

Utah State University

DigitalCommons@USU

---

Problems

Introductory Modern Physics

---

8-28-2017

## Problem Set #10

David Peak

Utah State University, david.peak@usu.edu

Follow this and additional works at: [https://digitalcommons.usu.edu/intro\\_modernphysics\\_problems](https://digitalcommons.usu.edu/intro_modernphysics_problems)



Part of the [Physics Commons](#)

---

### Recommended Citation

Peak, David, "Problem Set #10" (2017). *Problems*. Paper 10.

[https://digitalcommons.usu.edu/intro\\_modernphysics\\_problems/10](https://digitalcommons.usu.edu/intro_modernphysics_problems/10)

This Course is brought to you for free and open access by the Introductory Modern Physics at DigitalCommons@USU. It has been accepted for inclusion in Problems by an authorized administrator of DigitalCommons@USU. For more information, please contact [digitalcommons@usu.edu](mailto:digitalcommons@usu.edu).



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  $hc/4k_B T$ . 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  $\sigma T^4$ , where  $\sigma = 5.67 \times 10^{-8} \text{ W/m}^2\text{K}^4$ . The intensity of bright sunlight at the surface of Earth is about  $500 \text{ W/m}^2$  (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 ( $\lambda = 700 \text{ nm}$ ) 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.