

- 1/ Draw a sketch of the proton-proton chain.
- 2/ What nuclear reactions are possible when combining two ^2H nuclei?
- 3/ Why is ^{135}Xe such a problem in fission reactors? And why isn't it a problem for fission bombs?
- 4/ In a nuclear fission reaction, ^{235}U decays to ^{79}Br and a second element and a neutron. What is the second element?
[^{155}La]
- 5/ In a nuclear fission reaction, ^{239}Pu decays to ^{97}Zr and a second element and four neutrons. What is the second element?
[^{138}Xe]
- 6/ Given the average energy per fission of ^{235}U is 200MeV, calculate the mass of pure ^{235}U required to run a 350 MW nuclear power plant for 140 days.
[51.6kg]
- 7/ A lump of ^{235}U of mass 18.78kg undergoes a fission explosion with 42% efficiency. Each fission event produces 200MeV of energy. Calculate the energy of this explosion in kilotons TNT.
[155 kilotons TNT]
- 8/ Calculate the luminosity of a star of 6.3×10^{58} protons with a reaction rate of 5.6×10^{-18} /s per proton where each reaction yields 19.12 MeV. What is the main sequence lifetime of this star?
[$1.08 \times 10^{30}\text{W}$, 5.6 billion years]