Sample Exam type questions
to be addressed in Discussion Sections

Equations that may or may not be useful:

$F = ma; E = mc^2; T = T_o(1+z); D = v/H_0; F = L/(4\pi D^2)$

$H_0 = \dot{\mathrm{R}}_0/R;\ \dot{\mathrm{R}}_0^2/R_0^2 + kc^2/R_0^2 = G8\pi\rho_0/3$

$H_0^2 + kc^2/R_0^2 = G8\pi\rho_0/3$

$\dot{\mathrm{R}}_0^2/R_0^2 + kc^2/R_0^2 = G8\pi\rho_0/3 + \Lambda/3$

$\rho_c = 3H_0^2/G8\pi;\ d\tau^2 = (cdt)^2 - R^2dr^2/(1-kr^2)$

1. Surface brightness: I have an object with surface brightness "A" which is at distance "D." I now move the object a distance 2D, what is its surface brightness (assume we are so close in both cases that we can ignore "curvature" of the Universe).

2. If an object has a surface brightness "A" produces an observed flux "B" and "subtends" a solid angle "C." How are "A," "B, and "C" related?

3. The "fundamental plane consists of 3 data points per galaxy: line width, luminosity, and _____.

4. The data we showed in class of data from galaxies had 3 rows per galaxy, one row was for the light from the galaxy, what were the other two rows used for?_____

5. To measure a redshift using the sometimes "jumbled" galaxy spectra that we obtain, what technique do we use? (a) cross correlation with a "standard spectrum" (b) project the spectrum on a screen to see more detail (called an "exploded spectrum); (c) look for the highest point in the spectrum and assign a true (emitted) wavelength to that point; (d) look for the lowest spot on the spectrum and assign a "true" wavelength to that point.

6. What concept is involved when we use [the brightest] Globular clusters [in a galaxy] or the brightest galaxy in cluster as standard candles? If the rest of the class were lined up, 100 yards (300 ft) away so you could see us all, how would you use the above general concept to estimate the distance the class?

7. Using gravitation lens systems for measuring the Hubble constant relies on what property of the "lensed" object ? _____

8. The S-Z effect involved the interaction of : (a) hot gas with the CMB; (b) surface brightness with redshift; (c) subarc second seeing and high redshift; (d) spiral galaxies and redshift

9. What is a "good" value of the Hubble constant in units of km/(sec-Mpc) _____

10. The Great Attractor (as described in class) is : (a) a mass concentration of $10^{-3} M_{\odot}$ that orbits the sun, but is not seen (b) the huge magnet that is associated with Jupiter's magnetosphere; (c) a $10^{12} M_{\odot}$ concentration in the Virgo cluster; (d) a $5 \times 10^{16} M \odot$ mass concentration in the direction of Norma.

11. Tie together in a discussion: the great attractor, the tadpole plot, and dark matter.

12. How are rotation curves, the cosmic conspiracy, and dark matter all related?

13. We use _____ observations out beyond where we see light from a galaxy to make rotation curves measurements. The further out the observations go, we see a "flat rotation"" curve. What does this tell us about the galaxy we are observing? (a) the galaxy has a very flat disk, (b) the galaxy has a lot of young stars in it (c) the galaxy has a lot of old stars in it; (d) the galaxy had a great deal of mass in the form of dark matter that extends beyond the galaxy's visible region in the electro-magnetic spectrum.

14. In a general way how does the rotational velocity depend on the distance from the center of galaxy based on the uniform disk model , and the "Keplerian" model respectively : (a) goes up and goes down; (b) does down and up (c) remains constant (d) goes up and up, just at different rates