Ch. 8. Quantum Mechanics in Three Dimensions

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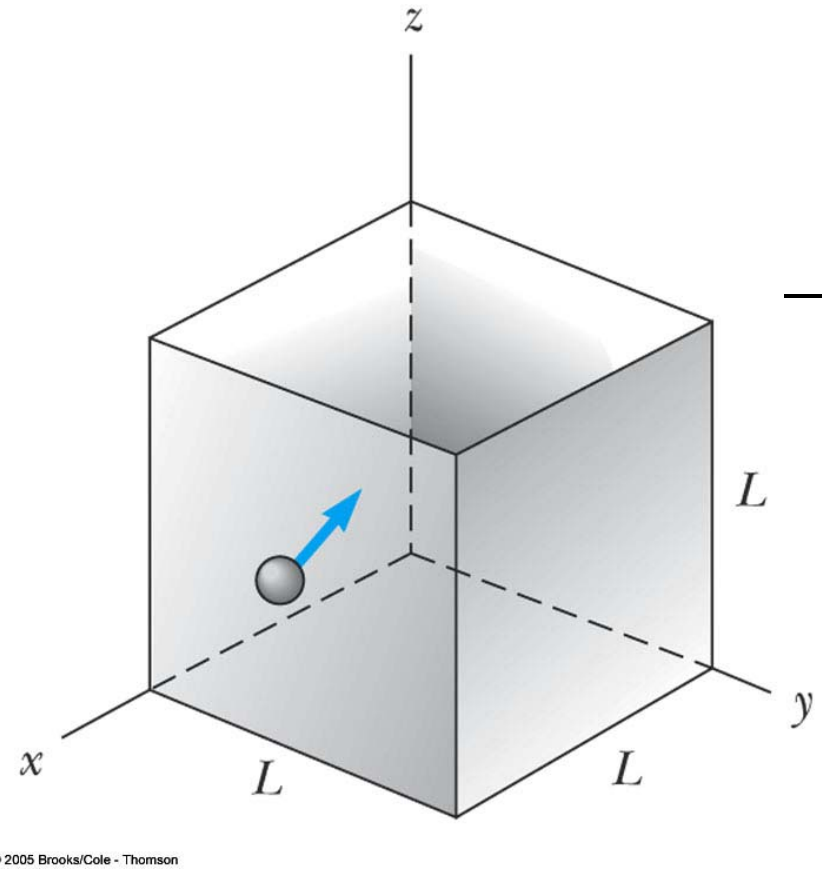
3-D Box



3D Schrödinger Equation

$$-\frac{\hbar^2}{2m}\nabla^2\Psi + U(\mathbf{r})\Psi = i\hbar\frac{\partial\Psi}{\partial t}$$

Fig. 8-1, p.261

3-D Box

Time-independent 3D Schrödinger Equation

$$-\frac{\hbar^2}{2m}\nabla^2\psi(\mathbf{r})+U(\mathbf{r})\psi(\mathbf{r})=E\psi(\mathbf{r})$$

