1. (2.5 pts) A 100 mW laser beam with wavelength $\lambda = 6328$ Å is focused onto a GaAs sample that is 0.5 μm thick. The absorption coefficient at this wavelength is 3×10^4 cm^{-1}, the bandgap is $E_g = 1.42$ eV at 300 K, and $m_e^* = 0.067\, m_o$.
   a) Find the number of photons emitted per second by radiative recombination in the GaAs, assuming perfect quantum efficiency.
   b) What is the power delivered to the sample as heat?
2. (1.5 pts) An aluminum layer having the work function $q\phi_m = 4.1$ eV is deposited onto a SiC substrate. SiC has an electron affinity of 3.9 eV and a bandgap of 3.0 eV and its effective density of states at room temperature of $N_C = N_V = 2.51 \times 10^{19}$ cm^{-3}. Determine the doping type and carrier density so that the work function of the SiC matches the Al layer at room temperature.

q	1.6×10^{-19} C	electron charge
ϵ_o	8.85×10^{-14} F/cm	permittivity of free space
K_s	11.8 (Si)	relative dielectric constant
K_o	3.9 (SiO_2)	relative dielectric constant
k_B	8.617×10^{-5} eV/K	Boltzman's constant
h	6.63×10^{-34} J s	Planck constant
m_o	9.11×10^{-31} kg	electron mass
k_BT/q	0.0259 V at 300 K	thermal voltage
c	3×10^8 m/s	speed of light