

Sample Exam Questions for ASTR 1023

The purpose of this sampling is to acquaint you with the way I ask questions. These specific questions will not be used this semester. Math questions like those at the end may appear on all exams.

Sample Questions for Exam 1:

- One light year can be defined as
 - a year that contains fewer calories than most
 - the time required by light to travel to the nearest star beside the Sun
 - the time required by sunlight to reach the Earth
 - the distance traversed by a light beam in one year
- Suppose that there are initially three competing, scientifically plausible explanations for a newly observed natural phenomenon. They have not yet been experimentally tested. Each one is then properly referred to as a
 - fact
 - postulate
 - hypothesis
 - theory
- There are ____ degrees in one full rotation, ____ arcminutes in one degree, and ____ arcseconds in one arcminute.
 - 360...60...3600
 - 60...60...60
 - 60...60...360
 - 360...60...60
- The right ascension and declination of a star
 - depend on the observer's position on Earth
 - change periodically because of the daily rotation of the Earth
 - describe its location relative to fixed locations on the celestial sphere
 - are measured in the same units as longitude and latitude
- The distance of 0.01 m would be written in scientific notation as ____ m.
 - 10^{-1}
 - 10^{-2}
 - 10^1
 - 10^2
- Which European revived the old Greek idea that the Earth and other planets orbit the Sun?
 - Brahe
 - Copernicus
 - Galileo
 - Kepler
- Venus and the Earth have almost identical masses, but Venus is closer to the Sun than the Earth is. Therefore, the Sun's gravity pulls
 - equally on Earth and Venus
 - more strongly on Earth
 - more strongly on Venus
 - insufficient information to answer
- Your roommate, who is normally of medium build, stands upright in a school bus that flies past you at 80% of the speed of light. To you, your high-speed roommate now appears to be
 - fatter
 - skinnier
 - unchanged
 - taller

9. A planet's gravity will curve the paths of passing _____ that were originally moving in straight lines.
 a) rocks b) light rays c) rocks and light rays d) photons
10. The famous equation $E = mc^2$, which describes the potential energy content of any given mass m , fully explains the
 a) mass losses in the Sun's hydrogen fusion reactions
 b) creation of particles having mass by the collisions of energetic photons
 c) mass losses in the uranium-fission reactions of powerplants
 d) all of the above
11. Earth's atmosphere is like a filter that only allows visible light and _____ to reach the ground from outer space.
 a) radio waves b) gamma rays c) X-rays d) sound waves
12. When comparing the light-gathering power of various telescopes, it is important to know that the amount of light entering a telescope is proportional to the _____ of its objective.
 a) diameter b) area c) volume d) thickness

Sample Questions for Exam 2:

13. A scientific instrument designed to "break" light from a star into its component colors is called a
 a) camera b) spectrograph c) CCD d) photometer
14. The _____ force of nature is important because it can hold two protons in a nucleus together despite the incredible repulsive effect of their positive charges.
 a) weak b) strong c) gravitational d) electromagnetic
15. The reddish emission line of hydrogen, H-alpha, has a "true" wavelength of 656.3 nm. If the H-alpha line in a gaseous supernova remnant's spectrum appears at a measured wavelength of 657.0 nm, that would suggest that the remnant is moving
 a) radially away from us b) radially toward us
 c) transversely to the left d) transversely to the right
16. The solar wind
 a) is observed to circulate around the Sun's equator about once per month
 b) causes the Sun to gradually lose mass
 c) consists principally of helium produced by the Sun's nuclear reactions
 d) is observed to emanate primarily from the Sun's polar regions
17. The parallax p of a star in arcseconds and its distance d in parsecs are related by the simple equation $p = 1 / d$. Therefore, a star that is 20 pc away will display a parallax of _____ arcsec.
 a) 5 b) 0.5 c) 0.05 d) 0.005

18. A Watt is a unit of power often used by engineers and electricians. It is also often used by astronomers as a unit of stellar _____ because a Watt has dimensions of _____.

- a) luminosity...energy
b) magnitude...energy
c) luminosity...energy / time
d) magnitude...energy / time

19. Two stars known to be equally distant from Earth have the same color. However, one of them is fainter than the other. This means that the brighter star is _____ than the other one.

- a) hotter
b) larger
c) cooler
d) smaller

20. Most generally, two stars whose orbital motions around each other are readily discernable in a series of images are called _____ binaries.

- a) visual
b) spectroscopic
c) astrometric
d) eclipsing

21. You have observed the spectra of three main-sequence stars, and found them to be of spectral types A, B and K. Arrange these stars in order of increasing mass (from lowest to highest).

