Some equations and formulae that might or might not be useful:

$\Delta E = h\nu$; $\nu = \frac{c}{\lambda}$; $\lambda = \frac{h}{p}$; $\tilde{\nu} = \frac{1}{\lambda}$

$h = 6.62 \times 10^{-34}$ J s; $\hbar = h/(2\pi)$; $c = 3 \times 10^8$ m/s

$E_{kinet} = K = \frac{p^2}{2m}$; $\hat{p}_x = -i\hbar\frac{\partial}{\partial x}$; $\Delta p_x \cdot \Delta x \geq \frac{\hbar}{2}$

$k_B = 1.38 \times 10^{-23}$ J K^{-1}; $N_A = 6.02 \times 10^{23}$ mol^{-1}
$R = N_A \times k_B = 8.31$ J mol^{-1} K^{-1}

$E_n = \frac{h^2 n^2}{8ma^2}$; $\Psi_n(x) = \sqrt{\frac{2}{a}}\sin\left(\frac{\pi n}{a}x\right)$

$m_e = 9.1 \times 10^{-31}$ kg; $m_p = 1.67 \times 10^{-27}$ kg
1 a.m.u. = 1.66×10^{-27} kg

$E_n = \left(n + \frac{1}{2}\right) h\nu$; $\Psi_n(x) = A_n H_n e^{-\alpha x^2/2}$

$\nu = \frac{1}{2\pi}\sqrt{\frac{k}{\mu}}$; $\alpha = \frac{\sqrt{k\mu}}{\hbar}$; $A_n = \frac{1}{\sqrt{2^n n!}}\left(\frac{\alpha}{\pi}\right)^{1/4}$

$H_0 = 1$; $H_1 = 2\sqrt{\alpha}x$; $H_2 = 2(2\alpha x^2 - 1)$
$H_3 = 4\sqrt{\alpha}x(2\alpha x^2 - 3)$
$\mu = m_1 m_2 / (m_1 + m_2)$

$E_{m_l} = \frac{\hbar^2}{2I} m_l^{\,2}$; $\Psi_{m_l}(\phi) = \frac{1}{\sqrt{2\pi}} e^{i m_l \phi}$

$\hat{l}_z = -i\hbar\frac{\partial}{\partial \phi}$; $l_z = m_l \hbar$; $I = \mu r^2$

$E_l = \frac{l(l+1)\hbar^2}{2I}$; $\Psi_{l,m_l} = Y_{l,m_l}(\theta,\phi)$;
$\left|\vec{l}\right|^2 = l(l+1)\hbar^2$; $l_z = m_l \hbar$
$E_J = \frac{J(J+1)\hbar^2}{2I} = hcBJ(J+1)$; $B = \frac{\hbar^2}{2hcI}$

$Y_{0,0}(\theta,\phi) = 1/\sqrt{4\pi}$; $Y_{1,0}(\theta,\phi) = (3/4\pi)^{1/2}\cos\theta$
$Y_{1,\pm1}(\theta,\phi) = \mp(3/8\pi)^{1/2}\sin\theta\, e^{\pm i\phi}$
$Y_{2,0}(\theta,\phi) = (5/16\pi)^{1/2}(3\cos^2\theta - 1)$
$Y_{2,\pm1}(\theta,\phi) = \mp(15/8\pi)^{1/2}\cos\theta\sin\theta\, e^{\pm i\phi}$
$Y_{2,\pm2}(\theta,\phi) = (15/32\pi)^{1/2}\sin^2\theta\, e^{\pm 2i\phi}$

$E_n = -\frac{m_e e^4}{8\varepsilon_o^2 h^2 n^2} = -\frac{\hbar^2}{2m_e a_o^2 n^2}$;
$\Psi_{n,l,m_l} = R_{n,l}(r)\, Y_{l,m_l}(\theta,\varphi)$;
$a_o = \frac{4\pi\varepsilon_o \hbar^2}{m_e e^2}$; $V = -\frac{e^2}{4\pi\varepsilon_o r}$

$e = 1.6 \times 10^{-19}$ C;
$\varepsilon_o = 8.85 \times 10^{-12}$ m^{-3} kg^{-1} s^4 A^2

$R_{1,0} = 2(1/a_o)^{3/2} e^{-r/a_o}$

$R_{2,0} = \frac{1}{\sqrt{8}}(1/a_o)^{3/2}\left(2 - \frac{r}{a_o}\right)e^{-r/2a_o}$

$R_{2,1} = \frac{1}{2\sqrt{6}}(1/a_o)^{3/2}\frac{r}{a_o}\, e^{-r/2a_o}$

$R_{3,0} = \frac{2}{81\sqrt{3}}(1/a_o)^{3/2}\left(27 - 18\frac{r}{a_o} + 2\frac{r^2}{a_o^{\,2}}\right)e^{-r/3a_o}$

