淡江大學九十三學年度碩士班招生考試試題

系別：物理學系　　　　科目：近　代　物　理

准帶項目請打「○」否則打「×」
簡單型計算機
×

1. (a) Draw the figure of the experimental setup used to study the photoelectric effect.

   (b) Describe with figures about the two important results obtained from this experiment that cannot be explained by the wave theory.　　　20%

2. Given the wave function for the "particle-in-a-box"

$$\Phi(x,t) = \begin{cases} A \cos(\dfrac{\pi x}{a}) \exp(\dfrac{-iEt}{\hbar}) & |x| < \dfrac{a}{2} \\ 0 & |x| \geq \dfrac{a}{2} \end{cases}$$

   Evaluate the expectation values of x, p, x^2, and p^2 and also prove $\Delta x \Delta p \geq \hbar/2$ for that particle.　　　25%

3. Show that if the uncertainty in the location of a particle is about equal to its de Broglie wavelength, then the uncertainty in its velocity is about equal to one tenth its velocity.　　　15%

4. Solve the time independent Schrodinger equation for a particle moving under the influence of a step potential with total energy E greater than the height V_o of the step as shown in Fig.1.　　　20%

5. State the postulates in Bohr's atomic model and show how to use them to obtain the hydrogen atomic spectra.　　　20%.
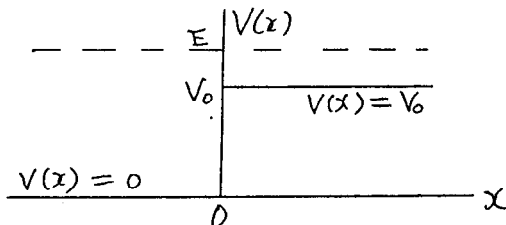

FIG. 1