

54. (a) The allowed values of l for a given n are $0, 1, 2, \dots, n - 1$. Thus there are n different values of l .
- (b) The allowed values of m_l for a given l are $-l, -l + 1, \dots, l$. Thus there are $2l + 1$ different values of m_l .
- (c) According to part (a) above, for a given n there are n different values of l . Also, each of these l 's can have $2l + 1$ different values of m_l [see part (b) above]. Thus, the total number of m_l 's is

$$\sum_{l=0}^{n-1} (2l + 1) = n^2 .$$