**PHYS301 HW 2 Dr. Amir**

**Double slits Interference**

1. Monochromatic light falls on two very narrow slits 0.048 mm apart. Successive fringes on a screen 6.00 m away are 8.5 cm apart near the center of the pattern. Determine the wavelength and frequency of the light.

For constructive interference, the path difference is a multiple of the wavelength, The location on the screen is given by for small angles, we have  Adjacent fringes will have 



1. If 720-nm and 660-nm light passes through two slits 0.68 mm apart, how far apart are the second-order fringes for these two wavelengths on a screen 1.0 m away?

For constructive interference, the path difference is a multiple of the wavelength.The location on the screen is given by  as seen in Fig. 34-7(c). For small angles, we have  Second order means *m* = 2.



This justifies using the small angle approximation, since x<<l

1. Light of wavelength 680 nm falls on two slits and produces an interference pattern in which the third-order bright fringe is 38 mm from the central fringe on a screen 2.6 m away. What is the separation of the two slits?

For constructive interference, the path difference is a multiple of the wavelength, The location on the screen is given by as seen in Fig. 34-7(c). For small angles, we have 



**Planck’s Quantum Hypothesis**

1. Estimate the peak wavelength for radiation from (*a*) ice at 273 K, (*b*) a floodlamp at 3500 K, (*c*) helium at 4.2 K, (*d*) for the universe at  assuming blackbody emission. In what region of the EM spectrum is each?

We use Wien’s law,

(*a*) 

This wavelength is in the far infrared.

(*b*) 

This wavelength is in the infrared.

(*c*) 

This wavelength is in the microwave region.

(*d*) 

This wavelength is in the microwave region.

**5.** Estimate the peak wavelength of light issuing from the pupil of the human eye (which approximates a blackbody) assuming normal body temperature.





**Photons and the Photoelectric Effect**

1. What is the energy of photons (in joules) emitted by a 104.1-MHz FM radio station?



1. What is the energy range (in joules and eV) of photons in the visible spectrum, of wavelength 410 nm to 750 nm?

We use Eq. of energy along with the fact that  for light. The longest wavelength will have the lowest energy.





Thus the range of energies is  or 

1. A typical gamma ray emitted from a nucleus during radioactive decay may have an energy of 380 keV. What is its wavelength? Would we expect significant diffraction of this type of light when it passes through an everyday opening, such as a door?

We know that for light.



Significant diffraction occurs when the opening is on the order of the wavelength. Thus there would be insignificant diffraction through the doorway.

1. What is the maximum kinetic energy of electrons ejected from barium (Φ=W0=2.48eV ) when illuminated by white light, λ=410nm to 750 nm?

The photon of visible light with the maximum energy has the minimum wavelength. the maximum kinetic energy.

