The five *Postulates of Quantum Mechanics*

<table>
<thead>
<tr>
<th>Postulate</th>
<th>Description</th>
<th>Equation</th>
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<tbody>
<tr>
<td>1.</td>
<td>Wave functions represent probability distributions</td>
<td>$P = \int_{x_1}^{x_2}</td>
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<td>2.</td>
<td>Operators represent physical quantities, or observables</td>
<td>$x \rightarrow \hat{x}$, $E \rightarrow \hat{H}$</td>
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<td>3.</td>
<td>Measurements with operators read out eigenvalues</td>
<td>$\hat{H}\psi_n(x) = E_n\psi_n(x)$</td>
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<td>4.</td>
<td>Expectation values of measurements</td>
<td>$\langle E \rangle = \int_{-\infty}^{\infty} \phi^*(x)\hat{H}\phi(x)dx$</td>
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<td>5.</td>
<td>The time-dependent Schrödinger equation</td>
<td>$\hat{H}\Psi(x, t) = i\hbar \frac{\partial\Psi(x, t)}{\partial t}$</td>
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Last lecture we discussed...
Road map for today’s lecture

We will find wavefunction solutions for several problems involving potentials with finite walls

• Particle in a finite box

• Particle hitting a finite step

• Particle tunneling through a finite barrier

• How quantum tunneling is important to chemistry
Practice Problem #1: Finite step potential

Qualitatively, what do you expect to happen for an incoming particle with \( E < V_0 \)?

Use what we learned about the particle in a finite box to write down general expressions for the three pieces of the total wavefunction:

1. Incoming wave
2. Reflected wave
3. Transmitted wave

What are the relevant boundary conditions you would use to constrain these general expressions?
Practice Problem #2: A particle and a cliff

- Qualitatively, what do you expect to happen for a particle incoming from the left that hits a cliff where $V(x)$ drops from 0 to $-V_0$?
- What would the wavefunctions look like in regions 1 and 2?
- What are the relevant boundary conditions?
• **Next time:** Heisenberg’s uncertainty principle

• **Problem sets:** PS3 due next Tuesday

• **In the last minute or two:** Your muddiest point from today’s lecture?