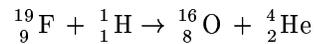
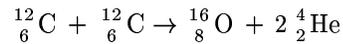
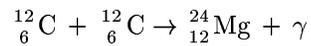


Exercise	1	2	3	Total
100%	5	5	7	17
Points				

Name:
Stellar Astrophysics
 Homework - Lecture 15 - Energy production
Due date: November 1st

1 Endothermic and exothermic reactions

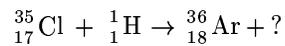
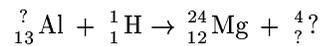
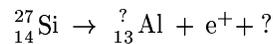
Calculate the amount of energy released or absorbed in the following reactions (express your answers in MeV):



The mass of ${}_{6}^{12}\text{C}$ is 12.0000 u, by definition, and the masses of ${}_{8}^{16}\text{O}$, ${}_{9}^{19}\text{F}$, and ${}_{12}^{24}\text{Mg}$ are 15.99491 u, 18.99840 u, and 23.98504 u, respectively. Are these reactions exothermic or endothermic?

2 Nuclear reactions puzzle

Complete the following reaction sequences. Be sure to include any necessary leptons.



3 Hydrogen burning lifetime

Estimate the hydrogen burning lifetimes of stars on the lower and upper ends of the main sequence. The lower end of the main sequence occurs near $0.085 M_{\odot}$, with $\log_{10} T_{eff} = 3.438$ and $\log_{10}(L/L_{\odot}) = -3.297$, while the upper end of the main sequence occurs at approximately $90 M_{\odot}$ with $\log_{10} T_{eff} = 4.722$ and

$\log_{10}(L/L_{\odot}) = 6.045$. Assume that the $0.085 M_{\odot}$ star is entirely convective so that, through convective mixing, all of its hydrogen becomes available for burning rather than just the inner 10%.

Look into Chapter 10 in Carroll & Ostlie in case you have problems with the exercises.