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$$\frac{dL}{dr} = 4\pi r^2 \rho(r) \epsilon(r)$$

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$$\epsilon_{\text{ppI}} = \frac{2.4 \times 10^4 \rho X^2 e^{-3.38/T_9}}{T_9^{2/3}}$$

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$$\frac{dT(r)}{dr} = -\frac{3k_R \rho}{64\pi r^2 \sigma T^3} L(r)$$

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$$\epsilon_{\text{CNO}} = \frac{4.4 \times 10^{25} \rho X Z e^{-15.2/T_9}}{T_9^{2/3}}$$

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$$\epsilon_{3\alpha} = (50.9 \text{ W/kg}) \rho^2 Y^3 T_8^{-3} f_{3\alpha} e^{-44.027/T_8}$$

$$\nabla_{\text{rad}} > \nabla_{\text{adi}} = \left(\frac{\gamma-1}{\gamma} \right)$$

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$$k_e = \frac{n_e \sigma T}{\rho}$$

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Stellar Structure

$$\frac{dP}{dr} = -\rho(r)g(r)$$

$$\frac{dM}{dr} = \rho(r)4\pi r^2$$

$$P_{gas} = \frac{\rho}{\mu m_H} k_B T$$

$$P_{rad} = \frac{4\sigma_{SB}}{3c} T^4$$

$$P_{nr} = \frac{h^2}{5m} \left(\frac{3}{8\pi}\right)^{2/3} n^{5/3}$$

$$P_{rel} = \frac{hc}{4} \left(\frac{3}{8\pi}\right)^{1/3} n^{4/3}$$