Astronomy 45

Introduction to Astrophysics

Problem Set 5   Due March 16, 2001

1. Assume the Sun radiates as a spherical blackbody with a radius of 7×10^{10} cm and a temperature of 5800 K. Estimate the flux received at the Earth in each of the wavelength bands given in the table on p.2-12 of the class notes. The estimates can be made by multiplying the intensity at the central wavelength of each band by the bandwidth. What is the value of the bolometric correction?

2. Determine the temperature of an asteroid-like body, radiating as a blackbody; lying at a distance of 0.01 AU from the Sun, given that the equivalent temperature of the Earth would be 277 K.

3. The temperature of a red giant star is 2000 K and its absolute magnitude is -5.24. If the temperature of the Sun is 5770 K and its absolute magnitude is 4.76, what is the radius of the star in units of the solar radius?

4. The brightness temperature T_b at a frequency ν of a radiation source is the equivalent temperature at which a black body has the same intensity. If kT_B is large compared to $h\nu$, calculate T_b for a source with the specific intensity $I_\nu = 3 \times 10^{13}$ ergs at $\nu = 100$ GHz $= 10^{11}$ Hz. Confirm that $h\nu \gg kT$.