$R_{3,1} = \frac{4}{81\sqrt{6}}(1/a_o)^{3/2}\left(6\frac{r}{a_o} - \frac{r^2}{a_o^{\,2}}\right)e^{-r/3a_o}$

$R_{3,2} = \frac{4}{81\sqrt{30}}(1/a_o)^{3/2}\frac{r^2}{a_o^{\,2}}\, e^{-r/3a_o}$

$\left[\hat{A},\hat{B}\right] = \hat{A}\hat{B} - \hat{B}\hat{A}$; $\Delta A \times \Delta B \geq \frac{1}{2}\left|\left\langle\left[\hat{A},\hat{B}\right]\right\rangle\right|$

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

For spin S: $\left|\vec{S}\right|^2 = S(S+1)\hbar^2$; $S_z = m_S \hbar$

For S = ½:

$\hat{S}_z\alpha = \frac{\hbar}{2}\alpha$; $\hat{S}_z\beta = -\frac{\hbar}{2}\beta$; $\left[\hat{S}_x, \hat{S}_y\right] = i\hbar\hat{S}_z$; $\hat{S}_x\alpha = \frac{\hbar}{2}\beta$; $\hat{S}_x\beta = \frac{\hbar}{2}\alpha$; $\hat{S}_y\alpha = i\frac{\hbar}{2}\beta$; $\hat{S}_y\beta = -i\frac{\hbar}{2}\alpha$

$\hat{S}^2\alpha = \frac{3\hbar^2}{4}\alpha$; $\hat{S}^2\beta = \frac{3\hbar^2}{4}\beta$; $\int\alpha^*\alpha\, d\sigma = 1$; $\int\beta^*\beta\, d\sigma = 1$; $\int\beta^*\alpha\, d\sigma = 0$; $\int\alpha^*\beta\, d\sigma = 0$

$p_i = \frac{a_i}{N} = \frac{g_i e^{-\varepsilon_i\beta}}{q}$; $q = \sum_i g_i e^{-\varepsilon_i\beta}$

$\beta = \frac{1}{k_B T}$

$q_{transl} = \frac{V}{\Lambda^3}$; $\Lambda = h\left(\frac{\beta}{2\pi m}\right)^{1/2} = \frac{h}{\sqrt{2\pi m k_B T}}$

$W = \frac{N!}{a_0! a_1! a_2! \ldots}$

$n! \approx \sqrt{2\pi}\, n^{n+\frac{1}{2}} e^{-n}$; $\ln n! \approx n\ln n - n$ (for n>>1)

$q_{rot} = \frac{1}{(\sigma)hcB\beta}$ (assuming $k_BT >> hcB$)

$q_{vibr} = \frac{1}{1-e^{-h\nu\beta}}$; $q_{vibr} \approx \frac{1}{h\nu\beta}$ (when $k_BT >> h\nu$)

$E = -N\frac{\partial}{\partial\beta}\ln q = Nk_BT^2\frac{\partial}{\partial T}\ln q$

$S = k_B \ln W$; $S = \frac{E}{T} + k_B N \ln q$

$e^{i\alpha} = \cos\alpha + i\sin\alpha$

$\cos\alpha = (e^{i\alpha} + e^{-i\alpha})/2$

$\sin\alpha = (e^{i\alpha} - e^{-i\alpha})/2i$

$\sin\alpha\sin\beta = \left[\cos(\alpha-\beta) - \cos(\alpha+\beta)\right]/2$

$\sin\alpha\cos\beta = \left[\sin(\alpha-\beta) + \sin(\alpha+\beta)\right]/2$

$\sin 2\alpha = 2\sin\alpha\cos\alpha$

$\cos 2\alpha = \cos^2\alpha - \sin^2\alpha$

$2\sin^2\alpha = 1 - \cos 2\alpha$

$2\cos^2\alpha = 1 + \cos 2\alpha$

$\cos\alpha\cos\beta = \left[\cos(\alpha-\beta) + \cos(\alpha+\beta)\right]/2$

$\int_0^a \sin^2(\frac{\pi n}{a}x)dx = \frac{a}{2}$

$\int_0^\infty e^{-ax^2}x^{2n}\, dx = \sqrt{\frac{\pi}{a}}\frac{1\cdot 3\cdot 5\cdot\ldots\cdot(2n-1)}{2^{n+1}a^n}$; (for $n \geq 1$) ; $\int_0^\infty e^{-ax^2}\, dx = \frac{1}{2}\sqrt{\frac{\pi}{a}}$; $\int_0^\infty e^{-ax^2}x^2\, dx = \frac{1}{4a}\sqrt{\frac{\pi}{a}}$

$\int_0^\infty x^n e^{-ax}dx = \frac{n!}{a^{n+1}}$; $n! = 1\cdot 2\cdot\ldots\cdot n$