

Birzeit University-Department of Physics
 Quantum Mechanics I Phys232
 Spring 2021
 Second Exam, June 2nd 2021

1. Consider an infinite square well width L:
 - (a) (6 points) Find the expression of the energy and wavelength of a photon emitted when a transition between state n and the ground state is made.
 - (b) (4 points) Find the expression for the probability that a particle in the nth state will be found in the first 1/3 of a well of width L.
 - (c) (6 points) Compare as a function of the quantum number n, the ratio of the probability that the particle will be found in the first third of the well to the probability that it will be found in the middle third.
2. (10 points) An electron and a photon each have a kinetic energy of 100keV find their deBroglie wavelength.
3. (a) (5 points) State the correspondence principle
 - (b) (15 points) Using the Bohr model of the hydrogen atom, the frequency of the emitted photon when an electron make a transition from state n to state n-1 is given by:

$$f = \frac{2\pi^2 m_e k^2 e^4}{h^3} \left(\frac{2n-1}{(n-1)^2 n^2} \right)$$

Show that if n is very large then this frequency reduces to the classical frequency (frequency of revolution of the electron around the nucleus)

4. (15 points) The wave function for the ground state of a Harmonic oscillator is given by: $\psi_0(x) = c_0 e^{-\alpha^2 x^2/2}$. Find α and the energy corresponding to this state

Question:	1	2	3	4	Total
Points:	16	10	20	15	61
Score:					

Good Luck