

## 4.5: Lessons from the square well

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The computer demonstration showed the following features:

1. If we drop the requirement of normalisability, we have a solution to the time-independent Schrödinger Equation at every energy. Only at a few discrete values of the energy do we have normalisable states.
  2. The energy of the lowest state is always higher than the depth of the well (uncertainty principle).
  3. Effect of depth and width of well. Making the well deeper gives more eigenfunctions, and decreases the extent of the tail in the classically forbidden region.
  4. Wave functions are oscillatory in classically allowed, exponentially decaying in classically forbidden region.
  5. The lowest state has no zeroes, the second one has one, etc. Normally we say that the  $n$ th state has  $n-1$  “nodes”.
  6. Eigenstates (normalisable solutions) for different eigenvalues (energies) are orthogonal.
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