# M04Q.3—Scattering from a Cube Potential

## Problem

A beam of particles of mass $m$ and energy $E$ propagates along the $z$ axis of a coordinate system, and scatters from the cubic potential

$$V = \begin{cases} v & \text{if } |x| \le L, |y| \le L, |z| \le L, \\ 0 & \text{otherwise} \end{cases}$$

where $v$ is a small constant energy

a) Use the Born approximation to find an explicit formula for the scattering cross section $\sigma = \sigma(\theta, \phi)$ as a function of the angles $\theta$ and $\phi$.
Recall that spherical coordinates of a point in space $(r, \theta, \phi)$ are related to cartesian coordinates $(x, y, z)$ by $x = r\sin\theta\cos\phi, y = r\sin\theta\sin\phi$ and $z = r\cos\theta$. The Born approximation is easy to evaluate in one coordinate system and hard in the other.

b) Under what circumstances is this approximation for the scattering cross section valid? Explain.