Physics - 2 Worksheet

1. In a double-slit arrangement the slits are separated by a distance equal to 100 times the wavelength of the light passing through the slits. (a) What is the angular separation in radians between the central maximum and an adjacent maximum? (b) What is the distance between these maxima on a screen $50.0 cm$ from the slits?

2. A double-slit arrangement produces interference fringes for sodium light ($\lambda = 589 \ nm$) that have an angular separation of $3.50 \times 10^{-3} \ rad$. For what wavelength would the angular separation be 10.0% greater?

3. Monochromatic green light, of wavelength $550 \ nm$, illuminates two parallel narrow slits $7.70 \ mm$ apart. Calculate the angular deviation θ of the third-order ($m = 3$) bright fringe (a) in radians and (b) in degrees.

4. In a double-slit experiment, the distance between slits is $5.0 \ mm$ and the slits are $1.0 \ m$ from the screen. Two interference patterns can be seen on the screen: one due to light of wavelength $480 \ nm$, and the other due to light of wavelength $600 \ nm$.What is the separation on the screen between the third-order ($m = 3$) bright fringes of the two interference patterns?

5. How hot is a metal being welded if it radiates most strongly at $520nm$?

6. Estimate the peak wavelength for radiation emitted from (a) ice at $0^o C$, (b) a floodlamp at $3100K$, (c) helium at $4K$, assuming blackbody emission. In what region of the EM spectrum is each?

7. (a) What is the temperature if the peak of a blackbody spectrum is at $18.0nm$? (b) What is the wavelength at the peak of a blackbody spectrum if the body is at a temperature of $2200K$?

8. An HCl molecule vibrates with a natural frequency of $8.1 \times 10^{13} Hz$ What is the difference in energy (in joules and electron volts) between successive values of the oscillation energy?

9. What is the energy of photons (joules) emitted by a $91.7 \ MHz$ FM radio station?

10. What is the energy range (in joules and eV) of photons in the visible spectrum, of wavelength $400nm$ to $750nm$?

11. Calculate the momentum of a photon of yellow light of wavelength $5.8 \times 10^{-7}m$

12. What minimum frequency of light is needed to eject electrons from a metal whose work function is 4.8×10^{-19} J?

13. What is the longest wavelength of light that will emit electrons from a metal whose work function is $2.90eV$?