Question Bank for Unit V: Quantum Physics

Que.		***Marks***
i)	What is the wavelength of matter wave?	[1]
ii)	What are the necessary conditions of physically accepted well behaved wave function.	[1]
iii)	If uncertainty in the position of a particle is equal to de Broglie wavelength, then show that uncertainty in velocity is equal to the velocity of particle	[3]
iv)	State and explain Heisenberg's uncertainty principle .prove the same for pair of variables energy and time.	[5]
v)	Starting from Schrodinger's time independent equation, show that the energy of a particle in one dimensional potential well of infinite height is *quantized*. (derivation for infinite potential well)	[5]
vi)	An infinite square well has a width of 1A.U. What is the fractional change in the lowest two permissible energies of one electron in this well if the width is increased by1 A.U?	[4]
vii)	Construct structure for TEM and give working in details.	[4]
viii)	Construct structure for SEM and give working in details.	[4]
ix)	Describe briefly the wave nature of matter and obtain an expression for the de-broglie wavelength.	[3]
x)	Explain Heisenberg Uncertainty principle with example.	[2]
xi)	Write down Schrodinger time independent and time dependent wave equation.	[2]
xii)	Apply the concept of Schrodinger equation to justify the phenomenon of Tunneling. Give its application in STM.	[5]
xiii)	Explain the physical significance of $\|\psi\|^2$	[1]
xiv)	Lowest energy of an electron trapped in a potential well is 38 eV. Calculate the width of the well. (Given h=6.63 x 10^{-34} J-s, mass of electron=9.1 x 10^{-31}kg)	[3]
xv)	Derive an expression for Schrödinger's time independent wave equation.	[5]
xvi)	Apply Schrödinger's wave equations to prove that quantum mechanically particle trapped inside the rigid box possesses only *discrete energy eigen values*. (derivation for infinite potential well)	[5]