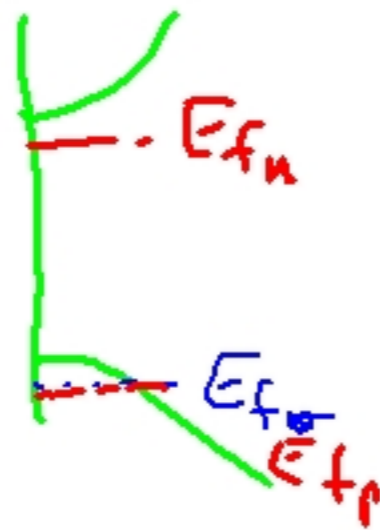
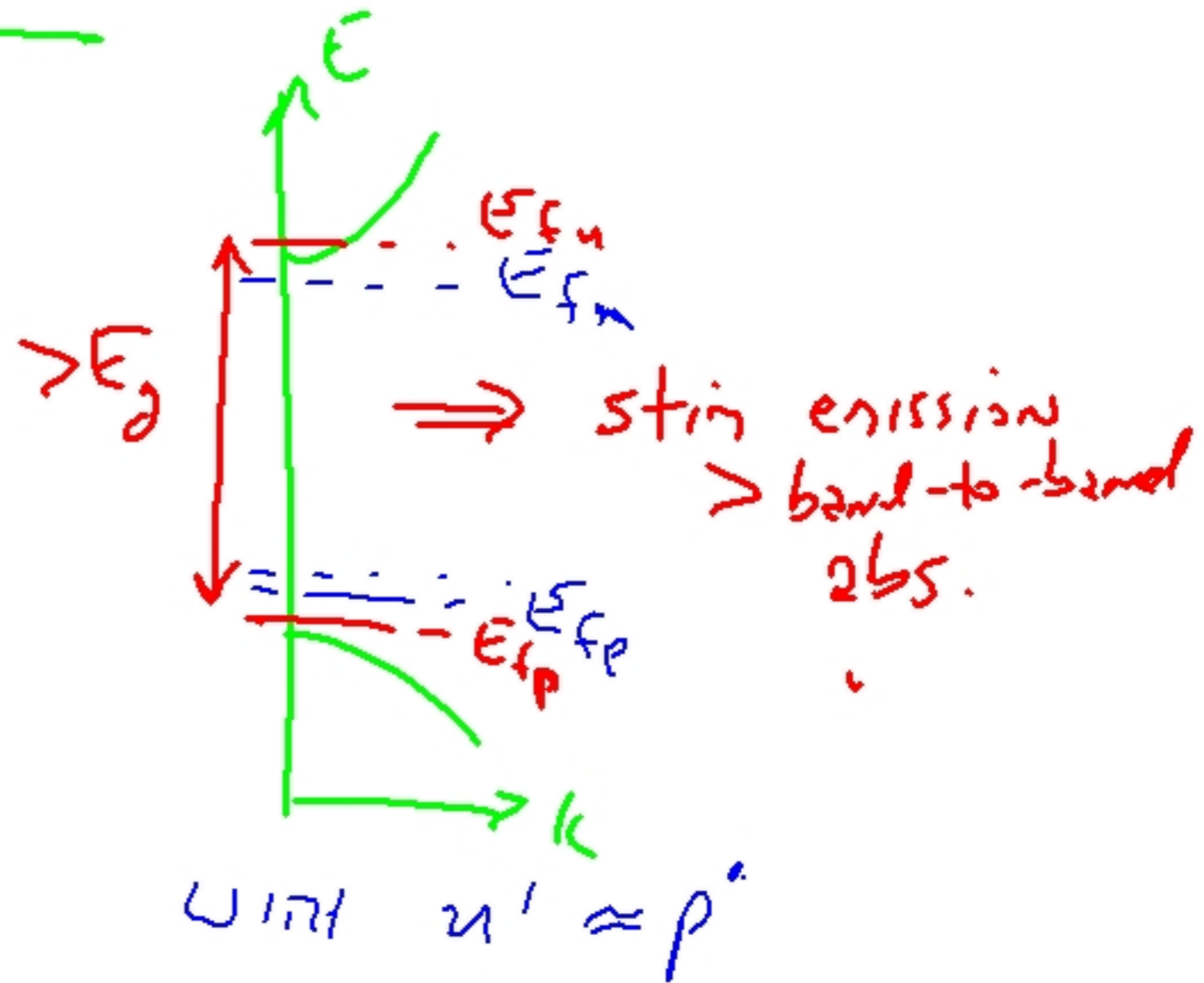
