Particle in a 3D Box (2)

Whenever U(x,y,z) can be written as the sum of functions of the individual coordinates, we can write some wave functions as products of functions of the individual coordinates: (see the supplementary slides)

$$\psi(x,y,z) = f(x)g(y)h(z)$$

For the 3D square well, each function is simply the solution to the 1D square well problem:

$$f_{n_x}(x) = N \sin\left(\frac{n_x \pi}{L} x\right) \quad E_{nx} = \frac{h^2}{2m} \cdot \left(\frac{n_x}{2L}\right)^2$$

Similarly for y and z.

Each function contributes to the energy. The total energy is the sum:

Etotal = E_x + E_y + E_z

2D wave functions:

$$\sin\left(\frac{n_x \pi}{L} x\right) \sin\left(\frac{n_y \pi}{L} y\right)$$

http://www.falstad.com/qm2dbox/