

29:50 Stars, Galaxies, and the Universe

Instructor: Spangler

Homework Assignment # 11

November 30, 2010

Note: Corresponding quiz on ICON must be completed by 8AM, Monday, December 6

Second Note: Three of the problems are phrased in a very similar manner, but they ask for three different answers. Read each carefully and understand what the answer for that question is.

1. The wavelength of the hydrogen alpha spectral line of hydrogen is at 656 nanometers (nm). In a distant galaxy, this spectral line is observed at a wavelength of 787 nm. What is the redshift z of this galaxy?
 - (a) 0.078
 - (b) 0.656
 - (c) 1.2
 - (d) 0.20
 - (e) 7.87
2. The wavelength of the hydrogen alpha spectral line of hydrogen is at 656 nanometers (nm). In a distant galaxy, this spectral line is observed at a wavelength of 787 nm. What is the speed at which this galaxy is receding from us?
 - (a) 450,000 km/sec
 - (b) 60,000 km/sec
 - (c) 7,870 km/sec
 - (d) 5400 km/sec
 - (e) 1.43×10^6 km/sec
3. The wavelength of the hydrogen alpha spectral line of hydrogen is at 656 nanometers (nm). In a distant galaxy, this spectral line is observed at a wavelength of 787 nm. What is the distance to this galaxy?
 - (a) 857 Megaparsecs
 - (b) 8.5 kiloparsecs
 - (c) 32.7 Megaparsecs
 - (d) 754 parsecs
 - (e) 3789 Megaparsecs
4. The Virgo Cluster is
 - (a) an old star cluster containing about 100,000 stars

- (b) a cluster of about 1000 stars that formed about 500 million years
 - (c) the nearest example of a rich cluster of galaxies
 - (d) the only known case of a galaxy with a supermassive black hole
 - (e) the most distant known cluster of galaxies
5. What is the rough range of masses of black holes at the centers of large galaxies? The answer is not the same for every large galaxy, but one of the answers below gives the right answer for most galaxies.
- (a) $10^{33} - 10^{34}$ solar masses
 - (b) 5 - 20 solar masses
 - (c) 5000 - 10000 solar masses
 - (d) $10^8 - 10^9$ solar masses
 - (e) 0.1 - 3 solar masses