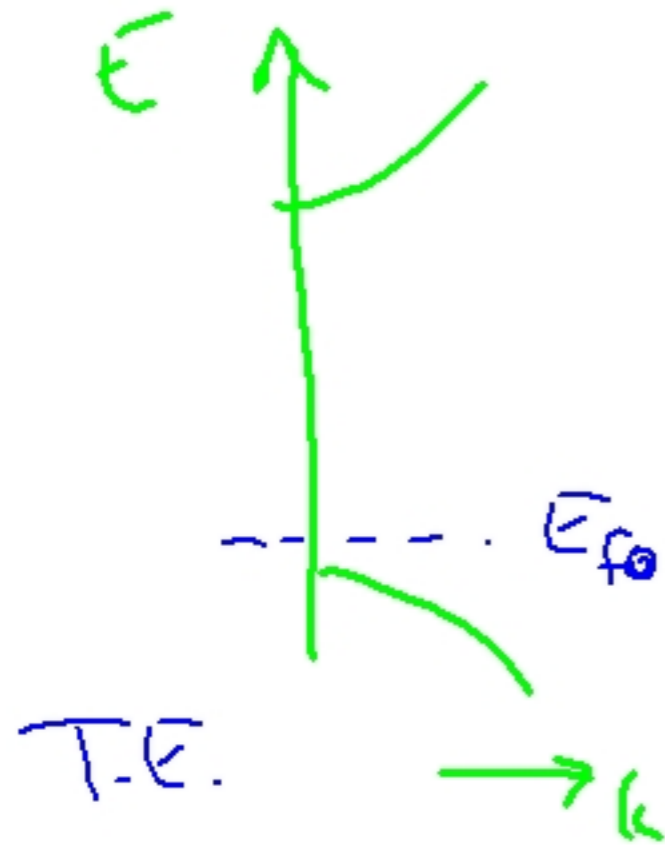
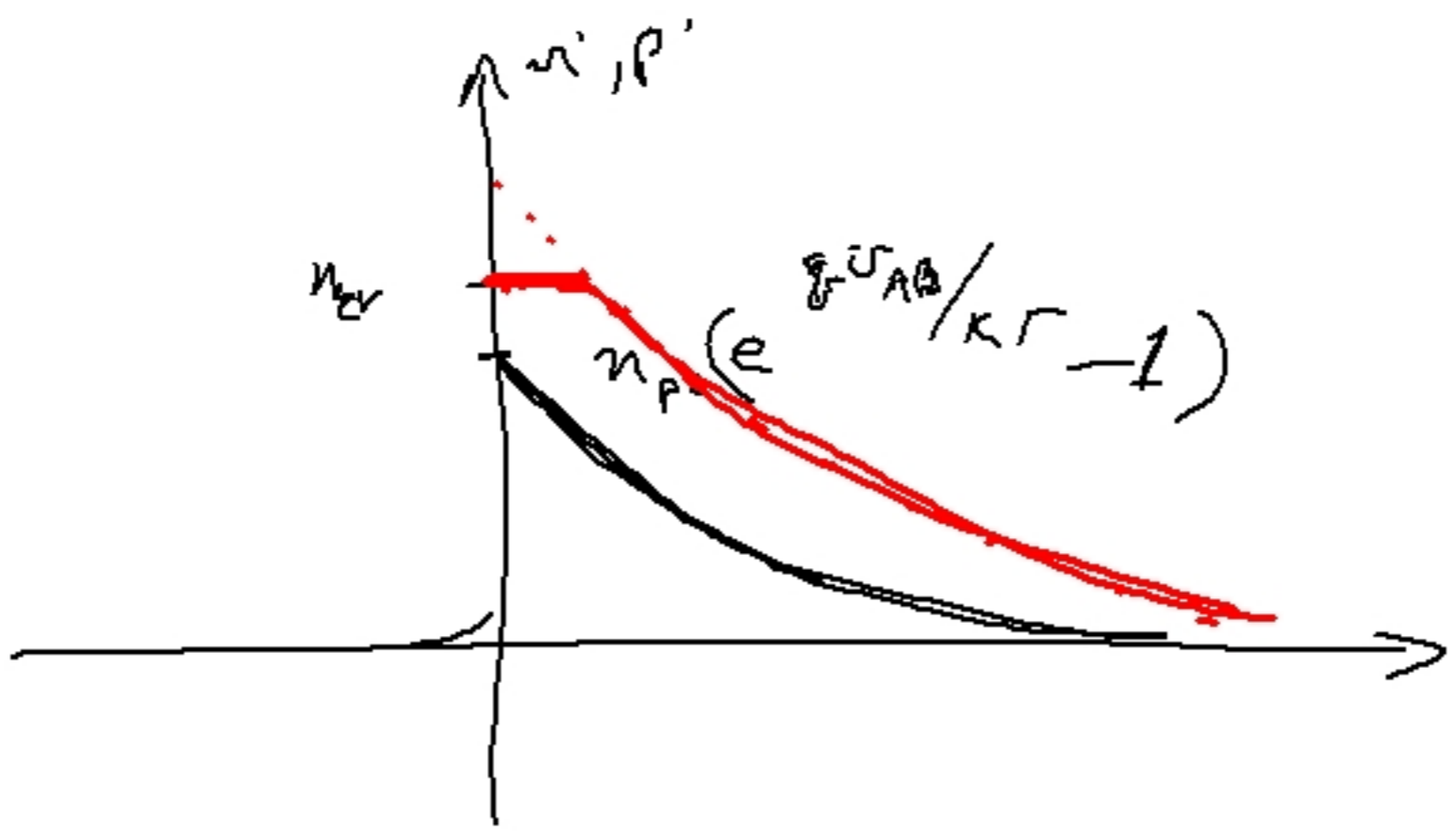
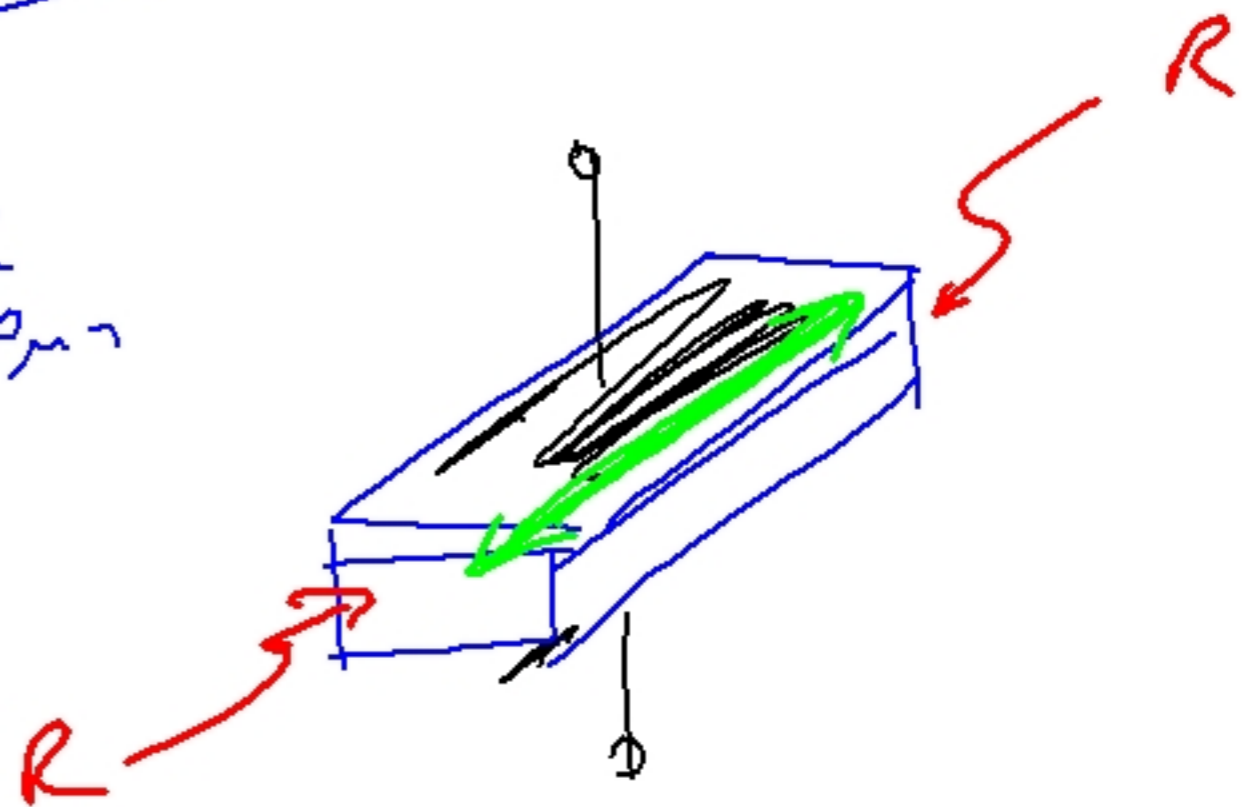
