

CHAPTER OVERVIEW

1: Quantum Fundamentals

- [1.1: An Approach to Quantum Mechanics](#)
- [1.2: Atomic and Molecular Stability](#)
- [1.3: Atomic and Molecular Stability](#)
- [1.4: Atomic and Molecular Stability](#)
- [1.5: Quantum Computation - A Short Course](#)
- [1.6: Quantum Computation- A Short Course](#)
- [1.7: Quantum Computation- A Short Course](#)
- [1.8: Quantum Computation- A Short Course](#)
- [1.9: Quantum Computation- A Short Course](#)
- [1.10: Quantum Computation- A Short Course](#)
- [1.100: Analysis of the Stern-Gerlach Experiment](#)
- [1.101: Related Analysis of the Stern-Gerlach Experiment](#)
- [1.103: Bloch Sphere](#)
- [1.104: 88. Related Analysis of the Stern-Gerlach Experiment](#)
- [1.105: Bill the Cat and the Superposition Principle](#)
- [1.106: Schroedinger's Dog](#)
- [1.107: The Bloch Sphere](#)
- [1.108: Density Matrix, Bloch Vector and Entropy](#)
- [1.109: State Vectors and State Operators- Superpositions, Mixed States, and Entanglement](#)
- [1.11: Quantum Computation- A Short Course](#)
- [1.110: The Gram-Schmidt Procedure](#)
- [1.12: Quantum Computation- A Short Course](#)
- [1.13: Quantum Mechanics and the Fourier Transform](#)
- [1.14: Quantum Mechanics and the Fourier Transform](#)
- [1.15: Quantum Mechanics and the Fourier Transform](#)
- [1.16: Quantum Mechanics and the Fourier Transform](#)
- [1.17: Quantum Mechanics and the Fourier Transform](#)
- [1.18: Exploring the Origin of Schrödinger's Equations](#)
- [1.19: Basic Quantum Mechanics in Coordinate, Momentum and Phase Space](#)
- [1.20: The Repackaging of Quantum Weirdness](#)
- [1.21: Quantum Principles Illuminated with Polarized Light](#)
- [1.22: Relationship Between the Coordinate and Momentum Representations](#)
- [1.23: Very Brief Relationship Between the Coordinate and Momentum Representations](#)
- [1.24: Getting Accustomed to the Superposition Principle](#)
- [1.25: The Dirac Delta Function](#)
- [1.26: Elements of Dirac Notation](#)
- [1.27: The Dirac Notation Applied to Variational Calculations](#)
- [1.28: Raising and Lowering; Creating and Annihilating](#)
- [1.29: Single Slit Diffraction and the Fourier Transform](#)
- [1.30: From Coordinate Space to Momentum Space and Back](#)
- [1.31: The Position and Momentum Commutation Relation in Coordinate and Momentum Space](#)
- [1.32: Simulating the Aharonov-Bohm Effect](#)

