$$P = nkT$$

$$\frac{P_{\rm in}}{P_{\rm out}} = \frac{n_{\rm in}T_{\rm in}}{n_{\rm out}T_{\rm out}}$$

$$\text{speed of sound } c_s = \sqrt{\frac{2kT}{m}}$$

$$\text{time to double in size } t_{\rm double} = \frac{R_{\rm initial}}{c_s}$$

$$\text{time to expand fully } t_{\rm expand} = \frac{R_{\rm final}}{c_s}$$

$$\text{lifetime on main sequence} \sim \frac{\text{mass of fuel}}{\text{rate of burning fuel}} \sim \frac{M}{L}$$