**Familiar Stars**

On the next two pages are two lists of stars. The first is a list of the brightest stars in the sky. The second is a list of the nearest stars – the stars within about 12 light years of the Sun. The tables give the distances to the stars in light years, as well as their apparent and absolute magnitudes and temperatures.

a.Which star listed is the brightest intrinsically? Which is the intrinsically faintest?

b. Which star is furthest from the Sun? Why does it appear so bright in our sky?

c. Why does Alpha Centauri appear so bright in our sky?

Astronomers use such information to compare the properties of stars using ratios. Bigger stars are brighter, hotter stars are brighter, and closer stars are brighter. The luminosity (L) is proportional to the square of the star’s radius (R) and the fourth power of its temperature (T), and inversely proportional to the square of its distance (D). When comparing two stars, some of these parameters are equal (e.g. two stars at the same distance), so the equation simplifies.

$$\frac{L\_{1}}{L\_{2}}=\frac{R\_{1}^{2}}{R\_{2}^{2}}\frac{T\_{1}^{4}}{T\_{2}^{4}}\frac{D\_{2}^{2}}{D\_{1}^{2}}$$

d. Betelgeuse and Rigel are at similar distances in the constellation Orion. Which has the larger radius?

e. Sirius and UV Ceti are at similar distances, but Sirius has an intrinsic brightness that is 4 x 105 times brighter than UV Ceti’s. What is the ratio of their radii?

f. Of the two stars Hadar and Acrux, which has the larger radius? Describe your reasoning.

**The Brightest Stars in the Sky**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Distance (light years)** | **Apparent Magnitude** | **Absolute Magnitude** | Temperature |
| Sun | - | -26.72 | 4.8 | 5800 |
| Sirius | 8.6 | -1.46 | 1.4 | 9600 |
| Canopus | 74 | -0.72 | -2.5 | 7600 |
| Rigil Kentaurus | 4.3 | -0.27 | 4.4 | 5800 |
| Arcturus | 34 | -0.04 | 0.2 | 4700 |
| Vega | 25 | 0.03 | 0.6 | 9900 |
| Capella | 41 | 0.08 | 0.4 | 5700 |
| Rigel | ~1400 | 0.12 | -8.1 | 11,000 |
| Procyon | 11.4 | 0.38 | 2.6 | 6600 |
| Achernar | 69 | 0.46 | -1.3 | 22,000 |
| Betelgeuse | ~1400 | 0.50  | -7.2 | 3300 |
| Hadar | 320 | 0.61  | -4.4 | 25,000 |
| Acrux | 510 | 0.76 | -4.6 | 26,000 |
| Altair | 16 | 0.77 | 2.3 | 8100 |
| Aldebaran | 60 | 0.85 | -0.3 | 4100 |
| Antares | ~520 | 0.96  | -5.2 | 3300 |
| Spica | 220 | 0.98  | -3.2 | 2600 |
| Pollux | 40 | 1.14 | 0.7 | 4900 |

**The NEAREST STARS – Stars within about 12 light years of the Sun**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | Distance (light years) | **Apparent****Magnitude** | **Absolute Magnitude** | **Temperature** |
| Proxima Centauri | 4.24 | 11.10 | 15.53 | 2800 |
| Alpha Centauri A | 4.35 | -0.01 | 4.37 | 5800 |
| Alpha Centauri B | 4.35 | 1.34 | 5.72 | 4900 |
| Barnard's Star | 5.98 | 9.54 | 13.23 | 2800 |
| Wolf 359 | 7.78 | 13.46 | 16.57 | 2700 |
| Lalande 21185 | 8.26 | 7.48 | 10.46 | 3300 |
| Sirius A  | 8.55 | -1.46 | 1.45 | 9900 |
| Sirius B  | 8.55 | 8.44 | 11.34 | 12,000 |
| Luyten 726-8A | 8.73 | 12.56 | 15.42 | 2700 |
| UV Ceti | 8.73 | 12.52 | 15.38 | 2600 |
| Ross 154 | 9.45 | 10.45 | 13.14 | 3000 |
| Ross 248 | 10.32 | 12.29 | 14.79 | 2799 |
| Epsilon Eridani | 10.52 | 3.73 | 6.19 | 5084 |
| Lacaille 9352 | 10.74 | 7.34 | 9.75 | 3626 |
| Ross 128 | 10.92 | 11.13 | 13.51 | 3180 |
| EZ Aquarii | 11.27 | 13.33 | 15.64 | 2650 |
| Procyon A | 11.27 | 0.38 | 2.66 | 6530 |
| Procyon B | 11.27 | 10.70 | 12.98 | 7740 |
| 61 Cygni A | 11.40 | 5.21 | 7.49 | 4526 |
| 61 Cygni B | 11.40 | 6.03 | 8.31 | 4077 |
| Gliese 725 | 11.53 | 8.90 | 11.16 | 3680 |
| Gliese 15 | 11.62 | 8.08 | 10.32 | 3730 |
| Epsilon Indi | 11.82 | 4.69 | 6.89 | 4630 |