

Name _____

5.73

Quiz 8

September 20, 2002

1.

$$\int_{x_-(E)}^{x_+(E)} p_E(x') dx' = \frac{h}{2}(n + 1/2)$$
$$p_E(x) = [2m(E - V(x))]^{1/2}$$

Even though WKB cannot be valid for a potential of the form

$$V = 0 \quad |x| \geq L/2$$
$$V = -V_0 \quad |x| < L/2$$

A. Evaluate the quantization integral at $E = 0$ and determine the number of bound levels, n_{\max} , in the potential.

B. Calculate $\frac{dn_{\max}}{dL}$.

C. Calculate $\frac{dn_{\max}}{dV_0}$.

(over)

- D. Which leads to a larger increase in n_{\max} , a 10% increase in L or a 10% increase in V_0 ?

- E. Consider the “bifurcated potential”:
- $$\begin{aligned} V &= 0 & |x| > 20L \\ V &= 0 & |x| < 19.5L \\ V &= -V_0 & 19.5L \leq |x| \leq 20L \end{aligned}$$

Without doing any new calculations but keeping the result of part A clearly in mind, compare the number of bound levels in the bifurcated potential to those in the original finite square well that is the subject of part A.