Energy Band Wave Functions
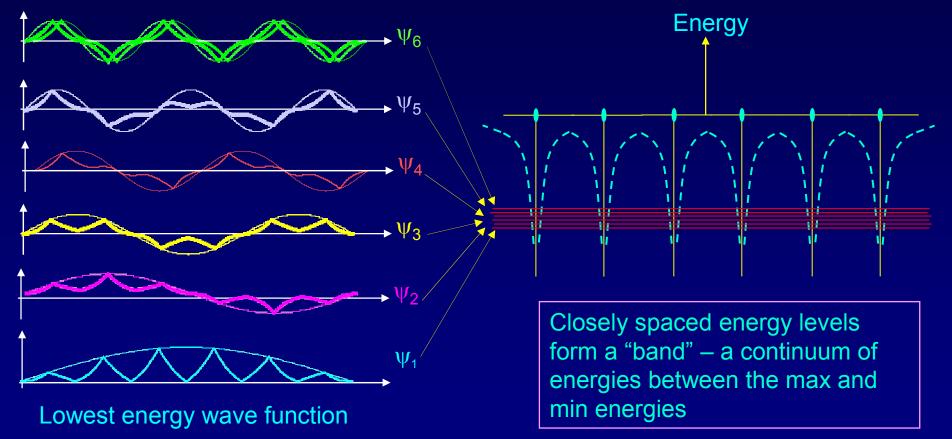
Example with six atoms → six crystal wave functions in each band.

Highest energy wavefunction

ψ_6

ψ_5

ψ_4

ψ_3

ψ_2

ψ_1

Lowest energy wave function

Energy

Closely spaced energy levels form a "band" – a continuum of energies between the max and min energies

FYI: These states are called "Bloch states" after Felix Bloch who derived the mathematical form in 1929. They can be written as: $\psi_n(x) = u(x)e^{ik_n x}$ where u is an atomic-like function and the exponential is a convenient way to represent both sin and cos functions.