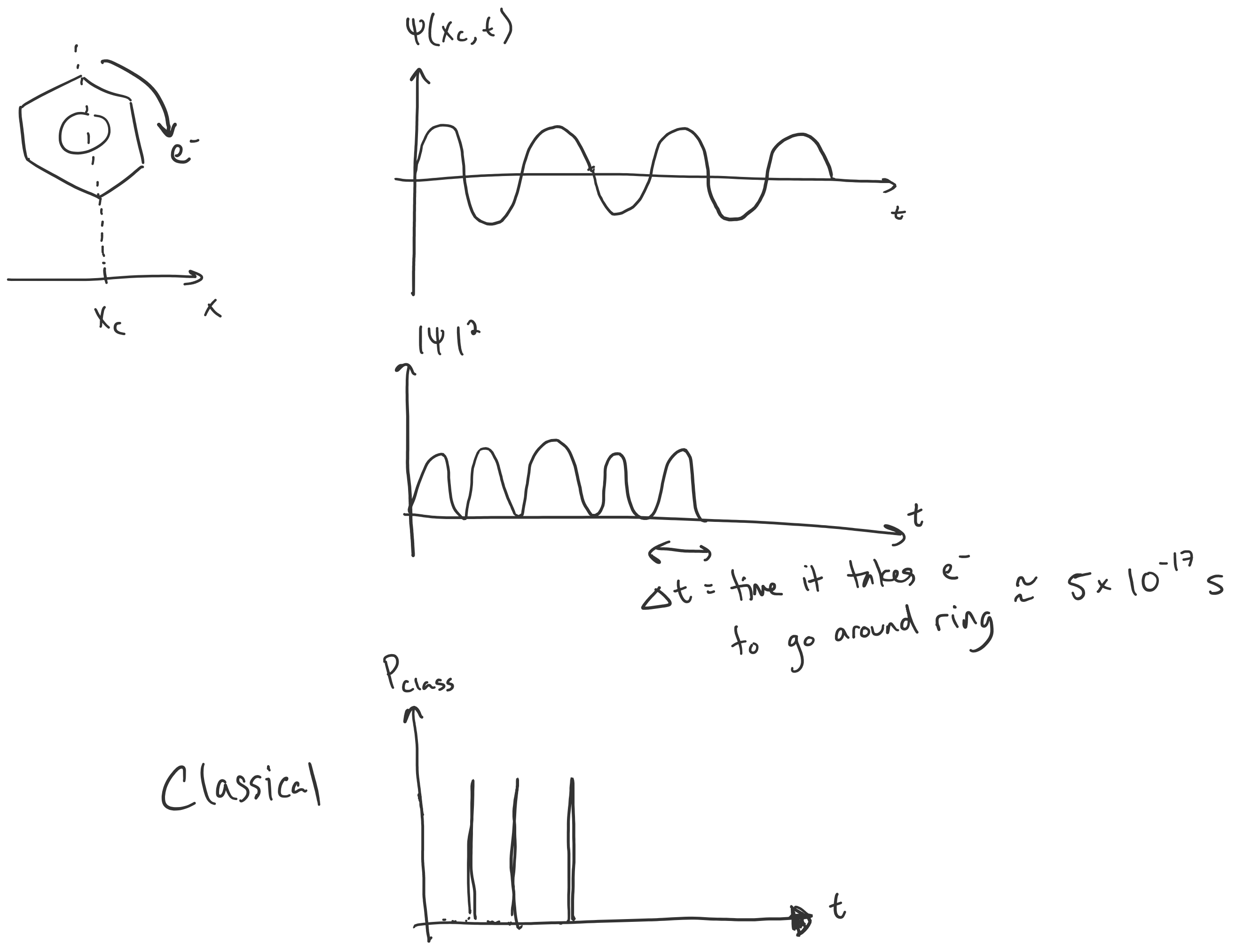
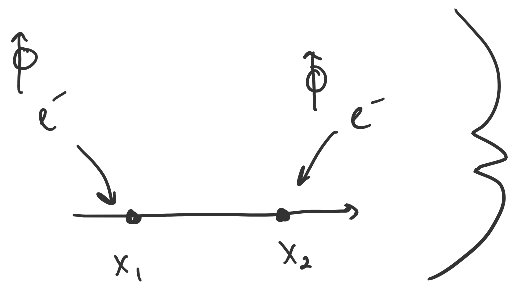
Lecture 6

Friday, September 1, 2023 9:59 AM

ex #1 Time Dependence of wavefunction of an e^- going around a benzene ring



ex 2 : Derive Pauli Exclusion Principle from P4



$\psi(x_1, x_2) = -\psi(x_2, x_1)$

As the e^- approach each other meaning $x_2 \rightarrow x_1$,

in the limit where $x_2 \rightarrow x_1$

$\Rightarrow \psi(x_1, x_1) = -\psi(x_1, x_1) \Rightarrow \psi(x_1, x_1) = 0$

There is no probability for e^- occupying the same spot,

& probability drops as they approach

PEP explains why objects are Solid

ex 3 : Schrödinger equation

P1 $\Rightarrow E = i\hbar \frac{\partial}{\partial t}$

$p = -i\hbar \frac{\partial}{\partial x} \Rightarrow p^2 = -\hbar^2 \frac{\partial^2}{\partial x^2}$

P2 $\Rightarrow \mathcal{H}\psi = i\hbar \frac{\partial}{\partial t}\psi$

$\left(\frac{p^2}{2m} + V(x)\right)\psi = i\hbar \frac{\partial}{\partial t}\psi$

$\left(\frac{-\hbar^2}{2m}\frac{\partial^2}{\partial x^2} + V(x)\right)\psi = E\psi \Rightarrow \mathcal{H}\psi = E\psi$

ex 4 : The order of things matters in QM

CM = $x \cdot p$, $p \cdot x \Rightarrow xp - px = 0$

QM = $(xp - px)\psi = \left(x \frac{\hbar}{i}\frac{\partial}{\partial x} - \frac{\hbar}{i}\frac{\partial}{\partial x} x\right)\psi$