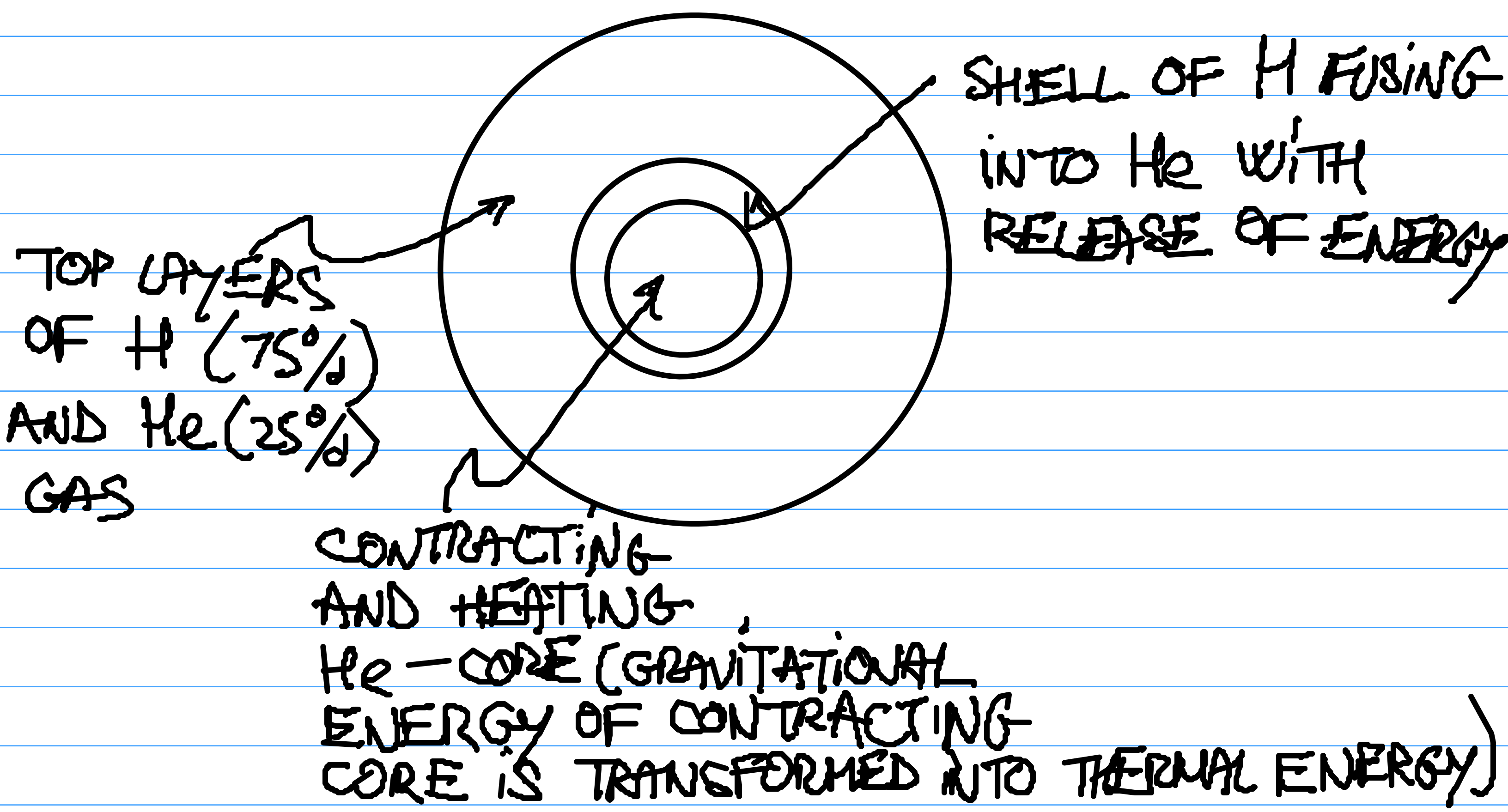
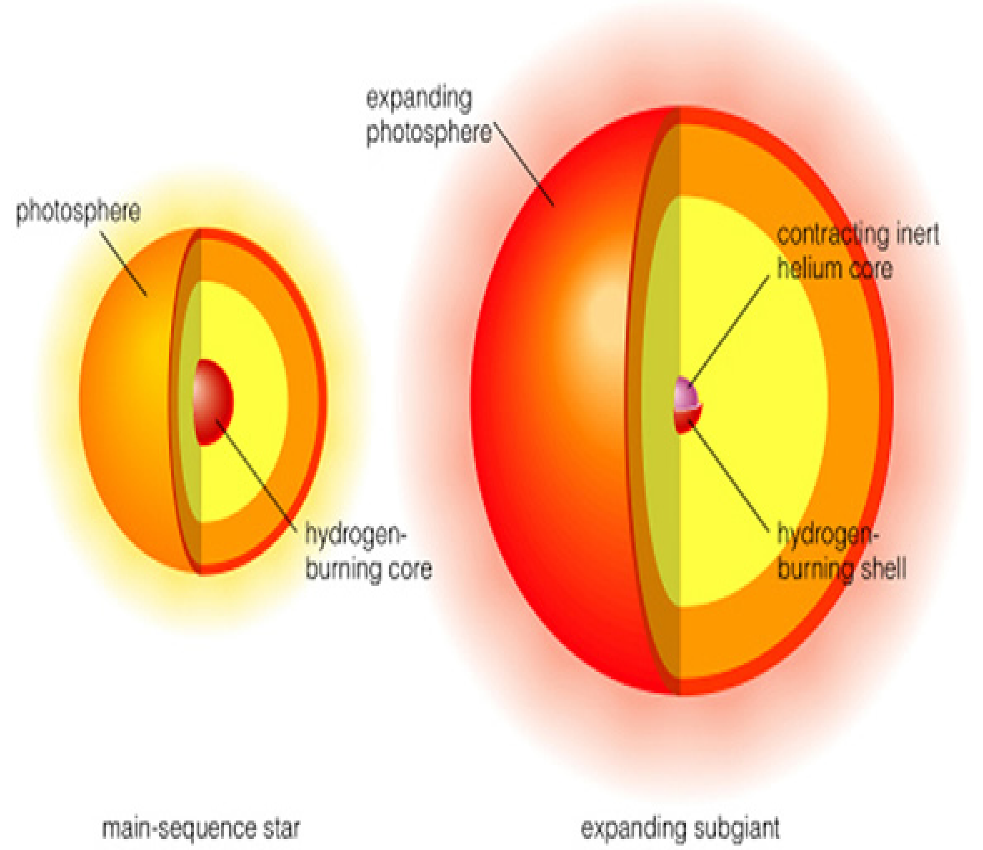
THE FINAL STAGES IN THE LIFE OF A SUN-LIKE STAR

