國立臺灣大學107學年度轉學生招生考試試題

題號： 18
科目：普通物理學(A)

1. The energy levels for an electron confined in a one-dimensional infinitely deep potential energy well of width L, are given by: $E_n = \left(\frac{h^2}{8mL^2}\right) n^2, \quad n = 1, 2, 3, \ldots$, where h is the Planck constant, and m the mass of the electron.
   a) Find the wavelength of the photon emitted during the transition of an electron from level $n = 3$ to level $n = 1$. [20%]
   b) If we place 5 (five) non-interacting electrons in this infinite potential well, find the minimum energy (the energy of the ground state) of this system. [30%]

2. An electron in the hydrogen atom is described by the principal, orbital and spin quantum numbers, $n, (l, m_l), (s, m_s)$, respectively.
   a) How many quantum states are available to the electron when the principal quantum number $n = 1$? [20%]
   b) Write down the quantum numbers for all possible quantum states available to that electron for the principal quantum number $n = 2$. [30%]

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