1

Consider an infinite 1D square potential well containing a particle of mass m.

a) Copy Fig. 1 into your answer book. On your copy, sketch the eigen-functions for n=1, 2, and 3, where n is the principle quantum number.

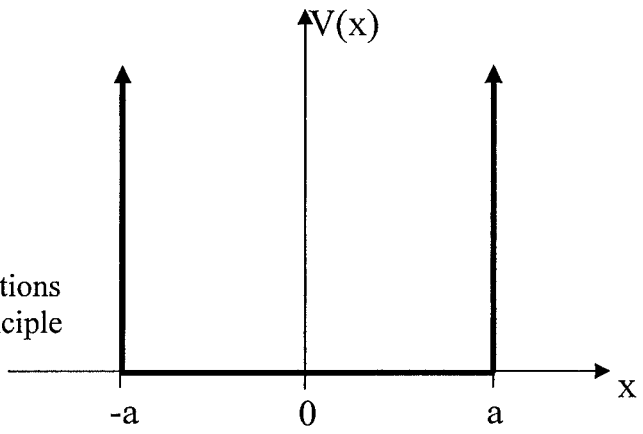

Fig. 1

b) Show that the energy of the nth level is given by $E_n = \frac{n^2\pi^2\hbar^2}{8ma^2}$

Now consider the following linear combination of the lowest two eigen-functions of the above infinite square well:

$$\psi(x) = k\left[\frac{1}{\sqrt{a}}\cos\left(\frac{\pi x}{2a}\right) + \frac{2}{\sqrt{a}}\sin\left(\frac{\pi x}{a}\right)\right]$$

c) Find the value of k which normalizes this wave function.

d) Calculate the expectation value of the kinetic energy.

e) Include the appropriate time factor in each term and find the time-dependent probability density function, $\rho(x,t)$.