Astr 423, Spring 2019

Homework 6: nuclear reactions

1 You may find this surprising

Calculate the energy generation rate per unit mass in the Sun, in ergs per gram per second. Compare with the case of a human being with a mass of 80 kg producing 2000 kilocalories per day. What is a calorie? Check in the section about units in Astrophysical Quantities.

Compare also with the average rate of energy production per unit mass in a typical car.

2 Energy production

Using the table of atomic mass excesses, calculate the energy in MeV generated in the production of an alpha particle (He nucleus) by the fusion of 4 protons in the solar core.

What mass of He per second must be generated to produce the solar luminosity?

Finally, calculate the energy in MeV generated in the production of a ^{12}C nucleus by the fusion of 3 alpha particles.