ASTR120 – Cheat Sheet for Mid-Term

Constants

k = 1.38×10^{-23} Joules / Kelvin
h = 6.626×10^{-34} Joules sec
c = 2.9979×10^{8} m / sec
G = 6.67×10^{-11} m^3 / kg sec^2
$\sigma = 5.67 \times 10^{-8}$ Joules / m^2 K^4 sec
$R_{Ryd} = 1.0974 \times 10^{7}$ m^{-1}
M(Sun) = 1.99×10^{30} kg
M(Earth) = 5.976×10^{24} kg
R(Sun) = 6.96×10^{8} m
R(Earth) = 6.38×10^{6} m
L(Sun) = 3.83×10^{26} Joules / sec
1 AU = 1.496×10^{11} m
1 Angstrom = 10^{-10} m
Earth-Moon distance = 3.84×10^{8} m

Relevant Formula

$$C = 2\,\pi\,R \qquad A = \pi\,R^2 \qquad V = \frac{4}{3}\,\pi\,R^3$$

$$D = V\,t \qquad V = a\,t \qquad D = \frac{1}{2}\,a\,t^2$$

$$P^2 = A^3 \qquad V_{escape} = (\frac{2GM}{r})^{0.5} \qquad V_{circ} = (\frac{GM}{r})^{0.5}$$

$$\frac{x^2}{A^2} + \frac{y^2}{B^2} = 1 \qquad e = \frac{(A^2 - B^2)^{0.5}}{A} \qquad C = (A^2 - B^2)^{0.5}$$

$$Momentum = m\,V \qquad F = m\,a$$

$$F = \frac{G\,m_1\,m_2}{D^2} \qquad g = \frac{GM}{r^2}$$

$$\Delta a = -\frac{2GMr}{D^3} \qquad P^2 = \frac{4\pi^2}{G(M_1 + M_2)}\,A^3$$

$$E = \frac{1}{2}mV^2 \qquad \Phi = -\frac{G\,M}{r}$$

$$\frac{1}{2}\,m\,v^2 + (-\frac{G\,M\,m}{r}) = \text{constant} \qquad \text{Angular Momentum} = m\,V_\theta\,D$$

$$\text{Energy} \;=\; \frac{1}{2}mV^2 - \frac{GMm}{R} \qquad \text{Energy/sec} \;=\; E_0\, cos(lat - \delta_{sun})$$

$$HA \;=\; \text{RA} \;-\; \text{LST}$$

$$cos(Z) \;=\; sin(\phi)\, sin(\delta) \;+\; cos(\phi)\, cos(\delta)\, cos(HA)$$

$$sin(\delta) \;=\; sin(\phi)\, cos(Z) \;+\; cos(\phi)\, sin(Z)\, cos(A)$$

$$\text{Energy} \;=\; h\,\nu \qquad \nu \;=\; \frac{c}{\lambda}$$

$$B(T) \;=\; \frac{2\,h\,\nu^3}{c^2}\,\frac{1}{e^{\frac{h\nu}{kT}} \;-\; 1}$$

$$\lambda_{maximum} \;=\; \frac{2.898 \times 10^{-3}}{T}\;\; meters \qquad \text{Energy radiated} \;=\; \sigma\, T^4$$

$$\text{L} \;=\; 4\pi R^2\, \sigma\, T^4 \qquad \text{apparent luminosity} \;=\; \frac{L}{4\pi(distance)^2}$$

$$E \;=\; h\, R_{Ryd}\, c\, (1 \;-\; \frac{1}{m^2}) \qquad E(photon) \;=\; h\, R_{Ryd}\, c\, (\frac{1}{m^2} \;-\; \frac{1}{n^2})$$

$$\frac{\lambda \;-\; \lambda_{rest}}{\lambda_{rest}} \;=\; \frac{\Delta\lambda}{\lambda_{rest}} \;=\; (\frac{1 + \frac{V}{c}}{1 - \frac{V}{c}})^{\frac{1}{2}} \;-\; 1 \qquad \frac{\Delta\lambda}{\lambda_{rest}} \;=\; \frac{V}{c}$$

$$t_{us} \;=\; \frac{t_{trav}}{(1 \;-\; \frac{V^2}{c^2})^{\frac{1}{2}}} \qquad D_{us} \;=\; D_{trav}\, (1 \;-\; \frac{V^2}{c^2})^{\frac{1}{2}} \;=\; \frac{D_{trav}}{\gamma}$$

$$m \;=\; \frac{m_{rest}}{(1 \;-\; \frac{V^2}{c^2})^{\frac{1}{2}}} \;=\; \gamma\, m_{rest} \qquad E \;=\; m\, c^2$$

$$angular\; resolution \;\approx\; \frac{wavelength}{diameter\; of\; telescope}$$

$$\frac{sin\; i}{sin\; r} \;=\; \frac{n'}{n} \qquad y \;=\; A\, X^2 \;+\; B$$

$$s \;=\; f\, \frac{S}{57.296} \qquad B \;\propto\; B_o\, (\frac{A}{f})^2$$