Cheat sheet QM

$$\frac{e}{a} = \frac{e_1}{a_1} = \ldots = E(\lambda, T) \qquad \lambda_{\max} = \frac{b}{T} \qquad P = \sigma A T^4 \qquad \overline{\varepsilon(\nu)} = \frac{\varepsilon_o}{e^{\varepsilon_o/kT} - 1} \qquad dE = \frac{h\nu}{e^{h\nu/KT} - 1}\frac{8\pi\nu^2}{c^3} V d\nu$$

$$E_n = -R\frac{1}{n^2} \qquad \lambda = \frac{h}{p} \qquad L_n = n \cdot \hbar \qquad \nu_{nm} = \frac{E_n - E_m}{h} \qquad \left(\hbar = \frac{h}{2\pi}\right) \qquad E = \frac{p^2}{2m} = \frac{\hbar^2 k^2}{2m} = \frac{\hbar^2 \pi^2}{2mL^2} n^2$$

$$-\frac{\hbar^2}{2m}\Delta\psi(\vec{r}) + V(\vec{r})\cdot\psi(\vec{r}) = E\cdot\psi(\vec{r}) \qquad -\frac{\hbar^2}{2m}\Delta\psi(\vec{r}) + V(\vec{r})\cdot\psi(\vec{r}) = -\frac{\hbar}{i}\frac{\partial}{\partial t}\psi(\vec{r}) \qquad P_{\Delta V} = \left|\Psi(\vec{r}, t)\right|^2 \Delta V$$

$$P = \int_{-\infty}^{+\infty} \left|\Psi(\vec{r}, t)\right|^2 dV = 1 \qquad E = \frac{1}{2} m\omega^2 a^2 \qquad E = \frac{1}{2} m\dot{x}^2 + \frac{1}{2} m\omega^2 x^2 \qquad E = E_o\left(n_x^2 + n_y^2 + n_z^2\right)$$

$$E_n^{SCH} = \left(n + \frac{1}{2}\right)\cdot\hbar\omega \qquad \tilde{\psi}(x, t) = \varphi(x) e^{-i\omega t} \qquad |t|^2 = \left(1 + \frac{V_o^2}{4E(V_o - E)}\sinh^2(\kappa d)\right)^{-1} \qquad \hat{p} = \frac{\hbar}{i}\frac{d}{dx}$$

$$\frac{d}{dt}\langle\hat{x}\rangle = \frac{i}{2m\hbar}\langle\psi\|[\hat{p}^2, \hat{x}]\psi\rangle = \left\langle\frac{\hat{p}}{m}\right\rangle \qquad \hat{L}_x = \frac{\hbar}{i}\left(y\frac{\partial}{\partial z} - z\frac{\partial}{\partial y}\right) \qquad \hat{x} = x\bullet \qquad \hat{p}_y = \frac{\hbar}{i}\frac{\partial}{\partial y} \qquad \hat{p}_z = \frac{\hbar}{i}\frac{\partial}{\partial z}$$

$$\hat{H}\cdot\psi(\vec{r}) = E\cdot\psi(\vec{r}) \qquad -\frac{\hbar^2}{2m}\Delta\psi(\vec{r}) + V(\vec{r})\cdot\psi(\vec{r}) = E\cdot\psi(\vec{r}) \qquad \langle A\rangle = \int_{-\infty}^{+\infty}\psi^*(x)\,\hat{A}\,\psi(x)dx$$

$$\left\langle\hat{A}^+ u\middle|v\right\rangle = \left\langle u\middle|\hat{A}v\right\rangle \qquad \psi(\vec{r}) = \sum_j c_j\varphi_j \qquad b_m = \sum_n A_{mn}c_n \qquad \Delta x\Delta p \geq \frac{\hbar}{2} \qquad [\hat{p}_x\hat{x} - \hat{x}\hat{p}_x] = \frac{\hbar}{i}\hat{1}$$

$$\langle A\rangle = \left\langle\psi\middle|\hat{A}\psi\right\rangle = \sum_n |c_n|^2 a_n \qquad \sum_n |n\rangle\langle n| = \hat{1} \qquad \frac{d}{dt}c_m = -\frac{i}{\hbar}\sum_n H_{mn}c_n \qquad \left[\hat{E}\hat{t} - \hat{t}\hat{E}\right] = -\frac{\hbar}{i}\hat{1}$$

$$\Delta A\Delta B \geq \frac{1}{2}\left|\left\langle\left[\hat{A}, \hat{B}\right]\right\rangle\right| \qquad E = \frac{\hbar^2\pi^2}{2m}\left(\frac{n_x^2}{a^2} + \frac{n_y^2}{b^2} + \frac{n_z^2}{c^2}\right) \qquad |t|^2 = \frac{16E(V_o - E)}{V_o^2}e^{-2\kappa d} \qquad \hat{L}_z = \frac{\hbar}{i}\left(x\frac{\partial}{\partial y} - y\frac{\partial}{\partial z}\right)$$

$$\frac{d}{dt}\langle\hat{p}\rangle = \frac{i}{\hbar}\langle\psi\|[V(\hat{x}), \hat{p}]\psi\rangle = -\frac{i}{\hbar}\langle\psi\|\left[\frac{\hbar}{i}\frac{\partial}{\partial x}, V(\hat{x})\right]\|\psi\rangle = \left\langle-\frac{\partial V(x)}{\partial x}\right\rangle = \langle F(x)\rangle \qquad \hat{L}_y = \frac{\hbar}{i}\left(z\frac{\partial}{\partial x} - x\frac{\partial}{\partial z}\right)$$