

26. We are looking for the values of the ratio

$$\frac{E_{n_x, n_y}}{h^2/8mL^2} = L^2 \left( \frac{n_x^2}{L_x^2} + \frac{n_y^2}{L_y^2} \right) = \left( n_x^2 + \frac{1}{4} n_y^2 \right)$$

and the corresponding differences.

- (a) For  $n_x = n_y = 1$ , the ratio becomes  $1 + \frac{1}{4} = 1.25$ .
- (b) For  $n_x = 1$  and  $n_y = 2$ , the ratio becomes  $1 + \frac{1}{4}(4) = 2.00$ . One can check (by computing other  $(n_x, n_y)$  values) that this is the next to lowest energy in the system.
- (c) The lowest set of states that are degenerate are  $(n_x, n_y) = (1, 4)$  and  $(2, 2)$ . Both of these states have that ratio equal to  $1 + \frac{1}{4}(16) = 5.00$ .
- (d) For  $n_x = 1$  and  $n_y = 3$ , the ratio becomes  $1 + \frac{1}{4}(9) = 3.25$ . One can check (by computing other  $(n_x, n_y)$  values) that this is the lowest energy greater than that computed in part (b). The next higher energy comes from  $(n_x, n_y) = (2, 1)$  for which the ratio is  $4 + \frac{1}{4}(1) = 4.25$ . The difference between these two values is  $4.25 - 3.25 = 1.00$ .