변수분리

$$\psi(\mathbf{r})=\psi_1(x)\psi_2(y)\psi_3(z)$$

$$E=\frac{\pi^2\hbar^2}{2mL^2}\left(n_1^2+n_2^2+n_3^2\right),$$

$$n_1=1,2,\cdots$$

$$n_2=1,2,\cdots$$

$$n_3=1,2,\cdots$$

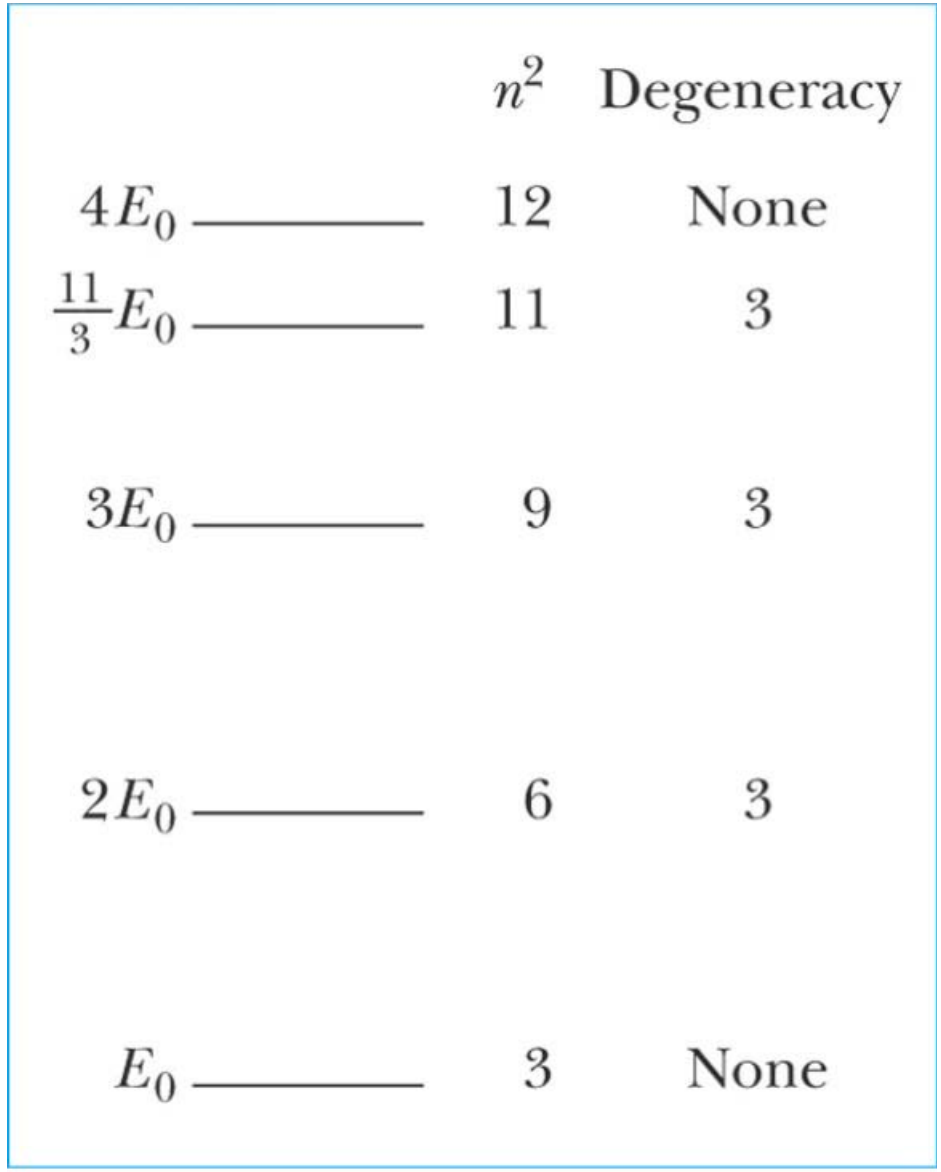


Fig. 8-3, p.264

Table 8.1 Quantum Numbers and Degeneracies of the Energy Levels for a Particle Confined to a Cubic Box*

n_1	n_2	n_3	n^2	Degeneracy
1	1	1	3	None
1	1	2	6	Threefold
1	2	1	6	
2	1	1	6	
1	2	2	9	Threefold
2	1	2	9	
2	2	1	9	
1	1	3	11	Threefold
1	3	1	11	
3	1	1	11	
2	2	2	12	None

*Note: $n^2 = n_1^2 + n_2^2 + n_3^2$.

