Tutorial-6 (PHY201) Due on Wednsday

1. Explain key features of the phenomenon of Rayleigh scattering of a plane EM radiation. Discuss by making careful diagram, how and when the Rayleigh scattering converts unpolarized light into a perfectly linear polarized light.

   Discuss five daily life phenomena that exploit the Rayleigh scattering of EM radiation.

2. A copper box with dimensions as shown in the figure acts as a cavity resonator. The electric field

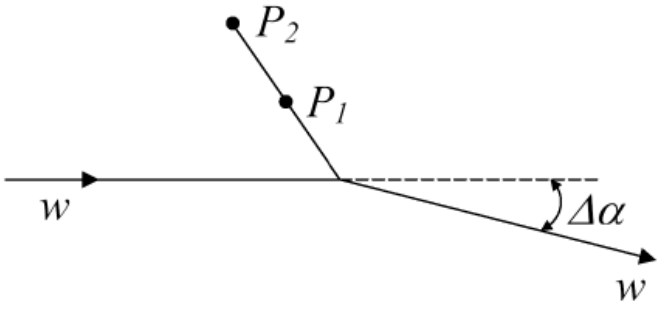
$$E_z = E_0 \, sin(k_x x) \, sin(k_y y) \, sin(\omega t), \; E_x = E_y = 0$$

   is a possible solution of the wave equation for this case.

   (a) Find the lowest resonance frequency ω_1 and the corresponding free space wavelength λ_1.

   (b) Find the next-to-lowest resonance frequency ω_2 and the corresponding free space wavelength λ_2.

3. A point charge q has been moving with constant velocity *w* along a straight line until the time $t=t_0$. In the short time interval from time t_0 to $t_0+\Delta t$, a force perpendicular to the trajectory changes the direction without changing the magnitude of the velocity. After the time $t= t_0+\Delta t$ the charge again moves with the velocity *w* along a straight line making a small angle $\Delta\alpha$ with the initial trajectory.



   (a) What is the direction of E-field caused by the acceleration, at the distant point P_1.
   (b) In what direction is the radiation intensity of the accelerated charge the most intense?
   (c) Where is it least intense
   (d) Point P_2 is twice as far from the bend of trajectory as P_1. By what fraction does the amplitude of magnetic disturbance decrease as the radiation pulse move from P_1 to P_2?
   (e) What is the total energy radiated?