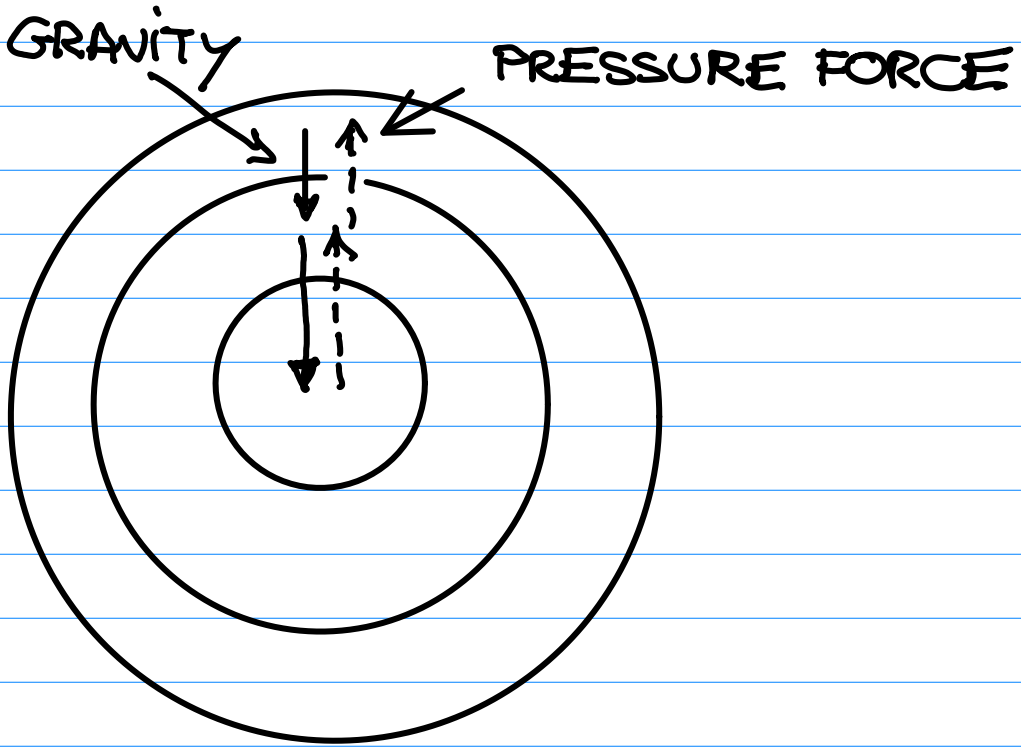
ONCE THE STAR BECOMES THE MAIN SEQUENCE STAR IT IS IN HYDROSTATIC EQUILIBRIUM: THE FORCE OF GRAVITY WHICH IS COMPRESSING THE STAR IS BALANCED BY THE OUTWARD GAS PRESSURE EVERYWHERE WITHIN THE STAR



THE PRESSURE AND TEMPERATURE INCREASE WITH DEPTH.

