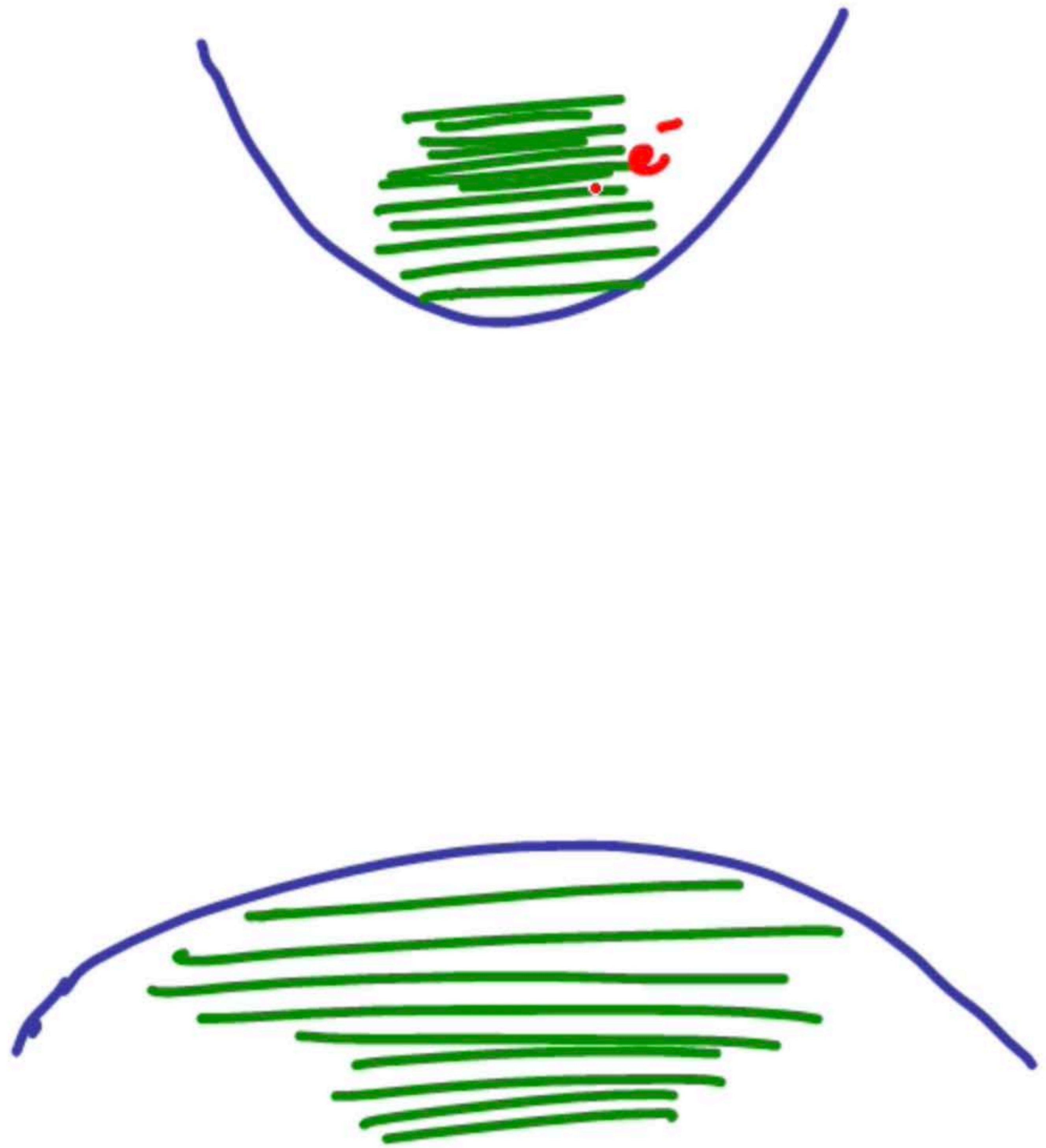
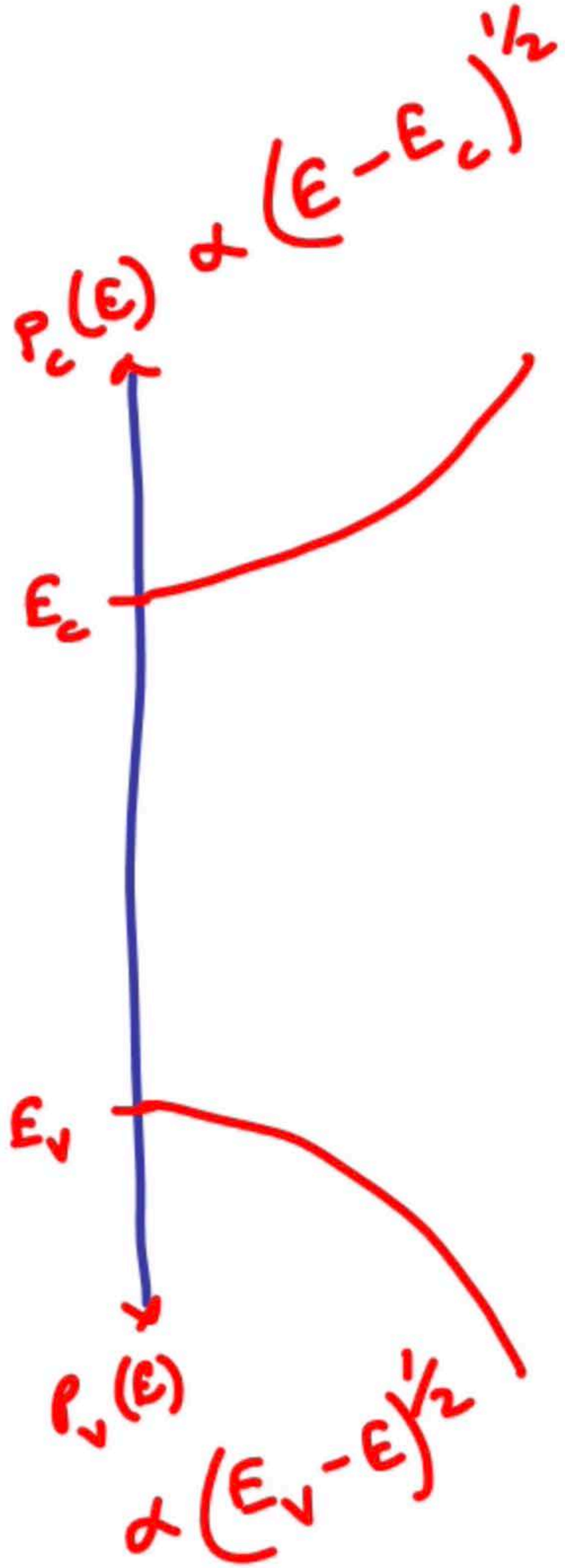
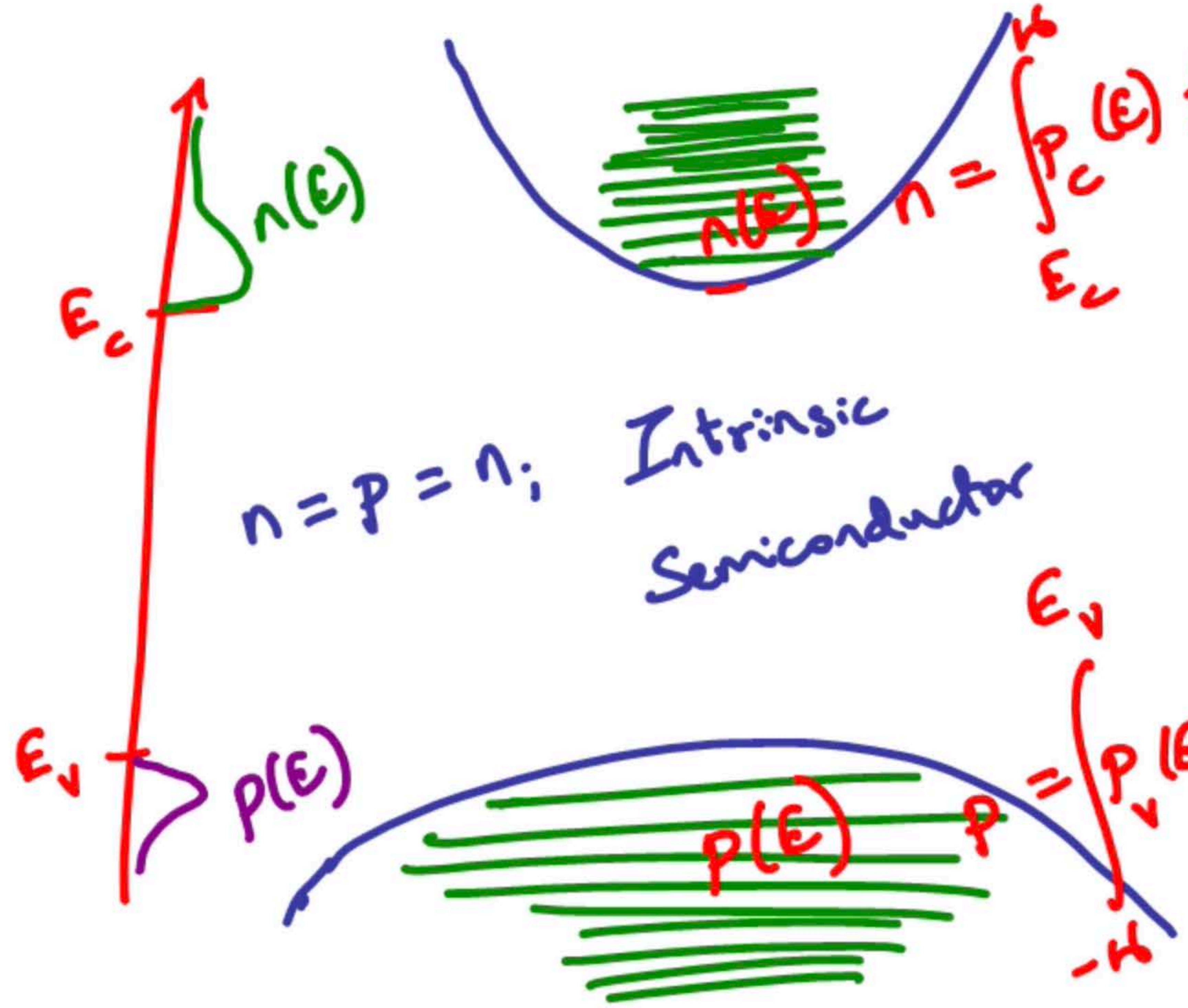




