
- a) apparent magnitude
 - (b) color
 - c) radial velocity
 - d) proper motion
32. A well trained stellar spectroscopist identifies a spectrum of a particular star as an A5 V star, but notices the colors are too red. She could conclude:
- I The star is reddened by interstellar dust
 - II The stellar classification system is wrong
 - III The star appears dimmer than it should due to extinction
 - IV The star is probably a black hole
- (a) I and IV
 - (b) I
 - (c) I and III
 - (d) II and IV
 - (e) I, II, III, and IV
33. Which of these stars is used in the most reliable method for measuring distances to nearby galaxies?
- (a) white dwarfs
 - (b) G2 V stars
 - (c) main sequence M stars
 - (d) Cepheid variables

34. A $5 M_{\odot}$ star would use which process to burn hydrogen on the main sequence?

- a) the proton-proton cycle
- b) the CNO cycle
- c) the triple-alpha reaction
- d) gravitational contraction

35. At the end of its life the sun will become a:

- a) white dwarf
- b) neutron star
- c) pulsar
- d) black hole
- e) main sequence star

36. Which is *not* true about Population I stars in our Galaxy?

- (a) They tend to be found in the disk
- (b) They are relatively young stars
- (c) They have high metallicities like our sun
- (d) They are found in the halo

37. The metal content (metallicity) of the Galaxy:

- (a) Increased as the galaxy got older
- (b) Decreased as the galaxy got older
- (c) Stayed the same as the galaxy got older
- (d) This is nonsense, the galaxy doesn't get older

38. In order to be a spiral galaxy, a galaxy must have:

- (a) Hot gas
- (b) Cool gas
- (c) No gas
- (d) A disk

Useful fact: Apparent magnitude of Barnard's star = 7.5

39. The apparent magnitude of Barnard's star is 7.5. The star Luyten 726-8A is 100 times fainter than Barnard's star. Its apparent magnitude is:

- a) 3.5
- b) 2.5
- c) 12.5
- d) 750.0

40. Another way of saying one billion years is:
- a) 10^2 yr
 - b) 10^3 yr
 - c) 10^6 yr
 - d) 10^8 yr
 - e) 10^9 yr
41. Most proper names for stars are taken from:
- a) Arabic
 - b) English
 - c) Greek
 - d) Latin
42. Which of these will result from precession?
- a) The relative positions of the stars from the north celestial pole changes with time.
 - b) The star that is the north star changes with time.
 - c) Thuban was the north star in Egyptian times.
 - d) Vega will be the north star in 14,000 AD
 - e) All of the above are true
43. The daily rising in the east and setting in the west of the sun, moon, planets and stars can be thought of in two equally valid ways.
- a) due to the rotation of the celestial sphere from east to west or due to the rotation of the earth from west to east
 - b) due to the revolution of the earth around the sun or due to the revolution of the sun around the earth.
 - c) due to the rotation of the moon on its axis or due to the orbit of the moon around the earth
 - d) due to the motions of these bodies in their orbits
 - e) It still is not completely understood.
44. The celestial sphere:
- a) is a useful model of the sky's appearance
 - b) was proposed by Copernicus
 - c) is centered about the sun
 - d) turns once in a year
45. We see different stars in the summer than we do in the winter because:
- a) the earth orbits the sun
 - b) the earth's axis is tipped
 - c) the earth's axis is precessing
 - d) the moon orbits the earth

46. The constellations along the ecliptic are called:
- a) the celestial equator
 - b) the bright stars
 - c) the north and south celestial poles
 - d) the constellations of the zodiac
47. Precession is:
- a) the accuracy with which numbers are given in astronomy
 - b) the slow motion of the earth's rotation axis on the celestial sphere
 - c) the apparent backward motion of planets on the celestial sphere
 - d) the daily eastward motion of the sun around the celestial sphere
48. Ocean tides on earth are caused:
- a) mainly by the sun, but partly by the moon
 - b) mainly by the moon, but partly by the sun
 - c) by the earth's rotation; the sun and moon aren't involved
 - d) the $23\text{-}1/2^\circ$ tilt of the equator with respect to the ecliptic
49. In order for a solar eclipse to occur, the moon must be:
- a) near new moon
 - b) near first or last quarter
 - c) near full moon
 - d) in a retrograde loop
50. Stockholm is at about 60° N latitude. I expect to find Polaris at what angular distance from the horizon?
- a) 20°
 - b) 40°
 - c) 60°
 - d) 80°
 - e) 100°
51. Which of the following is **not** true?
- a) one side of the moon always faces the earth, and the other side never does
 - b) during the two weeks after full moon, the moon is "waning"
 - c) different parts of the moon's surface are illuminated by the sun at "first quarter" and "third quarter"
 - d) one side of the moon is in perpetual sunshine, and the other side is in perpetual darkness

