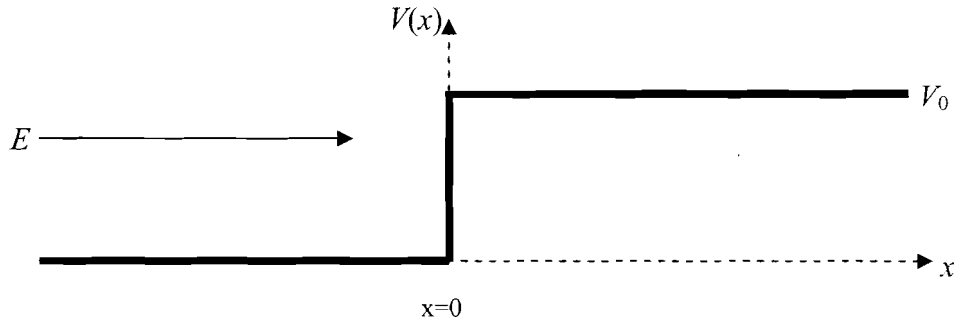
QM Spring 07 A

A particle of mass m and energy E approaches a one dimensional step potential of height V_0 as shown in the figure.



For $E < V_0$ determine

a) The penetration depth, which is the distance from x=0 where the probability to find the particle has dropped to $1/e$ of its value at x=0.

For $E > V_0$ determine

b) The transmission probability.

c) The reflection probability.

d) For the case when E is very much greater than V_0, find the leading approximiation to the way in which the reflection probability varies with increasing energy. (Hint: you may use physical reasoning to obtain the answer up to a numerical pre-factor if you wish.)

e) Suppose now that $V_0 < 0$, so that the step potential is a step down, and $E >> |V_0|$. Is there a non-zero reflection probability in this case? Briefly explain your reasoning. (You do not need to do any further calculations for this part.)