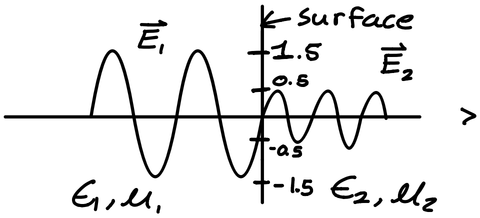
8.2

Given $\epsilon_2 = 9\epsilon_0$, $\epsilon_1 = \epsilon_0$.



$\vec{E}_1 = \vec{E}_{inc} + \vec{E}_{ref}$, $\vec{E}_2 = \vec{E}_{trans}$

Maxwell's Boundary Conditions state

$E_1^{\parallel} = E_2^{\parallel}$, $E_1^{\perp} = E_2^{\perp} = 0$ * direction of propagation is $\perp$ to surface

$E_I + E_R = E_T$ * Let $E_I = E_1^+$, $E_R = E_1^-$, $E_T = E_2^+$ (no E_2^- exists since wave is coming from left to right)

$E_1^- + E_1^+ = E_2^+$

* From Griffiths the Reflected & Transmitted amplitudes are solved in terms of the incident amplitude for normal incidence as:

$\tilde{E}_{0_R} = \left(\frac{1-\beta}{1+\beta}\right)\tilde{E}_{0_I}$, $\tilde{E}_{0_T} = \left(\frac{2}{1+\beta}\right)\tilde{E}_{0_I}$

where $\beta = \frac{\mu_1 v_1}{\mu_2 v_2}$ & v_1 & v_2 can be defined in terms of ϵ & μ

$v = \frac{1}{\sqrt{\epsilon\mu}}$

$v_1 = c$ & $v_2 = \frac{c}{3}$ * $\mu_1 = \mu_2 = \mu_0$ & $\epsilon_2 = 9\epsilon_1$

$\beta = \frac{\cancel{\mu_0}\, \cancel{c}}{\cancel{\mu_0}\, \cancel{c}/3} = 3$

$\therefore \tilde{E}_{0_T} = \left(\frac{2}{4}\right)E_{0_I} = \frac{1}{2}\tilde{E}_{0_I}$

$\tilde{E}_{0_R} = -\left(\frac{2}{4}\right)E_{0_I} = -\frac{1}{2}\tilde{E}_{0_I}$

Analyzing the peak-to-peak amplitude of Transmitted wave:

$1 = \frac{1}{2}E_{0_I}$

$\therefore E_{0_I} = 2\ \frac{V_{pp}}{m}$ * V_{pp} = Voltage peak-to-peak amplitude

$\therefore E_{0_R} = -1\ \frac{V_{pp}}{m}$, $E_{0_T} = 1\ \frac{V_{pp}}{m}$