Zeitabhngige Wellenfunktion:

$$\psi(x,t) = \alpha e^{-itE_0/\hbar} |0\rangle + \beta e^{-itE_1/\hbar} |1\rangle + \cdots$$

Mit den Energien $E_n = \left(n + \frac{1}{2}\right) \omega\hbar$
Und den Eigenfunktionen $|n\rangle = \psi_n(x)$

0.1 Operatoren

Ortsoperator	$\hat{x} = x = i\hbar\frac{\partial}{\partial p}$
Impulsoperator	$\hat{p} = p = -i\hbar\frac{\partial}{\partial x}$
Abstiegsoperator	$\hat{a} = \sqrt{\frac{m\omega}{2\hbar}}\hat{x} + \frac{i}{\sqrt{2\hbar m\omega}}\hat{p}$
Aufstiegsoperator	$\hat{a}^\dagger = \sqrt{\frac{m\omega}{2\hbar}}\hat{x} - \frac{i}{\sqrt{2\hbar m\omega}}\hat{p}$
Hamiltonoperator	$H = \frac{\hat{p}^2}{2m} + \frac{1}{2}m\omega^2\hat{x}^2 = \frac{\hat{p}^2}{2m} + V(\hat{x})$

0.2 Mittelwerte

$$\langle x\rangle = \langle\psi|x|\psi\rangle = \int_{-\infty}^{\infty} \hat{x}\, |\psi(x)|^2 \, dx$$

$$\langle p\rangle = \langle\psi|x|\psi\rangle = \int_{-\infty}^{\infty} \hat{p}\, |\psi(x)|^2 \, dx$$