

Physics 200

Chapter 34 Electromagnetic Waves (Homework)

1. Derive the relationship between E_{\max} and B_{\max} using Maxwell's Equations.
2. Derive speed of light using Maxwell's equations. ($E = E_0 \cos(kx - \omega t)$, $B = B_0 \cos(kx - \omega t)$ and $E_0 = c B_0$)
3. If $E_{\max} = E_0$ a distance, x , from a light bulb that is a point source, what is the power of the light bulb?
4. If $B_{\max} = B_0$ a distance, x , from a light bulb that is a point source, what is the power of the light bulb?
5. Determine E_{\max} a distance "x" from a point source whose average power is "W".
6. A resistor, R , is connected to a battery. What is the voltage of the battery if $E_{\max} = E_0$ and $B_{\max} = B_0$ at the resistor's surface. Assume the resistor has a radius, a , and a length, L .
7. Derive the average Poynting vector's magnitude in terms of E_{\max} .
8. A sphere has radius, a , and is a distance, x , from a light bulb with power, W . What radiation force acts on it? (Assume complete reflection.)
9. A black piece of cardboard has mass, m , and area, A , is being levitated by a laser beam. What is the power of the laser? (Assume complete absorption and the cross-sectional area of the laser beam is the same as the cardboard.)
10. A mirror reflects 95% of the sunlight that strikes it and absorbs the rest. If the intensity of the light is, I , and the mirror has area, A , what force is exerted on the mirror by the normally incident sunlight?