

2. According to Eq. 40-4 $E_n \propto L^{-2}$. As a consequence, the new energy level E'_n satisfies

$$\frac{E'_n}{E_n} = \left(\frac{L'}{L}\right)^{-2} = \left(\frac{L}{L'}\right)^2 = \frac{1}{2},$$

which gives $L' = \sqrt{2}L$. Thus, the width of the potential well must be multiplied by a factor of $\sqrt{2}$.