$$\begin{split} \hat{\mathcal{H}} &= -\frac{\hbar^2}{2m} \int_{-\infty}^{\infty} \mathrm{d}x |x\rangle \frac{\mathrm{d}^2}{\mathrm{d}x^2} \left\langle x \left| \otimes \mathbb{1} + \int_{-\infty}^{\infty} \mathrm{d}x \right| x \right\rangle V_0(x) \left\langle x \left| \otimes \mathbb{1} + \int_{-\infty}^{\infty} \mathrm{d}x \right| x \right\rangle V_z(x) \langle x | \otimes \hat{S}_z \end{split}$$