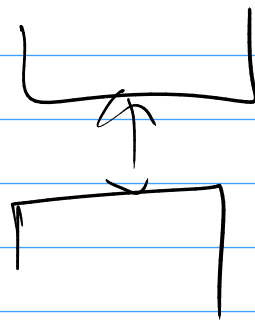
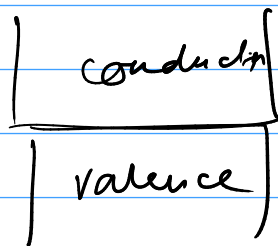
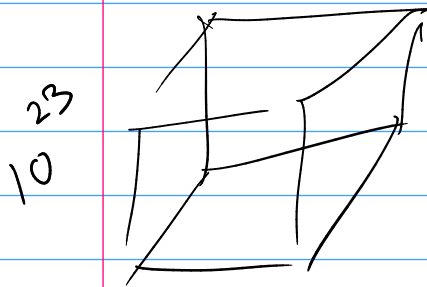


# Quantum Confinement



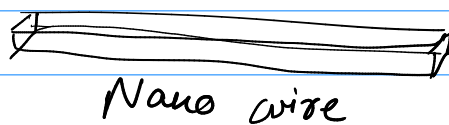
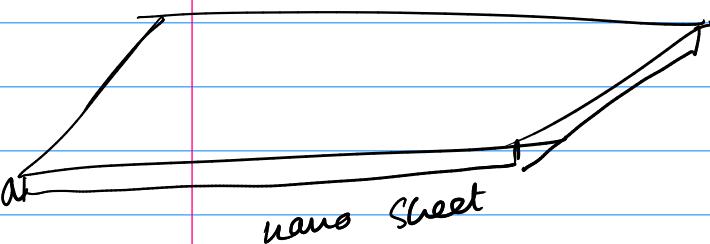
$$E_F = \left( \right) \frac{N}{L^3}$$



$$E_2 - E_1 = h\nu$$

$$E = \frac{n^2 \pi^2 \hbar^2}{2ma^2}$$

$E_1$



1D  $\rightarrow$  confined

2D  $\rightarrow$  free

quantum dot

$$\psi_n = \sqrt{\frac{2}{L}} \sin \frac{n\pi x}{L}$$

$$\psi_n = \sqrt{\frac{2}{a}} \sin \frac{n\pi x}{a} \sqrt{\frac{2}{b}} \sin \frac{n\pi y}{b} \sqrt{\frac{2}{c}} \sin \frac{n\pi z}{c}$$

For quantum dot

$$E_n = \frac{n^2 \pi^2 \hbar^2}{2m} \left( \frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2} \right)$$

$$E_n = \frac{p^2}{2m} = \frac{\hbar^2 k^2}{2m} = \frac{n^2 \pi^2 \hbar^2}{2m L^2}$$