FORMULA SHEET
Exam # 3

$$\Delta x \cdot \Delta p_x \geq \frac{\hbar}{2} \qquad \Delta E \cdot \Delta t \geq \frac{\hbar}{2}$$

$$\int_{-\infty}^{+\infty} |\psi|^2 dx = 1 \qquad \langle Q \rangle = \int_{-\infty}^{+\infty} \psi^* [Q] \psi \, dx$$

$$\psi_n(x) = \sqrt{\frac{2}{L}} \sin\left(\frac{n\pi}{L} x\right) \qquad E_n = \frac{n^2 \pi^2 \hbar^2}{2mL^2}$$

$$\psi_0(x) = \left(\frac{m\omega}{\pi\hbar}\right)^{1/4} e^{-m\omega x^2/2\hbar} \qquad E_n = \left(n + \frac{1}{2}\right)\hbar\omega$$

$$\Delta Q = \sqrt{\langle Q^2 \rangle - \langle Q \rangle^2}$$

$$[p_x] = \frac{\hbar}{i}\frac{\partial}{\partial x} \qquad [E] = i\hbar\frac{\partial}{\partial t} \qquad [K] = -\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2} \qquad [H] = -\frac{\hbar 2}{2m}\frac{\partial^2}{\partial x^2} + U(x)$$

$$E = \frac{\pi^2 \hbar^2}{2mL^2}\left(n_1^2 + n_2^2 + n_3^2\right)$$

$$|\vec{L}| = \sqrt{l(l+1)}\,\hbar \qquad L_z = m_l \hbar$$

$$\psi_{nlm}(r,\theta,\phi) = R_{nl}(r) Y_l^{ml}(\theta,\phi) \qquad E_n = (-13.6\,eV)\frac{Z^2}{n^2}$$

$$P(r) = r^2 |R_{nl}(r)|^2 \qquad \int_0^{\infty} P(r)dr = 1 \qquad \langle f \rangle = \int_0^{\infty} f(r) P(r) dr$$

Constant :

$$e = 1.6 \times 10^{-19}\ C \qquad m_e = 9.1 \times 10^{-31}\ kg \qquad \hbar = 1.05 \times 10^{-34}\ J \cdot s$$

$$m_p = 1.67 \times 10^{-27}\ kg$$