(12.2) What amount (kg) of hydrogen is consumed per second in the fusion reaction (12.6 in Table 12.2) by the sun? The solar constant (energy flux at earth's orbit) is 135.3 mW/cm2 and the earth's average distance from the center of the sun is 149599000 km.

$N_A := 6.022137 \cdot 10^{23} \cdot mole^{-1}$ $M_H := 1.008 \cdot gm \cdot mole^{-1}$ $MeV := 1.6021773 \cdot 10^{-13} \cdot joule$

$k_{solar} := 135.3 \cdot 10^{-3} \cdot watt \cdot cm^{-2}$ $k_{solar} = 1.353 \cdot 10^{3} \cdot m^{-2} \cdot watt$ $r_{orbit} := 149599000 \cdot km$

$Area := 4 \cdot \pi \cdot r_{orbit}^{2}$ $P_{tot} := k_{solar} \cdot Area$ $P_{tot} = 3.805 \cdot 10^{26} \cdot watt$

Reaction 12.6: $Q_{175} := 26.7 \cdot MeV$ Per He formed

$x := \frac{90}{100}$ 90% of total energy from 17.5

$Rate := 4 \cdot \frac{P_{tot} \cdot x}{Q_{175}}$ $Rate = 3.202 \cdot 10^{38} \cdot sec^{-1}$ 4 H consumed per He formed.

$Massrate := \frac{Rate}{N_A} \cdot M_H$ $Massrate = 5.36 \cdot 10^{11} \cdot kg \cdot sec^{-1}$

hydrogen consumed in reaction 12.6.