

# Lecture 1 - Class

Monday, January 12, 2026 1:34 PM

[PHYS 349 - Introduction to Quantum Computing](#)  
<https://phys349.github.io/>



Q  
"Which of these use quantum mechanics?"

Transistor

Atom

Metal

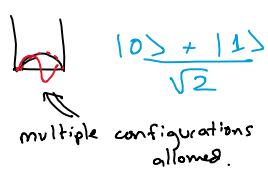
Swing.

"What makes something quantum?"

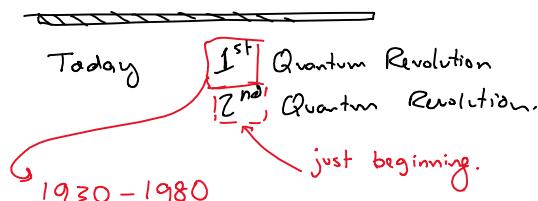
Classical Bit



Quantum Bit (Qubit)



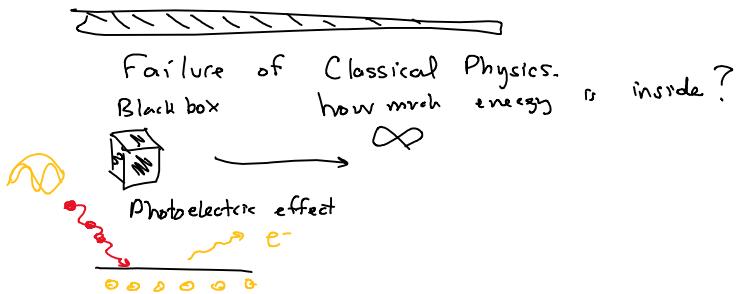
01 11 10 11



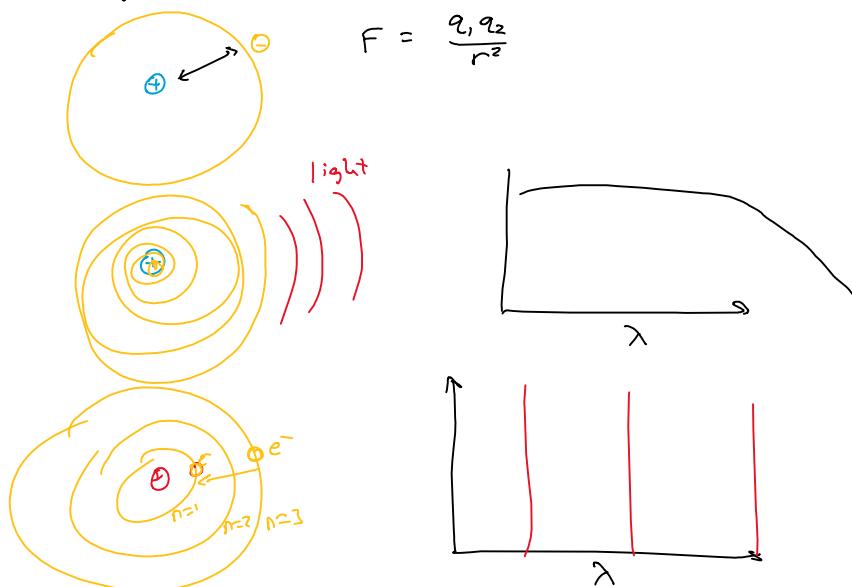
1<sup>st</sup> Quantum Revolution  
< 1900 "Physics is finished"

Classical Mechanics  
 $x(t)$   
 $F=ma$   
Thermodynamics  
"Emergent Phenomena"  
engines.

engines.



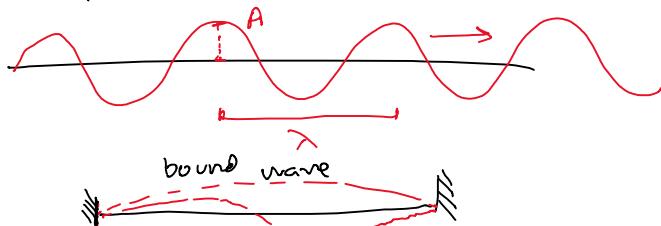
What is in atom?



### Resolution

"Matter is a wave"

$$p = h/\lambda$$



Each resonance is a bound/allowed state

w/ definite energy.



Wave Equation  $\rightarrow$  Schrödinger Equation

$$-\frac{\hbar^2}{2m} \frac{d^2}{dx^2} \psi(x, t) + V(x) \psi(x, t) = i\hbar \frac{d\psi}{dt}(x, t)$$

V wave      U wave

$$\frac{-\hbar^2}{2m} \frac{d^2}{dx^2} \psi(x, t) + V(x) \psi(x, t) = i \frac{\hbar \omega}{2t} \psi(x, t)$$

1930 - 1950      From atoms to

### Chemistry

- Periodic table



- molecular theory  
covalent bond  
orbitals.

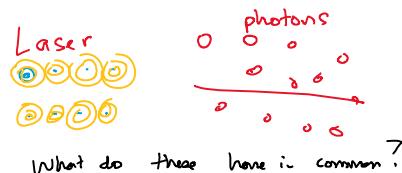
- magnetism

Materials

band theory  
conductor  
insulator  
semiconductor



1940's - 1980's      Quantum Enabled Technologies,



- ⊗ Many particles acting together
- ⊗ Classical "information"

2nd Quantum Revolution.

→  $|0\rangle + |1\rangle$