Astronomy 1 – Introductory Astronomy
Spring 2014

Equations and constants and conversion factors for the final exam

1 kilometer (km) = 1000 meters (m)
1 year (yr) = 3.15×10^7 seconds (s)
1 day = 86,400 s
1 Watt (W) is 1 Joule (J) per second (W = J/s)
1 electron Volt (eV) = 1.60×10^{-19} J
1 Hertz (Hz) is 1 cycle/second (1/s), the fundamental unit of frequency
1 Newton (unit of force) = kg*m/s^2
1 Joule (unit of energy) = kg*m^2/s^2

$c = 3.0 \times 10^8$ m/s
$h = 6.63 \times 10^{-34}$ Js
$k = 1.38 \times 10^{-23}$ J/K
$G = 6.67 \times 10^{-11}$ Nm^2/kg^2
$\sigma = 5.67 \times 10^{-8}$ W/m^2/K^4
$m_p = 1.67 \times 10^{-27}$ kg

$H_o = 22$ km/s/Mly

1 parsec (pc) = 3.09×10^{16} m = 3.26 light years
1 A.U. = 1.5×10^{11} m
$R_{sun} = 7.0 \times 10^8$ m
$R_{Jupiter} = 7.1 \times 10^7$ m
$R_{earth} = 6.4 \times 10^6$ m
$R_{moon} = 1.7 \times 10^6$ m
$L_{sun} = 3.8 \times 10^{26}$ W
$M_{sun} = 2.0 \times 10^{30}$ kg
$M_{Jupiter} = 1.9 \times 10^{27}$ kg
$M_{earth} = 5.97 \times 10^{24}$ kg

$$\theta = \frac{57.3L}{d}$$

$$v = \frac{d}{t}$$

$$B = \frac{L}{4\pi d^2}$$

$$E = hf$$

$$\lambda f = c$$

$$\lambda_{max} = \frac{2.9X10^6 nmK}{T}$$

$$B_{surf} = \sigma T^4$$

$$\frac{v_r}{c} = \frac{\lambda_{shift} - \lambda_{rest}}{\lambda_{rest}}$$

$$F = ma$$

$$F_g = \frac{GMm}{r^2}$$

$$a_{cent} = \frac{v^2}{r}$$

$$v^2 = \frac{GM}{r}$$

$$p^2 = \frac{4\pi^2 a^3}{G(M+m)}$$

$$p^2 = \frac{a^3}{M}$$

$$M_1 r_1 = m_2 r_2$$

$$P = nkT$$

$$\rho = mn$$

$$p = \frac{1}{d}$$

$$L = 4\pi R^2 \sigma T^4$$

$$E = mc^2$$

$$A_{sphere} = 4\pi R^2$$

$$V_{sphere} = \frac{4}{3}\pi R^3$$

$$C_{circle} = 2\pi R$$

$$PE = mgh$$

$$KE = \frac{1}{2}mv^2$$

fraction of light blocked = $(R_p/R_s)^2$

$$M_1 v_1 = m_2 v_2$$

$$v_p = \frac{2\pi a_p}{p_p}$$

$$M_p = \frac{M_s v_s P_p}{2\pi a_p}$$

density = mass/volume

signal = brightness*exposure time*collecting area*sensitivity

telescope collecting area = $\pi(D/2)^2$

$$\frac{current\ amount}{original\ amount} = \left(\frac{1}{2}\right)^{t/t_{half}}$$

$$M_{enclosed} = \frac{rv^2}{G}$$

$$v = H_o d$$

age = $1/H_o$

redshift, $z = \frac{v}{c} = \frac{\lambda_{observed} - \lambda_{rest}}{\lambda_{rest}}$

$$1 + z = \frac{\lambda_{observed}}{\lambda_{rest}}$$