EVENTUALLY ALL OF THE HYDROGEN IN THE CORE IS FUSED INTO HELIUM (IN ABOUT 4.5–5 BILLION YEARS).

THE MASS OF THE SUN IS NOT HIGH ENOUGH TO IGNITE THE He-CORE.
He-CORE CONTRACTS UNDER ITS GRAVITY AND HEATS UP





THE TEMPERATURE OF CONTRACTING He-CORE IS VERY HIGH AND THE RATE OF HYDROGEN FUSION IN THE SHELL IS VERY HIGH -; IT IS HIGHER THAN THE RATE OF FUSION IN H-CORE DURING THE MAIN SEQUENCE STAGE. THE HIGH RATE OF ENERGY PRODUCTION RESULTS IN HIGH GAS PRESSURE WHICH PUSHES OUT THE TOP LAYERS AND THE STAR EXPANDS. AS A RESULT THE SURFACE TEMPERATURE DROPS BECAUSE THE SURFACE IS AT THE GREATER DISTANCE FROM THE ENERGY PRODUCING REGION.

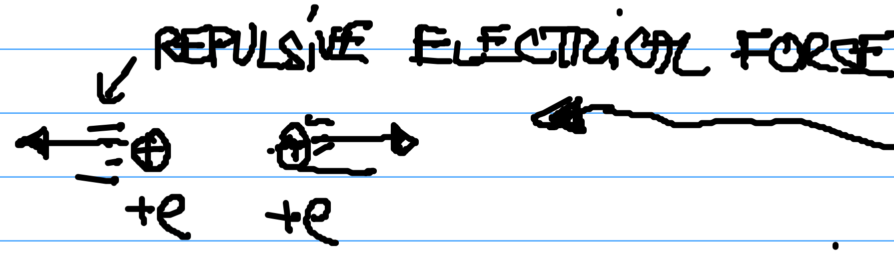
THE NET RESULT:

- THE LUMINOSITY INCREASES (MORE ENERGY IS PRODUCED)
- THE SURFACE TEMPERATURE DROPS AND ITS COLOUR CHANGES TO ORANGE-RED

THE STAR LIKE OUR SUN IS IN THE FIRST RED GIANT STAGE (IT WOULD EXPAND TO THE SIZE OF THE ORBIT OF MERCURY; THIS STAGE WOULD LAST FOR 1 BILLION YEARS)

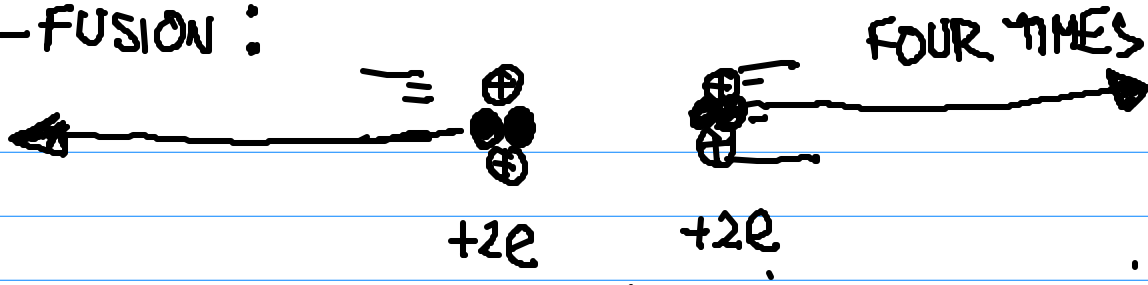
WHEN THE TEMPERATURE OF SHRINKING AND HEATING He-CORE REACHES 100 MILLION K THE ^{4}He NUCLEI WILL START FUSING INTO ^{12}C.

H-FUSION :



TEMPERATURE OF 10 MILLION K IS NEEDED FOR THEM TO GET CLOSE ENOUGH SO THAT THEY CAN BE FUSED BY THE STRONG, BUT SHORT RANGED, NUCLEAR FORCE

He-FUSION:



THE FORCE OF ELECTRICAL REPULSION BETWEEN THE NUCLEI IS PROPORTIONAL TO THE PRODUCT OF THEIR CHARGES. THUS, HIGHER TEMPERATURE, (AT LEAST 100 MILLION K) IS NEEDED TO FUSE ^{4}He INTO ^{12}C.

FUSION OF ^{4}He INTO ^{12}C IS ACHIEVED VIA <u>TRIPLE-ALPHA PROCESS</u>