

23. Because of the Pauli principle (and the requirement that we construct a state of lowest possible total energy), two electrons fill the $n = 1, 2, 3$ levels and one electron occupies the $n = 4$ level. Thus, using Eq. 40-4,

$$\begin{aligned} E_{\text{ground}} &= 2E_1 + 2E_2 + 2E_3 + E_4 \\ &= 2 \left(\frac{h^2}{8mL^2} \right) (1)^2 + 2 \left(\frac{h^2}{8mL^2} \right) (2)^2 + 2 \left(\frac{h^2}{8mL^2} \right) (3)^2 + \left(\frac{h^2}{8mL^2} \right) (4)^2 \\ &= (2 + 8 + 18 + 16) \left(\frac{h^2}{8mL^2} \right) = 44 \left(\frac{h^2}{8mL^2} \right) . \end{aligned}$$