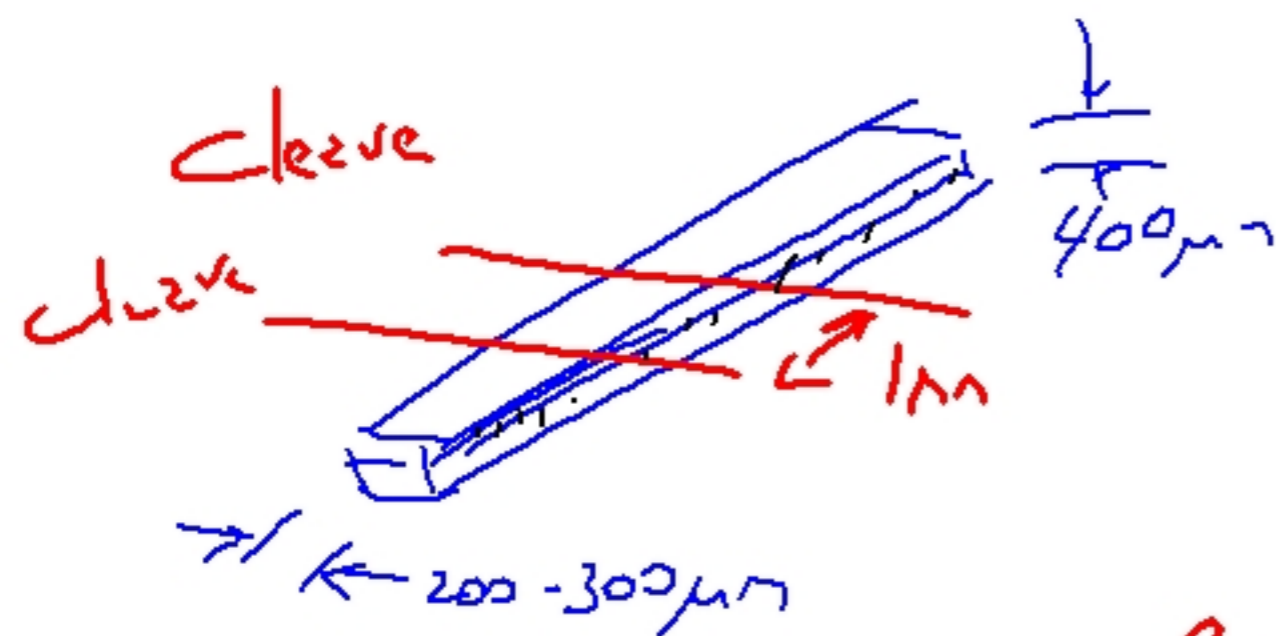
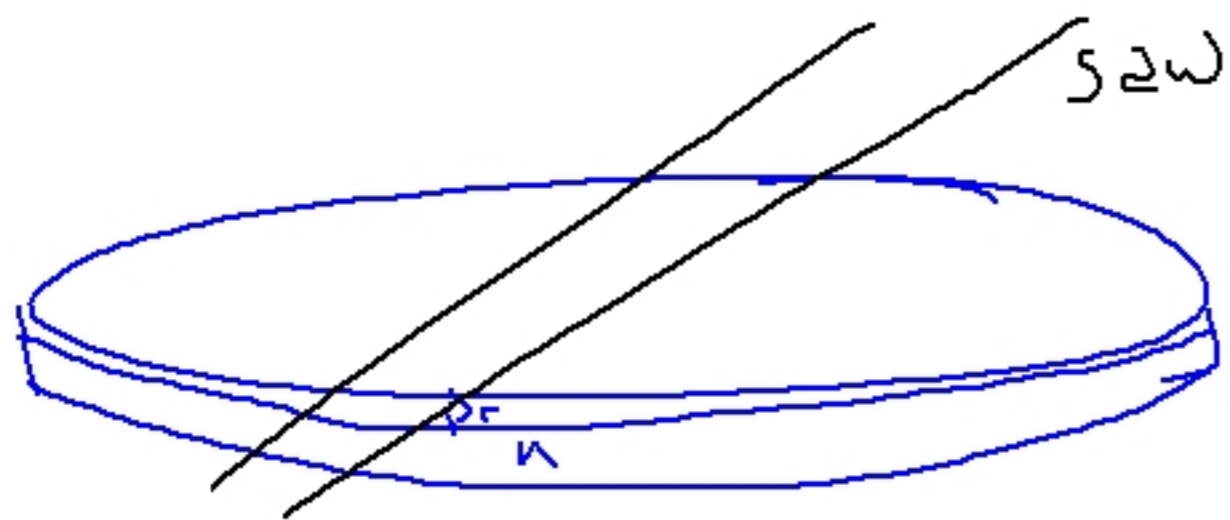


