**Primer on Semiconductors: Lecture 5.4 Short Problem**

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Provide a numerical answer to the question below.

1a) Assume P-type GaAs doped at  cm-3. The minority electron mobility is 4000 cm2/V-s. and the minority carrier lifetime is 3 nanoseconds. Compute the minority electron diffusion length at *T* = 300K.

1b) Assume P-type Si doped at  cm-3. The minority electron mobility is 250 cm2/V-s. and the minority carrier lifetime is 10 microseconds. Compute the minority electron diffusion length at *T* = 300K.

**Note:** In direct gap semiconductors like GaAs, the minority carrier lifetime in moderately and heavily doped materials is typically dominated by band-to-band radiative recombination and is short. For indirect gap semiconductors like Si, band-to-band radiative recombination is weak, and the minority carrier lifetime is dominated by defect-assisted (SRH) processes. For high quality, single crystal Si, the defect density is low and the minority carrier lifetime can be quite long.