2   Nuclear Fusion

Reading

"Nuclear Fusion," by Reynolds
"How the Sun Shines," by John Bahcall
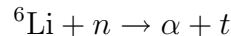"Nuclear Fusion," Hyperphysics
Optional reading
"Introduction to Particle Physics," by Reynolds
"Fusion as an Energy Source," by WJ Nuttall

Problems

1. How much energy is released in the third generation fusion reaction?

2. How much energy is released in the following tritium-breeding reaction?

$$^{6}\text{Li} + n \rightarrow \alpha + t$$

3. It is claimed that one cubic mile of seawater has enough deuterium, and hence enough stored nuclear energy, to equal to the world's entire energy reserves. Is this true? Assume a first generation d-d reaction.

4. Determine one possible fission reaction, making sure that you conserve both neutrons and protons. That is, fill in the reaction

$$n + {}^{235}\text{U} \rightarrow 3n +$$

Report

Write a 2-3 page report (typed, double-spaced, 12-point font, 1-inch margins) on one of the following topics:

- Nuclear fusion in stars older than the Sun (or in the Sun as it ages)

- Technologies for inducing d-t fusion in laboratories on Earth

- Helium-3 on the moon as nuclear fuel

- Nuclear fission reactors — how they work

- Radioactive elements — α emission

You must quote your references. In addition to online sources (give the name of the page and the URL), you must have at least one book reference from the ERAU library. The physics section is on the third floor under "QC" in the Library of Congress catalog system. The astronomy section is filed under "QB", also on the third floor.

Due Dates

- Fri 7/9 — Problems 1, 2

- Wed 7/14 — Problem 3

- Thu 7/15 — Problem 4

- Tue 7/19 — Report