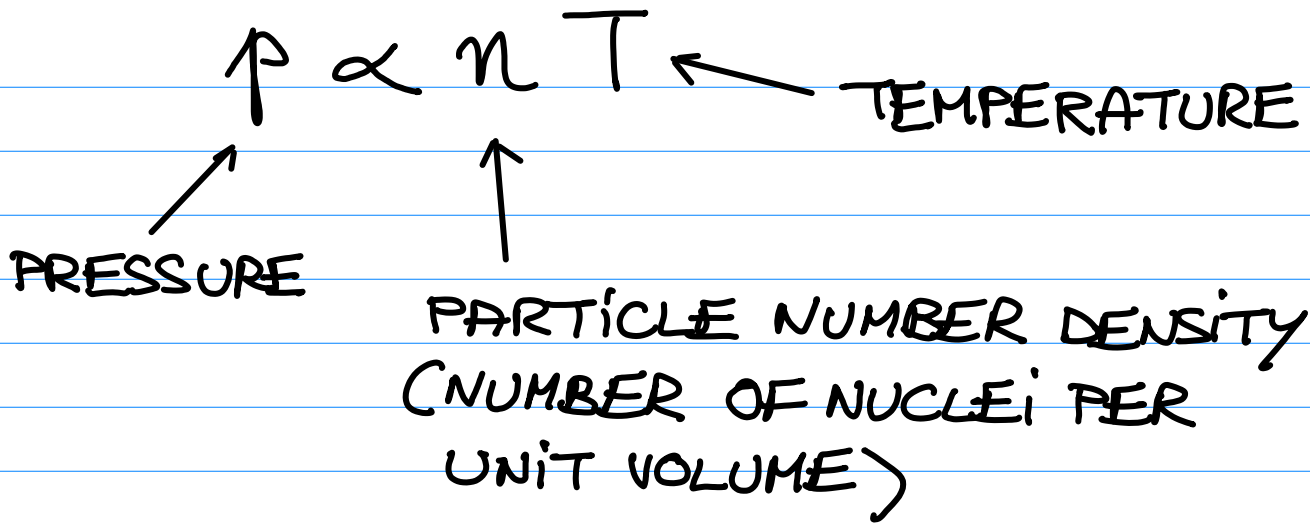
THE HYDROSTATIC EQUILIBRIUM IS MAINTAINED THROUGH THE PRESSURE-TEMPERATURE

THERMOSTAT: IF THE RATE OF THE HYDROGEN FUSION IN THE CORE GOES UP, THE TEMPERATURE AND PRESSURE WILL INCREASE. THE INCREASED PRESSURE IN THE CORE CAUSES IT TO EXPAND AND COOL. AS A RESULT THE REACTION RATE REDUCES.

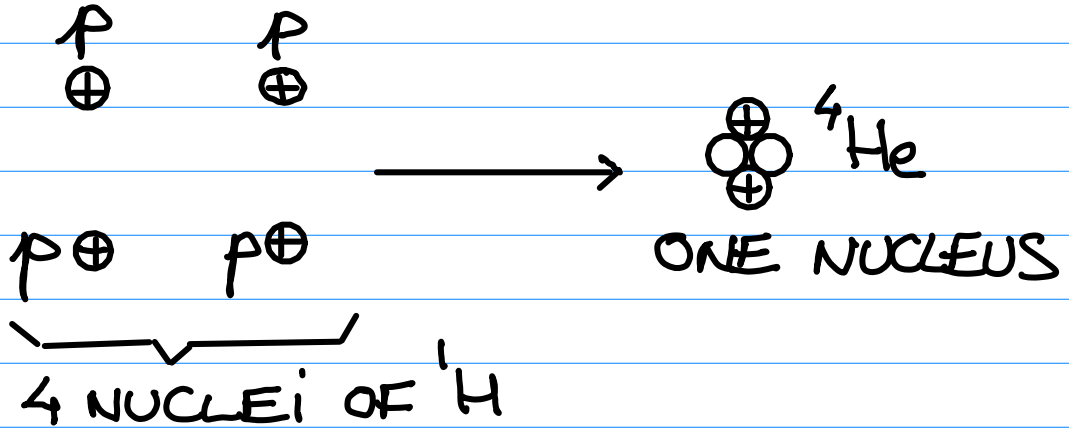
ANALOGY: A COVERED POT OF BOILING WATER

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 SEQUNCE STAR SOME 4.6 BILLION YEARS AGO.

WHY DOES LUMINOSITY INCREASE OVER TIME?



p-p-CHAIN:



AND n REDUCES OVER TIME.

TO MAINTAIN THE SAME PRESSURE (p) NEED TO SUPPORT THE TOP LAYERS, 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). IN ABOUT 0.5-1 BILLION YEARS THE LUMINOSITY OF THE SUN WILL BE HIGH ENOUGH THAT ALL WATER ON

EARTH WOULD EVAPORATE (THE LIFE ON EARTH WILL BECOME INPOSIBLE).

LIFE STORY OF A MEDIUM MASS STAR ($0.5M_\odot < M < 8M_\odot$):