Density of states in valence & conduction bands is higher as we move away from bandgap

Probability of occupancy (electron) → Fermi-Dirac distribution

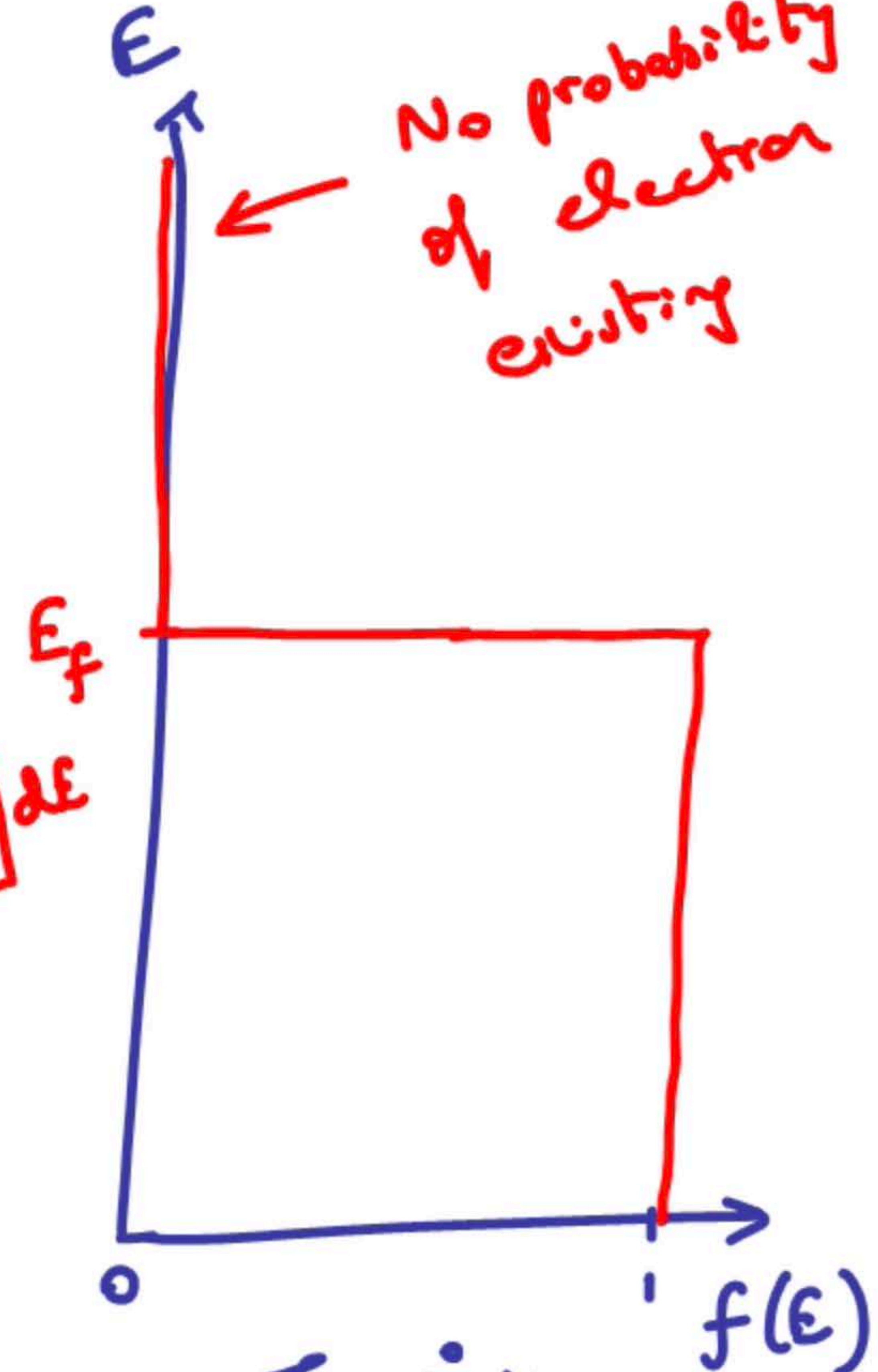
$$f(E) = \frac{1}{1+\exp\left(\frac{E-E_f}{k_B T}\right)}$$



