

Lecture 3

Tunnelling factor for a general barrier $V(x)$

Divide barrier into thin slices Δx and treat V as constant in each
Multiply together tunnelling factors for all slices and take $\Delta x \rightarrow 0$

$$T \simeq \exp \left[-2 \int_a^b \sqrt{\frac{2m}{\hbar^2} (V(x) - E)} dx \right]$$

a, b : edges of classically forbidden zone, $V(a) = V(b) = E$

Assumes wide, smoothly varying barrier
and energy E well below top of barrier (WKB approximation)

Gives the dominant factor in tunnelling probability
(corrections needed for edges where $E \simeq V(x)$)