

80. Letting

$$T \approx e^{-2kL} = \exp\left(-2L\sqrt{\frac{8\pi^2m(U-E)}{h^2}}\right) ,$$

and using the result of Exercise 3 in Chapter 39, we solve for  $E$ :

$$\begin{aligned} E &= U - \frac{1}{2m} \left( \frac{h \ln T}{4\pi L} \right)^2 \\ &= 6.0 \text{ eV} - \frac{1}{2(0.511 \text{ MeV})} \left[ \frac{(1240 \text{ eV} \cdot \text{nm})(\ln 0.001)}{4\pi(0.70 \text{ nm})} \right]^2 \\ &= 5.1 \text{ eV} . \end{aligned}$$