52. If on a certain day the sun has an apparent visual magnitude of -27, while in the evening the moon has an apparent magnitude of -12, how much brighter did the sun appear on that day?
- a) 10 times
 - b) 100 times
 - c) 1000 times
 - d) 10,000 times
 - e) 1,000,000 times
53. I go out camping. I make camp just before the sun sets. I eat dinner and watch the sunset, it gets dark before I start the dishes, but after about an hour the moon rises and I have lots of light to finish the dishes and put them away. The phase of the moon is:
- a) waxing crescent
 - b) full
 - c) waning gibbous
 - d) waxing gibbous
 - e) can't tell from information given
54. Circumpolar constellations are those which:
- a) rise at sunrise and set at sunset
 - b) are always above the horizon at night
 - c) rise at midnight and set at noon
 - d) can't tell from information given
55. The position of the north star in the sky:
- a) depends on your longitude
 - b) depends on your latitude
 - c) both (a) and (b)
 - d) none of the above
56. The first person (that we know about) to teach that thought can lead to understanding of the universe was:
- a) Aristotle
 - b) Eudoxus
 - c) Ptolemy
 - d) Thales
 - e) Hipparchus

57. The first heliocentric model of the universe was developed by:
- a) Aristotle
 - b) Aristarchus
 - c) Ptolemy
 - d) Thales
 - e) Hipparchus
58. Hipparchus:
- a) created the first star catalog
 - b) invented the magnitude system of measuring the brightness of stars
 - c) significantly improved upon Aristarchus' measurement of the earth-sun distance
 - d) all of the above
59. It was first realized that the earth was a sphere by:
- a) the ancient Greeks
 - b) Copernicus
 - c) Newton
 - d) Galileo
 - e) Columbus
60. An important contribution of Thales was that:
- a) thought can lead to understanding of the universe
 - b) he suggested planets move on epicycles around the earth
 - c) he first suggested the motion of the earth about the sun
 - d) he proved astrology to be incorrect
61. 21-cm radiation is produced by:
- a) cold hydrogen gas
 - b) electrons spiraling in a magnetic field
 - c) small dust grains
 - d) the cooling big bang
62. The central engines of quasars are thought to be:
- a) supernova explosions
 - b) nova explosions
 - c) accretion onto a supermassive black hole
 - d) nobody knows

63. The H_α line in neutral hydrogen, H I, is caused by the transition of the electron between which levels?
- a) The ground state ($n=1$) \rightarrow first excited state ($n=2$)
 - b) The second level ($n=2$) \rightarrow second excited state ($n=3$)
 - c) The third level ($n=3$) \rightarrow third excited state ($n=4$)
 - d) The second level ($n=2$) \rightarrow third excited state ($n=4$)
 - e) All of the above
64. Why are hydrogen Balmer lines weak in O stars?
- a) They don't have much hydrogen
 - b) Most of the hydrogen is in the ground state
 - c) Most of the hydrogen is in the second level
 - d) Most of the hydrogen is ionized
65. The amount of energy per unit area emitted by a blackbody is:
- a) proportional to the temperature $E/A = \sigma T$
 - b) inversely proportional to the temperature $E/A = \sigma/T$
 - c) proportional to the temperature squared $E/A = \sigma T^2$
 - d) proportional to the temperature to the fourth power $E/A = \sigma T^4$
66. The first step in the proton-proton cycle:
- a) involves fusing 2 protons to make a deuterium nucleus
 - b) produces a neutrino
 - c) produces a positron
 - d) all of the above
67. One of the chief observational problems in Greek times that led to Ptolemy's complicated system was:
- a) Explaining the phases of the moon
 - b) Explaining the phases of Venus
 - c) Explaining the retrograde motion of Mars
 - d) Calculating the size of the earth
68. The synodic period of the moon:
- a) Is the time it takes to complete its orbit around the earth
 - b) Is the time it takes it to come back to the same place among the stars
 - c) Is the time to complete one cycle of phases
 - d) Is the time it takes to complete its orbit around the sun

69. If a spaceship approaches you at a constant velocity of 99% of the speed of light, you would see its clocks running (compared with yours)

- (a) fast
- (b) backwards
- (c) the same
- (d) slow

70. The moon rises at midnight and sets at noon. Its phase is:

- a) New
- (b) 3rd Quarter
- c) Full
- d) Gibbous
- e) Can't tell

Have a Great Summer!

-END OF TEST-