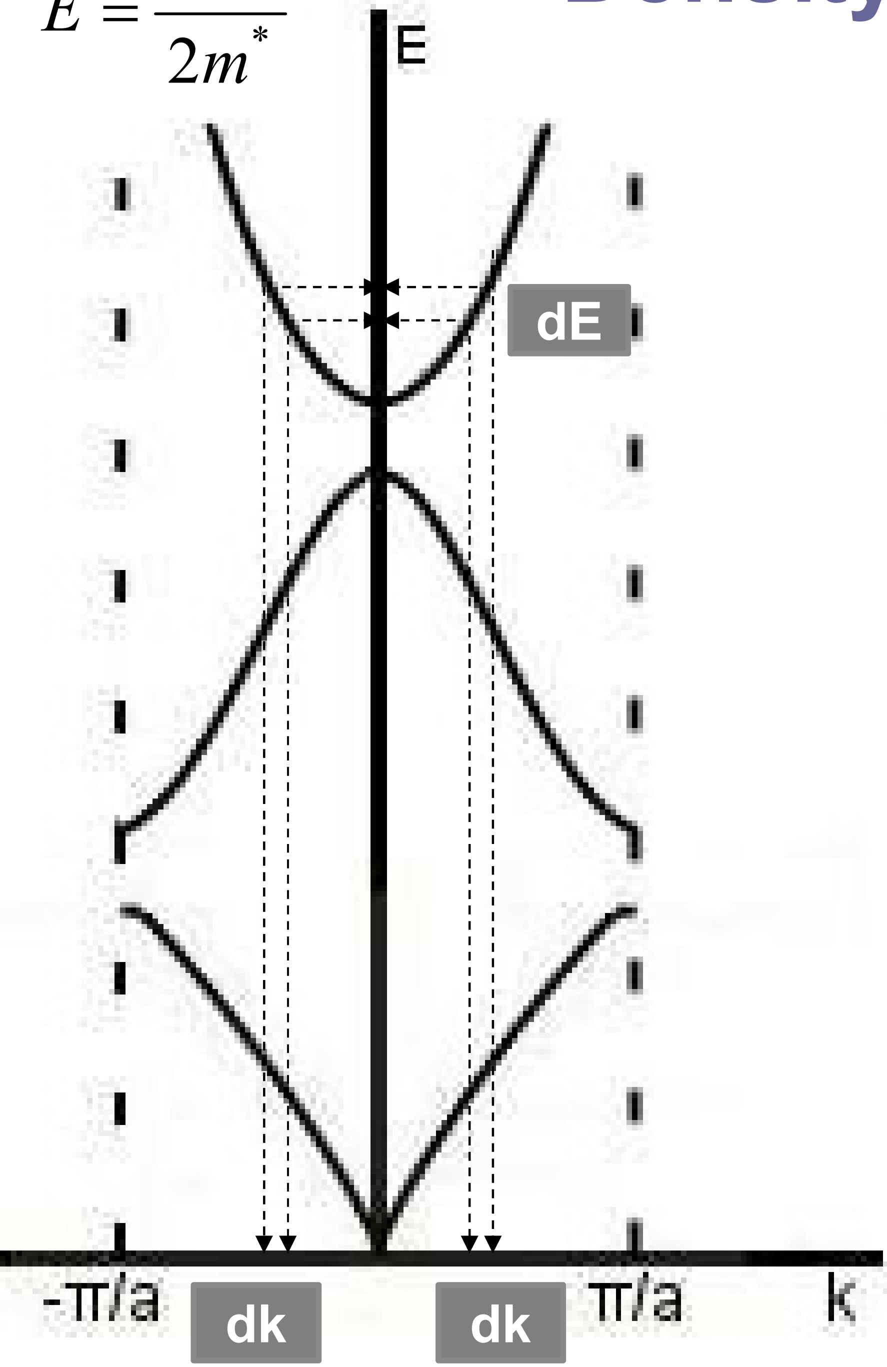
Density-of-states (1D)

