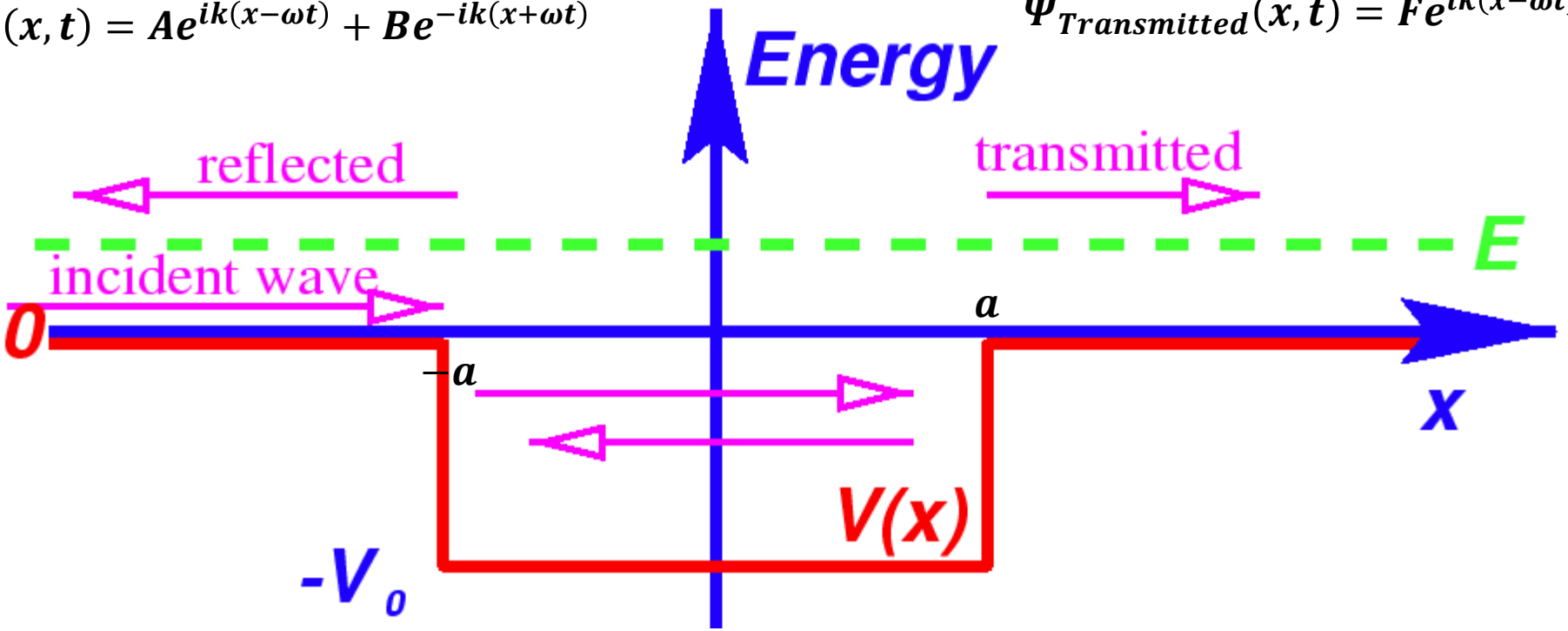
Scattering From a Finite Potential Well

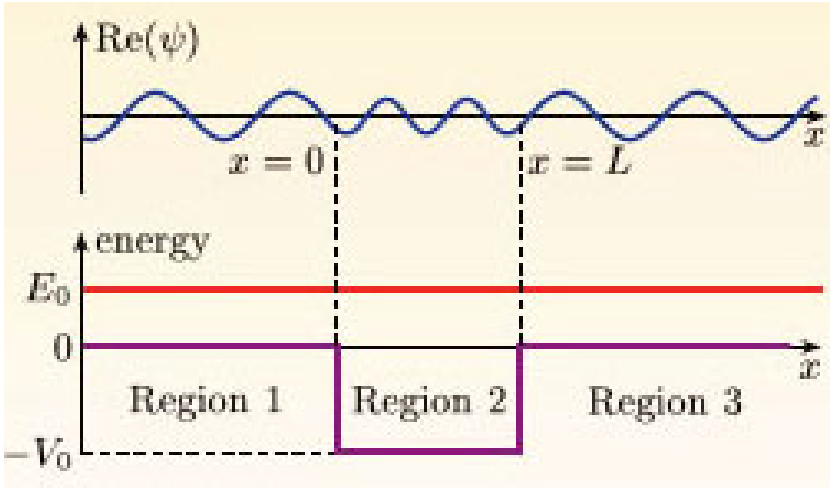
$$\Psi_I(x,t) = Ae^{ik(x-\omega t)} + Be^{-ik(x+\omega t)}$$

$$\Psi_{Transmitted}(x,t) = Fe^{ik(x-\omega t)}$$



Scattering From a Finite Potential Well

Particle speeds up over the well

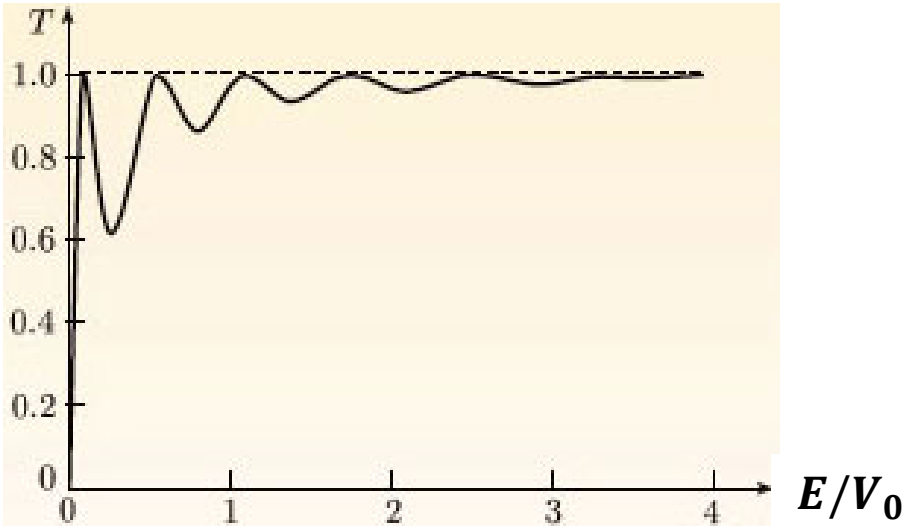


https://www.open.edu/openlearn/science-maths-technology/science/physics-and-astronomy/scattering-and-tunnelling/content-section-3.5

Transmission Probability vs. Incident Particle Energy

$$T = |F/A|^2$$

$$T^{-1} = 1 + \frac{V_0^2}{4E(E+V_0)} \sin^2\left(\frac{2a}{\hbar}\sqrt{2m(E+V_0)}\right)$$



Parameters used:

m = mass of electron
V_0 = 8.6 eV
$2a$ = 1 nm

Perfect transmission resonances at $\sin(n\pi)$ which corresponds to:

$$E + V_0 = \frac{n^2\pi^2\hbar^2}{2m(2a)^2} \qquad \text{with } n = 1, 2, 3, \ldots$$

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