Intro to Quantum Mechanics

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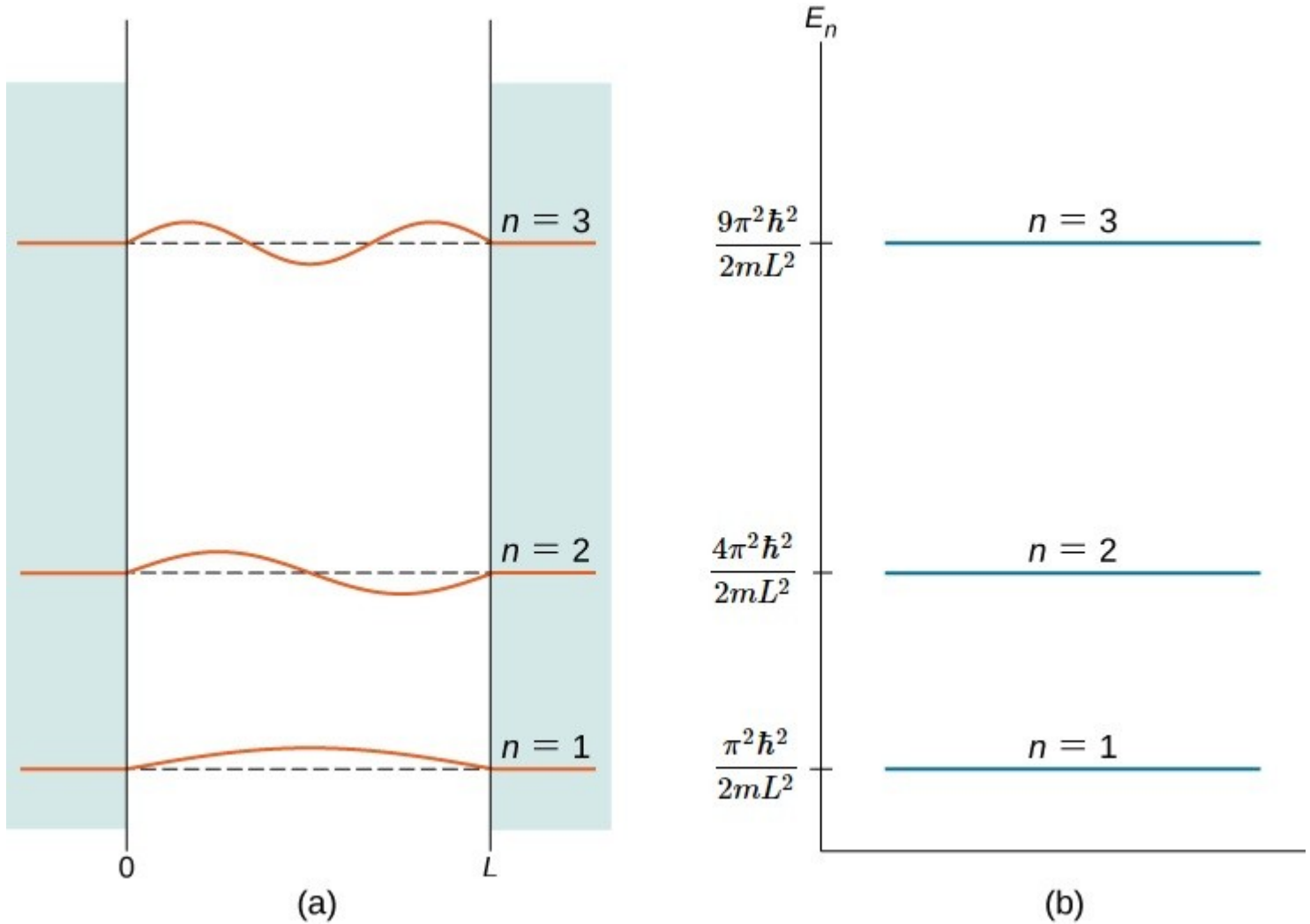
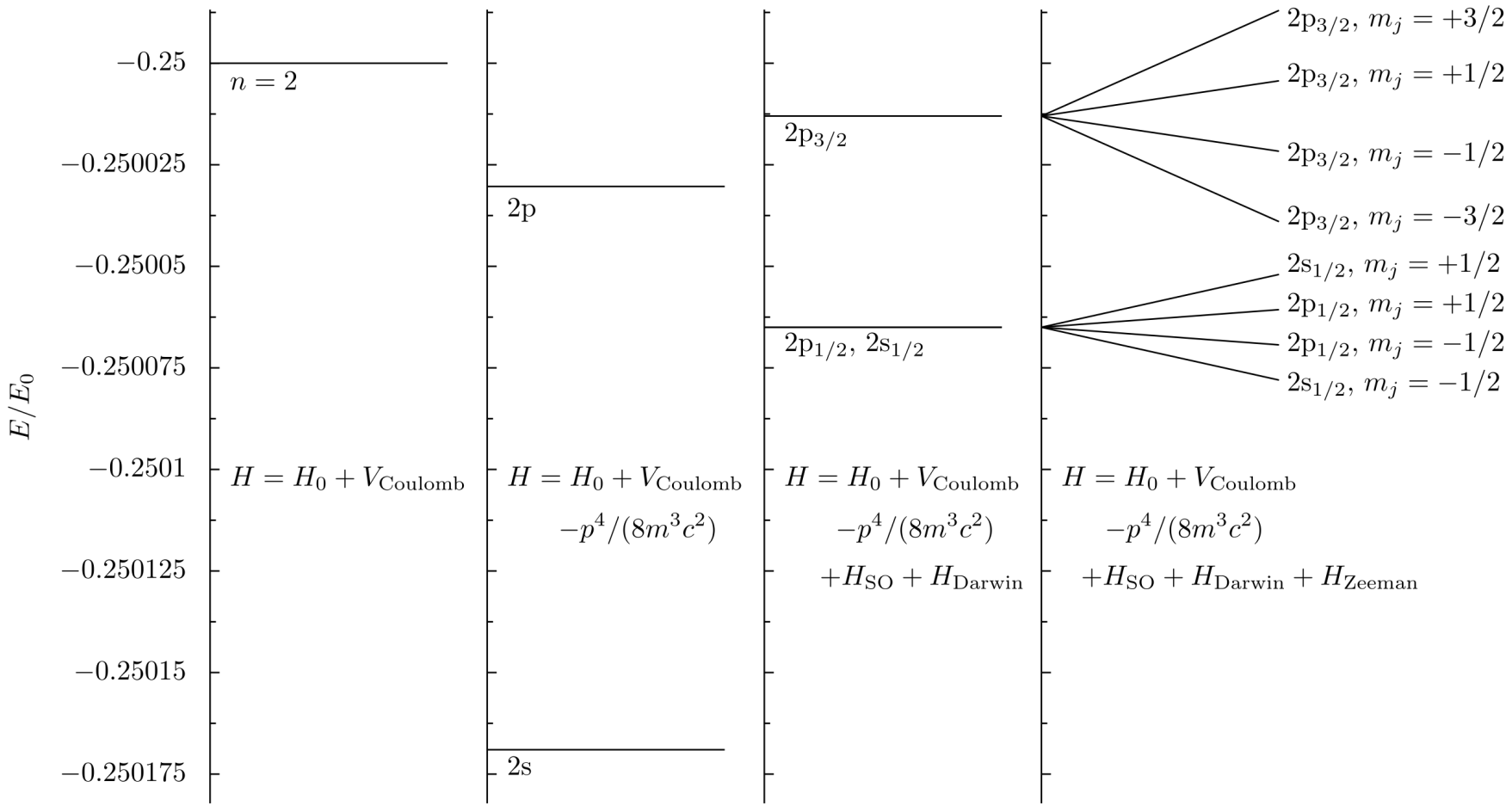
Overview

