In order to receive full credit for questions, you MUST explain your answer. In order to receive full credit for problems, you MUST show your work.

1. Using the equation given in Problem 1-1 in the textbook, do Problem 1-2 in the textbook.
   (c) Find the wavelength of a photon with energy \( E = 0.85 \text{ eV} \). What type of electromagnetic radiation is this? (visible, IR, UV, x-ray, …)
   (d) The shortest wavelength for the visible light spectrum is at about 350 nm. Calculate the energy of a photon with this wavelength. What color would you see?

2. (a) For a 100-watt light bulb which emits light with an average wavelength of 550 nm, calculate the number of photons per second emitted by the light bulb. \( 2.77 \times 10^{20} \text{ / sec} \)
   (b) If we assume that the light bulb is a point source and your hand is 1.20 m away from it, how many photons hit a square cm of your hand each second? [Hint: the surface area of a sphere is \( A = 4\pi R^2 \) ] \( 1.53 \times 10^{13} \text{ / (cm}^2\text{sec)}\)

3. Fill in the table below.

<table>
<thead>
<tr>
<th>Wavelength</th>
<th>Name of the electromagnetic radiation which has this wavelength</th>
<th>Name of an object that is approximately the same size (same order of magnitude) as the given wavelength</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) 1 fm = 1 fermi &lt;br&gt; = 1 femtometer = 10^{-15} m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) 1 Å = 1 Ångstrom</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) 1 μm = 1 micron</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(d) 1 cm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(e) 1 km</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(f) 1000 km</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: these are wavelengths of light from the left-hand column in Fig 2-1 in the textbook [except for (a) and it **should** be in the column!].

4. (a) An incandescent light bulb has a “color temperature” (according to the photographic film industry) of 3000 K. At what wavelength should its blackbody spectrum peak if that is its actual temperature?
   (b) What is the total power per square meter emitted by a bulb like this if it does act as a blackbody? \( 4.59 \times 10^6 \text{ W/m}^2 \)
   (c) Estimate the size of the **filament** of the mini-mag flashlights that we used in class, and calculate the total power it radiates. [ans depends on your size estimate]
   (d) Is this total power a reasonable number for the actual light bulb? Discuss.
5. The work function for beryllium metal is 5.30 eV.

(a) What is the cutoff wavelength $\lambda_c$ for beryllium?
(b) Is this cutoff wavelength a maximum or a minimum? Explain. [max because ...]
(c) What is the maximum kinetic energy of the photoelectrons when radiation of wavelength 178 nm is used? [1.67 eV]
(d) What is the stopping potential of the photoelectrons for the case of 198 nm incident radiation?
(e) If the incident light had a wavelength of 600 nm, what would be the stopping potential? Why? [none -- why?]

6. (a) If you were to measure the intensity on the ground due to parking lot lights on 10.0 meter poles, and you discover that the intensity is 9 times too small for pedestrian safety, how many times brighter would you need the light bulb to be in order to maintain the appropriate brightness?
(b) If you decided to shorten the lamp poles instead of buying more expensive (higher power) lamps, what height would the poles be?