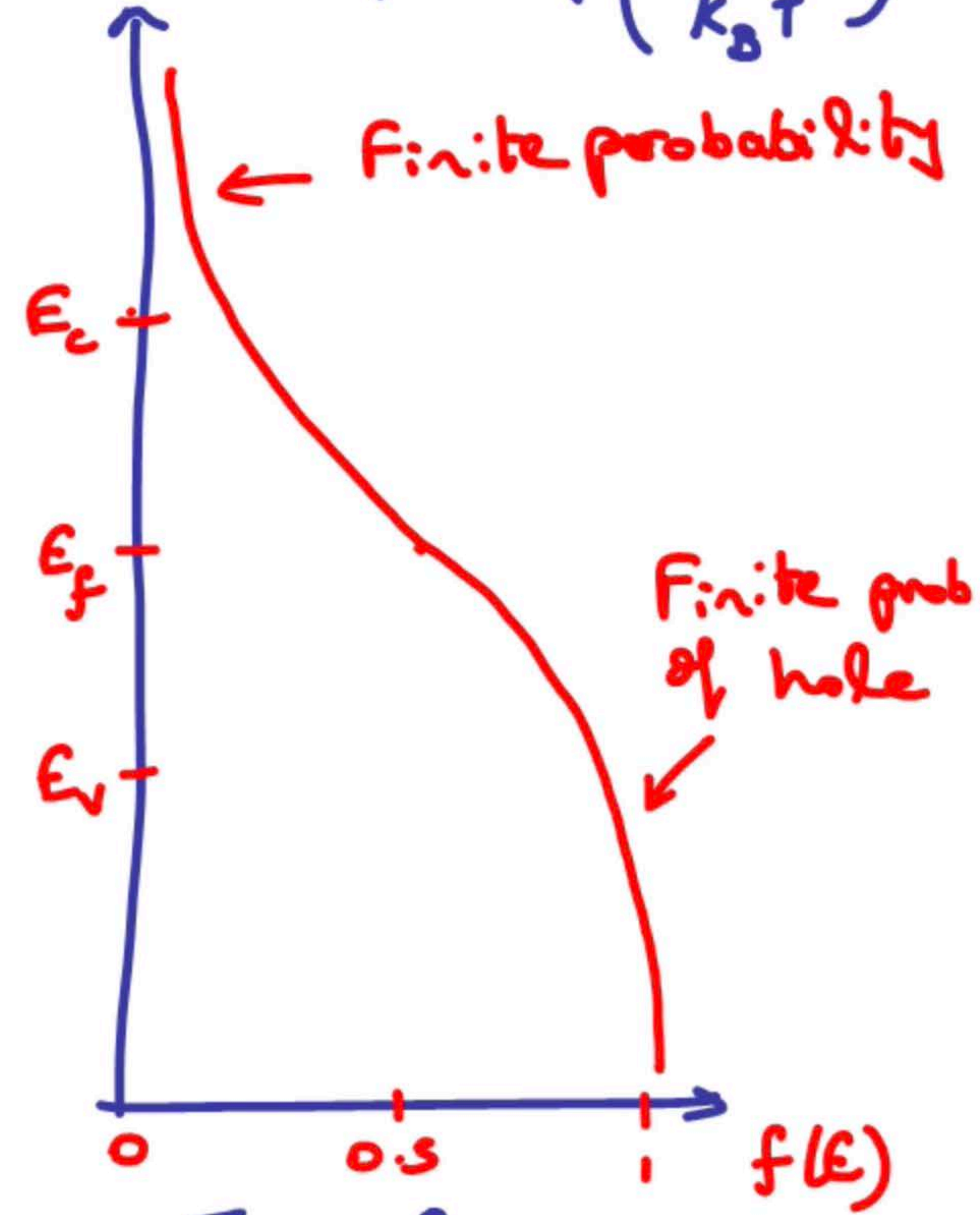
$$n = \int_{E_c}^{\infty} \rho_c(E)\, f(E)\, dE$$

