

$$n_s = n_0 e^{-\frac{e_s \phi}{T}}$$

$$\delta n_s = \frac{\partial n_s}{\partial \phi} \delta \phi = n_0 \frac{\partial \left( e^{-\frac{e_s \phi}{T}} \right)}{\partial \phi} \delta \phi = -\frac{n_0 e_s}{T} \delta \phi e^{-\frac{e_s \phi}{T}}$$

$$e(\delta n_i - \delta n_e) = e \left( -\frac{n_0 e}{T} e^{-\frac{e \phi}{T}} \delta \phi - \frac{n_0 e}{T} e^{\frac{e \phi}{T}} \delta \phi \right) = -\frac{n_0 e^2}{T} \delta \phi \left( e^{-\frac{e \phi}{T}} - e^{\frac{e \phi}{T}} \right)$$