8-28-2017

Problem Set #10

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Problem Set #10 *Blackbody*

1. The spectrum of *wavelengths* radiated by the surface of the Sun has a maximum for yellow photons (about 550 nm). If the spectrum is assumed to be from a blackbody (on the Sun's surface) the maximum in the wavelength spectrum occurs at about $hc/4k_BT$. What is the Sun's surface temperature?

2. The total *intensity* (energy per unit area per unit time) radiated by a blackbody over all wavelengths is σT^4, where $\sigma = 5.67 \times 10^{-8}$ W/m^{2}K^4. The intensity of bright sunlight at the surface of Earth is about 500 W/m^2 (much less than at Sun's surface—why?). If that radiation were directly from a blackbody at Earth's surface what would the equivalent temperature be?

3. Solids begin to glow a dull red (λ = 700 nm) at a temperature of about 1000K. What is the energy of a red photon of this wavelength? If the solid is a blackbody, what is the energy of the most frequently occurring photon in this radiation? Explain the difference.