$n = p = n_i$ Intrinsic Semiconductor

$$p = \int_{-\infty}^{E_v} \rho_v(E)\,[1-f(E)]\, dE$$



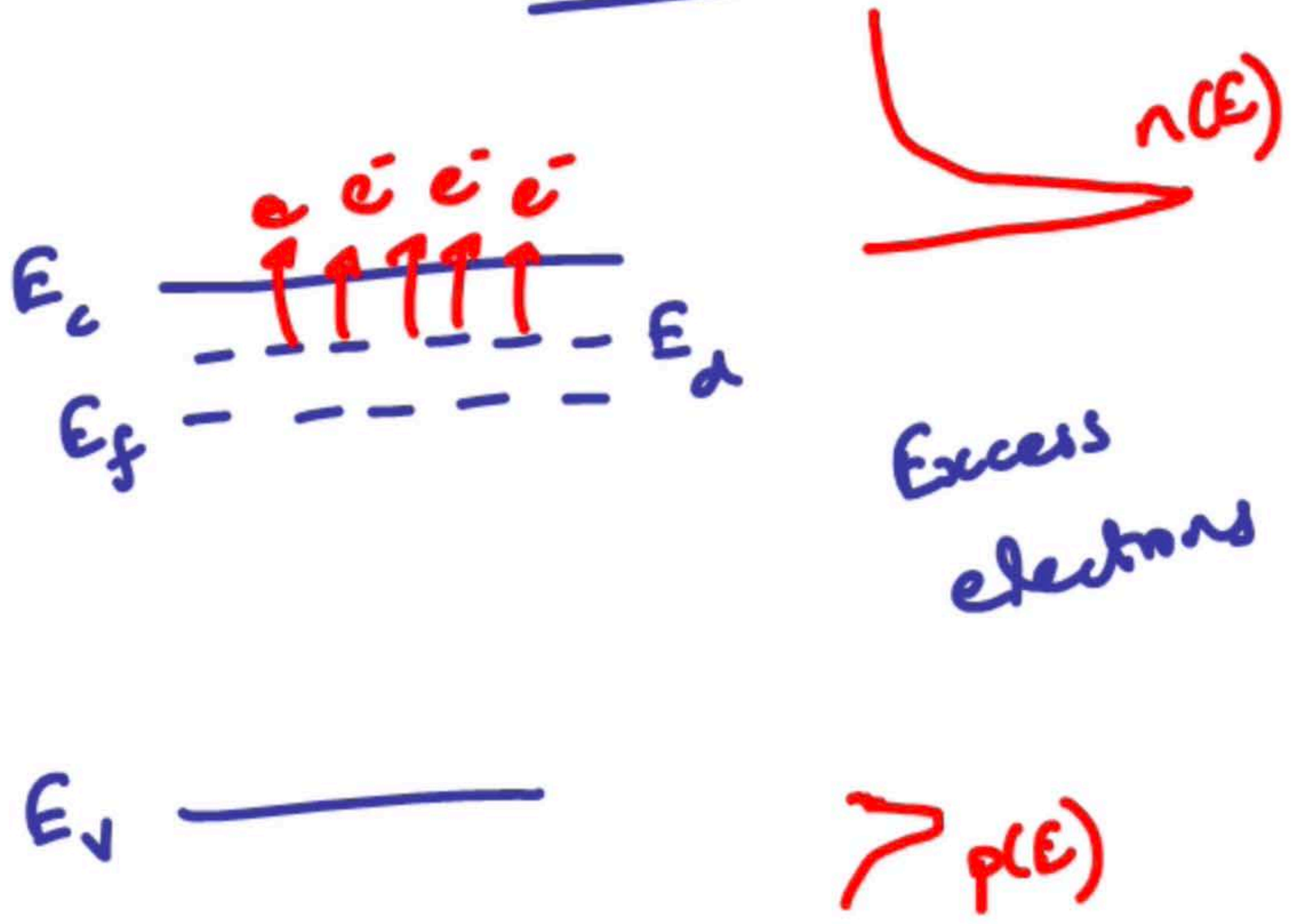
$T = 0°K$



$T > 0°K$

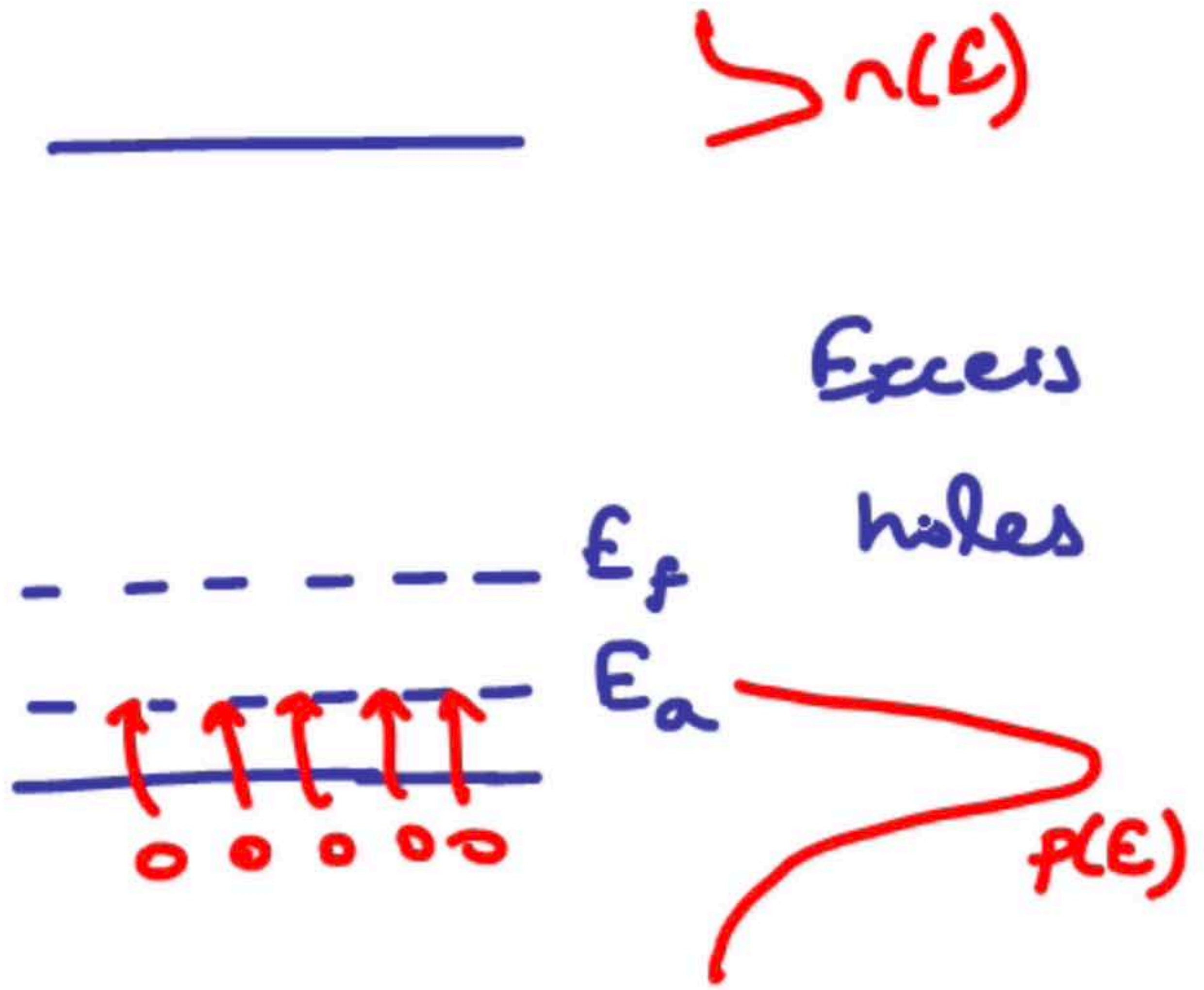
Extrinsic Semiconductors (doped)

n-type (Si: doped w/ Phos)

