

Answer on Question #61085-- Physics -- Astronomy -- Astrophysics

After about 1 billion year, the radius of a star is expected to increase by 100 times its present radius. If its temperature becomes half of what it is today, determine the change in its absolute magnitude.

We have luminosity according Stefan-Boltzmann law

$$L_0 = 4\pi R^2 \sigma T^4$$

After 1 billion years

$$T' = \frac{T}{2}$$

$$R' = 100R$$

$$L' = 4\pi (100R)^2 \sigma \left(\frac{T}{2}\right)^4 = 625L_0$$

Change of absolute magnitude

$$\Delta M = -2.5 \log_{10} \frac{L'}{L} = -6.99 m$$