How long will a 5MΘ star burn hydrogen as fuel, given that the Sun will do so for about 10^{10} years?

Solution:

The dependence of the lifetime on the star mass:

$$t = t_\Theta \times \left(\frac{M}{M_\Theta}\right)^{-3}$$

For the star with $M=5M_\Theta$.

For the sun $t_\Theta = 10^{10}$ years.

The final expression:

$$t = 10^{10} years \times \left(\frac{5M_\Theta}{M_\Theta}\right)^{-3} = 10^{10} \times 5^{-3} = 8 \cdot 10^{7} years$$

Answer: the star will burn its fuel in $8 \cdot 10^7$ years