LECTURE 20

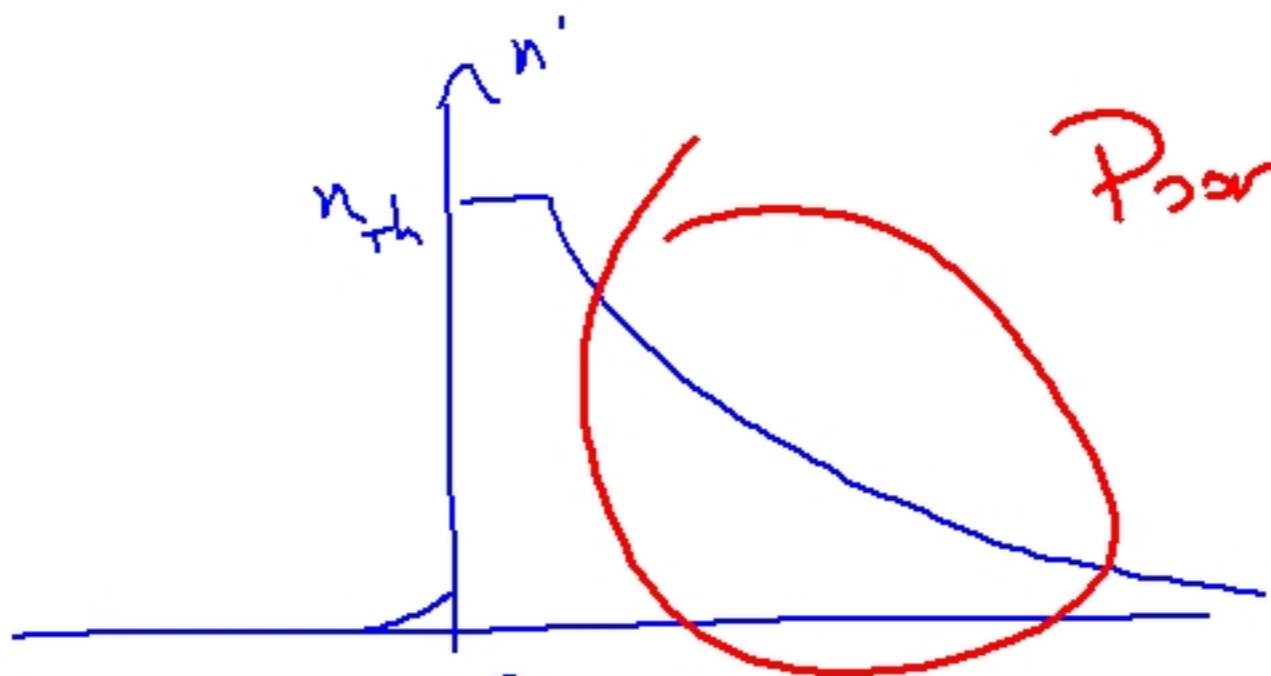




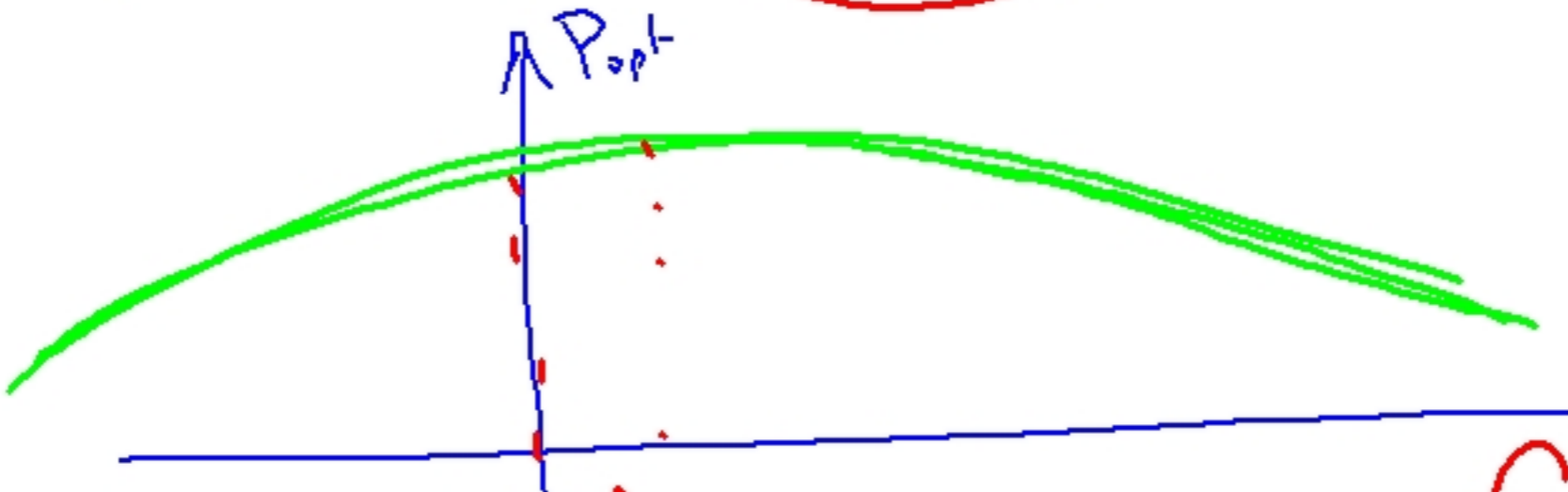
A. VERTICAL: ACTIVE LAYER DESIGN
 ↳ WAVEGUIDE LAYER "



Homojunction, broad area
laser diode



