Introductory Astronomy

Week 4: Stars

Clip 3: Solar Energy

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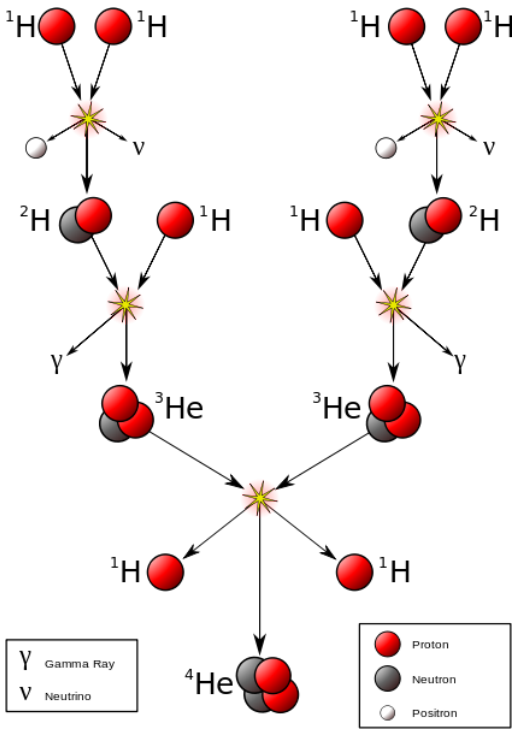
Solar Energy

- p-p chain is source of Solar Energy

$$p^+ + p^+ \rightarrow d^+ + e^+ + \nu_e$$
$$d^+ + p^+ \rightarrow {}^3\mathrm{He}^{2+}$$
$${}^3\mathrm{He}^{2+} + {}^3\mathrm{He}^{2+} \rightarrow {}^4\mathrm{He}^{2+} + p^+ + p^+$$

$$4p^+ \rightarrow \alpha^{2+} + 2e^+ + 2\nu_e + 4.3 \times 10^{-12}\ \mathrm{J}$$



- Sun could last 10^{11} y

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What it Takes

- To initiate fusion, protons must overcome electric repulsion
- One proton must inverse β decay before highly unstable $^{2}\mathrm{He}$ breaks up
- Requires temperatures of $10^{6}\,\mathrm{K}$ - only in core
- Inefficient because weak process required

Credits

- pp simulator: University of Nebraska-Lincoln Astronomy Education Group http://astro.unl.edu/
- pp Chain: Wikimedia/Borb http://en.wikipedia.org/wiki/File:FusionintheSun.svg

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