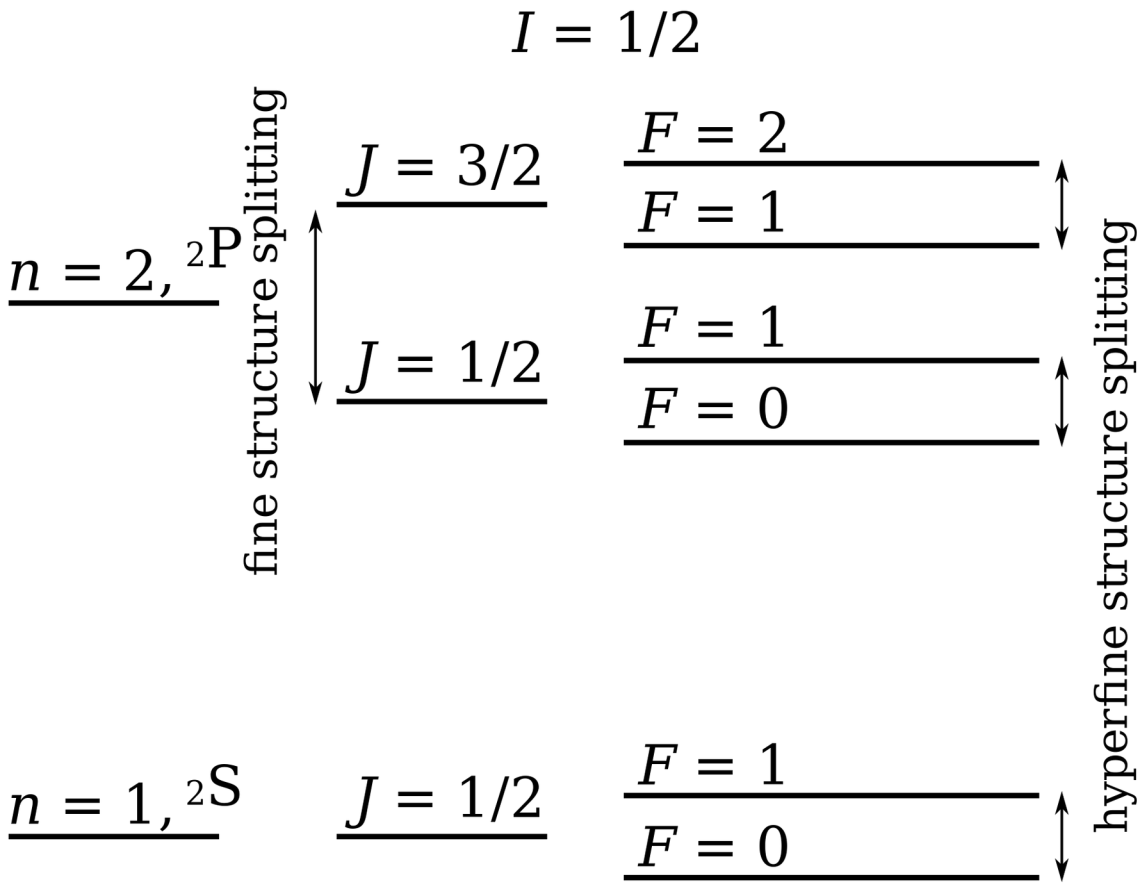
- Review on energy levels
  - Why do we care?
  - What other places do these energy levels appear in?
- Quantum Phenomenon that will be of interest to us in the future
  - Quantum tunneling
  - Lasers
- Go on and live your life (or start on this week's homework)

