

## 102 ASTR: General Astronomy Some Important Equations and Relations

Chapter	Equations and Relationships
Spectra + Telescopes	<ul style="list-style-type: none"> <li>• <math>1 \text{ AU} = 1.5 \times 10^{11} \text{ m}</math></li> <li>• <math>1 \text{ light year} = 9.461 \times 10^{15} \text{ m}</math></li> <li>• <math>1 \text{ pc} = 3.26 \text{ ly}</math></li> <li>• <math>1 \text{ pc} = 206265 \text{ AU}</math></li> <li>• <math>1 \text{ arcsec} = 4.85 \times 10^{-6} \text{ rad}</math></li> <li>• <math>D(\text{pc}) = \frac{1}{\theta(\text{arcsec})}</math></li> <li>• <math>M_{\text{max}} = (11.8)D</math> , <math>M_{\text{min}} = (1.18)D</math></li> <li>• <math>P = \frac{D^2}{0.49}</math></li> <li>• <math>R = \frac{11.58}{D}</math></li> <li>• <math>M = F/f</math></li> </ul>
Kepler's and Gravitational Laws	<ul style="list-style-type: none"> <li>• <math>r_p = a(1 - e)</math> , <math>r_a = a(1 + e)</math></li> <li>• <math>p^2 = a^3</math></li> <li>• <math>F = G \frac{Mm}{r^2}</math></li> <li>• <math>g = \frac{m}{R^2} g_e</math> , <math>\rho = \frac{m}{R^3} \rho_e</math>,</li> <li>• where <math>\rho_e \approx 5.52 \text{ g/cm}^3</math></li> <li>• <math>W = \frac{g}{g_e} W_e</math></li> <li>• <math>V = 30\sqrt{M} \sqrt{\left(\frac{2}{r} - \frac{1}{a}\right)}</math></li> <li>• <math>m = M \left(\frac{a_2}{a_1}\right)^3 \left(\frac{P_1}{P_2}\right)^2</math></li> <li>• <math>V_{es} = 11.2 \sqrt{\frac{m}{R}}</math></li> </ul>

### Important Constants:

Mass of the Sun:  $m_{\odot} = 1.99 \times 10^{30} \text{ kg}$

Average radius of the Sun:  $R_{\odot} = 6.96 \times 10^8 \text{ m}$

Mass of the Earth:  $m_e = 5.9736 \times 10^{24} \text{ kg}$

Average radius of the Earth:  $R_e = 6.376 \times 10^6 \text{ m}$

Gravitational acceleration  $g = 9.8 \text{ m/s}^2$

Gravitational constant:  $G = 6.67 \times 10^{-11} \text{ m}^3/\text{kg} \cdot \text{s}^2$