

## Intro to Galaxies & AGN

### Examples 1 : due Friday February 8, 9am to Kuang-Han Huang's mailbox

1. Go through the steps to show that fusion of hydrogen to helium has 0.7% efficiency, and that to fuse from hydrogen to iron is 0.9% efficient. Look up what values of parameters you need and evaluate the efficiencies.
2. Putting in constants etc into the scaling relations we derived in class, estimate the interior temperature of the Sun.
3. The received flux at Earth from a star of luminosity  $L$  (energy/sec), at distance  $r$ , is given by:

$$f(r) = \frac{L}{4\pi r^2}.$$

This is usually given in terms of apparent magnitude,  $m$ , where for any one star in a given magnitude system :

$$m = \text{constant} - 2.5 \log(f),$$

where the constant sets the zero-point of the magnitudes and is not important here. The absolute magnitude,  $M$ , is the apparent magnitude that the star would have if at a distance of 10pc. Derive the expression for the Distance Modulus

$$m - M = 5 \log(r/10)$$

with the distance  $r$  in pc.

Write down the relationship between absolute magnitude and luminosity in solar units, using the fact that the absolute (bolometric, over all wavelengths) magnitude of the Sun is +4.72.

What is the absolute magnitude of a typical galaxy of  $L_{galaxy} = 10^{11}L_{\odot}$ ?