Astronomy 123
Test 1
January 26, 2012

Name _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. There are 26 multiple choice questions. Each question is worth 2 point for 52 total points.

1) Which of the following paraphrases Hubble Law? 1) _____
A) The more distant a galaxy is, the younger it appears.
B) The greater the distance to a galaxy, the greater its redshift.
C) The older the galaxy appears to us, the more luminous it is.
D) The faster the galaxy spins, the more massive and luminous it is.
E) The greater the distance to a galaxy, the fainter it is.

2) The *Anthropic Pri*nciple states: 2) _____
A) What we observe the Universe to be is determined by condition that the Universe is unchanging in time.
B) We live in one universe in a multiverse of universes.
C) The Universe must be dominated by *Dark Energy*.
D) We, as typical observers in the Universe, do not exist at a preferred place or time, or universe.
E) What we can expect to observe must be restricted by the conditions necessary for our presence as observers.

3) The location of the center of the Galaxy was determined by Shapley from observations of: 3) _____
A) Giant Molecular Clouds like the Orion nebula.
B) the radio emissions from Sagittarius A.
C) the star clusters known as Globular Clusters.
D) the bright clouds of ionized hydrogen known as H II regions.
E) bight OB stars in the spiral arms.

4) What is the meaning of isotropic? 4) _____
A) the same temperature everywhere
B) the same in every way throughout space
C) the same in all directions
D) the same density everywhere
E) the same at all times

5) _____ is the concept that all large samples of the universe are alike in appearance anywhere in the universe. 5) _____
A) Conformity
B) Cosmology
C) Homogeneity
D) Isotropy
E) Universality

6) The object located at the center of the Milky Way galaxy , is believed to be: 6) _____
A) an enormous emission nebula.
B) a black hole of around 3.7 million solar masses.
C) a quasar of over a billion solar masses.
D) a hypernova about to happen...be very afraid.
E) a large cluster of very young and massive stars.

7) In Hubble's classification, which type of galaxy has a small bulge and loose, widely spread, poorly defined spiral pattern? 7) _____
A) SBw B) S9 C) Sc D) SO E) Sa

8) The redshift of galaxies in the Universe is correctly interpreted as: 8) _____
A) space itself is expanding with time; the wavelengths of photon are stretched while they travel through space.
B) an "aging" of the light.
C) the effect of intergalactic dust.
D) the difference in temperatures of distant and nearby galaxies.
E) resulting from a giant explosion in the early Universe in which we happened to sit at its center so that all galaxies are currently streaming away from us.

9) The Sun is roughly _____ from the center of the Milky Way galaxy. 9) _____
A) 600,000 light years
B) 3,000 light years
C) 25,000 light years
D) 150,000 light years
E) 2,100,000 light years

10) The Milky Way galaxy, in Hubble's system, is classified as: 10) _____
A) BS2. B) SIrr. C) S2B. D) BSE.5. E) SBb.

11) Which is the correct description of the Sun's location within the Milky Way? 11) _____
A) in the disc and about one–half a galactic radius from the center
B) in the disc but at its outer edge
C) above the disc and about one–third of the galactic radius from the center
D) as Herschel found, very close to the Galactic center
E) at the outer edge of the galactic bulge but in the plane of the disc

12) What two observations of an object allow for a determination of the Milky Way's mass? 12) _____
A) object's age and distance from Galactic Center
B) object's mass and age
C) object's velocity and distance from the galactic center
D) object's mass and velocity
E) object's age and chemical composition

13) The CMBR is not exactly 2.73 Kelvin everywhere on the sky. The Universe appears to be slightly hotter in one direction and cooler in the opposite direction. The difference is small however, around 0.001 Kelvin. This slight asymmetry in the temperature of the CMBR: 13) _____
A) arises because one–half of the Universe started to expand a little bit before the other half of the Universe.
B) arises because the sky is brighter during the daylight hours on Earth than at night.
C) arises of the slight matter/anti–matter asymmetry detected in the Universe.
D) arises because we are moving through the Universe and the motion leads to a Doppler shift in the CMBR.
E) arises because of the effects of annual trigonometric parallax.

14) The expansion rate of the Universe is currently increasing. The universal accelerating force responsible for this speed–up could NOT be considered: 14) _____
A) Einstein's cosmological constant.
B) dark energy
C) antigravity.
D) dark matter.
E) All of the above could be considered as the universal accelerating force.

15) Cosmology is: 15) _____
A) currently more driven by philosophical ideas than empirical data.
B) the study of how objects such as stars form in the universe.
C) the study of the structure and evolution of the universe.
D) the idea that the Universe appears the way it does because we are the observer.
E) based on the idea that Principle of Mediocrity is implausible.

16) The first attempt to map the Galaxy via star counts was done by: 16) _____
A) Harlow Shapley with the RR Lyrae variables in 1920.
B) Edwin Hubble with the new 100" Mt. Wilson telescope in the 1930s.
C) Galileo in 1612.
D) Edward Barnard with long exposure photos about 1900.
E) William Herschel in the late eighteenth century.