- 1.33: Basic Matrix Mechanics
- 1.34: Rudimentary Matrix Mechanics
- 1.35: Matrix Mechanics
- 1.36: Aspects of Dirac's Relativistic Matrix Mechanics
- 1.37: The Double-Slit Experiment
- 1.38: Double-Slit Experiment with Polarized Light
- 1.39: The Consequences of Path Information in a Mach-Zehnder Interferometer
- 1.40: Another look at the Consequences of Path Information in a Mach-Zehnder Interferometer
- 1.41: The Double-Slit Experiment with Polarized Light
- 1.42: The Quantum Eraser
- 1.43: Which Way Did It Go? - The Quantum Eraser
- 1.44: Which Path Information and the Quantum Eraser
- 1.45: Terse Analysis of Triple-slit Diffraction with a Quantum Eraser
- 1.46: Which Path Information and the Quantum Eraser (Brief)
- 1.47: Terse Analysis of Triple-slit Diffraction with a Quantum Eraser
- 1.48: Which-way Markers and Post-selection in the Double-slit Experiment
- 1.49: A Stern-Gerlach Quantum "Eraser"
- 1.50: Using the Mach-Zehnder Interferometer to Illustrate the Impact of Which-way Information
- 1.51: Quantum Theory, Wave-Particle Duality and the Mach-Zehnder Interferometer
- 1.52: Analysis of a Temporal Double-slit Experiment
- 1.53: An Analysis of Three-Path Interference
- 1.54: An Analysis of Three-Slit Interference
- 1.55: Using a Mach-Zehnder Interferometer to Illustrate Feynman's Sum Over Histories Approach to Quantum Mechanics
- 1.56: The Paradox of Recombined Beams
- 1.57: Evidence for Quantized Gravitational States of the Neutron
- 1.58: Quantized Gravitational States A Variational Approach
- 1.59: The Quantum Bouncer Doesn't Bounce, Unless...
- 1.60: Kinetic Energy Is Important in the Nanoscale World
- 1.61: Energy Expectation Values and the Origin of the Variation Principle
- 1.62: Examining the Wigner Distribution Using Dirac Notation
- 1.63: The Wigner Function for the Single Slit Diffraction Problem
- 1.64: Wigner Distribution for the Double Slit Experiment
- 1.65: Wigner Distribution for the Triple Slit Experiment
- 1.66: Wigner Distribution for the Quadruple Slit Experiment
- 1.67: Quantum Tunneling in Coordinate, Momentum and Phase Space
- 1.68: Another Look at the Wigner Function
- 1.69: The Wigner Distribution Function for the Harmonic Oscillator
- 1.70: Wigner Distribution for the Particle in a Box
- 1.71: The Wigner Distribution for a Particle in a One-dimensional Box
- 1.72: Superposition vs. Mixture
- 1.73: Time-dependent Wigner Function for Harmonic Oscillator Transitions
- 1.74: Momentum Operator in Coordinate Space
- 1.75: Momentum Wave Functions for the Particle in a Box
- 1.76: A Graphical Illustration of the Heisenberg Uncertainty Relationship
- 1.77: The Quantum Harmonic Oscillator
- 1.78: Coherent Superpositions for the Harmonic Oscillator
- 1.79: The Harmonic Oscillator and the Uncertainty Principle

- [1.80: Another view of the Harmonic Oscillator and the Uncertainty Principle](#)
- [1.81: Hydrogen Atom and Helium Ion Spatial and Momentum Distribution Functions Illustrate the Uncertainty Principle](#)
- [1.82: The Position-Momentum Uncertainty Relation in the Hydrogen Atom](#)
- [1.83: Demonstrating the Uncertainty Principle for Angular Momentum and Angular Position](#)
- [1.84: A Brief Tutorial on Wavepackets](#)
- [1.85: The Difference Between Fermions and Bosons](#)
- [1.86: Quantum Corrals - Electrons within a Ring](#)
- [1.87: Planck's Radiation Equation Fit to Experimental Data](#)
- [1.88: Planck's Radiation Equation Fit to Experimental Data - Another Algorithm](#)
- [1.89: Fitting Einstein's Heat Capacity Equation to Experimental Data for Silver](#)
- [1.90: Einstein's Heat Capacity Equation Fit to Experimental Data - Another Algorithm](#)
- [1.91: Fitting Debye's Heat Capacity Equation to Experimental Data for Silver](#)
- [1.92: Debye's Heat Capacity Equation Fit to Experimental Data - Another Algorithm](#)
- [1.93: Wave-particle Duality and the Uncertainty Principle](#)
- [1.94: Wave-Particle Duality for Matter and Light](#)
- [1.95: What Part of the Quantum Theory Don't You Understand?](#)
- [1.96: Quantum Potpourri - An Attempt to Demonstrate Two Fundamental Quantum Concepts- Wave-particle Duality and The Superposition Principle](#)
- [1.97: Quantum Dynamics- One Step at a Time](#)
- [1.98: Quantum Mechanical Pressure](#)
- [1.99: Visualizing the Difference Between a Superposition and a Mixture](#)

This page titled [1: Quantum Fundamentals](#) is shared under a [CC BY 4.0](#) license and was authored, remixed, and/or curated by [Frank Rioux](#) via [source content](#) that was edited to the style and standards of the LibreTexts platform.