

STELLAR PROPERTY FORMULAS:

Distance: $D = \frac{1}{p}$

Luminosity: $L_{star} = (9.94 \times 10^6) \pi \frac{Flux}{p^2}$

Temperature: $T_{star} = \frac{2,897,768.5}{\lambda_{peak}}$

Stellar Radius: $R_{star} = \frac{L^{\frac{1}{2}}}{(\frac{T}{5800})^4}$

Mass: $M_{star} = L^{\frac{1}{3.5}}$

Frostline: $FL \text{ (in AU)} = 131 \left(\frac{L}{16 \pi \sigma T_{ice}^4} \right)^{\frac{1}{2}}$ where $T_{ice} = 150 \text{ K}$

Conversion Factors:

$1 M_E = 5.97 \times 10^{27} g$

$1 R_E = 6.37 \times 10^8 cm$

$1 year = 365 days$

$1 L_s = 3.827 \times 10^{26} Watts$

$1 AU = 1.496 \times 10^{11} meters$

$\sigma = 5.67 \times 10^{-8} W m^{-2} K^{-4}$

Densities:

Gas: $0.5 \frac{g}{cm^3}$

Ice: $1.0 \frac{g}{cm^3}$

Rock: $3.0 \frac{g}{cm^3}$

Metal: $8.0 \frac{g}{cm^3}$

PLANETARY PROPERTY FORMULAS:

Orbital radius: $A = (MP^2)^{\frac{1}{3}}$

Planet Radius in Earth radii: $R_p = \left(\frac{\%drop}{100} \right)^{\frac{1}{2}} \times R_{star} \times 109$

Planet Radius in Jupiter radii: $R_p = 0.0892 \times R_p \text{ (in Earth radii)}$

Doppler velocity: $v = \left(\frac{\Delta \lambda}{\lambda_{rest}} \right) * (300,000,000)$

Planet mass: $M_p \text{ (in Earth masses)} = (v^2 * orbital radius * M_{star})^{\frac{1}{2}} * 11.177$

$M_p \text{ (in Jupiter masses)} = (v^2 * orbital radius * M_{star})^{\frac{1}{2}} * 0.0352$

Volume: $V = \frac{4}{3} \pi R_p^3$ with R_p in cm

Density : $Density = \frac{M_p}{Volume}$ with M_p in grams

Flux: $Flux = \frac{L}{(4 \pi (orbital radius^2))}$ with L in Watts and Orbital Radius in meters

Effective Temperature: $T_{eff} = \left(\frac{Flux (1-albedo)}{4 \sigma} \right)^{0.25}$

Planet Classes:

Gas Giant:

$den. < 1 \frac{g}{cm^3}$

Ice Giant:

$1 \frac{g}{cm^3} < den. > 3 \frac{g}{cm^3}$

Terrestrial:

$den. > 3 \frac{g}{cm^3}$

Age Dating: $Time = \frac{\tau \ln \left(\frac{D}{P} + 1 \right)}{\ln(2)}$

$^{238}U-^{206}Pb = 4.47 \text{ billion years}$

$^{235}U-^{207}Pb = 704 \text{ million years}$

$^{40}K-^{40}Ar = 1.25 \text{ billion years}$

$^{87}Rb-^{87}Sr = 49 \text{ billion years}$

$^{14}C-^{14}N = 5.730 \text{ years}$

Greenhouse Effect Strengths:

Absorption:	Add:
None (0%)	+ 0 K
Weak (0 - 40%)	+10 K
Moderate (40 - 60%)	+30 K
Strong (60 - 100%)	+100 K