- a) A, B, K
b) A, K, B
c) B, A, K
d) K, A, B

Sample Questions for Exam 3:

22. Which phase of the interstellar medium is typically coldest?

- a) intercloud medium
b) atomic clouds
c) molecular clouds
d) coronal gas

23. The temperatures required for stellar nuclear reactions _____ as the electrical charges of the fusing nuclei _____.

- a) increase ... decrease
b) increase ... increase
c) decrease ... increase
d) stay constant ... increase

24. The amount of fuel that a star has to "burn" is proportional to its mass, while the rate at which that star consumes its fuel is proportional to its luminosity. Therefore, a star's fuel-burning lifetime is proportional to its

- a) mass only
b) mass divided by its luminosity
c) luminosity divided by its mass
d) mass times its luminosity

25. A white dwarf has roughly the mass of the Sun, the size of _____, and is internally supported against gravity mainly by the outward pressure of _____.

- a) Earth ... degenerate electrons
b) Stillwater ... degenerate electrons
c) Earth ... normal gas ions and electrons
d) Stillwater ... nuclear fission

26. Single stars ten times more massive than the Sun will eventually explode as

- a) novae
b) supergiants
c) supernovae
d) emission nebulae

27. It is possible for a star's nova explosions to reoccur, sometimes periodically, because

- a) new material keeps falling onto the white dwarf
b) both (a) and (c)
c) only the outer layer of the star explodes
d) neither (a) nor (c)

28. The pulses of light emitted by a pulsar are direct consequences of its rapid rotation and

- a) strong gravitational field
- b) small size
- c) intense magnetic field
- d) nuclear fusion

29. A red supergiant, a black hole, and a pulsar weigh 3 solar masses each. All are 2 kiloparsecs away from you. Which object pulls on you with the strongest gravitational force?

- a) red supergiant
- b) black hole
- c) pulsar
- d) all pull equally

30. Which of the following exists almost exclusively in the halo of the Milky Way?

- a) globular star clusters
- b) open star clusters
- c) stellar associations
- d) cold gas and dust clouds

31. A galaxy that has just a little dust, but lots of red stars and a spheroidal shape, would be classified as a(n) _____ galaxy.

- a) elliptical
- b) irregular
- c) peculiar
- d) spiral

32. In a large cluster of galaxies, the mass of the very hot, x-ray-emitting gas between the galaxies is _____ the combined mass of the galaxies.

- a) comparable to
- b) much less than
- c) much greater than
- d) unrelated to

33. When two galaxies collide with each other,

- a) most of the stars in both galaxies are totally destroyed by tidal forces
- b) about half of the stars in one are destroyed by collisions with half the stars in the other
- c) collisions between their individual stars are relatively rare
- d) the galaxies essentially pass through each other with no observable "side effects"

Sample Questions for half of Final Exam (the other half covers topics for Exams 1–3):

34. Synchrotron radiation is produced by

- a) charged particles moving in a gravitational field
- b) charged particles spiraling in a magnetic field
- c) radioactive atoms
- d) neutral atoms moving in an electric field

35. A "cosmological redshift" results from the

- a) velocity of a distant object relative to Earth
- b) expansion of spacetime
- c) combined gravity of all the mass in the Universe
- d) none of the above

36. Quasars are thought to be

- a) very distant active galaxies
- b) objects with very low redshifts
- c) enormous black holes
- d) swarms of closely packed supernovae

37. The Cosmological Principle states that the Universe is

- a) inhomogeneous and isotropic
- b) homogeneous and isotropic
- c) the same at all times
- d) always changing

38. Which of the following is true about parallel lines in a positively curved Universe?
- they would intersect somewhere
 - their separation would be uniform
 - their separation could vary with location, but never equal zero
 - they would be infinitely long
39. If the Universe is "closed", like the surface of a sphere, then it has
- a finite extent
 - no edge
 - a positive curvature
 - all of the above
40. Which of the following does *not* help a planet orbiting a star to maintain relatively constant and uniform surface temperatures?
- a magnetic field
 - a moderate spin rate
 - a circular orbit
 - a spin axis perpendicular to its orbital plane
41. Which of the following spacecraft propulsion systems would *not* work well deep in *interstellar* space?
- chemical rockets
 - ion engines
 - fusion engines
 - solar sails
42. Twenty points is _____ of 1000 points.
- 0.02%
 - 0.5%
 - 2%
 - 5%

Sample Math Questions (could appear on any exam):

43. Star A has magnitude $m_A = 12$, while Star B has magnitude $m_B = 9$. What is the ratio R of the brightness of star B to the brightness of star A? *Hint:* recall that this ratio is defined to be $R = 2.5^x$, where $x = m_A - m_B$.
- 6.25
 - 0.75
 - 0.064
 - 16
44. Suppose that you have \$10,000 in the bank earning interest at the rate of 4% per year. How many years will you have to wait before your account balance reaches \$20,000? *Hint:* use the "Law of 72."
- 10
 - 18
 - 32
 - 72
45. In 1992, the federal budget was \$1.5 trillion (1 trillion = 10^{12}). This included \$241 billion (1 billion = 10^9) of interest payments on the federal debt (paid, *e.g.*, to US Savings Bond holders). Express the interest as a percentage of the federal budget.
- 0.16%
 - 0.62%
 - 6.2%
 - 16%