What is ‘Quantum Tunneling’ and its application in nanotechnology?

‘Quantum Tunneling’ is a quantum mechanical phenomenon which manifests itself when electron in the waveform encounters a barrier. If the barrier is thick, the electron is not able to penetrate across and gets reflected or decays. However when the barrier is of very low thickness comparable to the wave length of the electron, the wave is able to transmit through the barrier and appear on the other side. This is as if it has drilled a tunnel through the barrier and crossed over. In reality the electron does not permeate through the barrier, but just appears on the other side. The intensity of the wave after tunneling is weaker but the wavelength is the same as the original wave. This phenomenon is depicted in the Figure.
The intensity of the current generated by the tunneling electron gives information about the thickness of the boundary.

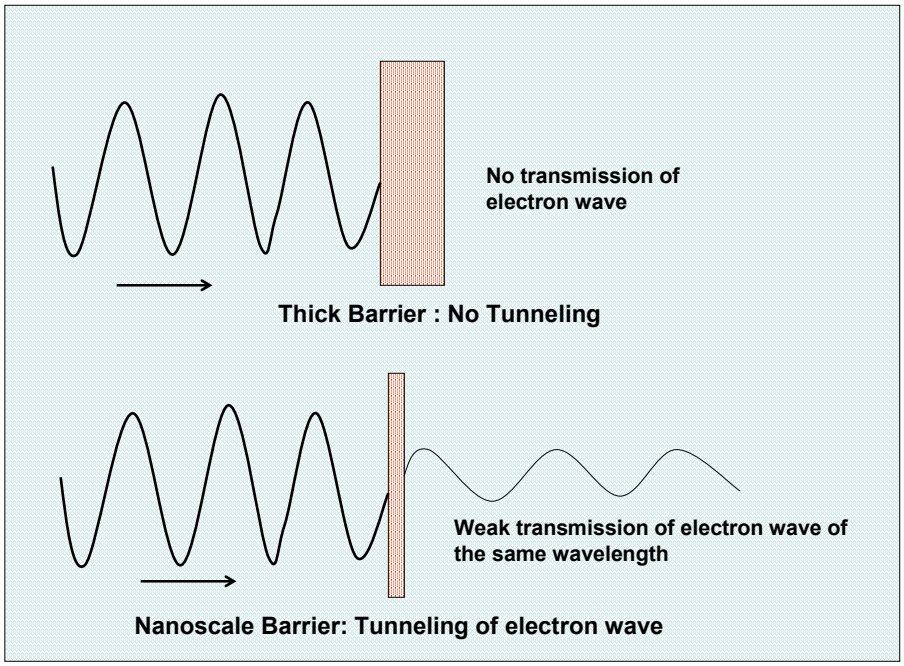

Figure: Quantum Tunneling

This principle is used in ‘Scanning Tunneling Microscopy’ (STM). Conductive surfaces with nanoscale texture can be imaged by measuring the tunneling current between a non-contact stylus and the substrate. Hence the STM has become an important research

tool in nanotechnology for characterization of surfaces with nano-scale resolution.
