# Equations Test 2 – PHYS 3313

$P(r) = r^2 R^2(r)$ $\qquad$ $|L| = \sqrt{l(l+1)}\hbar$

$\psi(r,\theta,\phi) = R(r)\Theta(\theta)\Phi(\phi)$ $\qquad$ $L_z = m_l \hbar$

$E_n = \frac{Z^2 E_1}{n^2}$ $\quad$ $E_1 = -13.6$ eV for Hydrogen $\qquad$ $\int_0^\infty u^n e^{-u} du = n!$

$$\frac{1}{r^2}\frac{d}{dr}\left(r^2 \frac{dR}{dr}\right) + \left[\frac{2m}{\hbar^2}\left(\frac{e^2}{4\pi\varepsilon_0 r} + E\right) - \frac{l(l+1)}{r^2}\right]R = 0$$

$\hbar = 1.054\times10^{-34}$ J.s $= 6.582\times10^{-16}$ eV.sec

$U_m = -\mu.B = -m_l \mu_B B$ $\qquad$ $\mu_B = \frac{e\hbar}{2m} = 9.274\times10^{-24}$ J/T $= 5.788\times10^{-5}$ eV/T

$I = \sum m_i r_i^2$

$for\ i = 2$ $\qquad$ $I = m' R^2$

$$m' = \frac{m_1 m_2}{m_1 + m_2}$$

$m_H = 1.6736\times10^{-27}\ kg = 938.79$ MeV/c$^2$ $\qquad$ $c = 3\times10^8$ m/sec

$$E_{rot} = E_J = \frac{J(J+1)\hbar^2}{2I}$$

$$\upsilon_{J\to J+1} = \frac{\hbar}{2\pi I}(J+1)$$

$E_{vib} = \left(v + \frac{1}{2}\right)h\upsilon_0 = \left(v + \frac{1}{2}\right)\hbar\sqrt{\frac{k}{m'}}$ $\qquad$ $k$ = Force constant

$n(\in) = g(\in) f(\in)$

$f_{MB} = Ae^{-\in/(kT)}$ $\qquad$ $k = 1.381\times10^{-23}$ J/K $= 8.617\times10^{-5}$ eV/K

Ideal Gas $\bar{\in} = \frac{3}{2}kT$ $\qquad$ $v_{rms} = \sqrt{\frac{3kT}{m}}$

$f_{BE} = \frac{1}{e^\alpha e^{\in/(kT)} - 1}$ $\qquad$ $f_{FD} = \frac{1}{e^\alpha e^{\in/(kT)} + 1}$

Planck Radiation Law : $\bar{\in} = \frac{h\upsilon}{e^{h\upsilon/kT} - 1}$

$\lambda_{\max} T = 2.898\times10^{-3}$ m.K

$R = e\sigma T^4$ $\qquad$ $\sigma = 5.67\times10^{-8}$ W/m$^2$ . K$^4$