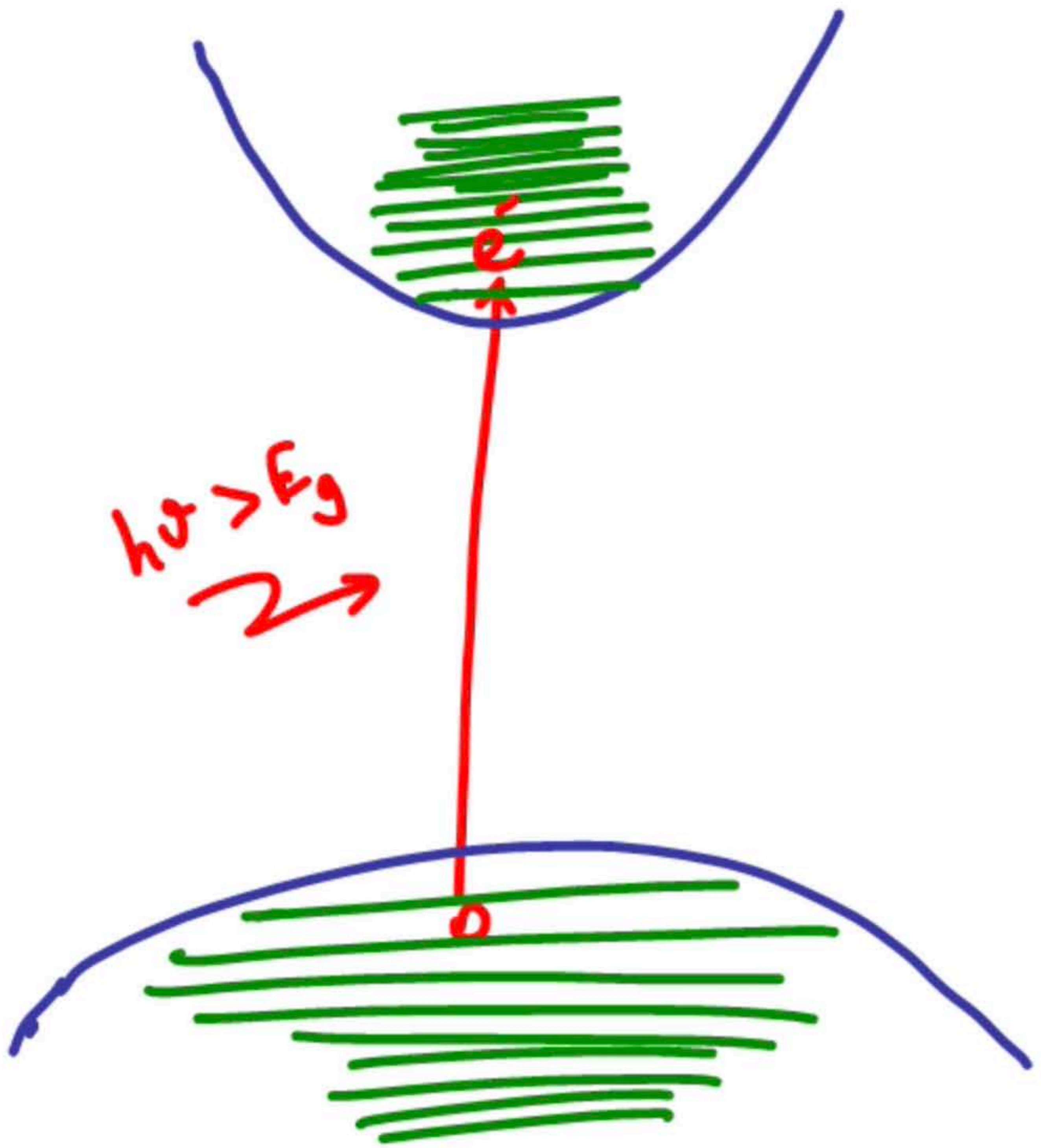


Excess electrons

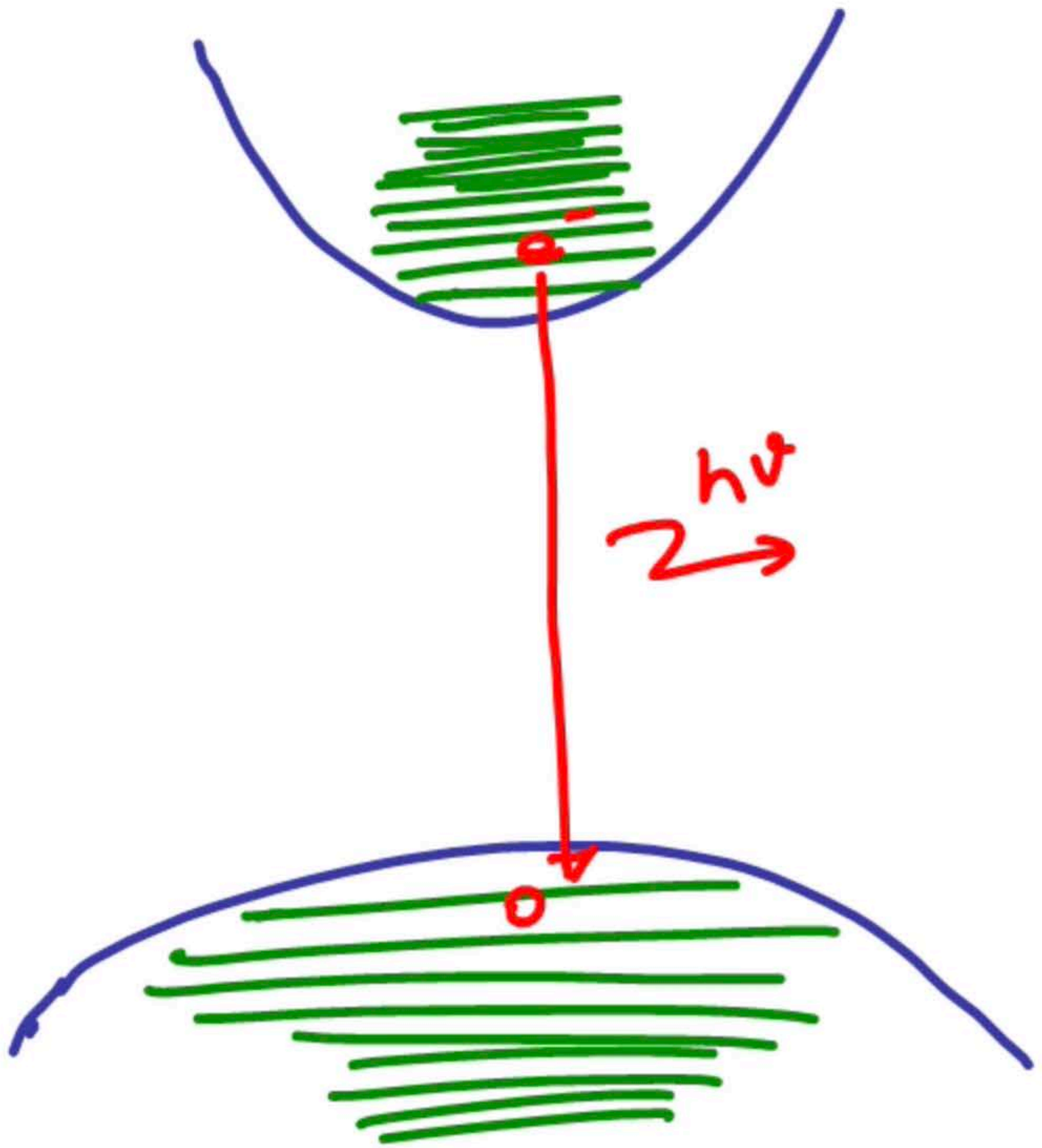
p-type (Si: doped with Al)



