

King Fahd University of Petroleum and Minerals
Physics Department
Phys-212: Modern Physics
Spring 2002

Assignment # 3

Date: Sat. Mar.2.2002

Due Date: Sat. Mar.9.2002

I encourage group discussion, but not copying (cheating).

Problem.1

Consider a photon whose wavelength is equal to the Compton wavelength λ_c of the electron. Show that the energy of such a photon is equal to the rest energy of an electron.

Problem.2

Go to web-pages:

<http://webphysics.ph.msstate.edu/ccp/27-5/>

<http://home.a-city.de/walter.fendt/phe/photoeffect.htm>

http://www.d.kth.se/~f93-jhu/phys_sim/compton/Compton.htm

http://www.student.nada.kth.se/~f93-jhu/phys_sim/compton2/Compton.htm

<http://physics.berea.edu/~king/Teaching/ModPhys/QM/Compton/compton.html>

Do some of the experiments there and write your observations (in details please).

Problem.3

Planck radiation law can be cast in the form

$$I_\lambda = G \frac{x^5}{e^x - 1},$$

where G is a constant, and $x = ch/\lambda kT$. Find the value $x = x_{\max}$ for which I_λ has its maximum value.

Show that this leads to Wien's displacement law (eq.2.6).

Do five (5) out of the following exercises:

Problem.4. Textbook Prob.2.9

Problem.5 Textbook Prob.2.16

Problem.6 Textbook Prob.2.19

Problem.7. Textbook Prob.2.25

Problem.8. Textbook Prob.2.29

Problem.9. Textbook Prob.2.32

Problem.10. Textbook Prob.2.36