17) Cosmologists have deduced that the Universe: 17) _____
A) started expanding 13.7 billion years ago
B) is unchanging so that it had no beginning and will have no end
C) is only one of a large number of universes
D) is slowly slowing in its expansion and one day will collapse into a single atom
E) is oscillating in size and that we are currently in a phase of contraction

18) Elliptical galaxies are similar to S)0 (lenticular) galaxies in that 18) _____
A) they both do not show strong spiral arms.
B) they both contain much smaller amounts of gas and dust than do spiral galaxies.
C) they both do not have disks of stars.
D) only A & B are correct statements.
E) A, B, & C are correct statements.

19) Of the following, which is not a major component of a typical spiral galaxy? 19) _____
A) disk of stars
B) large, spherically shaped halo
C) central bulge (nucleus)
D) large, extended ring of OB stars
E) All of the above are parts of typical spiral galaxies

20) The COBE and WMAP data showed that with very minor variations, the temperature of the cosmic microwave background radiation is: 20) _____
A) 1.4 K. B) 4.8 K. C) 2.7 K. D) 37.8 K. E) 0.23 K.

21) The spiral arms of the Milky Way galaxy are traced by: 21) _____
A) giant ionized hydrogen clouds, H II regions
B) clouds of neutral hydrogen H I regions
C) Giant Molecular Clouds
D) only A & B are correct
E) A, B, & C are correct

22) The early attempts to deduce our location in the Milky Way galaxy were unsuccessful because: 22) _____
A) the obscuring effects of dust were not aken into account.
B) the obscuring nature of dark matter was not taken into account.
C) the expansion of the Universe was not known at the time the attempts were made.
D) the telescopes of the era were too crude to see distant stars.
E) the halo of the Milky Way had not yet been discovered.

23) The disk of stars (the visible disk) of the Milky Way galaxy is: 23) _____
A) nearly 300,000 light years in diameter.
B) around 26,000 lights years in diameter.
C) composed of only very old stars, star formation in the disk stopped 10 billion years ago
D) similar in properties to elliptical galaxies of type E0.
E) 100,000–120,000 light years in diameter.

24) A galaxy is at a distance of 1 billion light years from the Earth. I observe the galaxy 24) _____
A) as it will appear in the future, roughly 1 billion years from now.
B) as it appears today (at this moment).
C) and find that it has a large blueshift.
D) as it was in the past, roughly 1 billion years ago.
E) and find that it is so distant that it cannot be part of our current Universe and so must have been formed in another universe.

25) A light year is: 25) _____
A) the distance a beam of light travels in 1 year.
B) the time it takes a beam of light to travel from the Sun to the Earth.
C) the time it takes the Sun to orbit the center of the Milky Way galaxy once.
D) the time it takes the Earth to orbit the Sun once.
E) the distance of the Earth to the nearest star, excluding the Sun.

26) The *Principle of Mediocrity* suggests: 26) _____

A) that we are average members of a typical universe
B) that we occupy a preferred place , but not time in the Universe.
C) tht we occupy a preferred place and time in the Universe.
D) that we live in a special universes.
E) that the universe we observe, is the only possible type of universe which we, as humans, can observe.

SHORT ANSWERS. Write your answer in the space provided. There are 5 questions for 48 total points. The point values are listed for each question.

27) Cosmological Constant (10 points)

a. State the Perfect Cosmological Principle (4 points)

b. Explain how Einstein's belief in the Perfect Cosmological Principle lead to his suggestion of an unknown repulsive force which permeated the Universe. (3 points)

c. What made Einstein withdraw his suggestion of a pervasive unknown repulsive force? (3 points)

28) Make–Up of the Universe (8 points)

a. What are the relative proportions of *dark matter, dark energy,* and *normal matter* in our current Universe? (4 points)

b. Contrast how *Dark Matter* and *Dark Energy* affect the future of the Universe. (4 points)

29) Science and the Ancients. (8 points)

a. What makes a theory (model) scientific and not philosophy? (4 points)

b. The Greeks favored Earth–centered models for the Solar System over Sun–centered models for the Solar System. Describe how annual trigonometric parallax helped lead them to this conclusion. Be sure to state precisely what annual trigonometric parallax is. (4 points)

30) Big Bang Theory (12 points)

a. List three pieces of evidence highlighted in class which offer strong support for the Big Bang Theory. (6 points)

b. Explain how each piece of evidence strongly supports the Big Bang Theory. (6 points)

31) Mysteries of the Universe (10 points)

a.. Describe the Horizon Problem? (6 points)

b. What is the primary difference between matter and anti-matter? (2 Points)

c. What is meant by the matter/anti-matter asymmetry of the Universe? Is the asymmetry a problem? (2 points)?

Answer Key
Testname: ASTR123.X1B.WTR2012

1) B
2) E
3) C
4) C
5) C
6) B
7) D
8) A
9) C
10) E
11) A
12) C
13) D
14) D
15) C
16) E
17) A
18) D
19) D
20) C
21) E
22) A
23) E
24) D
25) A
26) A