



## POSSIBLY USEFUL FORMULAE AND CONSTANTS.

$$P^2 = \frac{4\pi^2}{G(M+m)} a^3 \quad F = \frac{G M_1 M_2}{r^2} \quad P_{yr}^2 = \left(\frac{M_{sun}}{M}\right) a_{AU}^3 \quad \frac{v}{c} = \frac{\Delta \lambda}{\lambda} \quad f \lambda = c$$

$$\text{angular diameter}^{(o)} = \frac{360}{2\pi} \frac{\text{diameter}}{\text{distance}} \quad \text{diffraction limit ('')} = 250,000 \frac{\lambda}{D}$$

$$\text{circumference (circle)} = 2\pi r \quad \text{Perihelion} = a(1-e) \quad \text{Aphelion} = a(1+e)$$

$$\text{Vol (sphere)} = \frac{4}{3}\pi r^3 \quad \text{Surface area (sphere)} = 4\pi r^2 \quad \text{Area (circle)} = \pi r^2$$

$$\text{intensity} = \frac{S_o}{d_{AU}^2} \quad \text{density} = M/V \quad \frac{r}{R} = \sqrt{\Delta I}$$

$$F = \sigma T^4 \quad \lambda_{max} (nm) = \frac{2,900,000}{T_K} \quad T_K = T_C - 273$$

$$M_{star} V_{star} = m_{planet} v_{planet} \quad T = 280 K \times \sqrt[4]{\frac{1 - \text{albedo}}{d_{AU}^2}} \quad m_{pl} = \frac{M_{star} V_{star} P}{2\pi a}$$

## Constants

$$G = 6.67 \times 10^{-11} \text{ m}^3/(\text{kg s}^2) \quad c = 3 \times 10^8 \text{ m/s} \quad S_o = 1300 \text{ W/m}^2$$

$$1 \text{ m} = 100 \text{ cm} \quad 1 \text{ cm} = 10 \text{ mm} \quad 1 \text{ m} = 1,000,000 \text{ microns}$$

$$1 \text{ nm} = 10^{-9} \text{ m} \quad 1 \text{ AU} = 1.5 \times 10^8 \text{ km} \quad 1 \text{ pc} = 3.09 \times 10^{13} \text{ m} = 206265 \text{ au}$$

$$\text{Mass (Earth)} = 6.0 \times 10^{24} \text{ kg} \quad \text{Mass (Sun)} = 2.0 \times 10^{30} \text{ kg}$$

$$\text{Masses (relative to Earth)} : \text{Jupiter} = 317, \text{ Saturn} = 95, \text{ Earth's Moon} = 1/81$$

$$\text{Radii: Earth} = 6400 \text{ km} \quad \text{Mars} = 3400 \text{ km} \quad \text{Uranus} = 25,600 \text{ km} \quad \text{Sun} = 700,000 \text{ km}$$

$$\text{Radii (relative to Earth)} : \text{Venus} = 0.95, \text{ Mars} = 0.53, \text{ Jupiter} = 11, \text{ Uranus} = 4.0$$

$$\text{Semimajor axes (AU): Mercury} = 0.39, \text{ Venus} = 0.71, \text{ Earth} = 1.0, \text{ Mars} = 1.52,$$

$$\text{Jupiter} = 5.20, \text{ Saturn} = 9.5, \text{ Uranus} = 19.2, \text{ Neptune} = 30.0, \text{ Pluto} = 39.4$$

$$\text{Moon (around Earth)} = 0.0026 \text{ au}$$

$$\text{Wavelengths (approximate): visible} = 500 \text{ nm}, \text{ IR} = 0.01 \text{ mm}, \text{ X-ray} = 1 \text{ nm}, \text{ Radio} = 10 \text{ m}$$

$$\text{Approximate densities (kg/m}^3\text{)} : \text{rock} = 3000, \text{ metal} = 5000, \text{ water} = 1000$$

$$\text{Earth: } 5500, \text{ Jupiter: } 1300, \text{ Ganymede: } 2000$$

$$\text{Orbital periods (days) of : Mimas} = 0.0942 \quad \text{Enceladus} = 1.37 \quad \text{Titan} = 15.9 \quad \text{Io} = 1.8$$

$$\text{Obliquity of the ecliptic: } 23.5 \text{ degrees. } 1 \text{ degree} = 60 \text{ arcmin. } 1 \text{ arcmin} = 60 \text{ arcsec.}$$