

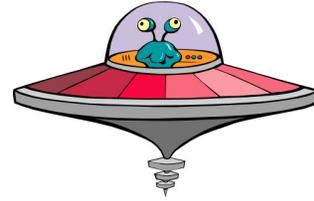
ASTR 135 Exam 4 – 5/4/2015

- 1) The Milky Way is a
 - a) star
 - b) star cluster
 - c) galaxy
 - d) nebula
 - e) universe
- 2) What distance indicator or method did Edwin Hubble use to establish the distance of the Andromeda galaxy?
 - a) parallax
 - b) the Hubble law
 - c) the inverse square law
 - d) Wien's law
- 3) An observer is located exactly on Earth's equator. They plant a vertical pole and watches the shadow cast by the sun over the course of a year. When does the pole cast no shadow at noon?
 - a) Never. It always casts a shadow.
 - b) Twice yearly, on the equinoxes
 - c) Twice yearly, between the equinoxes and the Dec 21 solstice
 - d) Twice yearly, between the equinoxes and the June 21 solstice
 - e) Once yearly, near June 21
- 4) What equation describes the inverse-square law of light?
 - a) $F_G = Gm_1m_2/r^2$
 - b) $E = mc^2$
 - c) $F = L/4\pi r^2$
 - d) $P^2 = a^3$
 - e) $v = Hd$
- 5) What equation describes Newtons "Law of Universal Gravitation?"
 - a) $F_G = Gm_1m_2/r^2$
 - b) $E = mc^2$
 - c) $F = L/4\pi r^2$
 - d) $E = \frac{1}{2} mv^2$
 - e) $v = Hd$
- 6) The most abundant element is
 - a) helium
 - b) hydrogen
 - c) oxygen
 - d) iron
- 7) The element magnesium in our bodies came from
 - a) the Big Bang
 - b) fusion in stars like the sun
 - c) fusion in massive stars
 - d) black holes
- 8) In a spiral galaxy, where are the globular clusters found?
 - a) In the disk.
 - b) in the spheroid.
- 9) In a spiral galaxy, where are the newly formed stars found?
 - a) In the disk.
 - b) in the spheroid.
- 10) In a spiral galaxy, where are the dark clouds found?
 - a) In the disk.
 - b) in the spheroid.
- 11) In a spiral galaxy, where are the H II regions found?
 - a) In the disk.
 - b) in the spheroid.

- 12) Which galaxy type is largely free of gas and dust?
- elliptical galaxy
 - normal spiral galaxy
 - barred spiral galaxy
 - star forming irregular galaxy
- 13) The Milky Way is about _____ light years from side to side.
- 10
 - 1000
 - 100,000
 - 1 million
- 14) What's faster?
- visible-wavelength light
 - microwaves
 - same speed for both
- 15) Approximately how many stars are there in the Andromeda galaxy (the other big galaxy in the Local Group)?
- 4 thousand
 - 4 million
 - 4 billion
 - 400 billion
 - 40 trillion
- 16) How far is the sun from the center of the Milky Way galaxy?
- we're pretty much at the center
 - about 350 light years from the center
 - 25,000 light years from the center
 - The concept of a center does not apply to the Milky Way galaxy
- 17) How far is the sun from the center of the universe?
- We're pretty much at the center.
 - We're about 35 million light years from the center
 - We're about nine billion light years from the center
 - The concept of a center does not apply to the universe.
- 18) Smoothed over large scales, the universe is assumed to be homogeneous and _____ .
- isotropic
 - directional
 - fractal
 - elastic
- 19) The "dark ages" of the universe came just after
- the inflationary epoch
 - the nucleosynthesis epoch
 - the epoch of recombination
 - the epoch of galaxy formation
- 20) We live in
- the inflationary epoch
 - the nucleosynthesis epoch
 - the epoch of recombination
 - the epoch of galaxy formation
 - the dark ages
- 21) The epoch of recombination is when
- helium fused from hydrogen in the early universe
 - hydrogen went from ionized to neutral
 - the matter-antimatter imbalance was created
 - the universe grew exponentially in size before 10^{-32} seconds of age
- 22) Which is the least-compelling supporting observation for the "hot big bang" model?
- the Hubble Law expansion of galaxies
 - the apparent existence of unseen matter (dark matter)
 - the cosmic microwave background radiation

- 23) One would expect the overall color of an elliptical galaxy to be
- a) blue
 - b) yellow
- 24) One would expect the overall color of a spiral arm to be
- a) blue
 - b) yellow
- 25) The sun will someday expand by a factor of 50 in size. When that happens, the earth will
- a) be sucked in
 - b) remain in stable orbit
 - c) be ejected from the solar system
- 26) Who discovered relativity and the theory of gravity we use today?
- a) Isaac Newton
 - b) Edwin Hubble
 - c) Karl Schwarzschild
 - d) Albert Einstein
- 27) What is the approximate age of the sun and planets?
- a) 25 million yr
 - b) 310 million yr
 - c) 1.9 billion yr
 - d) 4.5 billion yr
 - e) 14 billion yr
- 28) What is the approximate age of the universe?
- a) 6000 yr
 - b) 65 million yr
 - c) 565 million yr
 - d) 14 billion yr
 - e) 4.5 trillion yr
- 29) Which 20th century astronomer used V. M. Slipher's galaxy Doppler velocities and his own distance estimates to come up with a relation between velocity and distance?
- a) Lemaitre
 - b) Einstein
 - c) Hubble
 - d) Newton
- 30) About how many days does it take the sun to (apparently) move from one zodiac constellation to the next? (Hint: there are 12 zodiac constellations.)
- a) 1 day
 - b) 7 days
 - c) 12 days
 - d) 30 days
 - e) 120 days
- 31) How many "eclipse seasons" are there in each calendar year? Hint: "line of nodes."
- a) 0.5
 - b) 1
 - c) 2
 - d) 3
 - e) 4
- 32) The earth is tilted by _____ degrees relative to solar system north.
- a) 5
 - b) 16.8
 - c) 23.4
 - d) 67.2
 - e) 45
- 33) We have a north star. Is there a south star?
- a) yes
 - b) no