Poor use of carriers in tails (no spin entanglement)



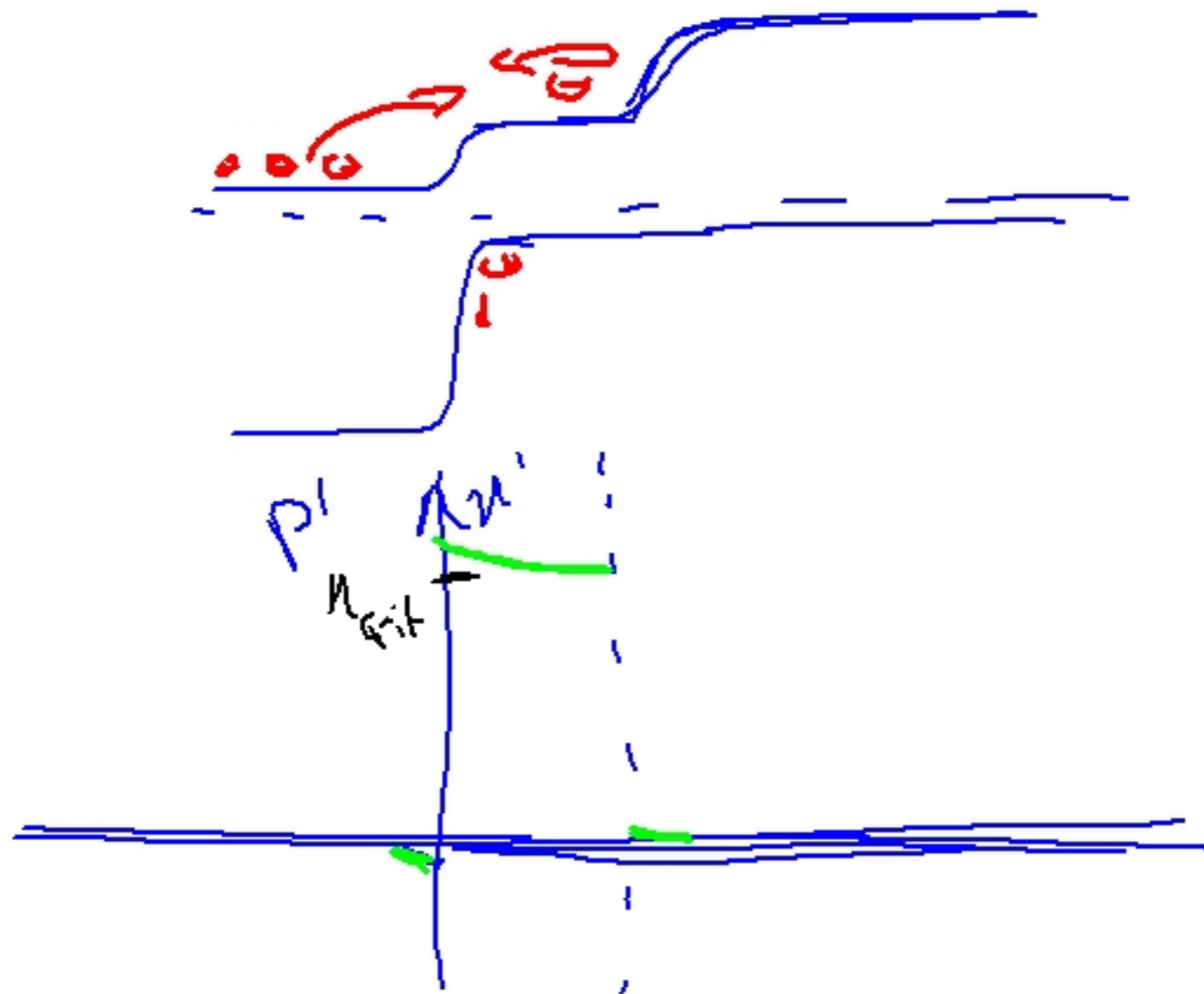
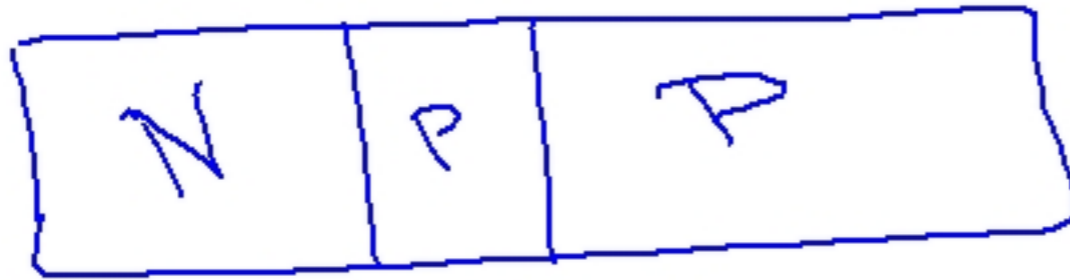
Poor overlap of photon population with inverted population

