

PhO Test D 2005/2006: Solutions

a) $\vec{E} = 0$; $0 < r < r_1$

$\vec{E} = \frac{\lambda}{2\pi\epsilon} \frac{1}{r} \vec{e}_r$; $r_1 < r < r_2$

$\vec{E} = \frac{\lambda}{2\pi\epsilon_0} \frac{1}{r} \vec{e}_r$; $r > r_2$

b) $\phi(r) = 0$; $0 < r < r_1$

$\phi(r) = -\frac{\lambda}{2\pi\epsilon} \ln\left(\frac{r}{r_1}\right)$; $r_1 < r < r_2$

$\phi(r) = -\frac{\lambda}{2\pi\epsilon} \ln\left(\frac{r_2}{r_1}\right) - \frac{\lambda}{2\pi\epsilon_0} \ln\left(\frac{r}{r_2}\right)$; $r > r_2$

c) $\sigma'_1 = -\frac{\lambda}{2\pi} \frac{1}{r_1} \frac{\epsilon - \epsilon_0}{\epsilon}$; $\sigma_1 = \frac{\lambda}{2\pi r_1}$

$D = \frac{\lambda}{2\pi} \frac{1}{r} \vec{e}_r$; $r_1 < r < r_2$

$D_{n_2} - D_{n_1} = \frac{\lambda}{2\pi r_1} - 0 = \sigma_1$ ✓

~~1/2/1/1~~

