

Homework 6 (due 10-21)

A stream of particles of mass m and energy E encounters a potential step of height V_0 , $V(x) = V_0\theta(x)$. Consider the case $E > V_0$. We can define the “flux” of particles using the probability current

$$j = \frac{i\hbar}{2m} \left\{ \left(\frac{d}{dx} \psi^* \right) \psi - \psi^* \left(\frac{d}{dx} \psi \right) \right\}.$$

1. Show that the fraction of reflected particles (the fraction of reflected flux) is

$$R = \left(\frac{1 - \mu}{1 + \mu} \right)^2.$$

where $\mu = \sqrt{1 - V_0/E}$.

2. Show that $R + T = 1$ where T is the fraction of transmitted particles.