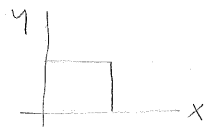


6. (8.11) lowest 6 energy levels for $a=1, b$



First, write down lowest 6 levels for $a=b$ (square box) from Fig. 8.2:

$$n_x = 1, n_y = 1 \quad 2E_0$$

$$\begin{matrix} 2 & 1 \\ 1 & 2 \end{matrix} \left. \vphantom{\begin{matrix} 2 \\ 1 \end{matrix}} \right\} 5E_0$$

$$2 \quad 2 \quad 8E_0$$

$$\begin{matrix} 3 & 1 \\ 1 & 3 \end{matrix} \left. \vphantom{\begin{matrix} 3 \\ 1 \end{matrix}} \right\} 10E_0$$

$$\text{where } E_0 = \frac{\hbar^2 \pi^2}{2Ma^2}$$

for the non-square box, $E = \frac{\hbar^2 \pi^2}{2M} \left(\frac{n_x^2}{a^2} + \frac{n_y^2}{b^2} \right)$

write in terms of a by substituting $b = a/1.1$

$$\text{then } n_x = 1, n_y = 1 \Rightarrow E = \frac{\hbar^2 \pi^2}{2M} \left(\frac{1}{a^2} + \left(\frac{1.1}{a} \right)^2 \right) = 2.21 \frac{\hbar^2 \pi^2}{2Ma^2} = 2.21 E_0$$

$$n_x = 2, n_y = 1 \Rightarrow E = \frac{\hbar^2 \pi^2}{2M} \left(\frac{2^2}{a^2} + \left(\frac{1.1}{a} \right)^2 \right) = 5.21 E_0$$

$$n_x = 1, n_y = 2 \Rightarrow E = \frac{\hbar^2 \pi^2}{2M} \left(\frac{1}{a^2} + 2^2 \left(\frac{1.1}{a} \right)^2 \right) = 5.84 E_0$$

$$n_x = 2, n_y = 2 \Rightarrow E = \frac{\hbar^2 \pi^2}{2M} \left(\frac{2^2}{a^2} + 2^2 \left(\frac{1.1}{a} \right)^2 \right) = 8.84 E_0$$

$$n_x = 3, n_y = 1 \Rightarrow E = \frac{\hbar^2 \pi^2}{2M} \left(\frac{3^2}{a^2} + \left(\frac{1.1}{a} \right)^2 \right) = 10.21 E_0$$

$$n_x = 1, n_y = 3 \Rightarrow E = \frac{\hbar^2 \pi^2}{2M} \left(\frac{1}{a^2} + \frac{3^2 (1.1)^2}{a^2} \right) = 11.89 E_0$$

		11.89E ₀ —	} all degeneracy 1
10E ₀ — degeneracy 2		10.21E ₀ —	
8E ₀ — degeneracy 1		8.84E ₀ —	
5E ₀ — degeneracy 2		5.84E ₀ —	
		5.21E ₀ —	
2E ₀ — degeneracy 1		2.21E ₀ —	
square box		a=1.1b	

so no degeneracies left