

Quiz 3

$$1. n_0 = N_d - N_a = 3 \times 10^{15} \text{ cm}^{-3} \quad 1'$$

$$E_c - E_F = kT \ln\left(\frac{N_c}{n_0}\right) = 0.236 \text{ eV} \quad 1'$$

$$\therefore E_c - E_d \approx 0.026 \text{ eV} \quad (\text{or } 0.045 \text{ eV}) \quad 1'$$

$$\therefore E_d - E_F = (E_c - E_F) - (E_c - E_d) = \underline{0.21 \text{ eV}} \quad (0.191 \text{ eV}) \quad 1'$$

$$\therefore E_c - E_v = E_g = 1.12 \text{ eV}, \quad E_a - E_v \approx 0.026 \text{ eV} \quad (0.045 \text{ eV})$$

$$\therefore E_c - E_a = (E_c - E_v) - (E_a - E_v) = 1.094 \text{ eV} \quad (1.075 \text{ eV}) \quad 1'$$

$$\therefore E_F - E_a = (E_c - E_a) - (E_c - E_F) = \underline{0.858 \text{ eV}} \quad (0.839 \text{ eV}) \quad 1'$$

$$2. E_x = - \frac{kT}{e} \cdot \frac{1}{N_d(x)} \cdot \frac{dN_d(x)}{dx} \quad 1'$$

$$= - \frac{kT}{e} \cdot 10^{16} \cdot e^{-\frac{x}{L}} \cdot 10^{16} \cdot \left(-\frac{1}{L}\right) \cdot e^{-\frac{x}{L}}$$

$$= \frac{kT}{eL} \quad 1'$$

$$= 1.295 \text{ V/cm}$$

$$E_x(0) = E_x(10^{-4}) = 1.295 \text{ V/cm} \quad 2'$$