Core 30.01 - Cosmology Fall 2006 **Prof. Micha Tomkiewicz Final Exam:**

My Name_____

A. Answer all of the following multiple choice questions (50%):



 $2. \,$ The best estimate for the Hubble parameter given in the text, based upon data known at the time of publication, is



- 3. The big bang theory says that the cosmic background radiation is a result of
- O_a red shifted radiation from the early universe.
- O_h radiation from stars.
- red shifted radiation of helium.
- $O_{\rm rd}$ red shifted radio waves from galaxies.
- O_e blue shifted radio waves from galaxies

4. Which model of the universe requires the continuous creation of matter?



O_{e.} Changing constants.

5. A galaxy has a recessional velocity of 7000 km/s and is known to be at a distance of 115 Mpc. Based on this one case, the Hubble parameter is about _____ km/s/Mpc.



6. If Hubble's constant equals 65 km/s/Mpc, a galaxy at a distance of 50 Mpc will have a recession velocity of _____ km/s



7. The critical mass limit for stability of white dwarf stars is called the _____ limit.

- Hayashi
 Hartmann
 Chandrasekhar
 Hertzsprung
 critical
 - 8. A star so compressed that the electrons in the interior have been crushed into the nucleus is called a ______star.
 O_{a.} neutron
 O_{b.} proton
 O_{c.} white dwarf
 O_{d.} black hole
 O_{e.} red giant
 - 9. When the Sun reaches its maximum size as a red giant, the temperature of Earth's surface will be
 - O_a much hotter than now -- oceans will boil and lead will melt in the direct Sunlight.
 - $O_{\mathbf{h}_{\mathbf{h}}}$ cooler than now since red giants are cooler than the Sun at present.
 - O a little bit hotter -- tropics in the Arctic.
 - O_{d} about the same temperature as now.
 - O_{e.} astronomers have no idea.

 $10. \ \ \,$ Which observation is evidence that stars have formed in our galaxy within the last few million years?

- O_a We see stars that are composed primarily of hydrogen and helium.
- O_{h} Jupiter is still heating itself by gravitational contraction.
- We see numerous red dwarf stars in the solar neighborhood.
- O_{d} We see globular clusters containing over 100,000 stars.
- We see stars more massive than 20 solar masses.
- 11. Which of the following forces would try to prevent the collapse of a dust cloud?
- O____ the pressure caused by molecule hitting molecule
- O_{b.} gravitational
- O_{c.} Bok
- $\mathbf{O}_{\mathrm{d.}}$ air
- O_{e.} social
- 12. The structure of a star stabilizes when it reaches the main sequence because
- O_{a.} none of these choices
- O_h its temperature decreases causing a decrease in stellar pressure.
- the inward pull produced by thermal pressure equals the outward pressure due to gravity.
- $O_{\rm r}$ the thermal pressure is greater than the pressure of gravitation contraction.
- $O_{\mathbf{r}}$ the inward pressure due to gravity equals the outward pressure produced by hot gases.

- 13. We expect to see more main sequence stars than other stars since
- O₂ misleading -- we don't see more main sequence than other types.
- O_h stars spend a larger fraction of their life on the main sequence than elsewhere.
- O_ our atmosphere transmits their light.
- $\mathbf{O}_{\mathbf{d}}$ astronomers don't know why we see more main sequence than other stars.
- O_e many are very bright.
- 14. A main-sequence star more massive than the Sun will exhaust its nuclear fuel
- O_a more quickly than the Sun.
- O_h none of these choices
- O more slowly than the Sun.
- $\mathbf{O}_{\mathbf{d}}$ at the same rate as the Sun.
- O_____ there are no stars more massive than the Sun
- 15. We can calculate the distance to a star once we know its
- O_a absolute magnitude.
- O_h need both apparent magnitude and absolute magnitude
- O apparent magnitude.
- O_d surface composition.
- e. need both apparent magnitude and surface composition

B. Answer three out of the four questions (50%):

1. The Scientific Method can be summarized as followed:



Discuss the static model and the Big-Bang theories of the creation and future of the universe, in terms of the Scientific Method. Mention a competitive method to address the same issue.

- 2. Here are some of the observations of the Solar System:
 - a. Most of the mass of the solar system is contained in the Sun; the planets contribute only 0.2 percent.
 - b. All the planet's orbits lie roughly in a single plane.
 - c. The Sun's rotational equator lies nearly in this plane.
 - d. The planets and the Sun all orbit in the same west-to-east direction.
 - e. Planetary orbits are nearly circular
 - f. Planets differ in composition
 - g. The composition of the planets varies roughly with distance from the Sun. dense, metal-rich planets lie in the inner system.
 - h. Outer planets are more massive than inner planets, and most of the mass of outer planets is composed of hydrogen and helium.

Discuss these observations in terms of the theory of formation of the solar system

3. The H-R Diagram is given below:



Explain it in terms of the life-cycle of stars.

4. We can study objects beyond the solar system only through the study of the electromagnetic radiation that is reaching us from these objects. Correlate the properties of stars and galaxies with the appropriate properties of the radiation that is emitted by these objects.