Astronomy Equations

Chapter 1 Measuring Distance

$parallax = \frac{360}{2\pi} \text{ x } \frac{baseline}{distance}$	$diameter = distance \text{ x } \frac{angular\ diameter}{57.3}$	$distance = baseline\ x\ \frac{57.3}{parallax}$

Chapter 2 Copernican Revolution

$p^2 (in\ earth\ years) = a^3 (in\ Au's)$	$F = \frac{Gm_1m_2}{r^2}$	$F = ma$
$p^2 (in\ earth\ years) = \frac{a^3 (in\ Au's)}{M_{total} (in\ solar\ units)}$	$a = \frac{v^2}{r}$	$v_{escape} = \sqrt{2\frac{GM}{r}}$
$V = \sqrt{\frac{GM}{r}}$		

Chapter 3 Radiation

$frequency = \frac{1}{period}$	$Velocity = \frac{wavelength}{period}$	$Velocity = wavelength\ x\ frequency$
$Wavelength\ of\ peak\ emission\ \alpha\ \frac{1}{temp}$	$total\ energy\ emission\ \alpha\ temp^4$	$\lambda_{max} = \frac{2.9mm}{T}$
$F = \sigma T^4$	$L = 4\pi\sigma R^2 T^4$ $OR\ luminosity\ \alpha\ radius(solar\ radii)^2 x\ tempurature(units\ of\ 5800K)^4$	$\frac{\text{Apparent wavelength}}{\text{true wavelength}} = \frac{\text{true frequency}}{\text{apparent frequency}}$
$\frac{\text{Apparent wavelength}}{\text{true wavelength}} = 1 + \frac{\text{recession velocity}}{\text{wave speed}}$	$\frac{\text{Apparent wavelength}}{\text{true wavelength}} = \frac{\text{recession velocity}}{\text{wave speed}}$	$\frac{\text{change in wavelength}}{\text{true wavelength}} = \frac{\text{recession velocity}}{\text{wavespeed}}$
$\frac{\text{recession velocity}}{\text{wavespeed,c}} = \frac{\text{change in wavelength}}{\text{true wavelength}}$		

Chapter 4 Spectroscopy

$E = hf$	$E_n = 13.6(1 - \frac{1}{n^2})(ev)$

Chapter 5 Telescopes

$Angular\ resolution(arcsec) = 0.25\frac{wavlength(\mu m)}{diameter(m)}$

Chapter 6 The solar system

$Linear\ momentum = mass\ x\ velocity$	$Angular\ momentum\ \alpha\ mass\ x\ rotation\ rate\ x\ radius^2$

Astronomy Equations

Chapter 7 Earth

Scattering by dust $\alpha \frac{1}{wavelength}$	*Scattering by molecules* $\alpha \frac{1}{wavelength^4}$	*Fraction of material remaining* $= \frac{1}{2}^{\frac{t}{T}}$

Chapter 8 The Moon and Mercury

Avg. molecular speed$(\frac{km}{s}) = 0.157\sqrt{\frac{gas\ temp.(k)}{molecular\ mass}}$	*Escape speed*$(\frac{km}{s}) = 11.2\sqrt{\frac{mass\ of\ body}{radius\ of\ mass}}$

Chapter 16 The Sun

$\frac{\text{Solar luminosity}}{\text{solar mass}} = 2 \text{ x } 10^{-4} \frac{\text{W}}{\text{kg.}}$	$E = mc^2$

Chapter 17 The Sun

Distance(parsecs) $= \frac{1}{parallax(arcseconds)}$	*Apparent brightness(energy flux)* $\alpha \frac{luminosity}{distance^2}$	*Apparent magnitude – absolute magnitude* $= 5log_{10}\frac{distance}{10pc}$
L(solar units) $= 10^{-(M-4.83)/2.5}$	$R = \frac{\sqrt{L}}{T^2}$	*Stellar lifetime* $\alpha \frac{stellar\ mass}{stellar\ luminosity}$
Stellar lifetime $\alpha \frac{1}{(stellar\ mass)^3}$		

Chapter 22 Neutron Stars and Black Holes

Deflection(arc sec.) $= 1.75\frac{M(solar\ masses)}{R(solar\ radii)}$

Chapter 23 The Milky Way Galaxy

Total mass (solar masses) $= \frac{orbital\ size\ (Au)^3}{orbital\ period\ (years)^3}$

Chapter 24 Galaxies

Recessional velocity $= H_0$ *x distance*	*Redshift* $= \frac{observered\ wave\ length - true\ wavelength}{true\ wavelength} = \frac{recessional\ velocity\ (v)}{speed\ of\ light\ (c)}$

Chapter 25 Galaxies and Dark Matter

Time $= \frac{distance}{velocity} = \frac{1}{H_0}$	$\frac{1\text{ Joule}}{(3 \text{ x } 10^8 \frac{\text{m}}{\text{s}})^2} = 1.1\text{x}10^{-17}\text{kg}$

Chapter 27 The Early Universe

$C = \lambda f$