Exam 1 Thursday. List of Concepts Covered.

Monday, October 26, 2015 07:45

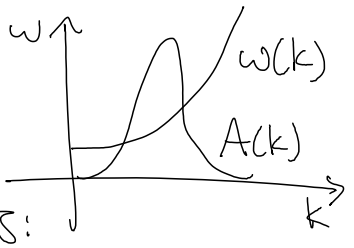
* Historical Underpinnings:
  - Planck's law, Photoelectric, Compton Effects, Bohr model
    deBroglie wavelength, Davisson-Germer expt. $E=\hbar\omega$, $L=n\hbar$, $p=\hbar k$
  - what basic principle did each contribute to Q.M.?
  - calculations of each effect

* probability distribution $P(x)$ & amplitudes $\Psi(x)$
  - calculate $\langle f(x)\rangle$, $\sigma_x^2 = \langle x^2\rangle - \langle x\rangle^2$
  - Born interpretation of wave function
    how is it similar to / different than classical $P(x)$?

* dispersion relation and wave packets
  - understand relations between E, p, ω, k
    quantization & dispersion

E	ω
p	k

  - be able to calculate v_g, v_ϕ
    from a dispersion curve.
  - construct wave packets as superposition
    of plane waves with amplitude $A(k)$
    (Fourier transforms)



  - describe major features & effects on packets:
    fundamental frequency, carrier frequency, bandwidth.
  - explain wave-particle duality (complementarity)
    and Heisenberg Uncertainty Principle in terms of packets.
  - compare/contrast classical waves/particles w/ quantum.

* Schrodinger equation
  - explain how TDSE evolves the state in time
    and how the TISE is used to solve the TDSE.

- show how TDSE is a generalization of old quantum theory. Planck's law, de Broglie wavelength, dispersion relation.

- solve the TISE for: free particle, infinite square well, SHO. calculate amplitudes of initial wavefunction & time dependance
- matrix elements for the SHO.
- what is the role of boundary conditions?

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