Introduction to Quantum Mechanics

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1 Introduction

Quantum mechanics is a fundamental theory in physics that describes nature at the smallest scales of energy levels of atoms and subatomic particles.

2 Basic Concepts

2.1 Wave-Particle Duality

One of the core concepts of quantum mechanics is that particles can exhibit both wave-like and particle-like properties.

$$\psi(x,t) = Ae^{i(kx-\omega t)} \tag{1}$$

This equation represents a wave function, where ψ is the wave function, k is the wave number, and ω is the angular frequency.

2.2 Heisenberg's Uncertainty Principle

The uncertainty principle states that it is impossible to simultaneously know the exact position and momentum of a particle.

$$\Delta x \Delta p \geq \frac{\hbar}{2} \tag{2}$$

3 Conclusion

Quantum mechanics challenges our classical understanding of the world and opens up a universe full of probabilities and uncertainties.