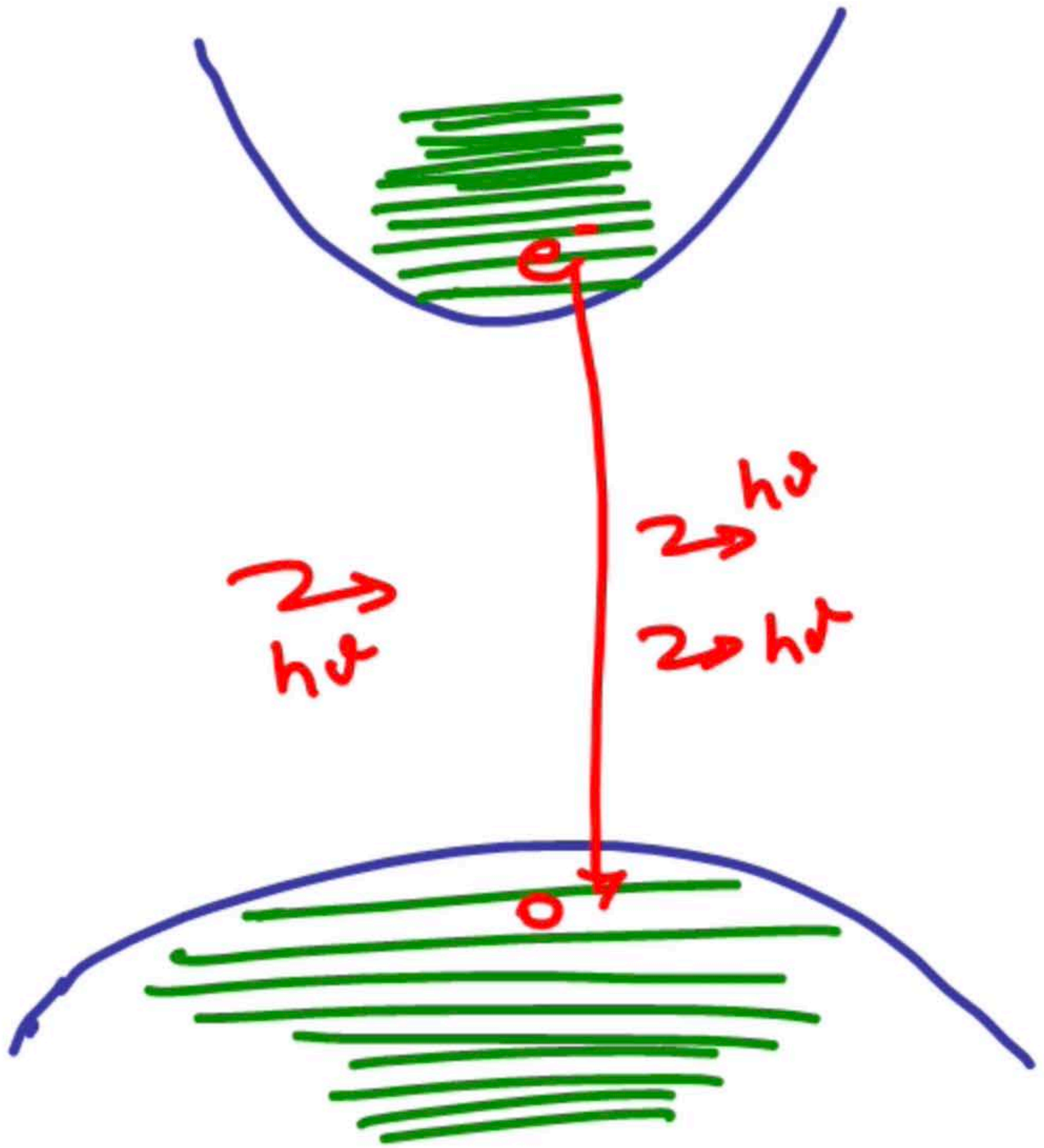
Excess holes



Absorption



Spontaneous emission

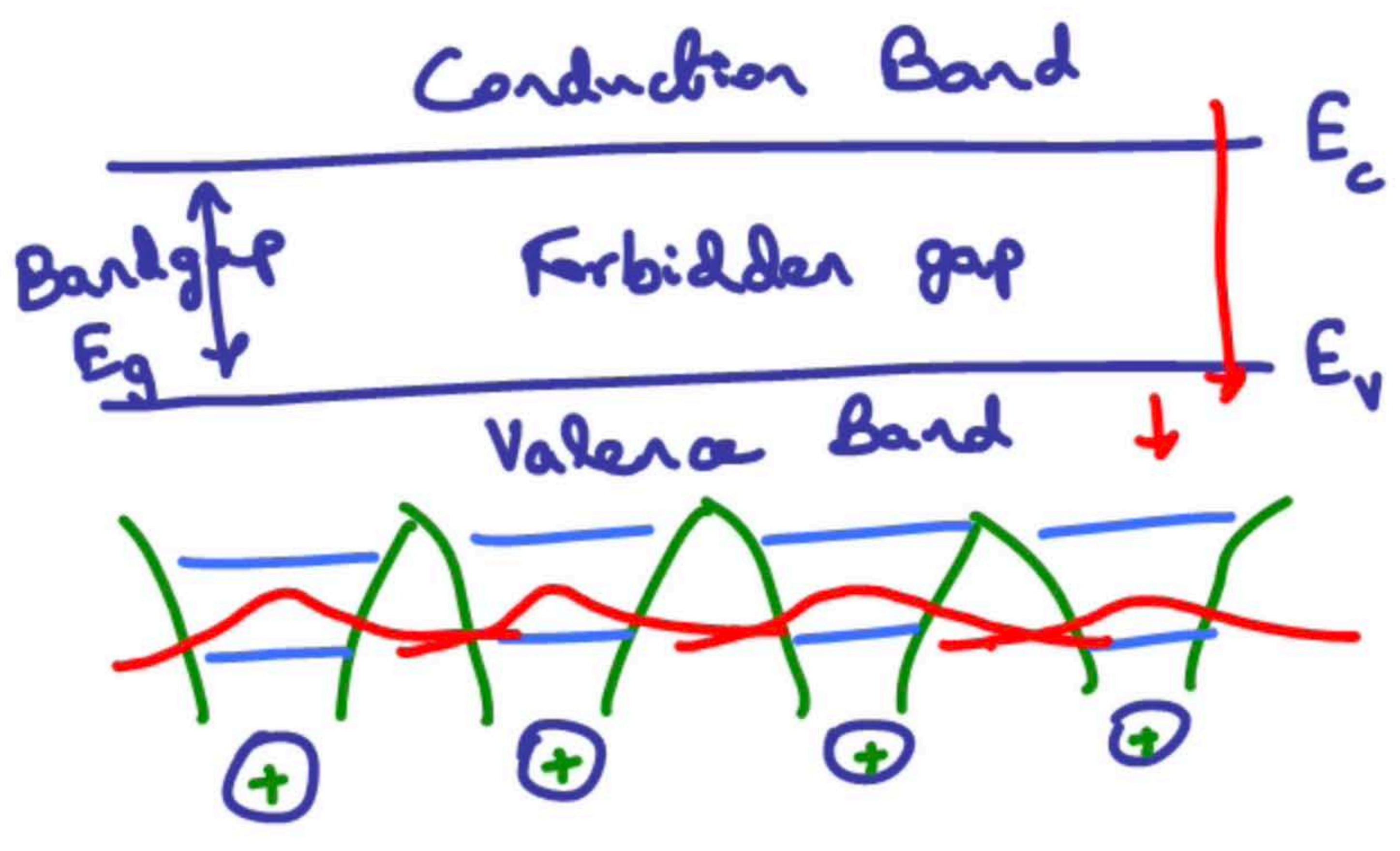


Stimulated emission

lec 24_Fundamentals of Semiconductors.mp4

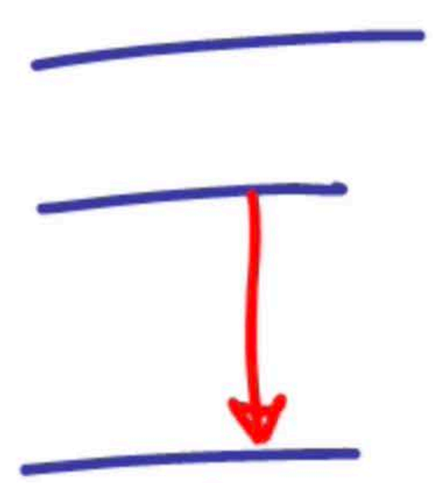
Learning Objective: Identify fundamental principles of semiconductor light sources & detectors

Schroedinger wave equation



$E_g >> K_B T$
25 meV

Kronig-Penney Model

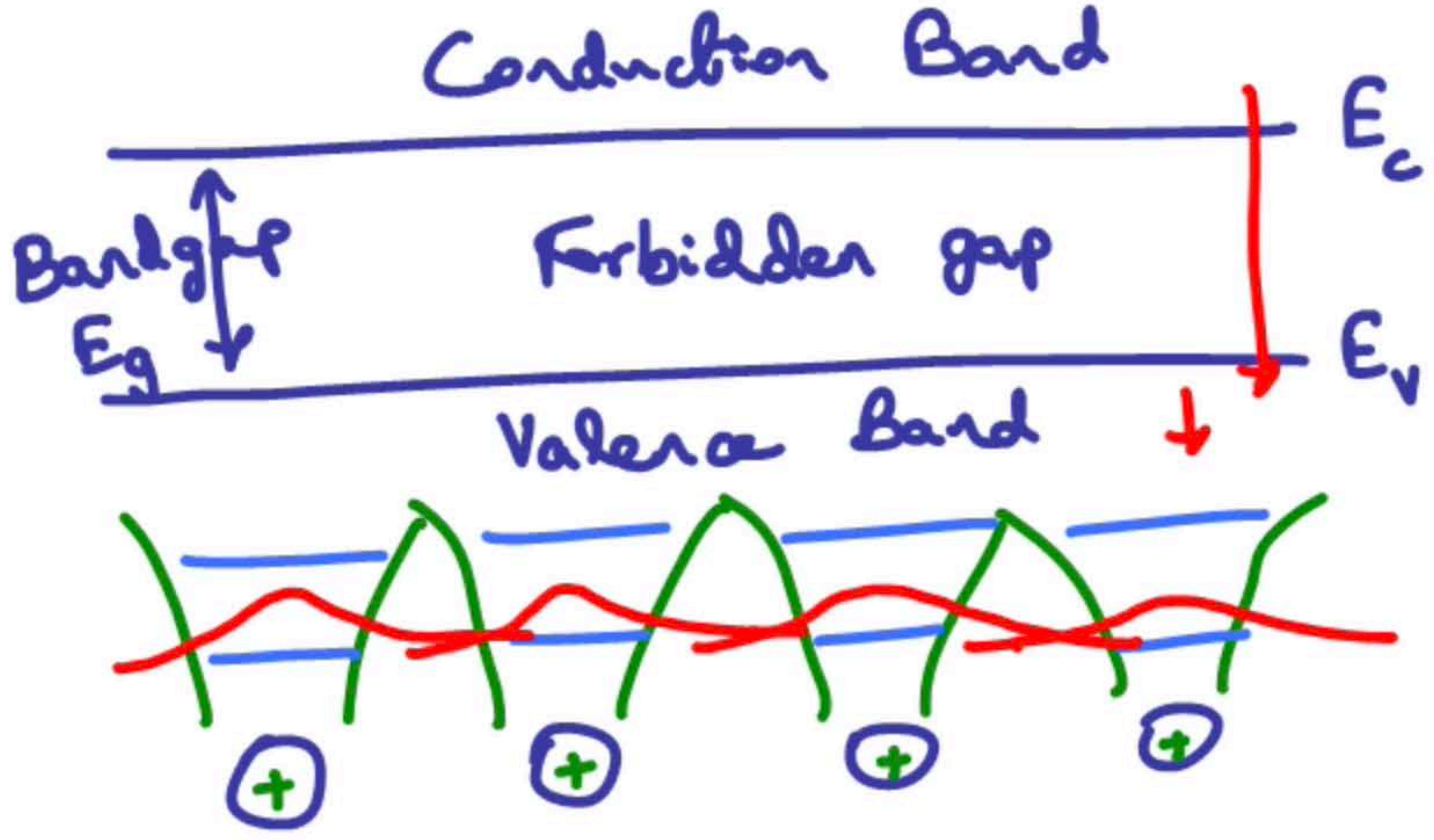


Dilute Atomic

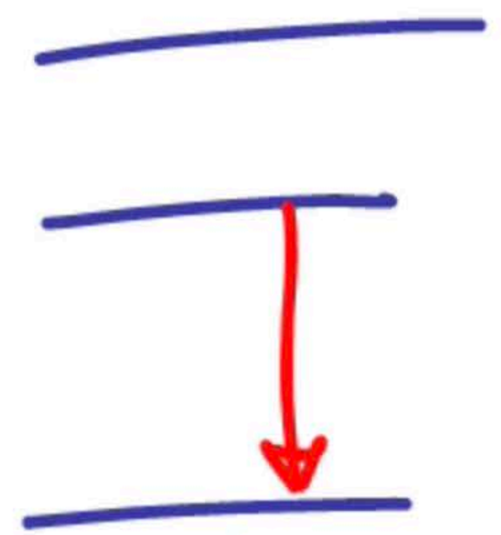
Learning Objective: Identify fundamental principles of semiconductor light sources & detectors

