$$(7)\quad \psi(x) \rightarrow \psi(x) + \varepsilon\varphi(x) \quad \leftarrow \left\{ \text{A VARIATION } \varphi(x) \text{ IS ADDED} \right.$$

$$(8)\quad \frac{\partial}{\partial\varepsilon}(\Delta x)^2(\Delta p)^2 = (\Delta p)^2\frac{\partial}{\partial\varepsilon}(\Delta x)^2 + (\Delta x)^2\frac{\partial}{\partial\varepsilon}(\Delta p)^2 = 0$$

$$(9)\quad (\Delta x)^2\left[\left(\frac{h}{4\pi}\right)^2\left(\frac{1}{\Delta x}\right)^4\frac{\partial}{\partial\varepsilon}(\Delta x)^2 + \frac{\partial}{\partial\varepsilon}(\Delta p)^2\right] = 0 \quad \left\{ \begin{array}{l}\text{UNDERIVED } \Delta p \\ \text{REPLACED BY (1)}\end{array} \right.$$

$$(10)\quad \frac{\partial}{\partial\varepsilon}\left[-\left(\frac{h}{4\pi}\right)^2\left(\frac{1}{\Delta x}\right)^2 + (\Delta p)^2\right] = 0 \quad \left\{ (\Delta x)^2 > 0, \text{ OTHERWISE } \begin{array}{l}(\Delta p)^2 \rightarrow \infty \\ E \rightarrow \infty\end{array} \right.$$

$$(11)\quad \frac{\partial}{\partial\varepsilon}\left[-\left(\frac{h}{4\pi}\right)^2 \cdot 4\int\left(\frac{d\psi(x)}{dx}\right)^2 dx + 2m\int\left(E - V(x)\right)\psi^2(x)\,dx\right] = 0 \quad \left\{ \begin{array}{l}\text{USING} \\ \text{(5) \& (6)}\end{array} \right.$$

$$(12)\quad -\left(\frac{h}{2\pi}\right)^2\int\frac{d\psi(x)}{dx}\cdot\frac{d\varphi(x)}{dx}\,dx + 2m\int\left(E - V(x)\right)\psi(x)\varphi(x)\,dx = 0 \quad \left\{ \frac{\partial}{\partial\varepsilon} \;\&\; \varepsilon = 0 \; (7) \right.$$

$$(13)\quad \int\left[\left(\frac{h}{2\pi}\right)^2\frac{d^2\psi(x)}{dx^2} + 2m\left(E - V(x)\right)\psi(x)\right]\varphi(x)\,dx = 0 \quad \left\{ \begin{array}{l}\text{INTEGRATION BY PARTS} \\ \varphi(x) = 0 \text{ AT BORDERS}\end{array} \right.$$

$$(14)\quad \boxed{\frac{d^2\psi(x)}{dx^2} + 2m\left(\frac{2\pi}{h}\right)^2\left(E - V(x)\right)\psi(x) = 0} \quad \left\{ \begin{array}{l}\text{(13)} = 0 \text{ FOR ALL} \\ \text{VARIATIONS } \varphi(x)\end{array} \right.$$

SCHRÖDINGER'S WAVE EQUATION