

Sample Exam type questions
to be addressed in Discussion Sections

Equations that may or may not be useful:

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

1. Clusters of galaxies contain about how many galaxies?
2. About how much total mass in solar masses are in a cluster?
3. The gas that we see by its X-ray emission in the ICM has a temperature of about the (multiple choice): (a) 10^8 k, (b) 3K, (c) 300K, (d) 10^3 K
4. How does measuring the masses of clusters tell us there must be some non-baryonic matter? And why do we think there is non-baryonic matter in clusters.
5. Why do we see some galaxies who are true the clusters members different velocities of recession from other galaxies (multiple choice): (a) because some are moving toward and some are moving away from us; (b) because some have more dust which makes them redder; (c) because the galaxies closest too us are being less affected by the expansion of the universe;(d) false, they all have the same redshift
6. What keeps the hot gas in the ICM from evaporating and leaving the cluster?
7. What keeps the hot gas in the ICM from collapsing to the cluster center.
8. Give an explanation of the physics principle behind gravitational lensing.
9. If we look back in time (i.e. higher z), what would we expect to find for a low Ω_m universe versus high Ω_m universe in terms of the number of clusters per unit volume?
10. What is the approximate value of Ω_m that we find based on our observations of cluster of galaxy counts? (a) 0.001; (b) 0.01; (c) 0.3; (d) 1.5
11. Summarize what we think our best model is for Ω_m , Ω_b , Ω_t , and Ω_Λ .