

UNIVERSITY OF HYDERABAD

School of Physics

Jan 2010 - Apr 2010
M.Sc. II-Semester

Quantum Mechanics-I

Time : 1hr
MM : 20

Tutorial-VI : Coordinate and Momentum Space Wave Functions
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- [1] Let $\chi(x) = \exp(ik_0x)\psi(x)$. Do the functions $\psi(x)$ and $\chi(x)$ represent the same state or not? Compute the difference in averages of the momentum $\langle\chi|p|\chi\rangle$ and $\langle\psi|p|\psi\rangle$. and check if the difference zero or non zero? Is it correct to say that the two wave functions $\chi(x)$, $\psi(x)$ differ by a phase and hence represent the same state?
- [2] Find the momentum space wave function, if the coordinate space wave function is given to be
- (a) $\psi_1(x) = C \exp(|x|/L)$
(b) $\psi_2(x) = N \exp(x^2/2^2)$
- [3] For a particle having the wave function

$$\psi(x) = N \exp(x^2/2^2)$$

compute the uncertainties Δx and Δp . Will you use the coordinate space, or momentum space, wave function? Why ?