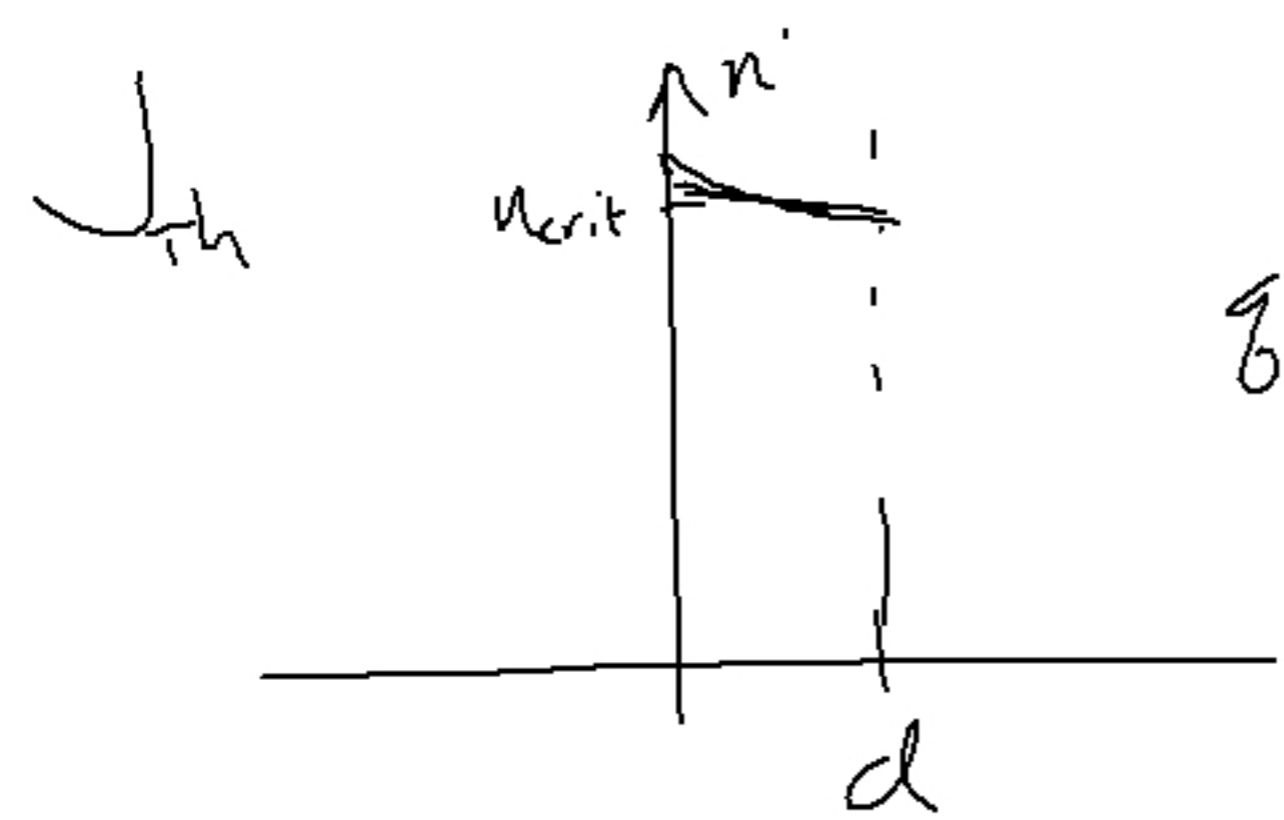
$$J_{th} \approx 20 \text{ kA/cm}^2 - 30 \text{ kA/cm}^2$$

