**Astrophysics Design Problem**

You see two stars in the night sky that have the exact same brightness. Choose a star #1 calculate properties so you can design a star #2 so that it has the same brightness.

|  |  |  |
| --- | --- | --- |
| 1 light year (ly) = 9.46 × 1015 m | 1 parsec (pc) = 3.26 ly | σ = 5.67 × 10-8 W m-2 K-4 |
| $$d (parsec)=\frac{1}{p (arcsecond)}$$ | $$L=σAT^{4}$$ | $$b=\frac{L}{4πd^{2}}$$ | $$λ\_{max}T=2.9×10^{-3}$$ |

**Star #1** (circle one)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Sirius B** | **Altair** | **61 Cygni A** | **Barnard’s Star** |
|  | A bright white spot next to a much smaller white dot on a dark background. | Star Facts: Altair - | 61 Cygni - Binary Star System | 61 Cygni is a famous binary … | Flickr | Star Facts: Barnard's Star (Gliese 699) - |
| Parallax Angle | 0.375 arcseconds | 0.198 arcseconds | 0.294 arcseconds | 0.543 arcseconds |
| Max Wavelength | 271 nm | 362 nm | 690 nm | 1035 nm |
| Stellar Radius | 9.94 × 106 m | 1.20 × 109 m | 3.82 × 108 m | 6.29 × 107 m |

|  |  |  |  |
| --- | --- | --- | --- |
| Temperature | Luminosity | Distance | Brightness |
|  |  |  |  |

**Star #2** (designed by you 😊)

Determine the luminosity of a main sequence star that is farther away from your calculated star but has the exact same brightness. The distance of this star must be based on your birthday. (for example, a birthday of August 3rd would be written 8.03 × 1018 m). Estimate the temperature by locating its position within the main sequence of the H-R Diagram (Lsun = 3.828 × 1026 W).



|  |  |
| --- | --- |
| Star Name |  |
| Distance [m] |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| m | m | **.** | d | d | × 1018 m |

 |
| Luminosity [W] |  |
| Temperature [K] |  |

