Tareas 4 – Física Nuclear

28 de Febrero 2025

1. Iron-55 decays by electron capture. What are its end products?

2. For each of the following reactions, identify the particle "X":

$$^{23}\mathrm{Mg} \rightarrow\ e^- + \nu_e + X$$

$$X \rightarrow\ ^{186}\mathrm{Os} + \alpha$$

$$^{11}\mathrm{C} \rightarrow\ e^+ + \nu_e + X$$

$$^{12}\mathrm{N} \rightarrow\ ^{12}\mathrm{C} + \nu_e + X$$

$$p + X \rightarrow\ ^{2}\mathrm{H} + e^+ + \nu_e$$

3. Calculate the kinetic energy of an alpha particle from the decay of ^{239}Pu.

4. Why does the proton cycle dominates over the carbon cycle at lower temperature?

5. The solar mass is $M_{\mathrm{sun}} = 2 \times 10^{30}$ kg. The chemical composition of the solar surface is 71 % hydrogen, 27 % helium and 2 % heavier elements (expressed as parts by mass). The luminosity of the sun is 4×10^{26} W. (a) How much hydrogen is converted into helium every second? (b) How much mass does the sun lose in the same period? (c) What fraction of the original hydrogen content has been converted into helium since the creation of the sun (5×10^9 yrs)? (d) How large was the loss of mass in the same period? (e) Model calculations indicate that the sun will burn hydrogen at a similar rate for a further 5×10^9 years. A shortage of hydrogen will then force it into a red giant state. Motivate this time scale.