

9/7/18

Phys 217

Due 9/14/18

1 (20 points)

a) A light source emits 1 W of light energy at a metal electrode. Its wavelength is adjustable and ranges from 400 nm to 600 nm. The work function of the metal is 2.4 eV. Use Mathematica to plot the maximum kinetic energy of the photoelectrons as a function of the light frequency. Set the label of the axes and indicate the units. Set the range of the plot to be from - 0.1 eV to 0.8 eV.

(* You may wish to learn from the documentation on how to use the built-in function 'Piecewise'. *)

b) Now that the power of the light source is increased to 5 W, and the range of wavelength remains the same. Again plot the maximum energy of the photoelectrons as a function of the light frequency.

2 (20 points)

Verification of the divergence theorem $\int_V \nabla \cdot \mathbf{F} \, dx \, dy \, dz =$

$\int_S \mathbf{dS} \cdot \mathbf{F}$: given a vector field $\mathbf{F} =$

(x^3, x^3, x^3) in a cube of side 2 a centered on the origin,

use Mathematica to show that the left hand side of the divergence theorem equals the right hand side.

(* When evaluating the left hand side of the divergence theorem, you should calculate the divergence of the vector field and then do a volume integration over the cube. As for the right hand side, surface integrals over the 8 faces of the cube should be done and then added together. *)