- 34) An Sd spiral galaxy is approximately the same shape as a
- football
 - basketball
 - frisbee
 - pickle
- 35) An E0 elliptical galaxy is approximately the same shape as a
- football
 - basketball
 - frisbee
 - flying saucer
- 36) Henrietta Swan Leavitt studied _____ variable stars in the Small and Large Magellanic clouds to establish the period-luminosity relation for these luminous stars. These stars were later recognized by Hubble in M31, the Andromeda galaxy.
- RR Lyrae
 - RU Leonis
 - Cepheid
 - Long-period Mira
- 37) What is not part of the “engine” that powers the various “active galactic nuclei?”
- a supermassive black hole
 - a gaseous accretion disk
 - polar jets of particles and radiation
 - a dusty, opaque torus of material that often hides the central engine
 - dark matter
- 38) A full moon sets about
- | | |
|-----------|-------------|
| a) noon | c) midnight |
| b) 6 p.m. | d) 6 a.m. |
- 39) A third quarter moon is placed highest in the sky about
- | | |
|-----------|-------------|
| a) noon | c) midnight |
| b) 6 p.m. | d) 6 a.m. |
- 40) Right ascension is measured _____ from the _____.
- eastward, vernal equinox
 - southward, celestial equator
 - westward, autumnal equinox
 - northward, celestial equator
- 41) The north pole is the same as your zenith if you are located at
- -90° latitude
 - 0° latitude
 - 90° latitude
 - 180° latitude
- 42) Gamma Draconis is at declination $+51.5^\circ$. Given that your latitude is 46.7° right now, is Gamma Draconis in the sky?
- yes
 - no
 - cannot tell from the given information
- 43) Which wavelength regime of light does penetrate the earth's atmosphere and is also ionizing and harmful to humans.
- gamma rays
 - X rays
 - visible
 - microwave
 - There is no wavelength regime that is both ionizing and penetrates the atmosphere.



- 44) Which wavelength regime of light requires a space telescope to do astronomy?
- gamma rays
 - infrared
 - visible
 - microwave
 - radio
- 45) Earth has perihelion in January. Earth is moving the fastest around its orbit in
- September
 - January
 - May
 - July
- 46) Around 1918, Harlow Shapley used _____ stars in _____ clusters to locate the center of the Milky Way.
- Cepheid variable, globular
 - RR Lyrae variable, open
 - Cepheid variable, open
 - RR Lyrae variable, globular
 - None of the above
- 47) Around 1950, Fritz Zwicky accounted for the visible matter in a galaxy cluster, and then noticed that the velocities of the galaxies were significantly larger than the visible matter could explain. This is evidence for
- black holes
 - dark matter
 - dark energy
 - antimatter
 - the cosmological constant
- 48) The name we have given to the largest “structures” in the universe is
- galaxy
 - galaxy cluster
 - galaxy supercluster
 - galaxy megacluster
 - galaxy ultracluster
- 49) The first star
- had small traces of iron
 - had small traces of lead
 - had helium
 - had small traces of carbon
- 50) The universe will
- expand for a while, then contract in a “great crunch”
 - expand forever, though its rate of expansion will decrease with cosmic time
 - expand forever, and its rate of expansion will increase over time
 - stay static and unchanging
 - explode in a second big bang and create multiverses
- 51) A star moving toward the telescope
- exhibits a blueshift
 - exhibits a redshift
 - exhibits time dilation
 - exhibits stellar aberration

- 52) If a pair of planets were at fixed distance, but one of them increases in mass by a factor of three, by what factor does the gravitational force increase?
- a) 1/9 (a decrease)
 - b) 1/3 (a decrease)
 - c) no change, same force
 - d) 3
 - e) 9
- 53) An observer is located in Panama, at 15° north latitude. Can the observer see the north celestial pole?
- a) Yes
 - b) No
 - c) Sometimes
- 54) The same Panamanian observer plants a vertical pole and watches the shadow cast by the sun over the course of a year. When does the pole cast no shadow at noon?
- a) Never. It always casts a shadow.
 - b) Twice yearly, on the equinoxes
 - c) Twice yearly, between the equinoxes and the Dec 21 solstice
 - d) Twice yearly, between the equinoxes and the June 21 solstice
 - e) Once yearly, near June 21
- 55) Which of the following did Newton not predict or describe?
- a) elliptical orbits for planets
 - b) line spectra for elements
 - c) the physics of motion
 - d) the force of gravity between planets
- 56) Other things being equal, an astronomer would prefer an instrument with a
- a) Small resolution angle
 - b) Large resolution angle
- 57) On February 1, a careful observer notes the exact compass point on the horizon where the sun rises. A few days later, the sun rises
- a) further north
 - b) at the same place
 - c) further south
- 58) On May 25, a careful observer notes the exact point on the horizon where the star Antares rises. On May 30, Antares rises _____. (Ignore effects of precession, please.)
- a) further north
 - b) at the same place
 - c) further south
- 59) The sun is at (R.A., dec.) = (6 h, +23.5 degrees).
- a) That happens around June 21 and is called the summer solstice.
 - b) That happens around March 21 and is called the summer solstice.
 - c) That happens around September 21 and is called the autumnal solstice.
 - d) That happens around December 21 and is called the winter solstice.
 - e) Trick! The sun will never be at those coordinates.
- 60) What's faster?
- a) a laser beam
 - b) radio waves
 - c) same speed for both