

# Astr 102: Introduction to Astronomy, Fall Quarter 2009

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## Practice Questions for the Final Exam

- 1) Briefly explain the three main observational results that support the Big Bang theory.
- 2) Briefly explain three methods of your choice for determining distances to astronomical objects.
- 3) Describe relationship between the color and morphology of galaxies?
- 4) Describe relationship between the color and luminosity of galaxies?
- 5) What is gravitational lensing? Microlensing?
- 6) What are gamma-ray bursts?
- 7) How do we know that baryons alone cannot account for  $\Omega_m \sim 0.3$ ?
- 8) What is the Hubble law?
- 9) Why are the observations of very distant galaxies analogous to a time machine?
- 10) Briefly explain the origin of the cosmological redshift (i.e. why is the wavelength of a photon that we observe today longer than its wavelength when it was emitted?).
- 11) You put a Barbie doll into a super-oven, heat the oven to  $10^{12}$  K and then cool it back to 300 K. Describe approximately what happens, and what is in the oven at the end of the experiment?
- 12) Describe the two main properties of dark matter. What observations imply the existence of dark matter?
- 13) Briefly explain how “standard candles” can be used to measure cosmological parameters.
- 14) What is the cosmological concordance model?
- 15) Which cosmological parameter is strongly constrained by the measured abundance of light elements?
- 16) What are the basic properties of the Cosmic Microwave Background?

- 17) What happened in the life of the Universe when the CMB photons were emitted?
- 18) Why does the Cosmic Microwave Background support the Big Bang theory?
- 19) What feature of the Cosmic Microwave Background quantitatively constrains the total energy density of the Universe?
- 20) What problems of the Big Bang theory are addressed by the inflation theory?
- 21) What observations imply the existence of dark energy? Are there alternative explanations for these observations?
- 22) Is it possible to have life on planets other than Earth?
- 23) What kind of stars are spiral arms made of?
- 24) What is a rotation curve? Sketch a typical rotation curve for spiral galaxies.
- 25) What is a quasar/AGN, and why are they of astrophysical interest?
- 26) What does "Unification Model" unify?
- 27) What are the three major phases of gas in spiral galaxies? Rank them in order of increasing temperature.
- 28) From observations of stars in the Milky Way, astronomers have deduced that stars in the stellar halo are very metal-poor, stars in the thin disk have solar metallicity, and stars in the bulge are somewhere in between. Using this information, place the components in order of increasing formation epoch (i.e. oldest component listed first).
- 29) Justify why you could use the metallicity to derive the particular order you chose in question 29.
- 30) Qualitatively describe the stellar distribution in the Milky Way (hint: how do the three main components look like)? Describe the stellar kinematics in the Milky Way (hint: what are the two components that greatly differ from each other)?