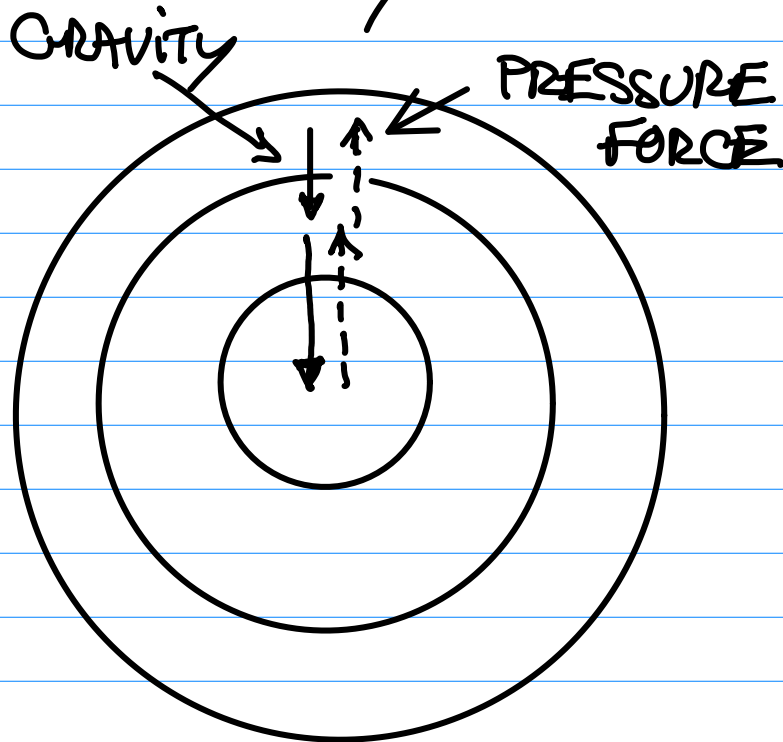


HIGH MASS STARS: $M > 8M_{\odot}$

ONCE THE STAR BECOMES THE MAIN SEQUENCE STAR IT IS IN HYDROSTATIC EQUILIBRIUM:

THE FORCE OF GRAVITY WHICH IS COMPRESSING THE STAR IS BALANCED BY THE OUTWARD GAS PRESSURE EVERYWHERE WITHIN THE STAR.



THE PRESSURE AND THE TEMPERATURE INCREASE WITH DEPTH

HYDROSTATIC EQUILIBRIUM IS MAINTAINED THROUGH PRESSURE - TEMPERATURE

THERMOSTAT: IF THE RATE OF THE HYDROGEN

FUSION IN THE CORE GOES UP, THE PRESSURE AND TEMPERATURE WILL INCREASE. INCREASED PRESSURE PUSHES OUT THE TOP LAYERS AND THE STAR EXPANDS AND COOLS. THE REACTION RATE REDUCES.

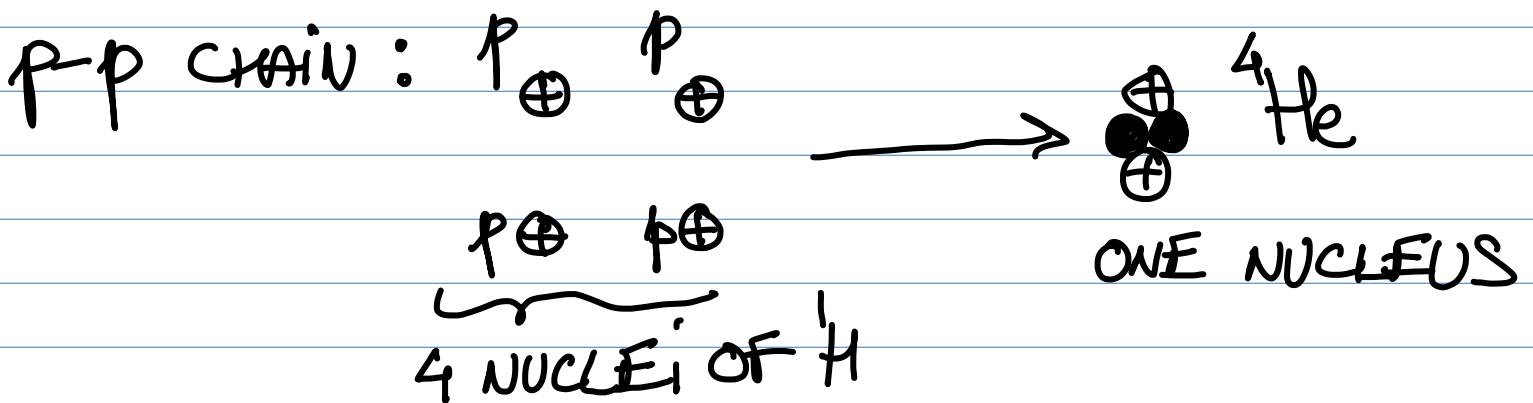
ANALOGY: COVERED POT OF BOILING WATER



HOWEVER, THE LUMINOSITY OF MAIN SEQUENCE STARS INCREASES SLOWLY OVER TIME (THE PRESENT LUMINOSITY OF THE SUN $L_{\odot} = 4 \times 10^{26}$ WATTS IS ABOUT 30% HIGHER THAN WHAT IT WAS WHEN IT BECAME A MAIN SEQUENCE STAR SOME 4.6 BILLION YEARS AGO). WHY DOES THE LUMINOSITY INCREASE OVER TIME?

$$P = n T$$

↑ PRESSURE ↑ PARTICLE NUMBER DENSITY (NUMBER OF NUCLEI PER UNIT VOLUME) ← TEMPERATURE



TO MAINTAIN THE SAME PRESSURE (P), IN ORDER TO SUPPORT THE TOP LAYERS, WITH DECREASING n THE TEMPERATURE (T) HAS TO INCREASE OVER TIME. AS T INCREASES THE RATE OF FUSION REACTIONS INCREASES PRODUCING MORE ENERGY PER UNIT TIME (I.E. THE LUMINOSITY L INCREASES). IT TURNS OUT THAT IN ABOUT 0.5-1 BILLION YEARS THE LUMINOSITY OF THE SUN WOULD BE HIGH ENOUGH THAT ALL

WATER ON EARTH WOULD EVAPORATE (THE LIFE ON EARTH WOULD NOT BE POSSIBLE)

LIFE STORY OF A MEDIUM MASS STAR:

