ASTRONOMY TEST IV

NAME _____ STUDENT NUMBER _____

There are a possible 106 points.

Section I. TRUE/FALSE (1 point each)

_____ 1. The Milky Way is about 1000 lightyears in diameter.

_____ 2. J. C. Kapteyn's results indicated that the Sun was at the center of the Galaxy.

_____ 3. In the inner portions of the Galaxy, the entire system rotates like a rigid object.

_____ 4. In our galaxy, the star density is much greater in the spiral arms than it is between them.

_____ 5. It is very likely that the halo of our galaxy is low in mass, adding little to the total mass of the galaxy.

_____ 6. Interstellar dust grains act to polarize light.

_____ 7. The Galaxy does not have a magnetic field.

_____ 8. Molecules have been detected in dark clouds from their radio emissions.

_____ 9. Population II stars are located in the halo and central bulge of the Galaxy.

_____ 10. There is a gradient of increasing heavy-element abundance from the halo to the disk of the Galaxy.

_____ 11. The outer parts of the spiral arms rotate slower than the inner parts.

_____ 12. The halo contains very old objects, indicating that the cloud of gas from which the Galaxy formed was spherical.

_____ 13. The tuning-fork diagram represents an evolutionary sequence.

_____ 14. If a galaxy has a mass-to-light ratio greater than 1, then the galaxy emits less light per solar mass than the Sun.

_____ 15. Elliptical galaxies are dynamic entites with active star formation, whereas spirals have reached a sort of equilibrium with little new star formation.

_____ 16. There is gas between the galaxies of a cluster that is so hot that it emits X-rays.

_____ 17. The age of the universe can be calculated from the value of Hubble's constant and the speed of light alone.

_____ 18. The distance to a far off galaxy can be determined from its redshift.

_____ 19. Quasars are now known to be highly active super-stars that burn out early and enrich the interstellar gas with heavy elements.

_____ 20. The General Theory of Relativity predicts that the universe is static.

_____ 21. The inflationary universe model was proposed to explain the observed amount of symmetry and homogeneity in the universe.

_____ 22. In the open universe model, there will ultimately be only positrons, electrons, and radiation. All stars, galaxies, and black holes will dissipate or evaporate.

Section II. MULTIPLE CHOICE (1 point each)

_____ 1. In a galaxy, a star's deviation in motion from a circular orbit is called the
(a) proper motion
(b) interstellar motion
(c) peculiar velocity
(d) spiral movement.

_____ 2. Roughly, how many stars are there in our Galaxy?
(a) 10^6
(b) 10^{11}
(c) 10^{50}
(d) 10^{100}.

_____ 3. If a diffuse cloud lies behind a star, the dust grains scatter blue light in our direction producing a(n):
(a) emission nebula
(b) reflection nebula
(c) H II region
(d) dark cloud.

_____ 4. How many galaxies are there in the Local Group
(a) 30
(b) 100
(c) thousands
(d) millions.

_____ 5. Which of the following is not deduced from the background radiation:
(a) the energy source of quasars
(b) that the Local Group is falling towards the Virgo Cluster
(c) It is direct evidence for the Big Bang
(d) that clusters of galaxies seem to be streaming towards a "great attractor".

_____ 6. Which of the following is not a property of all quasars:
(a) high redshift
(b) radio emissions
(c) X-ray emissions
(d) luminosity many times that of a normal galaxy.

_____ 7. Absorption lines in a quasar's spectrum may be due to
(a) the redshift of the quasar
(b) the Earth's atmosphere
(c) eigenvalues in the spectrum
(d) gaseous halos or disks of galaxies between us and the quasar.

_____ 8. Which of the following has not been proposed as a source of hidden (dark) matter:
(a) "mini" black holes
(b) neutrinos
(c) hot, massive hydrogen clouds between galaxies
(d) postulated elementary particles yet to be discovered.

Section III. FILL IN THE BLANK (2 points each)

1. The extended outer portions of a galaxy that contain stars and globular culsters is the

_____.

2. _____ (person) used the positions of the globular clusters to conclude that the Sun was several kiloparsecs from the center of the Galaxy.

3. Some evidence for there being a very massive object at the center of the Galaxy is

_____.

4. The two types of interstellar matter are _____ and _____.

5. An interstellar coud that is not hot enough to glow or dense enough to show up as a dark patch is a(n) _____.

6. If a hot star is in a cloud, its radiation ionizes and heats the gas until it glows. This is a(n) _____.

7. Diffuse clouds moving at high speeds away from groups of bright stars are probably propelled by _____.

8. The heavy elements in Populatiion I stars come from _____.

9. A Population II star found in the Sun's neighborhood would be a _____.

10. The leading theory that explains the spiral structure of our Galaxy is the _____.

11. The two main categories of galaxies are _____ and _____.

12. Draw and label the tuning-fork diagram:

13. _____ are oddly shaped galaxies with a hint of a spiral structure. The Magellanic Clouds are in this category.

14. Three ways of estimating the distance to a galaxy are _____,

_____, and _____.

15. The mass of an elliptical galaxy is directly related to its _____. The latter is due to the randomly oriented stellar orbits in an elliptical galaxy.

16. The mass of a cluster can be determined by adding up the masses of the individual members or by _____.

17. In the _____ theory of cluster formation, galaxies formed first and then aggregated into clusters.

18. Penzias and Wilson discovered the _____ which is the radiation left from the Big Bang.

19. _____ are spiral galaxies that have very active nuclei which appear blueish.

20. _____ of several quasars indicates that the quasars are relatively small.

21. A probable power source for quasars is _____.

22. The assumption that the universe looks the same at all points is the assumption of _____. The assumption that the universe looks the same to an observer, no matter in which direction that he looks, is called the assumption of _____. These two assumptions together are the Cosmological Principle.

23. Two observational approaches to determing whether the universe is open or closed are

_____ and _____.

Section IV. DISCUSSION (10 points each)

1. Explain, in some detail, why the Milky Way appears to have a spiral structure. Include some mention of Populations of stars and the rotation of the Galaxy.

2. List the three models for the shape of the universe that were discussed in class. Mention curvature and the "death" of such a universe.

3. Discuss the first several minutes of the universe, including the particles that were present at certain times.