Schroedinger wave equation

$E_g \gg K_B T$
25 meV



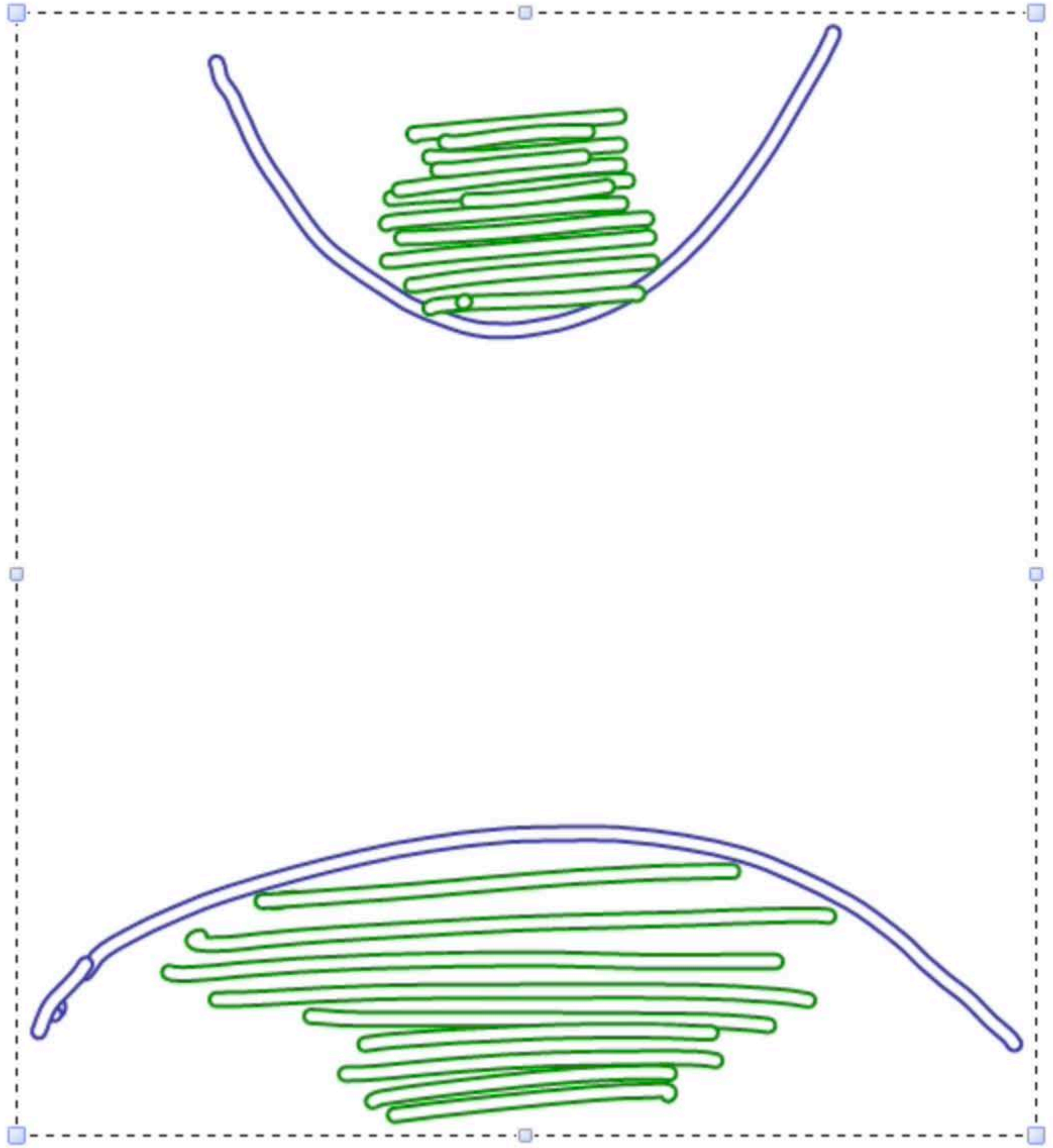
Kronig-Penney Model



Dilute Atomic

Note Title

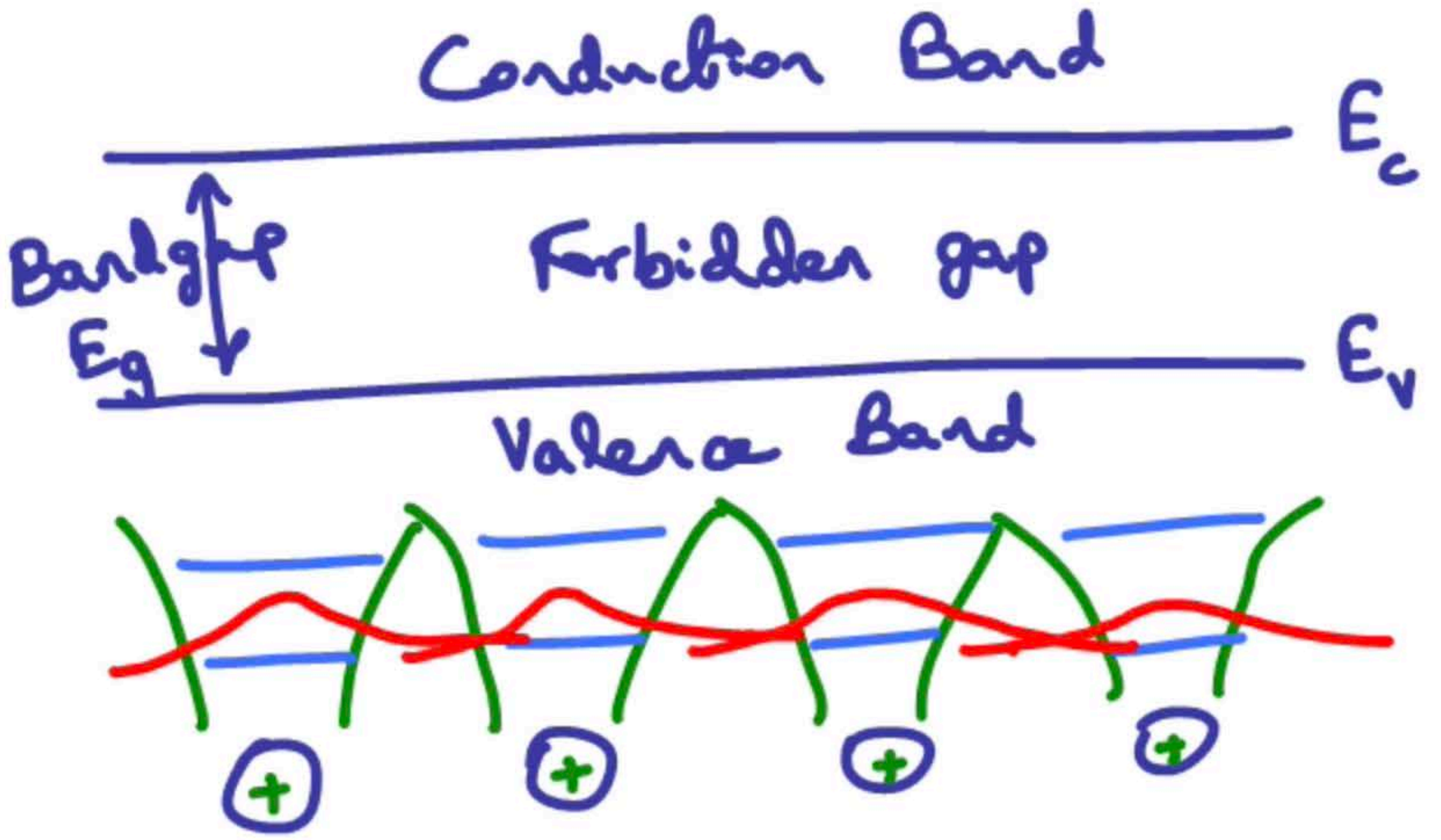
Learning Objective: Identify fundamental principles of semiconductor light sources & detectors