Double heterojunction

5-

LPE grown

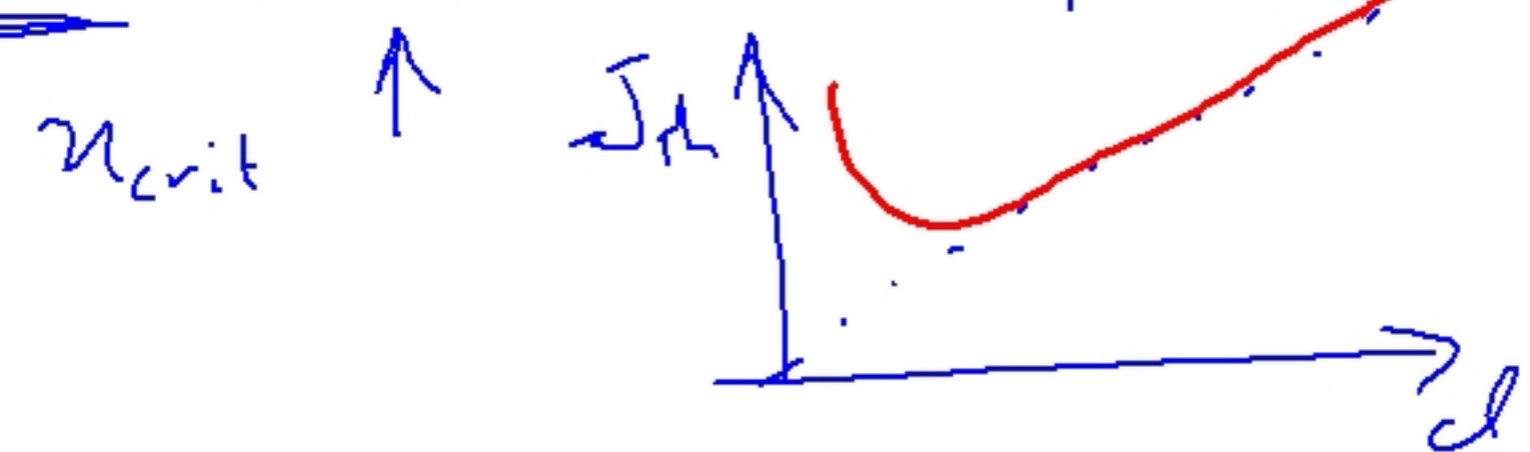




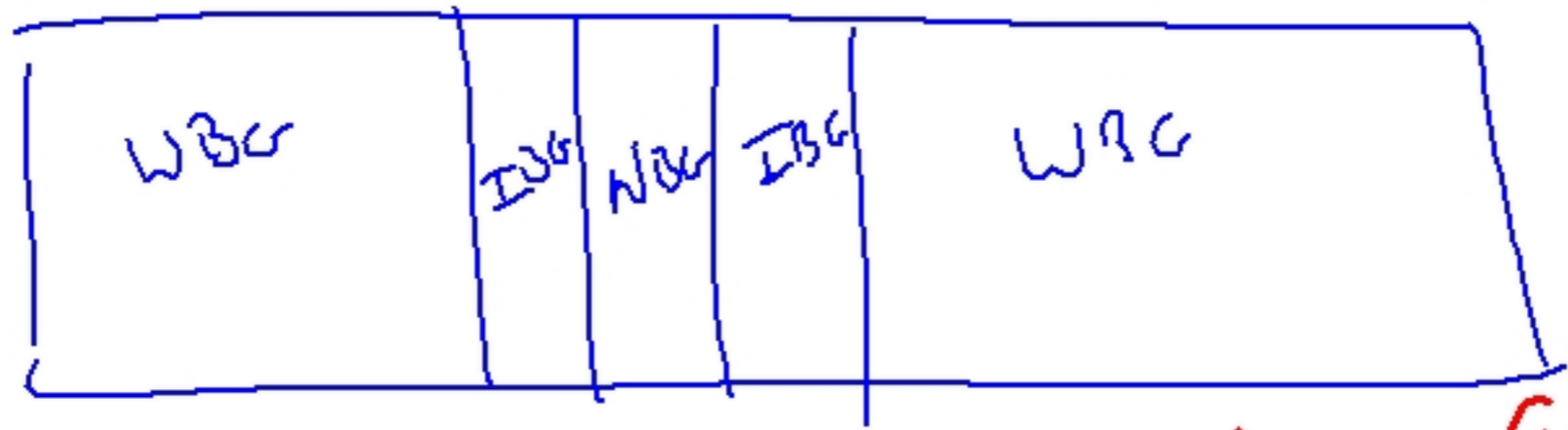
$$\int_0^d \frac{n_{crit} d}{z_{niw}} = J_{th}$$