$$E = \frac{\hbar^2 k^2}{2m^*}$$



$$g = \frac{dn}{dE} = \frac{1}{\pi\hbar}\sqrt{\frac{2m^*}{E}}$$

Spacing between points in k-space	$\delta k = \frac{2\pi}{Na} = \frac{2\pi}{L}$
Number of points in k-space volume Δk	$\Delta N = \frac{\Delta k}{\delta k} = \frac{L\Delta k}{2\pi}$
Elemental *k-volume* of equal-energy states	$[\Delta k]_{E-E} = 2dk$
Number of equal-energy states	$dN = \frac{L \cdot 2dk}{2\pi} \times 2$
Equal-energy states per unit *volume*	$\frac{dn}{dk} = \frac{2}{\pi}$
Density-of-states	$\frac{dn}{dE} = \frac{dn}{dk}\frac{dk}{dE}$

Density-of-states (3D)

$$\frac{dn}{dE} = \frac{\sqrt{2}}{\pi^2}\left(\frac{m^*}{\hbar^2}\right)^{3/2}\sqrt{E - E_C}$$

Spacing between points in k-space

$$\delta k = \left(\frac{2\pi}{L}\right)^3$$

Number of points in k-space volume Δk

$$\Delta N = \frac{\Delta k}{\delta k} = \frac{L^3 \Delta k}{8\pi^3}$$

$$E = E_C + \frac{\hbar^2 k_x^2}{2m^*} + \frac{\hbar^2 k_y^2}{2m^*} + \frac{\hbar^2 k_z^2}{2m^*}$$

