

## Step potential summary

This is a summary of the *results* of the calculation for the step potential done in class. It is *not* intended to be the complete calculation or to be a substitute for the full discussion. It is supposed to be enough of the results that you can check yourself and reproduce other things you might want or need.

$V(x)=0$  for  $x<0$  and  $V(x)=V_0$  for  $x>0$ .

To the left of  $x=0$ ,  $\psi_{EL}(x) = ae^{ipx/\hbar} + be^{-ipx/\hbar}$

and to the right  $\psi_{ER}(x) = ce^{iqx/\hbar}$  with  $p^2=2mE$  and  $q^2=2m(E-V_0)$ .

The boundary conditions at  $x=0$  are  $\psi_{EL}(0) = \psi_{ER}(0)$  and  $\psi'_{EL}(0) = \psi'_{ER}(0)$

After some calculation, I got  $b = a \frac{p-q}{p+q}$  and  $c = a \frac{2p}{p+q}$ .

In the case that  $E-V_0 < 0$ ,  $q$  is imaginary, and the  $x>0$  form is  $\psi_{ER}(x) = ce^{-\sqrt{2m(V_0-E)} x/\hbar}$ .