$d \downarrow, J_{th} \downarrow$

Problem \rightarrow as $d \downarrow$ optical overlap \downarrow

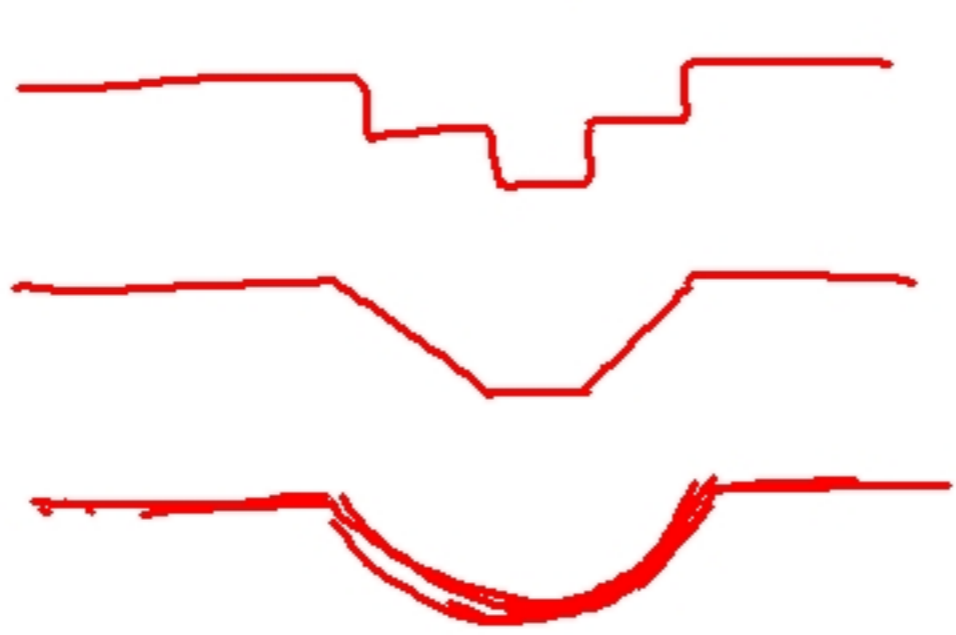


Solution \rightarrow separate confinement



Waveguide

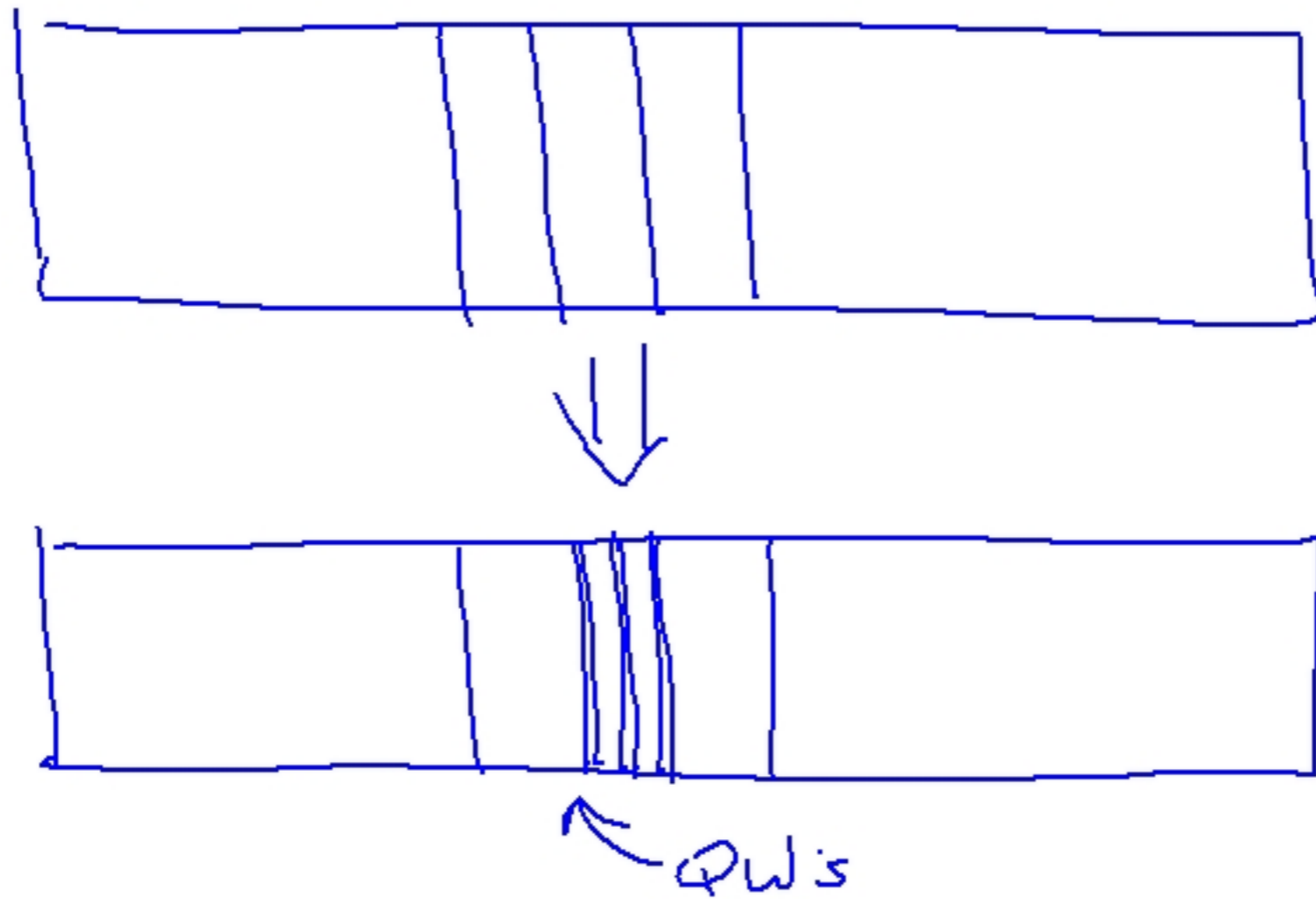
Eg ↑



options

Quantum well active layer

9



$$400 \text{ A/cm}^2$$

$$2 \text{ kA/cm}^2$$

$$\frac{J_{\text{THQW}}}{J_{\text{THDIT}}} = \frac{n_{\text{THQW}}}{n_{\text{THDIT}}} \cdot \frac{d_{\text{QW}}}{d_{\text{DIT}}} \cdot \frac{\sqrt{\epsilon_{\text{QW}}}}{\sqrt{\epsilon_{\text{DIT}}}} \approx \frac{1}{5}$$

2
 $1/10$
 ≈ 1
 $\approx \frac{1}{5}$