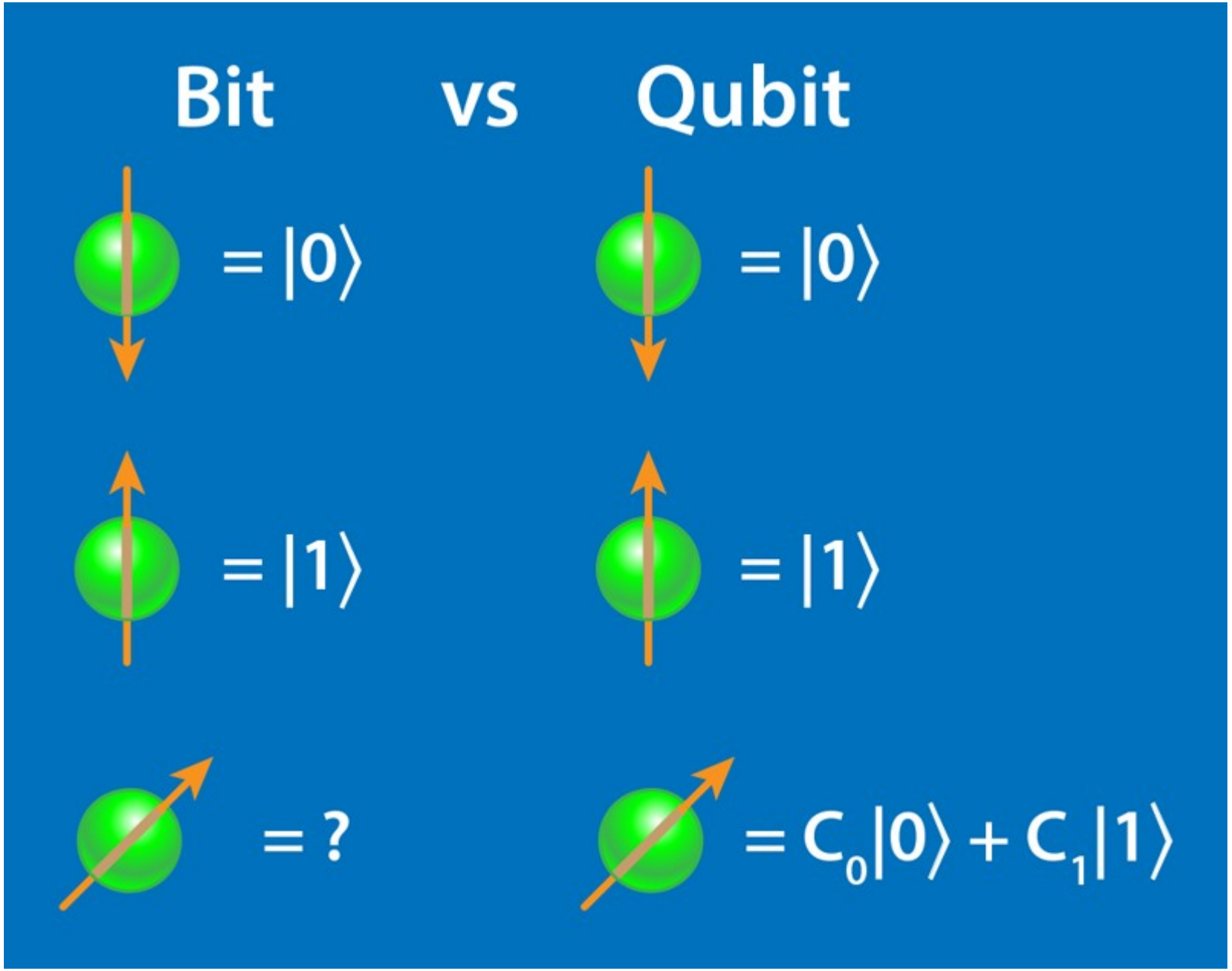

n = 3
n = 2
n = 1
0
L
(a)
E_n
$\frac{9\pi^2\hbar^2}{2mL^2}$
$\frac{4\pi^2\hbar^2}{2mL^2}$
$\frac{\pi^2\hbar^2}{2mL^2}$
n = 3
n = 2
n = 1
(b)

