

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

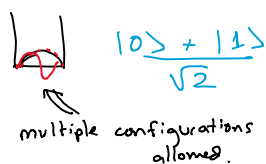
Swing.

"What makes something quantum?"

Classical Bit



Quantum Bit (Qubit)



01 11 10 11

Today

1st Quantum Revolution
2nd Quantum Revolution.

1930-1980

just beginning.

1st Quantum Revolution

<1900 "Physics is finished"

Classical Mechanics
 $x(t)$

$F=ma$

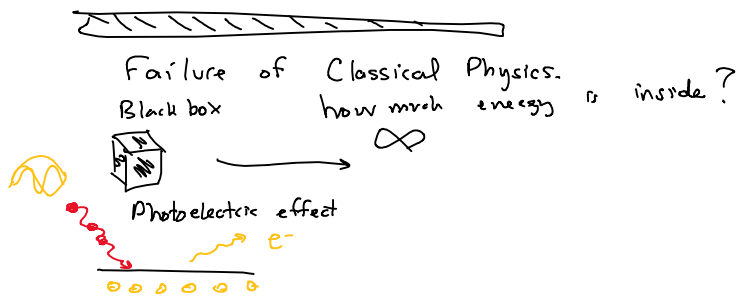
$E + M$



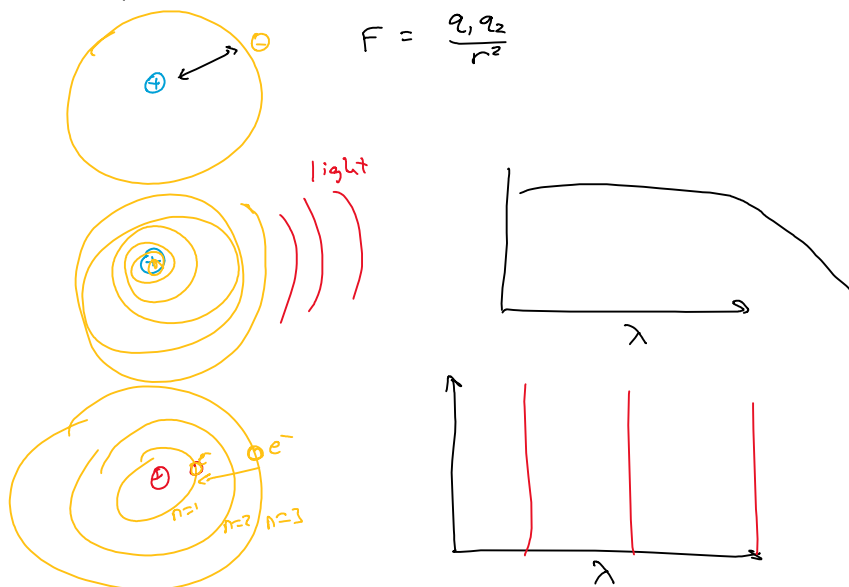
Thermodynamics.

"Emergent Phenomena"
engineer.

engineer.



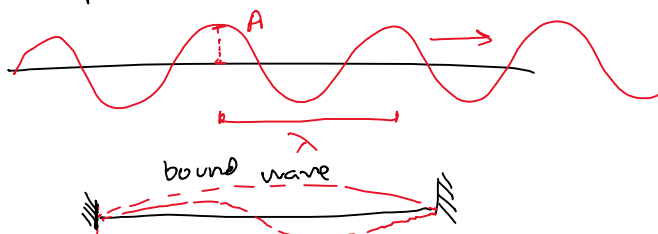
What is in atom?



Resolution

"matter is a wave"

$$p = h/\lambda$$



Each resonance is a bound/allowed state w/ definite energy.




Wave Equation \rightarrow Schrodinger Equation

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

V wave $\psi(x,t)$

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


↑ wave



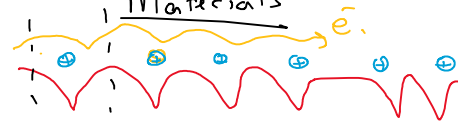
1930 - 1950 From atoms to

Chemistry


- Periodic table
- molecular theory
covalent bond
orbitals.
- magnetism



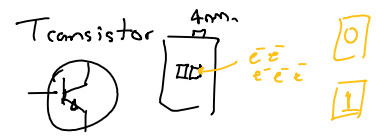
Materials



band theory
conductor
insulator
semiconductor.



1940's - 1980's Quantum Enabled Technologies,



What do these have in common?

- Many particle acting together
- Classical "information"

2nd Quantum Revolution.

