CNO Cycle Activity

Helpful websites:

Wikipedia CNO Cycle, http://en.wikipedia.org/wiki/CNO_cycle

The CNO cycle is described by the reactions in the diagram below. At first this appears very complicated, it becomes much easier to follow if we understand the symbols that chemists and physicists utilize to describe these reactions, as we did with the proton-proton chain.

$$
\begin{aligned}
{}^{12}C + {}^{1}H &\rightarrow {}^{13}N + \gamma \\
{}^{13}N &\rightarrow {}^{13}C + e^{+} + \nu_e \\
{}^{13}C + {}^{1}H &\rightarrow {}^{14}N + \gamma \\
{}^{14}N + {}^{1}H &\rightarrow {}^{15}O + \gamma \\
{}^{15}O &\rightarrow {}^{15}N + e^{+} + \nu_e \\
{}^{15}N + {}^{1}H &\rightarrow {}^{12}C + {}^{4}He
\end{aligned}
$$

Source: http://burro.cwru.edu/Academics/Astr221/StarPhys/cno1.gif

^{1}H - hydrogen, 1 proton + 0 neutron

^{4}He - helium-4, 2 protons + 2 neutrons

^{12}C - carbon-12, 6 protons, 6 neutrons

^{13}C - carbon-13, 6 protons, 7 neutrons

^{13}N - nitrogen-13, 7 protons + 6 neutrons

^{14}N - nitrogen-14, 7 protons + 7 neutrons

^{15}N - nitrogen-15, 7 protons + 8 neutrons

^{15}O - oxygen-15, 8 protons + 7 neutrons

e^{+} - positron

ν_e - electron neutrino

γ - gamma ray photon

1. Access and experiment with the CNO Cycle Simulator (source: Astronomy Education at the University of Nebraska-Lincoln)

2. What is the CNO cycle?

3. What percent of a high mass star is in the forms of carbon, nitrogen, and oxygen?

4. What role do they play in the fusion process in high mass stars?

5. Select one of the reactions in the diagram above and "translate" it into words.