Atomic Structure, but fine

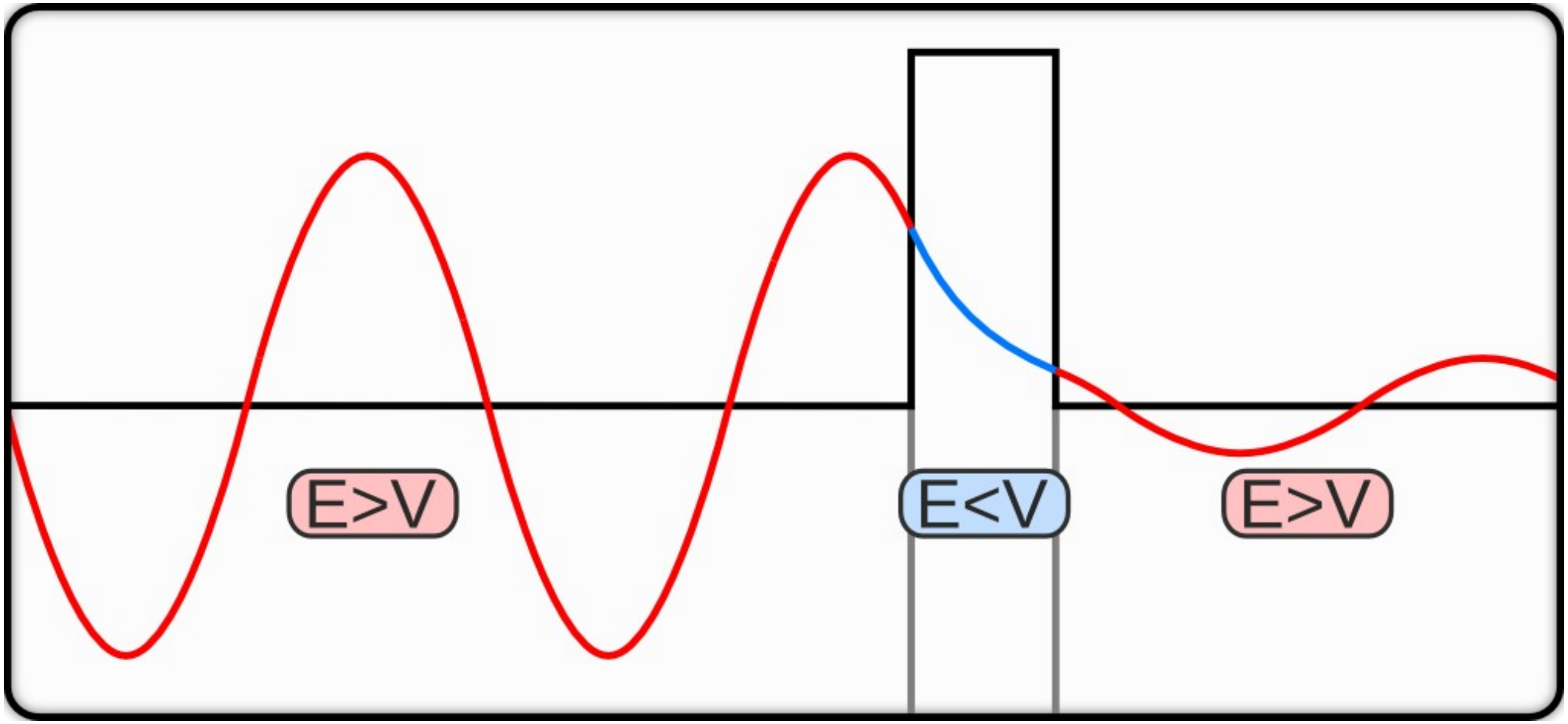


Atomic Structure, but hyperfine




Bit
vs
Qubit
= |0⟩
= |0⟩
= |1⟩
= |1⟩
= ?
= C0|0⟩ + C1|1⟩

Quantum Tunneling



Lasers

- light amplification by stimulated emission of radiation
- Singular wavelength
- High intensity
- Excited atoms (electrons)
- Spontaneous Emission
- Cavity

Take-away from the introduction

- Quantum computing relies fundamentally on quantum mechanics
- State |0>s and |1>s in quantum computing are essentially energy levels, or energy eigenstates, in a system
- There can be a plethora of systems that have distinguishable energy eigenstates that are interesting to study
- As you go on to learn more about the linear algebra and algorithms, keep in mind the physical systems that you might be operating on, and understand that the linear transformations that you perform are superpositions of states in the real world.