Table 8-1, p.265

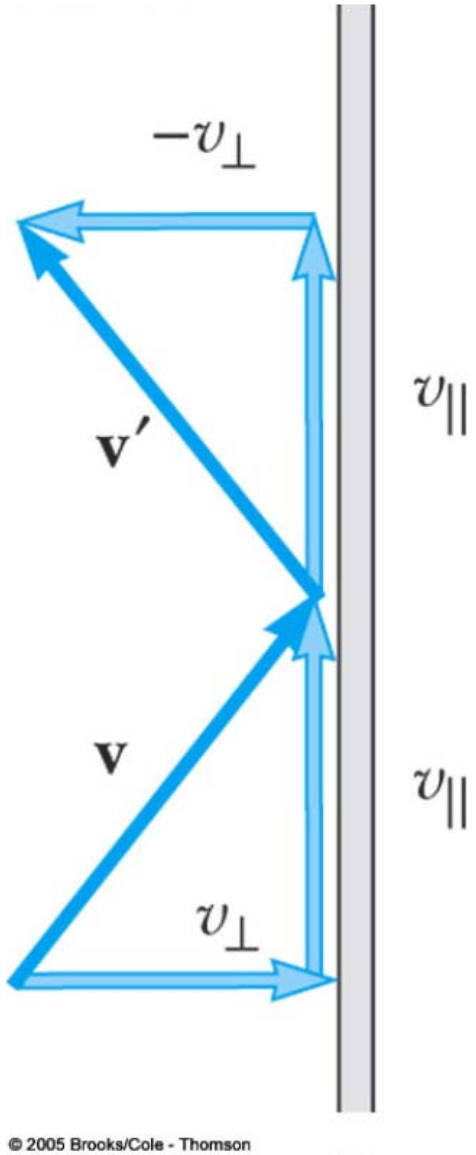


Fig. 8-2, p.261

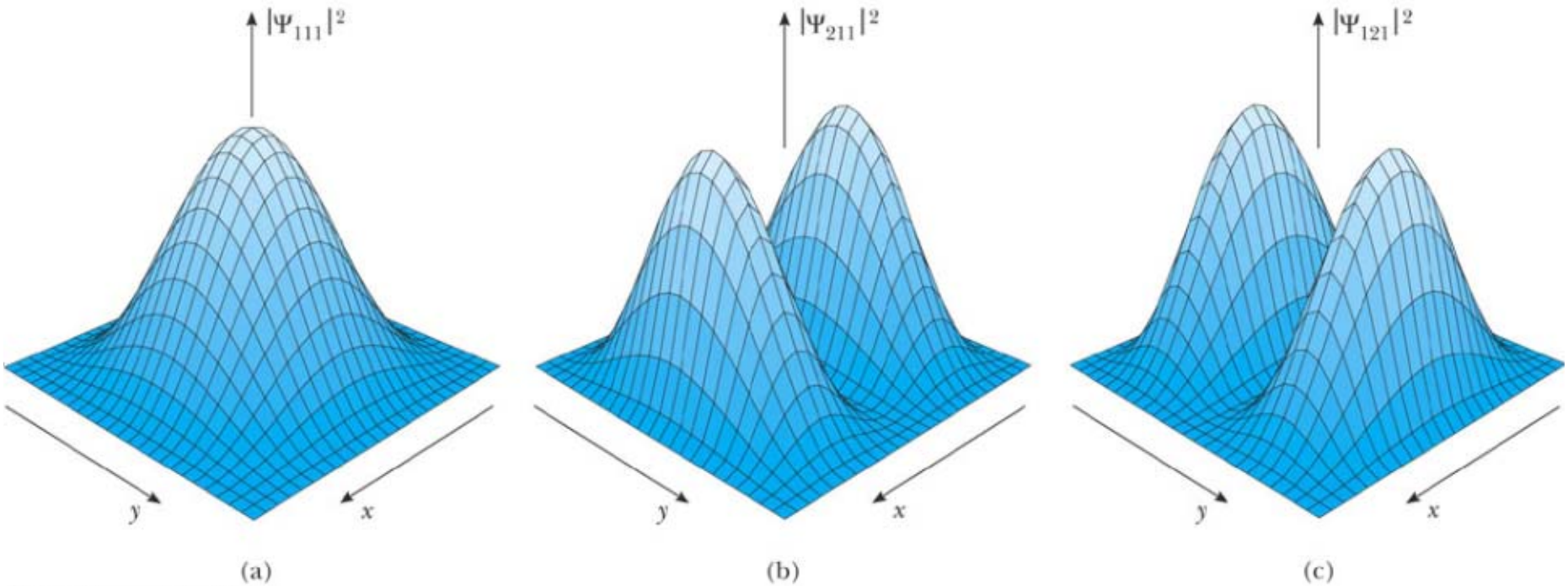


Fig. 8-4, p.265