Notre Dame University-Louaize
Faculty of Natural & Applied Sciences
Department of Sciences

PHS 213 – Modern Physics
Exam II - Fall 2006
Duration: 60 minutes (1h)

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1. Calculate the wavelength at which a blackbody is brightest if its temperature is 5800 K. If you triple the temperature, what happens to the peak wavelength?

2. When illuminating Potassium with light of wavelength 400 nm, it is found that the stopping potential is 0.9 V, whereas it is equal to 1.9 V when 300-nm light is shone on the plate.
   a) Find the value of Planck's constant and the ~~stopping potential of~~ Potassium ϕ
   b) What is the stopping potential if 500-nm light is used?

3. It is found that the energy of a photon scattered off an electron at 60 degrees is 1.6424 keV. Find the wavelength of the incident photon.

4. a) Calculate the wavelength of the Balmer α photon (n=3 to n=2) from $_{26}Fe^{25+}$.
   b) What is the wavelength associated with the electron at n=2? ? ?

5. Consider an electron placed in an infinite potential well of width 1nm.
   a) Calculate the wavelength of the photon emitted when the electron jumps from the 3rd excited state to the 2nd excited state.
   b) If the electron stays in the 1st excited state, what is the probability to find it in the middle 1/3 of the well, i.e. between $\frac{1}{3}nm \le x \le \frac{2}{3}nm$.

Good Luck!!

$$\frac{E}{x} = \frac{1}{\pi} \qquad E_n = -Z^2 \frac{E_R}{n^2}$$

$$\Gamma\pi = \lambda$$

$$E_{3\to 2} = -Z^2 E_R \left(\frac{1}{n^{12}} - \frac{1}{n^2}\right)$$

$$\frac{1}{\lambda} = R$$