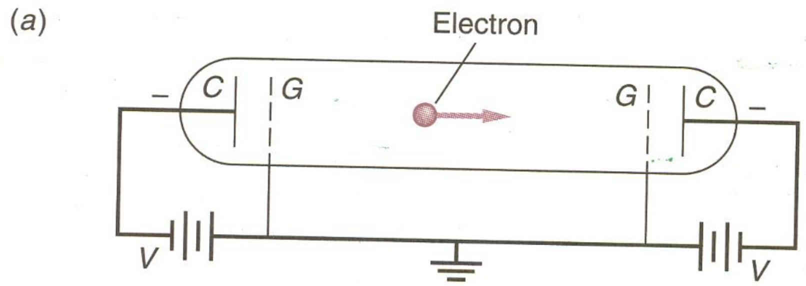
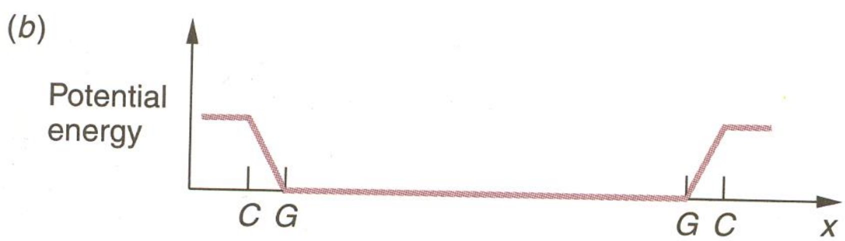
INFINITE SQUARE WELL POTENTIAL (PARTICLE IN A BOX)

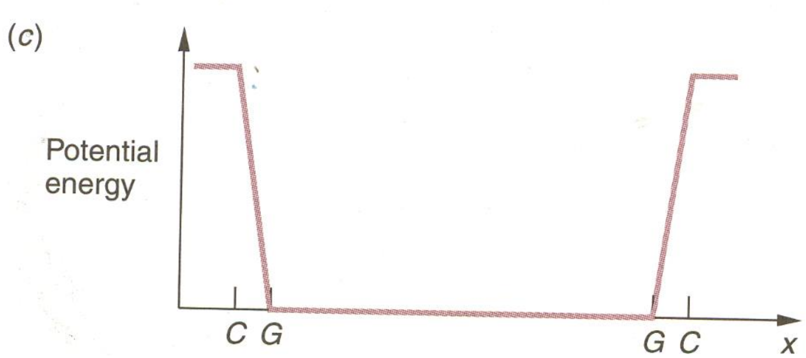
1) Consider an electron placed between two sets of electrodes C and grids G. The electron experiences NO forces between the grids G because they are at ground potential (i.e V = 0)
2) In the region between C and G the electron experiences a force due to the repelling E-field whose strength depends on V.



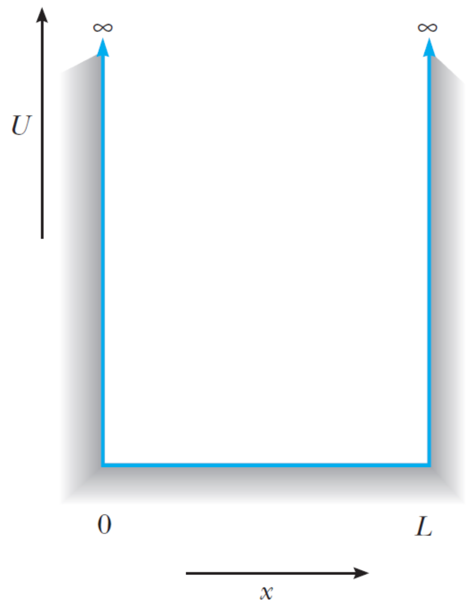
3) If V is relative small, then the electron's potential energy vs. x has low sloping walls as seen below.



4) If V is now increased between C and G you have the following

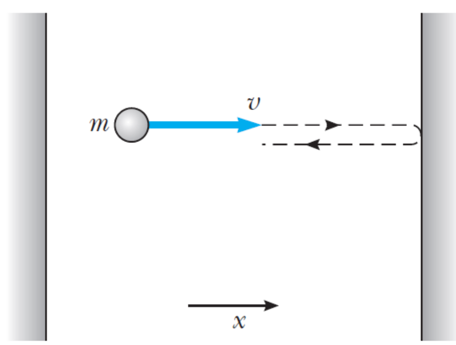


5) As V $\rightarrow \infty$ and the distance between C and G $\rightarrow 0$ amount we reach the idealization known as the INFINITE SQUARE WELL POTENTIAL (PARTICLE IN A BOX).



$$U(x) = \infty \quad (x < 0, x > L)$$
$$U(x) = 0 \quad (0 < x < L)$$

The motion would be equivalent to that of a ball bouncing elastically between two walls.



As the ball bounces back and forth, its speed and thus kinetic energy remains constant. Furthermore, classical physics does NOT put any restrictions on the values of energy or momentum. However, quantum mechanics does restrict the values of the energy and momentum!

Although a particle in such potential is an idealization, it is a very important problem because:

a) Exact solutions are obtained from the Schrodinger Equation.

b) It demonstrates important features of quantum-mechanical problems.

c) This potential is a good approximation to some real situations such as a free electron in a metal.