Note Title

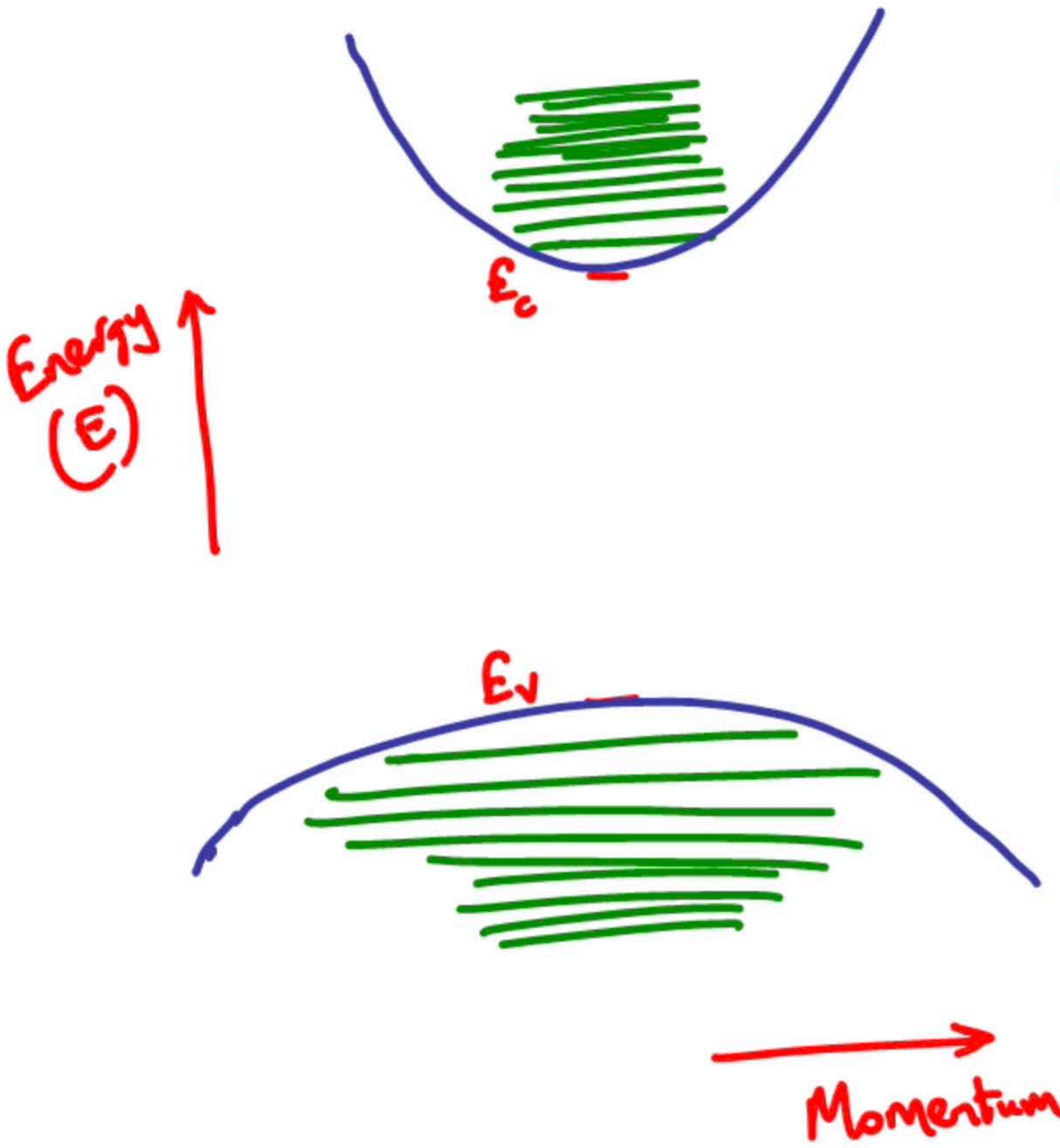
Learning Objective: Identify fundamental principles of semiconductor light sources & detectors

Schroedinger wave equation



$E_g >> K_B T$

Kronig-Penney Model



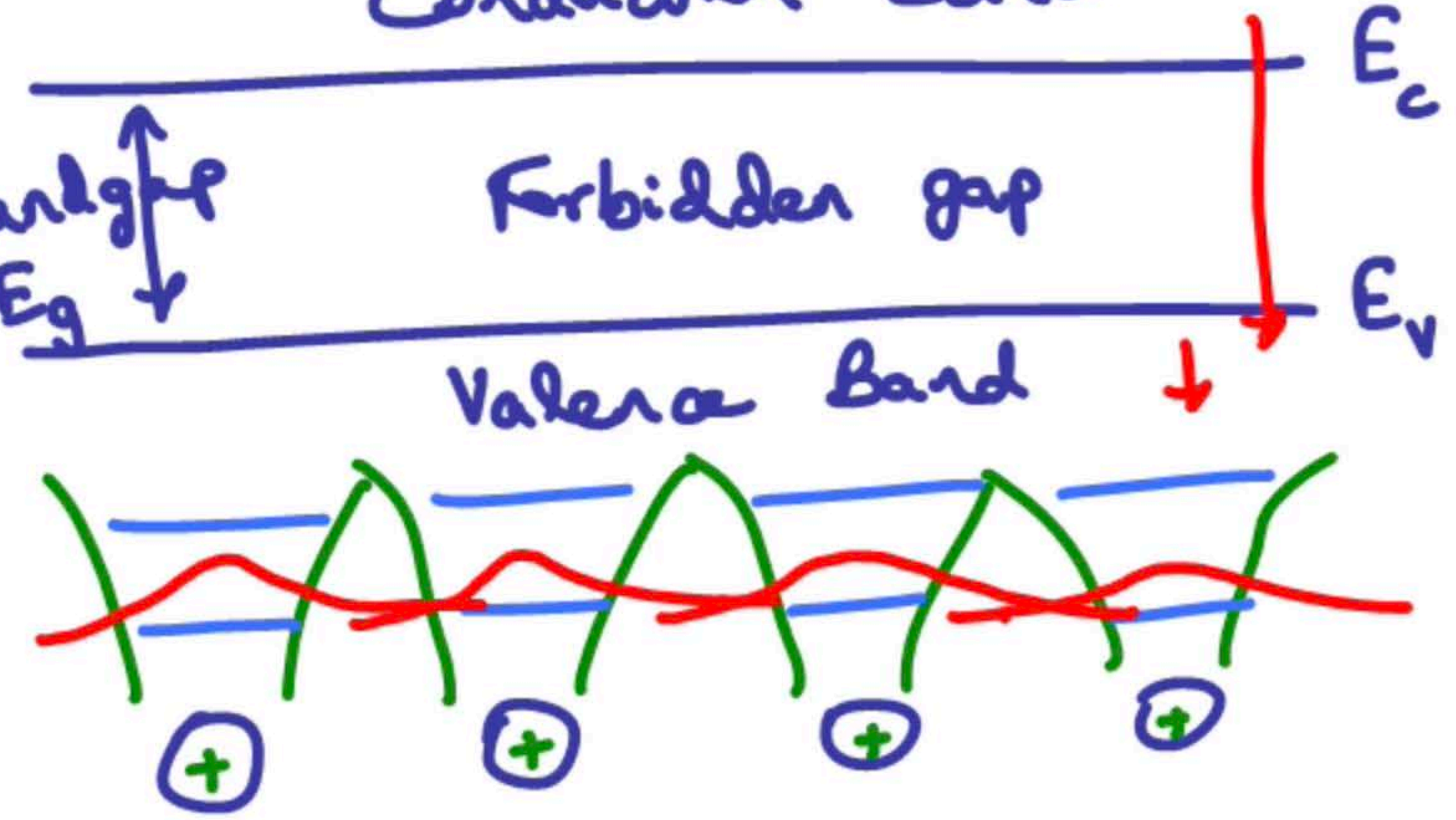
$$E = E_c + \frac{\hbar^2 k^2}{2 m_c}$$

$$E = E_v - \frac{\hbar^2 k^2}{2 m_v}$$

Note Title

Learning Objective: Identify fundamental principles of semiconductor light sources & detectors

Schroedinger wave equation



$E_g \gg K_B T$
25 meV

Kronig-Penney Model