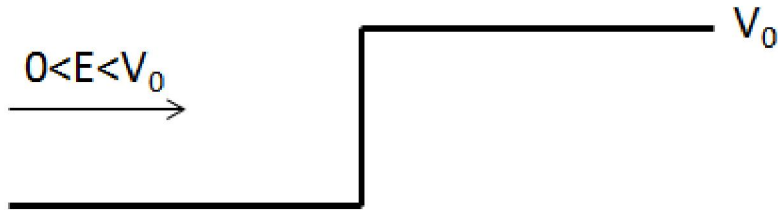
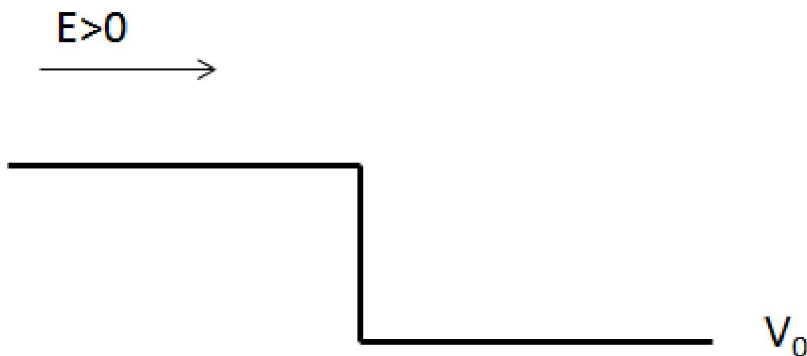


1. A particle with energy  $E$  incident on a step potential from the left. The potential is:  $V(x)=0$  for  $x<0$ ,  $V(x)=V_0$  ( $V_0>0$ ) for  $x>0$ . Assuming  $0<E<V_0$ , calculate the wave function assuming the incident wave has an amplitude of 1, and calculate the reflection probability. Classically what is the reflection probability?



2. A particle with energy  $E$  incident on a step potential from the left. The potential is:  $V(x)=0$  for  $x<0$ ,  $V(x)=V_0$  (**now**  $V_0<0$ ) for  $x>0$ . Assuming  $E>0$ , calculate the wave function assuming the incident wave has an amplitude of 1, and calculate the reflection probability. Classically what is the reflection probability?



1. A ball with a mass of 1 gram is connected to a spring with spring constant  $k=1$  N/m. What is the classical oscillation frequency of the ball? Considering quantum mechanics, what are the energy levels of the ball? What if the ball has the mass of an electron instead?
2. Consider a 3D particle-in-a-box. The box has a dimension of  $L \times L \times L$ . Inside the box the potential energy is  $V=0$ . Outside the box the potential energy is  $V=\text{infinity}$ . What is the wave function of the particle and what is the energy?