Elemental *k-volume* of equal-energy states

$$\left[\Delta k\right]_{E-E} = 4\pi k^2 dk$$

$$E = E_C + \frac{\hbar^2 k^2}{2m^*}$$

Number of equal-energy states

$$dN = \frac{L^3 \cdot k^2 dk}{2\pi^2} \times 2$$

Equal-energy states per unit *volume*

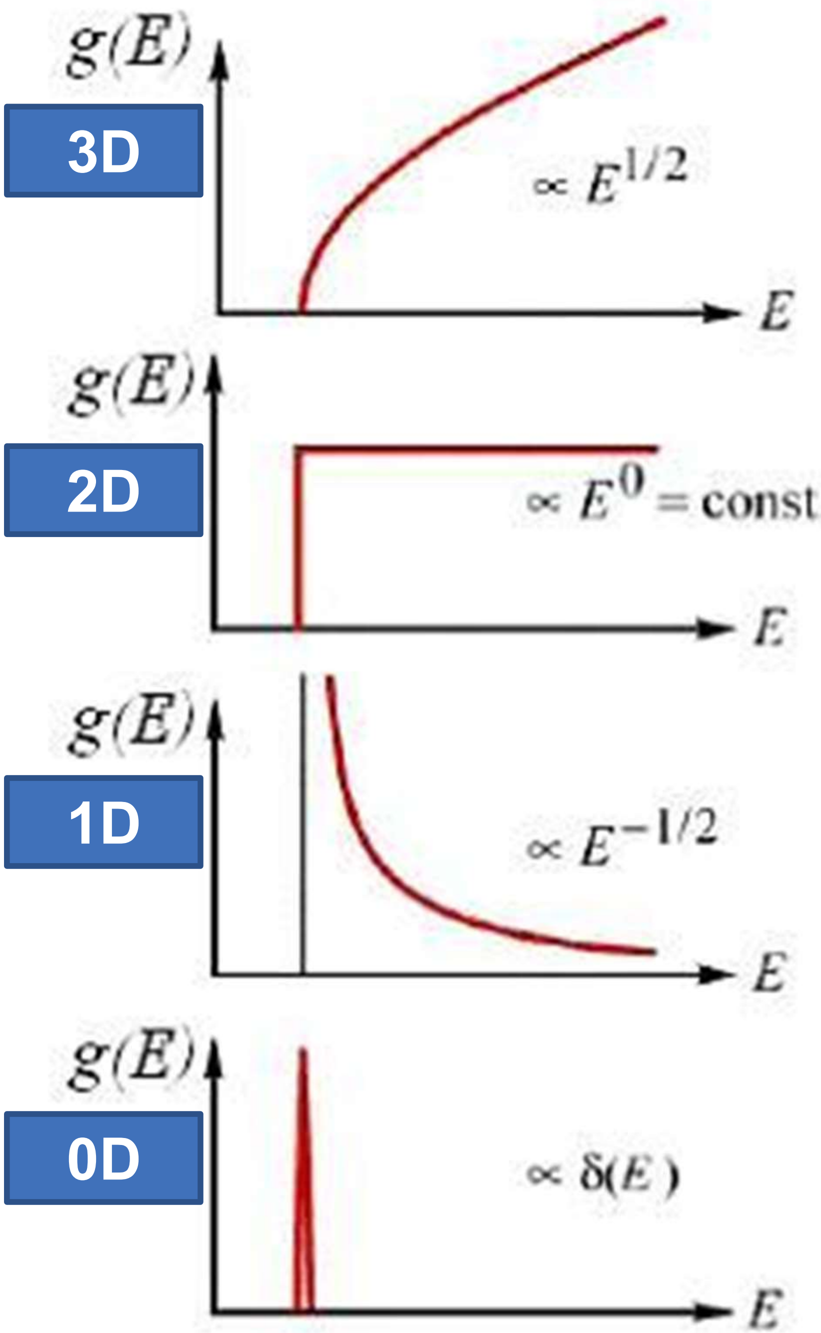
$$\frac{dn}{dk} = \frac{k^2}{\pi^2}$$

$$E = E_C + \frac{\hbar^2 k^2}{2m^*} \Rightarrow \frac{dE}{dk} = \frac{\hbar^2 k}{m^*}$$

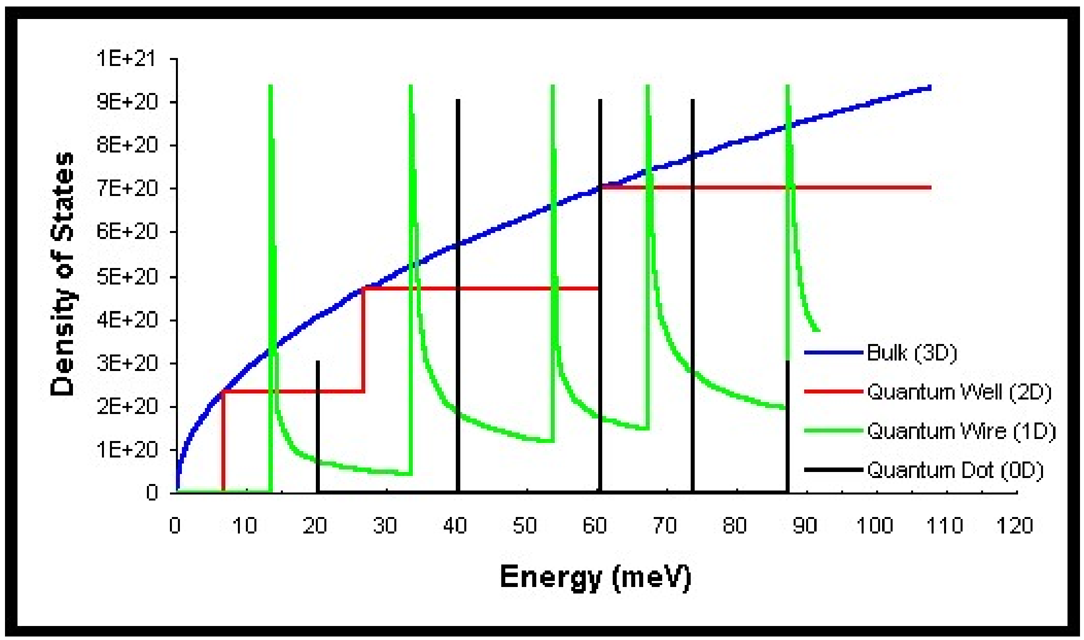
Density-of-states

$$\frac{dn}{dE} = \frac{dn}{dk}\frac{dk}{dE}$$

Density-of-states



Derive 2D DOS.



Justify 0D DOS.

Finis

Artwork Sources:

1. www.britneyspears.ac
2. electrons.wikidot.com