Putting $X(0) = X(L) = 0$

$$Y(0) = Y(L) = 0$$

$$Z(0) = Z(L) = 0$$

We get $B_1 = B_2 = B_3 = 0$

and $k_x = \frac{n_1 \pi}{L}$, $k_y = \frac{n_2 \pi}{L}$ & $k_z = \frac{n_3 \pi}{L}$

So,

$$\psi_{(x,y,z)} = A \sin \frac{n_1 \pi x}{L} \sin \frac{n_2 \pi y}{L} \sin \frac{n_3 \pi z}{L} \quad \text{--- (4)}$$

where $A = A_1 A_2 A_3$

The value of A may be found from the normalisation condition

$$\int |\psi|^2 dv = 1$$

$$\Rightarrow |A|^2 \iiint \sin^2 \frac{n_1 \pi x}{L} \sin^2 \frac{n_2 \pi y}{L} \sin^2 \frac{n_3 \pi z}{L} = 1$$

$$\Rightarrow A = \sqrt{8/L^3}$$

and $E = \frac{\hbar^2}{2m} (k_x^2 + k_y^2 + k_z^2)$

$$\Rightarrow E = \hbar^2/2m \; \pi^2/L^2 \, (n_1^2 + n_2^2 + n_3^2) \quad \text{--- (5)}$$

The first energy level is obtained by putting $n_1 = n_2 = n_3 = 1$. It is non-degenerate. From the second energy state, the energy states are degenerate. The second energy level is obtained by putting $n_1 = 1$, $n_2 = 1$, $n_3 = 2$. It is also obtained from the combination of (n_1, n_2, n_3) such as $(1,2,1)$, $(2,1,1)$.