

Origin of Quantum theory

Key Discoveries/experiments

Implications

**Black body radiation,
Heat Capacities**

Energy is quantized

Photoelectric Effect

**Light behaves as
particles**

Electron Diffraction

**Electron behaves like
Waves**

De Broglie relation

**Dual nature (particle
and wave) of light and
particles (*e. g.* electrons)**

**Heisenberg's Uncertainty
Principle**

**The momentum and
position of a particle
cannot be determined
simultaneously
 $\Delta x \Delta p > 1/2 (h/2\pi)$.
Particles such as electrons
cannot be described by its
trajectory.**

Main differences between classical and quantum mechanics

Classical Mechanics (applicable to macroscopic particles): Energy is continuous; the trajectory of a particle can be determined.

Quantum Mechanics (applicable to microscopic particles, *e. g.* electrons and atoms): Energy is quantized (discrete - - energy level); the location and momentum of the particle must be described in terms of probability distribution.