

Question:

(b) What is the luminosity L of Altair in units of the solar luminosity L_{\odot} ? (4 points)

Solution:

We can use the formula:

$$f \propto \frac{L}{d^2} \text{ or } f = C \times \frac{L}{d^2}, \text{ where } C \text{ is a constant.}$$

So we can write:

$$\frac{f(\text{Altair})}{f(\text{Sun})} = \frac{L(\text{Altair})}{L(\text{Sun})} \times \frac{d^2(\text{Sun})}{d^2(\text{Altair})}$$

$$\frac{L(\text{Altair})}{L(\text{Sun})} = \frac{f(\text{Altair})}{f(\text{Sun})} \times \frac{d^2(\text{Altair})}{d^2(\text{Sun})}$$

$$L(\text{Altair}) = \frac{9.4 \times 10^{-12} \times (5 \text{ pc})^2}{\left(\frac{1}{206265 \text{ pc}}\right)^2} L(\text{Sun}) = 10L(\text{Sun})$$

Answer: 10 L_{\odot}