

CL16_Q1. What is a quantum mechanical tunnelling? Explain its significance.

Ans:

Quantum tunnelling or barrier tunnelling refers to the process of transmission through a potential barrier even when the energy of the particle is lesser than the barrier potential. This plays an essential role in several physical phenomena, such as the alpha decay and the nuclear fusion that occurs in main sequence stars like the Sun. It has important applications to modern devices such as the tunnel diode, quantum computing, and the scanning tunnelling microscope.

CL16_Q2. Interpret the wave function and its nature in the three regions of the barrier potential?

Ans:

The wave function in the first region is $\psi_I(x) = Ae^{ik_I x} + Be^{-ik_I x}$. It is oscillatory in nature

The wave function in the second region is $\psi_{II}(x) = De^{-\alpha x}$. It is exponentially decrease in nature

The wave function in the third region is $\psi_{III}(x) = Ge^{ik_{III} x}$. It is oscillatory in nature